MULTILATERAL
COOPERATION CENTER
FOR DEVELOPMENT FINANCE

Beyond Compliance:

Unlocking Sustainable Infrastructure Financing Through IFI Environmental and Social Standards



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Foreword

Reliable, sustainable infrastructure is essential to expanding access to services, connecting markets, and supporting inclusive growth. In developing and emerging economies, a persistent challenge is preparing projects that can attract financing and deliver lasting development benefits. Managing environmental and social (E&S) risks and impacts is integral to project preparation. Opportunities to avoid adverse impacts are often greatest early in the preparation process, when alternative sites, designs, and technologies can still be considered.

Beyond Compliance: Unlocking Sustainable Infrastructure Financing Through IFI Environmental and Social Standards examines how integrating E&S standards into the preparation of infrastructure projects supported by multilateral development banks can strengthen financing readiness. The report draws on a literature review, a comparison of E&S frameworks, nine main case studies, and two supporting comparative cases. Across the cases, E&S analysis informed design choices, helped identify the resources and institutional capacity needed to implement mitigation measures, informed the allocation of E&S responsibilities through enforceable project agreements, and supported coordination among financiers and implementing institutions.

For governments and development partners, the findings underscore the importance of funding E&S assessments early enough to inform project design and translating their findings into costed mitigation measures, clear responsibilities, and enforceable commitments. In operations involving multiple financiers, common E&S frameworks can align due diligence, supervision, and reporting, reducing duplication and easing clients' administrative burden. During implementation, continued engagement with affected communities, effective grievance mechanisms, and monitoring can help project teams assess E&S performance and address outstanding impacts.

The report's case evidence illustrates how these measures can strengthen financing readiness by giving financiers a clearer basis for assessing project risks and arrangements for managing them. Bankability also depends on sound technical preparation, financial viability, and credible commercial and institutional arrangements.

For the Multilateral Cooperation Center for Development Finance (MCDF), these findings reinforce the importance of partnering with International Financial Institutions (IFI) and beneficiary countries to integrate E&S considerations early in the preparation of connectivity infrastructure projects. Early integration can strengthen financing readiness and contribute to project bankability. It is my hope that this report informs their efforts to strengthen project preparation and improve E&S outcomes throughout the project cycle.



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Abbreviations

AC	alternating current
ADB	Asian Development Bank
AFD	Agence Française de Développement
AfDB	African Development Bank
AIIB	Asian Infrastructure Investment Bank
BDA	Benban Developers Association
BMU	German Federal Ministry for the Environment
BMZ	German Federal Ministry for Economic Cooperation and Development
CAPEX	capital expenditure
CEXIM	Export-Import Bank of China
COD	commercial operation date
CSP	concentrated solar power
DFC	United States International Development Finance Corporation
DFI	development finance institution
DKTI	German Climate Technology Initiative
E&S	environmental and social
EADB	East African Development Bank
EBRD	European Bank for Reconstruction and Development
ECA	export credit agency
EIB	European Investment Bank
EIRR	economic internal rate of return
EKF	Danish Export Credit Agency
EPC	engineering, procurement, and construction
ERR	economic rate of return
ESAP	Environmental and Social Action Plan

ESF	Environmental and Social Framework
ESG	environmental, social, and governance
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESP	Environmental and Social Policy
ESRS	Environmental and Social Review Summary
EU	European Union
EV	electric vehicle
FI	financial intermediary
FiT	feed-in tariff
FMO	Dutch Entrepreneurial Development Bank
FPIC	free, prior, and informed consent
GFF	Green Financing Framework
GHG	greenhouse gas
GRM	grievance redress mechanism
HSE	health, safety, and environment
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion and Results Report
IDA	International Development Association
IDB	Inter-American Development Bank
IDC	Industrial Development Corporation
IFC	International Finance Corporation
IFI	International Financial Institution
IRR	internal rate of return
KEMP	Kenya Electricity Modernization Project
KETRACO	Kenya Electricity Transmission Company Limited

KfW	Kreditanstalt für Wiederaufbau
km	kilometer
KOSAP	Kenya Off-Grid Solar Access Project
kV	kilovolt
LAP	Land Acquisition Plan
Lao PDR	Lao People's Democratic Republic
LARAP	Land Acquisition and Resettlement Action Plan
MAD	Moroccan dirham
MASEN	Moroccan Agency for Sustainable Energy
MCDF	Multilateral Cooperation Center for Development Finance
MDB	multilateral development bank
MIGA	Multilateral Investment Guarantee Agency
MW	megawatt
NDB	New Development Bank
NETAP	Nigeria Electricity Transmission Project
NIF	Neighbourhood Investment Facility
NPV	net present value
NREA	New and Renewable Energy Authority
NTPC	Nam Theun 2 Power Company
O&M	operations and maintenance
OECD	Organisation for Economic Co-operation and Development
OHS	occupational health and safety
OMVG	Gambia River Basin Development Organization
OPIC	Overseas Private Investment Corporation
PAD	Project Appraisal Document
PPA	power purchase agreement
PPF	Project Preparation Facility

PPP	public-private partnership
PRG	political risk guarantee
PV	photovoltaic
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SDP	Social Development Plan
SESA	Strategic Environmental and Social Assessment
SEP	Stakeholder Engagement Plan
US¢	United States cent
WMPA	Watershed Management and Protection Authority

Executive Summary

Environmental and social (E&S) integration can strengthen infrastructure project preparation when it informs decisions that shape design, implementation, and risk allocation. Its contribution to financing readiness depends on whether identified risks are addressed through credible management arrangements supported by clearly defined roles and responsibilities, adequate budget allocations, realistic timelines, and monitoring provisions. This report examines that contribution in infrastructure projects supported by multilateral development banks (MDBs), including its implications for bankability and the conditions for private capital mobilization.

The analysis draws on a literature review, a comparative overview of MDB E&S frameworks, nine main case studies, and two supporting comparative cases. It adopts a qualitative, comparative approach to identify recurring mechanisms through which E&S integration can contribute to project development and financing readiness. The cases are illustrative rather than statistically representative. Quantitative information from individual cases provides context on the projects examined. It is not pooled to estimate the independent effects of E&S integration on financing, delays, costs, or investment returns.

The report's central argument is that the value of E&S integration extends beyond compliance with safeguard requirements. While compliance remains essential, E&S risk assessment and management can also serve as practical tools for project preparation by informing design, strengthening implementation readiness, clarifying risk allocation, and supporting stakeholder engagement and investor confidence. These contributions can improve financing readiness and bankability, helping to create conditions conducive to private capital mobilization. Going beyond compliance means using E&S assessment and management to inform decisions that materially affect how a project is designed, financed, or implemented, such as selecting its location, changing a route to avoid sensitive habitats, budgeting for resettlement, or assigning responsibility for mitigation measures.

Why E&S Integration Matters for Infrastructure Financing

Mobilizing private capital for infrastructure remains a central challenge in emerging markets and developing economies. Despite substantial global liquidity and growing investor interest in infrastructure assets, many projects fail to reach financial close or encounter delays, restructuring, or underperformance during implementation.

A recurring constraint is the limited availability of projects that are sufficiently prepared and structured, with risks adequately managed, to meet investor requirements. Weak upstream preparation, particularly in relation to environmental and social risks, can undermine project credibility, delay implementation, increase costs, and weaken investor confidence.

The timing of E&S integration matters. When E&S considerations are addressed after key project parameters have been defined, risks associated with land acquisition, involuntary resettlement, stakeholder opposition, biodiversity impacts, or environmental compliance can become more difficult and costly to mitigate and manage.

The report's central focus is therefore on the early stages of project preparation, when decisions about design, sequencing, and structuring remain flexible. It examines how E&S integration can inform these decisions, clarify risks, strengthen implementation and financing readiness, and contribute to bankability.

Core Findings

Finding 1: E&S integration can strengthen project readiness when identified E&S risks and impacts, analysis of alternatives, and proposed mitigation measures inform key design and implementation decisions while alternatives remain feasible.

Across the case studies, E&S integration contributed to project preparation when identified risks and impacts, analysis of alternatives, and proposed mitigation measures informed the selection of sites, routes, or technologies; the sequencing of land acquisition, resettlement, and civil works; or the allocation of mitigation responsibilities within implementation and financing arrangements. Early integration allows the mitigation hierarchy (avoidance, minimization, restoration, and, where applicable, compensation or offsets) to inform project choices before financial commitments constrain feasible alternatives. Once decisions on project location, alignment, technology, or footprint are finalized, the scope to avoid adverse E&S impacts through alternative designs may narrow, increasing reliance on measures to minimize impacts and address residual impacts during implementation. The timing of E&S integration should therefore be assessed by whether risk and impact assessment, analysis of alternatives, and application of the mitigation hierarchy informed these decisions while feasible alternatives remained available. The completion date of an assessment alone does not establish that such influence occurred.

Finding 2: Clear identification of material E&S risks and impacts can support financing readiness when mitigation measures are adequately resourced and supported by defined responsibilities, implementation schedules, and monitoring arrangements.

The case evidence suggests that E&S integration can reduce uncertainty for sponsors, lenders, investors, and public authorities by clarifying material risks and impacts, the measures required to address them, and the capacity of responsible parties to implement those measures. Credible arrangements translate assessment conclusions into specific commitments in E&S management plans and, where applicable, procurement documents, contracts, and financing agreements. These commitments require adequate budgets, clearly assigned responsibilities, schedules linked to relevant project activities, and monitoring and reporting provisions that enable corrective action. Financing readiness therefore depends on evidence that these arrangements are in place and appropriate to the project's stage of development. Completing an E&S risk assessment or management plan alone does not demonstrate implementation capacity, effective mitigation, or satisfactory E&S outcomes.

Finding 3: E&S integration can contribute to financing readiness through its influence on project design, implementation readiness, enforceable risk-management obligations, and coordination among project participants.

The comparative analysis identifies four recurring mechanisms: design influence, implementation readiness, risk allocation and enforceability, and coordination and signaling. Design influence concerns how identified risks and impacts, analysis of alternatives, and the mitigation hierarchy inform project location, alignment, technology, and footprint. Implementation readiness concerns the availability of resources, institutional capacity, and arrangements to implement mitigation measures, engage stakeholders, and monitor performance at the relevant project stage. Risk allocation and enforceability concern how E&S obligations are assigned to responsible parties and incorporated into procurement documents, contracts, and financing agreements, with provisions for monitoring compliance and requiring corrective action. Coordination and signaling concern how agreed E&S requirements, coordinated due diligence, and consistent monitoring and reporting arrangements establish a shared understanding of material risks and impacts, mitigation commitments, and implementation responsibilities among project participants.

These arrangements provide financiers with information to assess the adequacy of proposed mitigation measures, the capacity of responsible parties, and outstanding actions relevant to financing readiness. Together, these mechanisms provide a qualitative framework for examining contributions to financing readiness and bankability under different project conditions. They may operate together and do not constitute a numerical score or ranking of cases.

Finding 4: Common E&S frameworks can strengthen coordination by aligning risk assessment, mitigation requirements, and monitoring arrangements across financiers and implementing institutions.

Several cases illustrate how common E&S frameworks, standards, and management systems can provide a shared basis for due diligence, agreement on mitigation measures, and supervision. Alignment can reduce duplication in assessments, clarify applicable requirements and institutional responsibilities, and support consistent monitoring and reporting across financiers, developers, and implementing institutions. These arrangements were particularly relevant in multi-lender projects, blended finance structures, and programmatic investment approaches.

For financial intermediaries and funds, E&S integration also operates through E&S management systems that govern screening and risk categorization, assessment of proposed investments, incorporation of E&S conditions into investment agreements, portfolio monitoring, and corrective action. The existence of these systems indicates that institutional arrangements for managing E&S risks are in place; it does not, by itself, demonstrate effective implementation of mitigation measures or satisfactory E&S outcomes at individual project sites.

Finding 5: E&S integration can support financing readiness and bankability when combined with sound technical preparation, financial viability, and credible commercial and institutional arrangements.

Private investment decisions reflect market conditions, financing structures, government commitment, guarantees, and sponsor capability, among other factors. E&S integration can inform these decisions by clarifying material risks and impacts, defining mitigation obligations and associated costs, and establishing responsibilities and arrangements for implementation, monitoring, and corrective action. These contributions can reduce uncertainty about E&S liabilities and the capacity of responsible parties to meet their obligations. Bankability also depends on financial viability, revenue arrangements, sponsor capability, and the allocation of commercial risks.

Financing readiness, bankability, and private capital mobilization are therefore related but distinct: readiness concerns whether the information and arrangements needed to assess and manage project risks are in place; bankability concerns whether the project meets financiers' requirements; and mobilization concerns the amount of private financing actually secured. The evidence identifies documented E&S contributions and plausible pathways to financing outcomes but does not establish that E&S integration independently causes private capital mobilization.

Practical Implications

The findings point to five practical steps for MDBs, project preparation facilities, and development partners seeking to strengthen financing readiness and project outcomes through upstream E&S integration.

1. Integrate E&S considerations while project alternatives remain feasible

Risk and impact assessment, analysis of alternatives, and application of the mitigation hierarchy should inform decisions on project location, alignment, technology, and footprint before these parameters are finalized. Preparation schedules should allow E&S analysis to inform engineering design and implementation planning, with documented consideration of alternatives and the measures adopted to avoid or minimize adverse impacts.

2. Translate E&S commitments into enforceable project obligations

Mitigation commitments should be reflected, as applicable, in procurement documents, project agreements, construction contracts, and financing agreements. These instruments should define responsible parties, required resources, implementation milestones, and monitoring and reporting obligations, together with provisions for addressing noncompliance and requiring corrective action. Management plans should provide a clear operational basis for meeting these obligations

3. Establish implementation readiness before the relevant activities proceed

Readiness should be assessed against the E&S requirements associated with each project stage. This includes confirming that budgets, qualified personnel, institutional responsibilities, and implementation schedules are adequate for the measures concerned. Compensation and relocation assistance should precede displacement, while livelihood restoration measures should be initiated at the appropriate stage and supported through ongoing implementation and monitoring. Readiness to implement agreed measures should be distinguished from verified implementation and demonstrated effectiveness.

4. Align due diligence, supervision, and reporting across project participants

In multi-lender and programmatic operations, financiers and implementing institutions should agree on applicable E&S requirements, assessment needs, mitigation commitments, and responsibilities. Coordinated due diligence and compatible supervision and reporting arrangements can reduce duplication and support consistent oversight. Common frameworks should retain sufficient flexibility to address the risks, impacts, and implementation conditions of individual projects.

5. Match E&S effort to risk and document implementation and outcomes

The scope and depth of E&S assessment and management should reflect the nature, significance, and complexity of project risks and impacts. To strengthen learning, project records should document how E&S analysis informed decisions and distinguish among proposed measures, contractual commitments, verified implementation, and demonstrated outcomes. Monitoring should track unresolved impacts, the effectiveness of mitigation measures, and the completion and effectiveness of corrective actions.

Outlook

The findings point to a practical priority: integrate E&S assessment and management early enough to inform project design, and translate mitigation commitments into adequately funded and enforceable implementation arrangements with clearly assigned responsibilities. Together with coordinated due diligence and oversight, these measures can strengthen financing readiness and contribute to bankability alongside sound technical, financial, and commercial preparation.

The analysis does not establish an independent effect on private capital mobilization. The contribution of E&S integration depends on how commitments are implemented and monitored throughout the project life cycle. Financial close is a milestone; delivering satisfactory outcomes for affected people, workers, and ecosystems requires sustained implementation and corrective action.

1 / Introduction



Chapter 1: Introduction

The World Bank estimates that achieving development goals in emerging economies requires annual infrastructure spending equivalent to about 4.5% of gross domestic product, or roughly $1.5 trillion per year.[i,ii] This financing far exceeds what public resources alone can provide, particularly in the context of constrained fiscal space, rising debt burdens, higher borrowing costs, and post-pandemic economic pressures.[iii] The literature reinforces the scale of this challenge: multilateral development banks (MDBs) and development finance institutions (DFIs) mobilized $71.1 billion for middle- and low-income countries in 2022, while broader studies point to persistent Sustainable Development Goal and infrastructure financing gaps that require more effective use of public finance, MDB and DFI resources, blended finance, and private capital. Bridging the infrastructure financing gap therefore requires a coordinated approach that can combine public investment with significantly greater mobilization of private and institutional capital.

Yet private investors often perceive infrastructure in developing markets as high-risk, citing political uncertainty, the creditworthiness of offtakers, and environmental and social (E&S) risks among their top concerns. Herein lies a critical insight: robust management of E&S risks can be a powerful tool for de-risking projects and attracting investment.[iv, v, vi, vii] Historically, E&S standards at MDBs and International Financial Institutions (IFIs) were designed as safeguards to ensure that projects "do no harm" to communities or ecosystems.[viii, ix, x, xi, xii, xiii] They imposed requirements to avoid or mitigate adverse impacts, such as necessitating E&S impact assessments, fairly resettling affected people, protecting vulnerable groups and Indigenous Peoples, and undertaking stakeholder engagement and grievance redress. While these measures have sometimes been perceived as compliance requirements that increase preparation costs or extend project timelines, their practical value has become increasingly evident.

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i J. Rozenberg, and M. Fay, eds. 2019. *Beyond the Gap: How Countries Can Afford the Infrastructure They Need While Protecting the Planet.* Washington, DC: World Bank.

ii J. Rosenberg, and M. Fay, eds. 2019. Beyond the Gap.

iii I. N. Fakhoury, and F. T. Ibrahima. 2023. Yes, It Is Possible to Finance Critical Infrastructure in a Tight Economy. 1 February, World Bank Blogs.

iv X. Qi, B. Wang, and Q. Gao. 2023. Environment, Social and Governance Research of Infrastructure Investment: A Literature Review and Bibliometric Analysis. *Journal of Cleaner Production* 398: 136512.

v J. Meng, Z. Ye, and Y. Wang. 2024. Financing and Investing in Sustainable Infrastructure: A Review and Research Agenda. *Journal of Sustainable Finance & Investment* 14 (2): 215–240.

vi World Bank. 2010. *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience.* IEG Study Series, No. 63896. Washington, DC: World Bank.

vii International Finance Corporation, World Bank, Asian Development Bank, Asian Infrastructure Investment Bank, European Investment Bank, European Bank for Reconstruction and Development, African Development Bank, and Inter-American Development Bank. 2023. *Joint Report on Mobilization of Private Finance by MDBs and DFIs.* Washington, DC: International Finance Corporation.

viii World Bank. 2010. *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience.*

ix Asian Development Bank Independent Evaluation Department. 2020. *Effectiveness of the 2009 Safeguard Policy Statement.* Manila: Asian Development Bank.

x World Resources Institute. 2019. *The Role of Environmental and Social Standards in Infrastructure Finance.* Washington, DC: World Resources Institute.

xi K. Markowitz. 2019. The Evolution of MDB Safeguard Policies. *Environmental Policy and Law* 49 (2-3): 89–102.

xii P. Kahangirwe, and F. Vanclay. 2024. Evaluating the Effectiveness of Environmental and Social Safeguards in Development Finance. *Sustainability* 16 (3): 1123.

xiii Inter-American Development Bank. 2021. *Environmental and Social Policy Framework.* Washington, DC: Inter-American Development Bank.

A growing body of evidence and operational experience points to a shift in how E&S standards are understood in the project cycle. When applied early and in a substantive manner, the value of these standards extends beyond compliance to enhancing project readiness and overall bankability.[xiv, xv, xvi, xvii, xviii] Early identification of E&S risks, combined with meaningful stakeholder engagement, can improve project design, reduce uncertainty, and strengthen implementation prospects — all factors that are closely aligned with investor requirements.[xix, xx, xxi] In this sense, effective management of E&S risks is closely aligned with sound project risk management. By improving the predictability of outcomes and reducing downside risks, it strengthens projects' investment profiles and increases their attractiveness to financiers (Figure 1.1).

Figure 1.1: Conceptual Relationship Between E&S Risk Management and Investment Attractiveness



xiv World Bank. 2010. *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience.*

xv X. Qi, B. Wang, and Q. Gao. 2023. Environment, Social and Governance Research of Infrastructure Investment: A Literature Review and Bibliometric Analysis.

xvi J. Meng, Z. Ye, and Y. Wang. 2024. Financing and Investing in Sustainable Infrastructure: A Review and Research Agenda.

xvii T. Whelan, U. Atz, T. Van Holt, C. Clark, C. Salazar, Z. Liu, and C. Bruno. 2021. *ESG and Financial Performance: Uncovering the Relationship by Aggregating Evidence from 1,000 Plus Studies Published between 2015–2020.* New York, NY: NYU Stern Center for Sustainable Business and Rockefeller Asset Management.

xviii G. Friede, T. Busch, and A. Bassen. 2015. ESG and Financial Performance: Aggregated Evidence from More Than 2000 Empirical Studies. *Journal of Sustainable Finance & Investment* 5 (4): 210–233.

xix World Bank. 2010. *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience.*

xx Asian Development Bank Independent Evaluation Department. 2020. *Effectiveness of the 2009 Safeguard Policy Statement.*

xxi Organisation for Economic Co-operation and Development. 2022. *Trends in ESG Investing and Quality Infrastructure Investment in Asia-Pacific.* Paris: OECD Publishing.

In this report, the term "beyond compliance" does not mean exceeding applicable MDB E&S requirements or introducing additional standards. Rather, it refers to using E&S policies, standards, and risk-management instruments proactively to inform project preparation, design, structuring, and implementation arrangements — not solely to demonstrate that applicable requirements have been met. This includes identifying material risks and impacts while project alternatives remain open; applying the mitigation hierarchy to avoid, minimize, mitigate, and, where necessary, compensate for residual impacts; and incorporating agreed measures into project design, institutional responsibilities, budgets, contracts, implementation schedules, and monitoring arrangements. The distinction is therefore not between compliance and noncompliance but between the procedural completion of E&S requirements and their substantive integration into project decision-making. When applied in this manner, E&S risk management can improve outcomes for people and the environment while strengthening project quality, implementation readiness, and the credibility of arrangements for managing material risks.

MDBs and IFIs, as public-oriented investors, are well positioned to demonstrate the catalytic role of environmental and social risk management in project preparation and financing. They typically engage early in the project cycle, during project preparation, and have the policy leverage to establish and enforce robust E&S requirements. In doing so, they provide a credible signal of project quality and reduce perceived risks, thereby facilitating the participation of private co-investors who might otherwise remain hesitant. Evidence indicates that development institutions, including MDBs, DFIs, and blended finance vehicles, remain important in mobilizing private capital for infrastructure in emerging markets. In 2023, they formed part of the financier mix for 30% of total private investment in infrastructure projects in low- and middle-income countries, while MDBs and DFIs mobilized $41.6 billion in infrastructure-related private finance in these countries.[xxii, xxiii] Blended finance approaches further reinforce this role, with MDBs frequently deploying risk mitigation instruments, such as guarantees, insurance, and subordinated capital, while maintaining strong safeguard frameworks, thereby enhancing risk-adjusted returns and improving the investment profile for commercial financiers.[xxiv, xxv, xxvi]

Despite this recognition, a knowledge gap remains. Past analyses of MDB E&S policies have largely focused on compliance and processes to ensure that projects meet standards to avoid harm. Less attention has been paid to the following questions: **How have E&S standards contributed to unlocking financing? What are the mechanisms linking strong E&S performance to capital mobilization? How do different institutions' approaches compare in this regard?** The lack of comparative understanding, especially in relation to large-scale and cross-border projects, motivated the Multilateral Cooperation Center for Development Finance (MCDF) and partner MDBs to initiate this flagship study.

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xxii World Bank and Global Infrastructure Hub. 2024. *Infrastructure Monitor 2024*. Washington, DC: World Bank.

xxiii MDB Task Force on Mobilization. 2025. *Mobilization of Private Finance by Multilateral Development Banks and Development Finance Institutions in 2023*. Washington, DC: IFC/MDB Task Force on Mobilization.

xxiv M. Brown, R. Kadam, and K. Klein. 2023. *Catalytic Capital in Impact Investing: Forms, Features, and Functions.* Washington, DC: Global Impact Investing Network.

xxv T. Popovic, K Lygnerud, I. Denk, N. Fransson, and B. Ulunturk. 2024. Blended Finance as a Catalyst for Accelerating the European Heat Transition. *Climate Policy* 24 (3): 345–362.

xxvi United Nations Principles for Responsible Investment. 2021. *Closing the Funding Gap: ESG Incorporation in Emerging Markets.* London: United Nations Principles for Responsible Investment.

This report aims to fill the knowledge gap by examining how early and strategic integration of E&S risk management can contribute to better project preparation by informing changes in project design, with potential implications for bankability and private capital participation in MDB-supported infrastructure projects. It builds on the following research:

- A literature review of MDB reports, academic studies, and practitioner insights on the relationship between E&S risk management and financial outcomes.
- A high-level comparative overview of major MDB E&S frameworks, highlighting key differences that may impact financing or investor decisions.
- Nine main case studies and two supporting comparative cases of infrastructure projects across Asia, Africa, Europe, and Latin America. These cases span sectors and financing structures and provide evidence and lessons on how E&S integration can influence project preparation, financing readiness, bankability, and capital mobilization.
- A qualitative, comparative synthesis drawing on findings from the literature, cases, and interviews to identify recurring themes, best practices, and areas for improvement.

The analysis identifies documented contributions and plausible mechanisms; it does not estimate effects on delays, costs, returns, or financing attributable to E&S integration. The overarching message is one of opportunity: in the face of a substantial infrastructure financing gap, E&S risk management should be viewed not only as a safeguard requirement but also as an integral component of robust project preparation. When integrated early and strategically, E&S considerations can improve project quality and design, strengthen implementation readiness, support investor confidence, and contribute to project bankability and capital mobilization. The report not only demonstrates why this is the case but also provides guidance on how to realize this potential. It offers recommendations to different actors, including MDBs, IFIs, national governments, and development partners, on mainstreaming these approaches and overcoming the remaining barriers.

The report begins with a synthesis of the existing literature on E&S and finance. It then provides a comparative overview of E&S frameworks across major IFIs to establish the institutional context.

The core analysis is based on in-depth case studies, each illustrating specific channels through which E&S practices may support financing readiness. The report concludes by distilling the findings into key themes and presenting targeted, actionable recommendations.

Through this analysis, the report aims to inform a broad range of development finance stakeholders, including MDB investment teams, government agencies responsible for infrastructure planning, DFIs, private investors, and civil society organizations. The objective is to support a shift in perspective from viewing E&S standards primarily as compliance requirements to recognizing the role that early, robust, and decision-useful E&S integration can play in strengthening project preparation, risk management, and financing readiness.

This approach is aligned with the mandate of MCDF and the broader MDB community to advance sustainable, high-quality infrastructure while mobilizing diverse sources of capital in support of development and climate objectives.

2 / Literature Review: E&S Standards and Sustainable Finance



Chapter 2: Literature Review: E&S Standards and Sustainable Finance

The literature review provides the analytical context for the report. It draws on research and knowledge products produced by MDBs and DFIs, as well as relevant academic and policy literature addressing infrastructure finance, project preparation, risk management, and sustainability.

The literature is used selectively to support three analytical objectives:

- Establish the financial relevance of environmental and social risks in infrastructure investment.
- Highlight the importance of upstream project preparation in shaping investment outcomes.
- Inform the interpretation of the case study findings.

2.1 Risk Management and Infrastructure Finance

The relationship between environmental, social, and governance (ESG) performance and financial performance has been widely examined in the academic and practitioner literature. Large-scale reviews generally find a positive or non-negative relationship, although the strength, direction, and consistency of this relationship vary by sector, time horizon, methodology, and whether the ESG issues examined are financially material, i.e., significant enough to affect a company's financial performance or value. Friede, Busch, and Bassen's review[xxvii] of more than 2,000 empirical studies found that roughly 90% of those studies reported a non-negative relationship between ESG and corporate financial performance, while Whelan et al.'s review[xxviii] of more than 1,000 studies found a positive relationship in 58% of corporate studies. At the same time, more recent meta-analysis cautions that ESG investment performance is not uniformly superior and depends on the nature of the strategy and context.[xxix]

There is, however, stronger agreement that unmanaged E&S risks can have material financial consequences at the project level through delays, operational disruptions, cost overruns, legal or regulatory exposure, reputational damage, reduced creditworthiness, and difficulty raising capital. Davis and Franks' study of company-community conflict[xxx] found that social conflict can result in project modification costs, material damage, lost productivity, impacts on capital, reputational damage, and personnel costs. It also documented cases in which delays generated costs ranging from tens of thousands of dollars per day to hundreds of millions of dollars.

Similarly, the MFI Working Group on Environmental and Social Standards notes that inadequate stakeholder engagement can lead to high costs from project delays,

xxvii Friede, G., T. Busch, and A. Bassen. 2015. ESG and Financial Performance.
xxviii T. Whelan, U. Atz, T. Van Holt, C. Clark, C. Salazar, Z. Liu, and C. Bruno. 2021. *ESG and Financial Performance.*
xxix Friede, G., T. Busch, and A. Bassen. 2015. ESG and Financial Performance.
xxx R. Davis, and D. M. Franks. 2014. *Costs of Company-Community Conflict in the Extractive Sector*. Corporate Social Responsibility Initiative Report No. 66. Cambridge, MA: Harvard Kennedy School.

retroactive corrective actions, reputational damage, loss of political support, reduced creditworthiness, and, in some cases, project abandonment.[xxxi] As a result, E&S risk management is increasingly treated as an integral part of project risk management rather than as a stand-alone compliance exercise. International Finance Corporation (IFC) Performance Standard 1 and related guidance frame E&S assessment and management as part of the broader systems that clients use to manage projects and state that a good E&S management system can lead to improved financial, social, and environmental outcomes.[xxxii] The World Bank's Environmental and Social Framework similarly uses a risk-based and proportionate approach to integrated E&S risk management, while the Equator Principles describe E&S risk management as a core project finance risk management framework that supports better loan decisions, reduced credit risk, improved project implementation, and better financial performance.[xxxiii]

The literature also supports the use of E&S standards as tools for identifying, assessing, and mitigating potential environmental and social risks that could otherwise affect project implementation and performance. By reducing uncertainty surrounding potential E&S impacts, E&S risk management can strengthen project preparation and support informed decision-making by project sponsors, lenders, and investors.[xxxiv] For private investors, particularly those engaged in long-term infrastructure and development projects, credible approaches to managing E&S risks can contribute positively to assessments of project viability and implementation risk.

Several studies and practitioner reports have explored the relationship between ESG performance and financing outcomes. For example, McKinsey argued that ESG can create value through several channels, including risk reduction, cost reduction, regulatory support, and improved investment and resource allocation.[xxxv] However, this evidence is best treated as corporate-level context rather than direct evidence of project-level financing outcomes.

MDB evaluations, accountability mechanism cases, and safeguard implementation reviews show that inadequate or delayed attention to environmental and social risks can lead to project delays, disputes, remedial costs, and broader implementation challenges. Asian Development Bank (ADB) safeguard reviews, for example, note that social safeguard work left until later stages can result in lengthy implementation delays, while land acquisition is repeatedly identified as a major source of project delay in infrastructure operations. Joint MDB guidance on stakeholder engagement similarly warns that weak consultation can generate significant costs through project delays, retroactive corrective actions, reputational harm, loss of political support, reduced creditworthiness, and even project abandonment.

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xxxi MFI Working Group on Environmental and Social Standards. 2019. *Meaningful Stakeholder Engagement: A Joint Publication of the MFI Working Group on Environmental and Social Standards.* Washington, DC: Inter-American Development Bank.

xxxii International Finance Corporation. 2012. *Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts and Related Guidance Note*. Washington, DC: International Finance Corporation. https://ifcsia.org/wp-content/uploads/pdf/publications/IFC-Guidance-Note-1-Assessment-and-Management-of-Environmental-and-Social-Risks-and-Impacts.pdf

xxxiii World Bank. 2016. *Environmental and Social Framework*. Washington, DC: World Bank. https://www.worldbank.org/en/projects-operations/environmental-and-social-framework

xxxiv T. Whelan, U. Atz, T. Van Holt, C. Clark, C. Salazar, Z. Liu, and C. Bruno. 2021. *ESG and Financial Performance.* F. Rana. 2017. Preparing Bankable Infrastructure Projects. September 26. World Bank Blogs.

xxxv McKinsey and Company. 2019. Five Ways that ESG Creates Value. November 14. *McKinsey Quarterly.*

The World Bank's Uganda Transport Sector Development Project provides a concrete example: financing was cancelled following serious worker, social, environmental, contractor-management, and sexual misconduct concerns, prompting remedial measures and institutional reforms. These experiences support the practical rationale for integrating E&S risk management early and systematically into project preparation and implementation. Similarly, research by the Global Infrastructure Hub highlights the importance of effective risk mitigation in attracting private investment to infrastructure projects, particularly in emerging markets, where perceived risks can be a significant barrier to investment.[xxxvi]

2.2 Upstream Project Preparation and Intermediate Outcomes

The contribution of E&S standards to project preparation has been widely documented in MDB and DFI literature. The integration of E&S considerations during project preparation and feasibility stages can help identify potential impacts and risks before key project decisions are finalized, allowing mitigation measures and design adjustments to be incorporated proactively. This approach is reflected in MDB safeguard frameworks, which seek to integrate E&S considerations into project design rather than addressing them only during implementation.[xxxvii]

The timing of E&S integration matters because it determines whether E&S considerations can influence project decisions while key parameters remain flexible. The value of project preparation lies not simply in conducting assessments early but in ensuring that the resulting information can inform project design, implementation arrangements, and risk allocation decisions before they become difficult or costly to change. This distinction is particularly relevant when assessing how E&S integration contributes to project preparation and financing readiness.

The role of E&S standards in improving project preparation and due diligence is also well established. E&S assessments, stakeholder engagement processes, resettlement planning, and related studies can contribute to more comprehensive project documentation and a clearer understanding of implementation risks. For private lenders and equity investors, E&S due diligence can help streamline the assessment process and demonstrate that potential issues have been comprehensively considered and addressed, reducing the risk that they will take on "unbankable assets."[xxxviii]

The literature also highlights several intermediate outcomes through which E&S integration may influence project performance. These include improved project design, stronger stakeholder support, enhanced implementation readiness, and more effective identification and management of project risks. Early engagement with affected communities can help identify concerns before they escalate into disputes or implementation challenges, while environmental assessments can inform design choices that reduce future operational constraints or regulatory risks.

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xxxvi Global Ingrastructure Hub. 2023. *How Can Risk Mitigation Instruments Accelerate Investment in Infrastructure?*

xxxvii World Economic Forum. 2025. Beyond Compliance: Embedding Impact through Innovative Finance. Insight Report in collaboration with SK Group's Center for Social Value Enhancement Studies and Rockefeller Philanthropy Advisors. Geneva: World Economic Forum.

xxxviii World Economic Forum. 2025. Beyond Compliance: Embedding Impact through Innovative Finance. Insight Report in collaboration with SK Group's Center for Social Value Enhancement Studies and Rockefeller Philanthropy Advisors. Geneva: World Economic Forum.

A number of MDB and infrastructure finance studies have argued that stronger project preparation contributes to improved project bankability by reducing uncertainty and strengthening investor confidence in project implementation. While the precise contribution of E&S measures is difficult to isolate from other project characteristics, the literature suggests that E&S considerations can play an important supporting role within broader project preparation and risk management processes.

2.3 Market Standards, Investor Practices, and Financing Frameworks

A growing body of practitioner literature highlights the role of E&S standards within broader financing and due diligence frameworks used by DFIs, commercial lenders, and some institutional investors. While approaches vary across institutions and markets, E&S considerations are increasingly incorporated into project appraisal processes alongside technical, financial, legal, and governance assessments.

One important development has been the expansion of voluntary financing frameworks that incorporate E&S risk management requirements. The Equator Principles, adopted by more than 130 financial institutions, commit participating lenders to applying E&S risk management approaches derived largely from the IFC Performance Standards when financing eligible projects. Although implementation varies across institutions, the Equator Principles have contributed to greater harmonization of E&S due diligence practices within international project finance and have helped extend the influence of MDB and DFI standards beyond projects directly financed by those institutions.

A related strand of literature focuses on the growing integration of ESG considerations into investment decision-making. Initiatives such as the United Nations Principles for Responsible Investment, together with publications from organizations including the Organisation for Economic Co-operation and Development (OECD) and the Global Impact Investing Network, point to increasing interest among some investors in environmental and social performance considerations alongside financial objectives. At the same time, the literature emphasizes that investor approaches remain highly diverse and that the importance attached to ESG factors varies considerably across investor groups, sectors, geographies, and asset classes.

The literature examining MDB and DFI participation in infrastructure finance highlights a related but distinct mechanism. Studies on co-financing and risk mitigation note that MDB involvement can help facilitate investment by strengthening project preparation, providing risk-sharing instruments, and establishing institutional oversight arrangements. Environmental and social standards are typically embedded within these broader project preparation and risk management processes. However, the literature generally treats E&S standards as one component of a wider package of measures influencing financing decisions, rather than as a stand-alone determinant of investor participation.

These studies suggest that E&S standards increasingly form part of the financing environment within which infrastructure investment decisions are made. However, the literature also indicates that financing outcomes are shaped by multiple factors, including project economics, government support, regulatory conditions, risk allocation arrangements, and the participation of trusted financing institutions. This reinforces the importance of examining how E&S considerations interact with these broader factors in practice.

2.4 Knowledge Gaps, Attribution, and Evidence Limitations

The literature highlights important limitations in understanding the relationship between environmental and social standards and financing outcomes. While qualitative evidence and individual case studies frequently suggest that E&S standards can contribute to project quality, risk management, and investment readiness, quantifying these effects remains challenging.

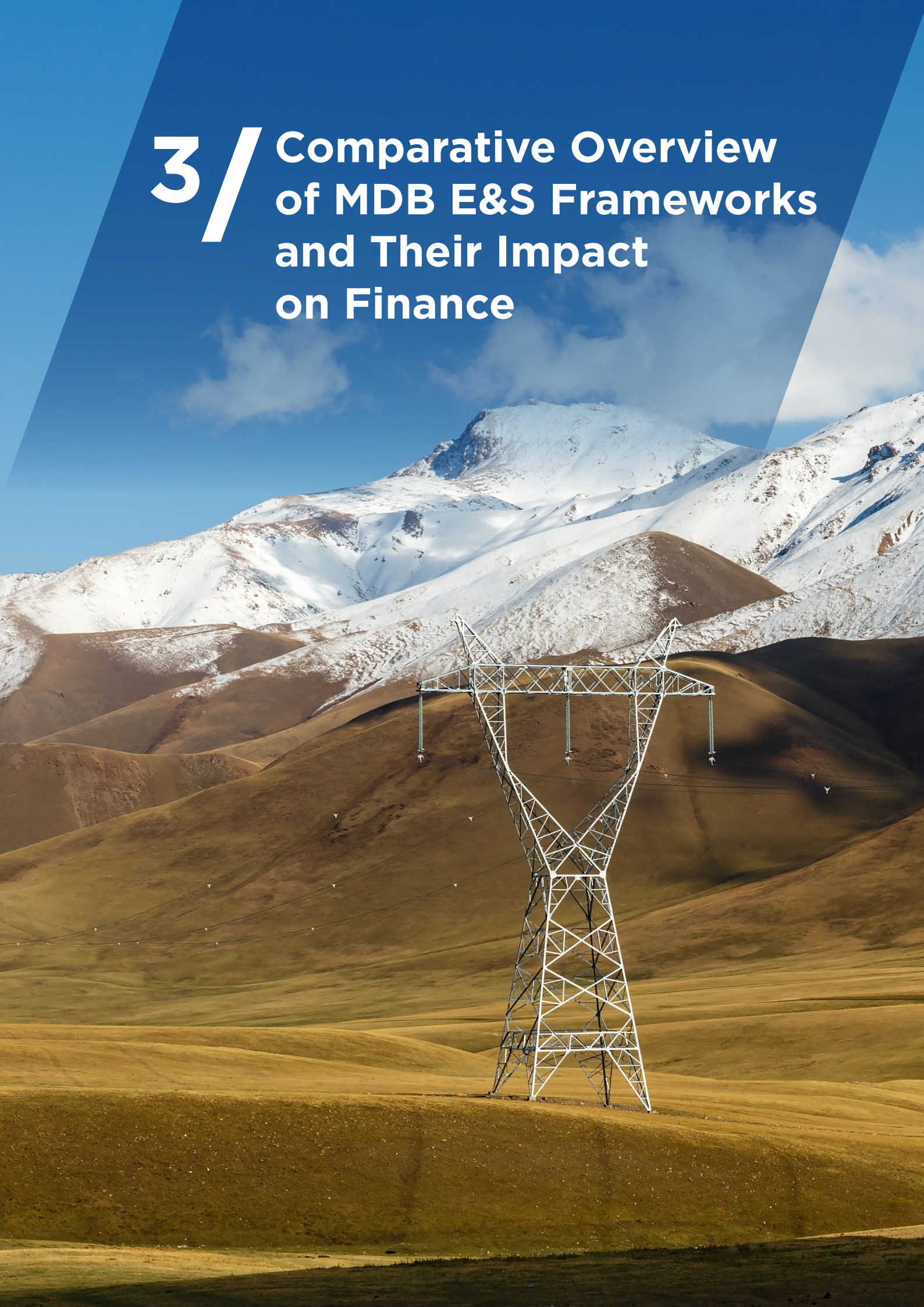
One important constraint relates to attribution. Financing decisions are influenced by multiple factors, including project economics, regulatory conditions, government support, market dynamics, risk allocation arrangements, and the participation of MDBs and other financing institutions. This makes it difficult to isolate the specific contribution of E&S measures to financing outcomes.

The literature also points to potential selection effects. Projects that do not adequately address E&S risks may fail to advance to financing, may be restructured, or may be cancelled during preparation. As a result, observed project samples are often biased toward projects that have successfully progressed to implementation, many of which have benefited from stronger risk management and project preparation processes. This introduces a form of survivorship bias that complicates direct comparisons across projects.

Despite these limitations, some studies have sought to assess the effectiveness of MDB safeguard systems more directly. Georgoulias and Arrasate (2016), in a comparative assessment of IDB safeguard policies and nine IDB-financed projects using the Envision framework, found that safeguards contributed to stronger sustainability performance, particularly where the IDB engaged early in the project cycle. The study also found that safeguard implementation strengthened national regulatory frameworks and institutional capacity and encouraged project sponsors to adopt improved sustainability practices. However, the authors also noted the challenges associated with measuring and attributing such effects across diverse project contexts.

Addressing these limitations will require more systematic data collection and analytical approaches. Suggested approaches include structured cross-project comparisons, improved project-level data on E&S performance, and the development of counterfactual frameworks that can better assess how different levels of E&S integration influence project outcomes.

3/ Comparative Overview of MDB E&S Frameworks and Their Impact on Finance



Chapter 3: Comparative Overview of MDB E&S Frameworks and Their Impact on Finance

3.1 Introduction

E&S frameworks are key operational instruments through which MDBs, DFIs, and IFIs identify, assess, manage, and monitor project-level E&S risks and impacts. Historically, these frameworks have often been understood primarily as safeguard systems designed to prevent, minimize, mitigate, or compensate for adverse E&S impacts. While this compliance function remains essential, E&S frameworks can also support broader project preparation and financing readiness objectives. When applied early and proportionately, they help clarify material risks, improve project design, strengthen implementation arrangements, allocate responsibilities, and provide financiers with greater confidence that E&S risks can be managed during construction and operation.

This chapter examines the relevance of MDB and IFI E&S frameworks not simply as policy instruments but as mechanisms that influence project preparation, due diligence, risk allocation, and financing decisions. It does not seek to provide a full legal or procedural comparison of each institution's framework. Instead, it focuses on the shared functions of these frameworks and the specific ways in which differences among them can affect financing readiness, transaction efficiency, implementation risk, and investor confidence.

Across major MDBs and IFIs, E&S frameworks have increasingly converged around a common set of substantive principles. These include E&S assessment, pollution prevention, resource efficiency, labor and working conditions, community health and safety, land acquisition and involuntary resettlement, biodiversity conservation, Indigenous Peoples and vulnerable groups, cultural heritage, stakeholder engagement, disclosure, grievance redress, and monitoring. This convergence is significant because it creates a broadly recognized international baseline for responsible project preparation and implementation.

At the same time, convergence should not be overstated. MDB and IFI frameworks differ in their structure, terminology, risk classification systems, disclosure requirements, treatment of borrower systems, accountability arrangements, climate-related requirements, implementation procedures, and use of Environmental and Social Action Plans (ESAPs). These differences can affect project preparation timelines, documentation requirements, borrower obligations, transaction costs, co-financier coordination, and the confidence of lenders and investors.

For this report, the key question is not whether one MDB or IFI framework is inherently stronger than another. The more operationally relevant question is how E&S frameworks influence the conditions under which infrastructure projects become finance-ready, implementable, and bankable. In this context, E&S frameworks should be understood as part of the broader project risk management architecture. When applied early, proportionately, and consistently, they help identify material risks, translate those risks into management measures and institutional responsibilities, clarify residual risk,

inform project design and costing, strengthen implementation arrangements, and provide a basis for thorough due diligence and monitoring. Their value therefore lies not only in ensuring compliance with policy requirements but also in improving the design quality and financing readiness of infrastructure projects.

3.2 Convergence Around Core E&S Risk Management Functions

Most major MDB and IFI E&S frameworks now perform five common functions that are directly relevant to project preparation and financing readiness.

First, they require systematic identification and assessment of environmental and social risks and impacts. This includes screening, risk categorization, environmental and social impact assessment, cumulative impact assessment where relevant, and the identification of mitigation measures. For financiers, this reduces uncertainty by making project risks visible before major financing or construction decisions are finalized.

Second, they require application of the mitigation hierarchy. Projects are expected to avoid adverse impacts where feasible, minimize impacts where avoidance is not possible, restore affected conditions where necessary, and compensate for or offset residual impacts where appropriate. This is particularly relevant for high-risk infrastructure projects, in which early design choices can determine whether risks remain manageable or later result in delays, disputes, or reputational harm.

Third, they require stakeholder engagement, disclosure, and grievance mechanisms. These processes are not merely procedural. When undertaken meaningfully, they help identify project risks, understand community concerns, strengthen social license, reduce conflict, and provide mechanisms for resolving issues before they escalate into implementation disruptions.

Fourth, they require institutional arrangements and management and monitoring systems. E&S frameworks typically require borrowers, project companies, or implementing agencies to define roles, responsibilities, budgets, staffing, contractor obligations, reporting arrangements, and supervision mechanisms. These arrangements are critical to implementation readiness because financiers need confidence not only that risks have been identified but also that they can be managed in practice.

Fifth, they provide a basis for enforceability. Through ESAPs, loan covenants, legal agreements, disbursement conditions, concession obligations, procurement requirements, and monitoring commitments, E&S requirements can become embedded in the project's contractual and financing structure. This is where E&S considerations move most clearly from policy compliance to risk allocation and bankability.

These shared functions explain why E&S frameworks matter for financing. A project with a credible E&S assessment, feasible mitigation measures, realistic land and resettlement arrangements, functioning stakeholder engagement processes, clear institutional responsibilities, and enforceable obligations is generally easier for financiers to appraise than a project in which these issues remain uncertain or unresolved.

3.3 How E&S Frameworks Influence Financing Readiness

E&S frameworks influence financing readiness through six practical channels.

The first channel is **risk clarity**. Infrastructure projects often face material risks related to land acquisition, resettlement, biodiversity, permitting, pollution, labor, occupational health and safety (OHS), community health and safety, cultural heritage, and stakeholder opposition. If these risks are not identified early, they may later emerge as delays, cost overruns, legal disputes, or reputational problems. E&S frameworks require these issues to be assessed before financing and implementation advance too far. This improves the quality of due diligence and reduces uncertainty for financiers.

The second channel is **design influence**. E&S assessment can affect project location, route alignment, technology choice, construction methodology, phasing, ancillary facilities, access roads, transmission lines, waste management systems, and operational arrangements. When E&S analysis is undertaken early enough to influence these decisions, it can help avoid or reduce risks that would otherwise become costly or difficult to manage.

The third channel is **implementation readiness**. Many infrastructure projects fail or experience delays not because risks were unknown but because implementation arrangements were weak. E&S frameworks require borrowers and project companies to prepare management plans, allocate responsibilities, establish budgets, engage affected people, secure permits, prepare resettlement arrangements, and define supervision systems. These measures help determine whether a project is practically ready to proceed.

The fourth channel is **risk allocation and enforceability**. E&S frameworks can clarify which party is responsible for specific risks: the government, project company, contractor, operator, lender, or implementing agency. In public-private partnership (PPP) and project finance structures, this is particularly important. Responsibilities for land acquisition, resettlement, permits, biodiversity offsets, community engagement, labor management, and contractor compliance all need to be clearly allocated. Where responsibilities are ambiguous, financiers may perceive higher implementation risk.

The fifth channel is **coordination among financiers**. Many large infrastructure projects involve multiple MDBs, IFIs, commercial lenders, export credit agencies (ECAs), private sponsors, and government agencies. Common E&S frameworks or mutually recognized standards can reduce duplication, support harmonized due diligence, and create a shared basis for monitoring. This can reduce transaction friction and improve financing efficiency.

The sixth channel is **signaling and credibility**. MDB and IFI participation can signal that a project has undergone a level of technical, financial, environmental, and social due diligence that private investors may not be able or willing to undertake alone. E&S frameworks form part of that credibility signal. They do not guarantee bankability, but they can strengthen confidence that material risks have been identified and are being managed in accordance with recognized international standards.

3.4 Framework Features with Direct Financing Implications

The financing relevance of E&S frameworks becomes clearer when specific framework features are linked to project preparation and financing effects.

Table 3.1 illustrates that E&S frameworks affect financing readiness not through abstract compliance but through concrete project-preparation functions. They help answer questions that financiers routinely ask: Are the risks known? Are they manageable? Who is responsible? Have the costs been budgeted? Are permits and land issues under control? Have affected communities been engaged? Are obligations legally enforceable? Is the borrower or project company capable of implementation?

Table 3.1: Framework Features with Direct Financing Implications

E&S Framework Feature	Project Preparation Implication	Financing Readiness Implication
Risk screening and categorization	Identifies the level of E&S risk and determines the scope of required due diligence.	Helps lenders understand the risk profile early and determine whether the project is financeable, requires redesign, or needs additional mitigation.
Environmental and social assessment	Identifies impacts, alternatives, mitigation measures, cumulative risks, and residual impacts.	Provides the evidence base for lender due diligence, permitting, risk pricing, and investment decision-making.
Alternatives analysis	Assesses route, site, design, technology, and implementation options.	Can reduce future delays and costs by avoiding high-risk locations or designs before decisions become fixed.
Mitigation hierarchy	Prioritizes avoidance and minimization before compensation or offsets.	Reduces residual risk and improves confidence that impacts are technically and financially manageable.
Land acquisition and resettlement requirements	Require a census, asset inventory, compensation framework, livelihood restoration, consultation, grievance redress, and implementation arrangements.	Improve construction readiness and reduce the risk of land-related delays, disputes, or legal challenges.

Biodiversity and natural habitat requirements	Require screening for protected areas, critical habitat, ecosystem services, offsets, and cumulative impacts.	Reduce permitting, reputational, and lender-risk concerns, particularly in sensitive areas.
Labor and working conditions requirements	Require the management of worker health and safety, labor terms, contractor labor, worker grievance mechanisms, and supply chain risks where relevant.	Reduce construction risk, liability exposure, reputational risk, and contractor performance uncertainty.
Community health and safety requirements	Require assessment of traffic, security, emergency response, disease transmission, hazardous materials, and public safety risks.	Reduce the risk of community harm, protests, claims, and implementation disruption.
Stakeholder engagement and disclosure	Require timely information sharing, consultation, documentation, and grievance management.	Strengthen social license, reduce conflict risk, and give financiers confidence that affected people have been meaningfully engaged.
Indigenous Peoples and vulnerable groups provisions	Require culturally appropriate engagement, benefit sharing, avoidance of adverse impacts, and consent where required by the applicable standard.	Reduce the risks of rights-based disputes, reputational harm, and project delay in sensitive social contexts.
Cultural heritage requirements	Require identification, consultation, chance-find procedures, and the management of tangible and intangible heritage.	Reduce the risk of construction stoppages, legal challenges, and reputational damage.
Environmental and social management systems	Establish institutional capacity, procedures, staffing, budgets, monitoring, and reporting arrangements.	Help financiers assess whether the borrower or project company can manage risks during implementation.

Contractor E&S management	Integrates E&S requirements into procurement, bidding documents, contracts, supervision, and performance monitoring.	Reduces implementation risk by ensuring that E&S obligations are transferred into construction execution.
Environmental and social action plans	Define corrective actions, timelines, responsibilities, and monitoring requirements.	Provide a practical tool for closing gaps before approval, financial close, disbursement, or construction.
Legal covenants and conditions precedent	Embed E&S obligations in financing or project agreements.	Strengthen enforceability and give lenders remedies if material E&S obligations are not met.
Monitoring, reporting, and supervision	Require ongoing tracking of E&S performance and corrective action.	Support lender oversight and reduce the risk that unresolved issues remain hidden until they become material.
Accountability mechanisms	Provide channels through which affected people can raise concerns outside project-level systems.	Create reputational discipline and reinforce the need for credible stakeholder engagement and compliance.
Use of borrower or country systems	Allows reliance on national systems where they are materially consistent with MDB requirements or where gaps can be addressed.	Can reduce duplication and improve ownership but may require gap analysis and capacity strengthening to maintain lender confidence.
Climate- and sustainability-related requirements	Integrate climate risk, greenhouse gas emissions, resilience, and Paris Agreement alignment considerations where applicable.	Can affect financing eligibility, investor appetite, and alignment with climate finance or sustainability-linked financing requirements.

3.5 Areas of MDB and IFI Convergence

Convergence among MDB and IFI E&S frameworks is particularly important in co-financed and blended finance projects. Although institutions use different terminology and procedures, several areas of broad alignment are evident.

Most frameworks require E&S assessment proportionate to risk. High-risk projects typically require more comprehensive assessment, broader consultation, and more detailed management planning. This helps establish a shared risk-management baseline among financiers.

Most frameworks also require stakeholder engagement throughout the project cycle. This includes the disclosure of relevant information, consultation with affected people, the establishment of grievance mechanisms, and continued engagement during implementation. For financiers, these requirements help reduce the risk that affected communities will oppose a project after financing decisions have already been made.

Most frameworks include requirements concerning land acquisition, restrictions on land use, involuntary resettlement, and livelihood restoration. These requirements are especially important for transport, energy, water, urban, and cross-border infrastructure projects, in which land-related issues are often among the most common causes of delay.

Most frameworks include provisions on biodiversity and natural habitats. These are increasingly important as infrastructure expands into ecologically sensitive areas and financiers become more attentive to nature-related financial risks.

Most frameworks address labor, OHS, and community health and safety. These requirements are directly relevant to construction-intensive infrastructure projects, in which contractor performance can determine whether E&S risks are effectively managed.

Most frameworks also require monitoring and corrective action. This creates an ongoing link between E&S due diligence and implementation supervision, allowing financiers to track whether commitments made during preparation are being fulfilled.

This convergence matters because it enables MDBs and IFIs to co-finance projects using broadly compatible expectations. It also allows project sponsors to structure E&S preparation around internationally recognized standards that may be accepted by multiple financing institutions. In this way, convergence can reduce transaction costs, support mutual reliance, and improve lender coordination.

3.6 Areas Where Differences Still Matter

Despite broad convergence, differences among MDB and IFI frameworks remain important. These differences can affect both project preparation and financing readiness.

One important difference concerns **disclosure timing and scope**. Some institutions require earlier and more extensive disclosure of E&S documentation, particularly for high-risk projects. Earlier disclosure can improve transparency and stakeholder trust, but it can also affect preparation timelines and require borrowers to address concerns before approval or financial close.

A second difference concerns **risk classification systems**. Institutions use different categories and thresholds to determine project risk. A project classified as having high risk by one institution may be treated differently by another, even when the underlying risks are similar. In projects involving multiple financiers, differences in classification can affect the scope of assessment, supervision intensity, and approval processes.

A third difference concerns the **use of borrower or country systems**. Some frameworks allow greater reliance on national systems when those systems are assessed as materially consistent with MDB requirements or when identified gaps can be addressed. This can improve ownership and reduce duplication, but it may also require significant diagnostic work, capacity-building, and agreement on gap-filling measures.

A fourth difference concerns **implementation responsibility**. Some frameworks place stronger emphasis on borrower systems and institutional capacity, while others rely more heavily on project-specific action plans or lender supervision. These differences can affect how responsibilities are allocated and how financiers assess implementation risk.

A fifth difference concerns **accountability mechanisms**. MDBs and IFIs differ in how project-affected people can raise concerns, how complaints are handled, and how accountability findings influence project implementation. These mechanisms can affect reputational risk and the incentives for borrowers and sponsors to address E&S concerns proactively.

A sixth difference concerns **climate, Paris alignment, and sustainability requirements**. As MDBs strengthen their climate-related commitments, E&S frameworks increasingly interact with requirements concerning climate risk assessment, greenhouse gas (GHG) accounting, resilience, just transition, and nature-related considerations. These requirements can influence a project's eligibility for climate finance and affect investor perceptions.

These differences do not necessarily prevent co-financing, but they can create complexity. Borrowers and project sponsors may face multiple documentation requirements, different review timelines, differing expectations on disclosure, and varying interpretations of residual risk. When these differences are not managed early, they can increase transaction costs, delay financial close, or create uncertainty during implementation.

3.7 E&S Harmonization, Mutual Reliance, and Co-Financing

The financing relevance of E&S harmonization is particularly clear in projects involving several MDBs, IFIs, commercial lenders, or blended finance partners. Large infrastructure projects often depend on multiple sources of financing. If each financier applies separate E&S requirements without coordination, borrowers may face duplicated due diligence, inconsistent documentation demands, and competing supervision requirements.

Greater harmonization and mutual reliance can reduce these frictions. Where financiers agree on a common E&S framework, a lead-lender arrangement, shared due-diligence process, or a coordinated ESAP, project preparation can become more efficient. This is particularly relevant for PPP, renewable energy platforms, transport corridors, water infrastructure, and regional connectivity projects involving several institutions.

However, harmonization should not be understood as the lowering of standards. Effective harmonization requires early agreement on the applicable standard, analysis of gaps between institutional requirements, a shared understanding of material risks, common disclosure expectations, coordinated supervision, and a clear allocation of responsibilities. In high-risk projects, harmonization is most useful when it provides greater clarity and reduces duplication while preserving the substantive requirements needed to manage impacts.

For project sponsors and borrowers, a common E&S approach can make financing more predictable. For financiers, it can increase confidence that risks are being managed according to recognized standards. For affected communities, it can reduce confusion about consultation, disclosure, grievance mechanisms, and accountability. For MDBs and IFIs, it can improve efficiency while reinforcing the credibility of international E&S practices.

3.8 E&S Frameworks as Part of the Bankability Architecture

E&S frameworks should not be treated as separate from the financial structuring of infrastructure projects. They form part of the broader bankability architecture.

A bankable project is not only one with a technically feasible design and a credible revenue model. It is also one in which material risks are identified, allocated, priced, mitigated, and monitored. E&S risks are part of this risk universe. Land acquisition delays can affect construction schedules. Biodiversity risks can affect permits and lender acceptability. Stakeholder opposition can delay implementation. Weak contractor management can lead to accidents, work stoppages, or reputational harm. Inadequate resettlement can create legal disputes and social conflict. Weak grievance mechanisms can allow problems to escalate. Poor institutional capacity can undermine even well-designed mitigation plans.

For these reasons, E&S frameworks contribute to bankability when they are integrated into project preparation and structuring. Their value is greatest when E&S analysis influences project decisions before they become fixed; mitigation measures are feasible and appropriately budgeted; responsibilities are allocated clearly; E&S obligations are embedded in contracts and financing documents; and monitoring systems are credible.

This does not mean that E&S integration alone makes a project bankable. Infrastructure financing decisions also depend on tariffs, demand forecasts, offtaker creditworthiness, sovereign support, regulatory stability, currency risk, political risk, guarantees, sponsor capacity, and macroeconomic conditions. E&S integration is therefore best understood as a necessary but not sufficient contributor to bankability. It improves the conditions under which financing decisions can be made, but it does not replace the need for sound economics, strong institutions, and credible risk allocation.

3.9 Implications for Project Preparation Facilities and MDB Operations

For project preparation facilities, including those supporting cross-border and regional infrastructure, the comparative analysis of MDB and IFI E&S frameworks suggests several operational implications.

First, E&S work should begin before core design, site, route, technology, and structuring decisions are fixed. Early screening and scoping can identify red flags, alternatives, and implementation constraints before they become costly to address. Second, E&S analysis should be integrated into feasibility studies, financial structuring, PPP design, procurement planning, and legal documentation. Treating E&S as a parallel compliance track reduces its value. Integrating it into core project preparation increases its relevance to financing readiness.

Third, PPFs should support borrower capacity, not only documentation. E&S instruments are only credible if implementing agencies, project companies, and contractors have the capacity, budget, and authority to implement them.

Fourth, E&S risk allocation should be explicit. For PPPs and project-finance structures, responsibilities for land, permits, resettlement, biodiversity management, stakeholder engagement, grievance mechanisms, contractor supervision, and monitoring should be clearly assigned.

Fifth, facilities should promote common E&S approaches when multiple financiers are involved. Early coordination among MDBs, IFIs, and commercial lenders can reduce duplication, shorten due-diligence processes, and improve transaction clarity.

Sixth, E&S readiness should be tracked through measurable indicators. These may include the completion of screening, disclosure of E&S instruments, permit status, land acquisition readiness, Resettlement Action Plan (RAP) implementation progress, stakeholder engagement status, grievance resolution, contractor E&S readiness, ESAP completion, and the inclusion of E&S obligations in financing or concession agreements.

These measures would help shift E&S from a late-stage compliance requirement to a practical project-preparation tool that supports financing readiness.

3.10 Conclusion

MDB and IFI E&S frameworks have converged around a common set of principles for identifying, assessing, managing, and monitoring environmental and social risks. This convergence has important financing implications because it provides a recognized baseline for due diligence, risk management, stakeholder engagement, implementation planning, and lender coordination.

However, differences among frameworks still matter. Variations in disclosure requirements, risk classification, the use of country systems, accountability mechanisms, implementation procedures, climate-related requirements, and the treatment of financial intermediaries can affect project preparation timelines, transaction costs, and co-financier coordination. These differences need to be managed early, particularly in complex multi-financier infrastructure projects.

The central relevance of E&S frameworks to this report lies in their contribution to financing readiness. They help clarify risks, influence design, strengthen implementation arrangements, allocate responsibilities, support enforceability, and build confidence among financiers and stakeholders. Their value therefore extends beyond procedural compliance. When applied early and proportionately, MDB and IFI E&S frameworks can function as practical tools for improving project quality, reducing uncertainty, and strengthening the conditions under which infrastructure projects become bankable.

This chapter provides the institutional foundation for the case analysis that follows. Subsequent chapters examine how these framework functions operate in practice across selected infrastructure projects, and how E&S integration has influenced project preparation, implementation readiness, risk allocation, coordination, and financing outcomes under different sectoral and institutional conditions.



4 / Methodology

Chapter 4: Methodology

This report examines how the integration of E&S considerations can contribute to project preparation, financing readiness, bankability, and private capital mobilization in infrastructure investments supported by MDBs and other DFIs. It uses a qualitative, comparative approach to identify the decisions and management arrangements through which E&S requirements may influence these outcomes. The analysis does not estimate the independent effect of E&S integration on financing volumes, implementation delays, project costs, or investment returns.

The evidence base comprises the literature discussed in Chapter 2, the institutional frameworks reviewed in Chapter 3, the nine main case studies presented in Chapter 5, and two supporting comparative cases. The case studies provide the principal basis for the cross-case findings and typologies in Chapter 6. Quantitative information reported within individual cases provides transaction and project context. It is not pooled into a cross-project statistical analysis or treated as a measure of the financing attributable to E&S interventions.

4.1 Analytical Framework Linking E&S Integration to Financing Readiness

The analytical framework examines the connection between a material E&S risk, the response to that risk, the project or institutional decision influenced by the response, and the potential relevance of that decision to financing readiness. The central question is whether E&S work informed substantive choices and implementation arrangements while those choices remained open. Completing an assessment or management plan is relevant but does not by itself demonstrate that project design, risk allocation, implementation capacity, or financing conditions improved.

For this report, upstream integration means introducing E&S considerations before the relevant design, procurement, structuring, or financing decisions are effectively made. This timing is assessed in relation to the decision concerned rather than by the date of a document alone. In an infrastructure investment, the relevant decision may concern a site, route, technology, land acquisition plan, or construction arrangement. In a financial intermediary operation or investment fund, it may concern eligibility criteria, exclusion controls, due diligence procedures, approval requirements, or portfolio monitoring before investments are selected or capital is deployed.

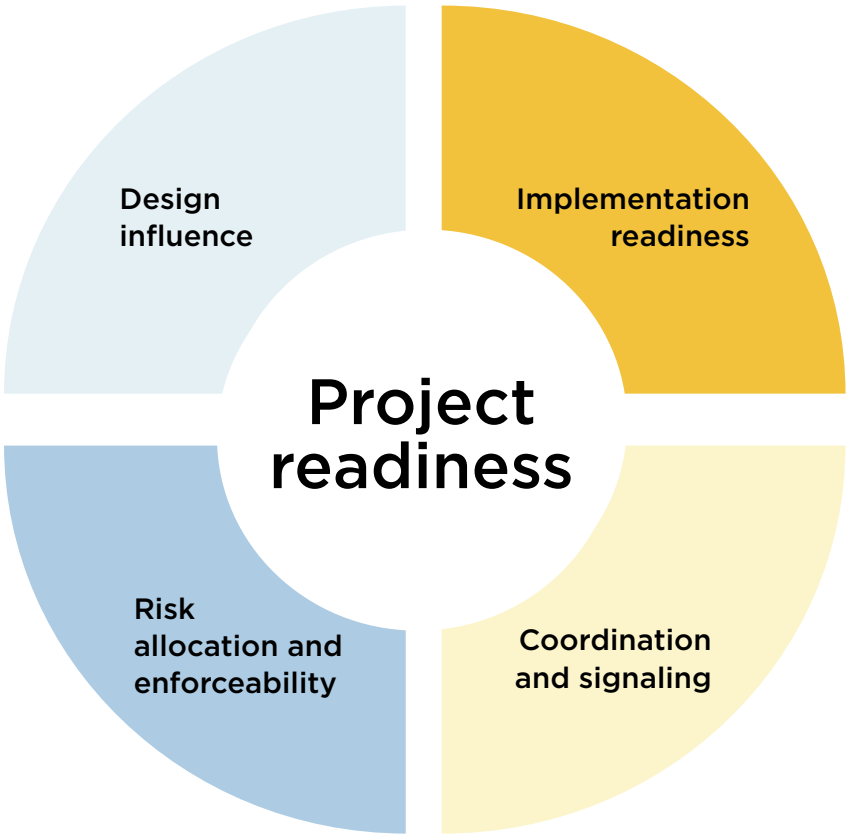
Financing readiness refers to the extent to which the information, responsibilities, resources, and implementation arrangements needed for financiers to assess and manage material project risks are established. Bankability is broader: it also depends on the revenue model, financial viability, sponsor capability, legal arrangements, and allocation of commercial and other risks. Private capital participation is an observed financing outcome and is not interchangeable with either readiness or bankability. A project may become better prepared without obtaining private finance. It may also obtain finance while retaining unresolved E&S risks.

The analysis organizes the contribution of E&S integration around four mechanisms used in the cross-case synthesis: design influence, implementation readiness, risk allocation and enforceability, and coordination and signaling. These mechanisms can operate together. They describe how E&S integration may contribute to a financing decision. They do not constitute a numerical score or ranking of projects.

Figure 4.1 illustrates the four complementary mechanisms through which E&S integration may contribute to financing readiness, while Table 4.1 sets out the evidence considered for each.

Figure 4.1: Conceptual Framework Linking E&S Integration to Financing Readiness

Conceptual analytical framework — not an empirical finding



E&S integration throughout project preparation

Note: The mechanisms are complementary analytical categories, not measured causal effects or a ranking. Their contribution depends on project context and implementation. E&S integration alone does not establish bankability or guarantee financing.

Source: Analytical synthesis for this report, drawing on the literature review in Chapter 2, the case studies in Chapter 5, and the typologies in Chapter 6.

Table 4.1: Analytical Mechanisms and Evidence Considered

Mechanism	Evidence Considered in the Case Analysis	Relevance to Financing Readiness
Design influence	E&S findings linked to choices about location, alignment, technology, project configuration, or alternatives while those choices remained open.	Clarifies how material impacts and risks are addressed in the proposed design.
Implementation readiness	Plans linked to feasible sequencing, land and livelihood measures, permits, budgets, responsible institutions, contractor requirements, and monitoring.	Provides a basis for assessing whether agreed measures can be implemented and material execution risks can be managed.
Risk allocation and enforceability	E&S commitments reflected in concession arrangements, financing conditions, contracts, assigned responsibilities, reporting, or corrective action requirements.	Clarifies who must act, how commitments are funded, and how performance is supervised.
Coordination and signaling	Shared assessments, common requirements, coordinated oversight, or institutional management systems used by multiple financiers or implementing actors.	Establishes a more consistent basis for due diligence and confidence in risk-management arrangements.

4.2 Case Study Scope and Comparative Design

The nine main cases cover different infrastructure sectors, regions, investment stages, and financing structures. They comprise the Noor Ouarzazate Solar Complex in Morocco, the Nam Theun 2 Hydropower Project in Lao PDR, Bogotá Metro Line 1 in Colombia, Benban Solar Park in Egypt, Scaling Solar in Zambia, the Belgrade Solid Waste PPP in Serbia, the Lake Turkana Wind Power Project in Kenya, the China EXIM Bank Green On-Lending Facility in China, and the Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund. The Nacala Corridor and Argentina's RenovAr Program provide supporting comparative material and are examined in less detail.

The cases form an illustrative selection rather than a statistically representative sample of MDB-supported infrastructure. Their diversity permits comparison of how E&S integration operates in different settings. It does not support estimates of the frequency or average effectiveness of particular interventions across the wider infrastructure portfolio.

The unit of analysis varies with the operation. For a single investment, the focus is on the preparation, structuring, and implementation arrangements for that investment, including associated facilities where discussed in the case. For a program or multi-project platform, the focus includes common requirements and shared management arrangements. For a financial intermediary or fund, the focus is on institutional systems governing the selection, assessment, and monitoring of subsequent investments. These distinctions are retained when drawing lessons; a fund-level management system is not treated as equivalent to completed mitigation at an individual site.

Each case is considered through five common questions:

- What were the material E&S risks and affected interests?
- When and how were E&S considerations introduced?
- Which design, implementation, institutional, or contractual decisions did they inform?
- What outcomes or continuing difficulties are documented?
- How could those decisions and arrangements contribute to financing readiness within the wider financing package?

The analysis draws on the documentary material identified in the case narratives, including project appraisal and financing documents, E&S assessments and management instruments, institutional disclosures, and implementation or completion reports where available. The available material differs across cases. An assessment records anticipated impacts and proposed measures; a contractual commitment establishes an obligation; implementation reporting provides evidence about delivery. These forms of evidence are interpreted according to their purpose and the stage of the operation.

4.3 Interpretation of Project Information

4.3.1 Timing and Implementation Constraints

Timing is examined through the relationship between E&S inputs and the decisions they could influence. Relevant evidence includes consideration of alternatives before design commitments are made, inclusion of E&S requirements in procurement and financing arrangements, and establishment of implementation responsibilities and resources before the relevant activities proceed. Early document preparation is not treated as proof of effective integration where the evidence indicates that important choices were already fixed or material issues remained unresolved.

The analysis considers reported implementation constraints, including land acquisition, resettlement, permitting, stakeholder concerns, and institutional capacity. Where an E&S issue prevented a dependent activity from proceeding, it may be described as a constraint on the critical path of the project or a component. This description requires evidence of the dependency and cannot be inferred solely from the presence of an E&S issue.

Reported total project delays are distinguished from delays specifically attributed to E&S issues. A revised completion date alone does not identify the contribution of land acquisition, compensation, or another E&S activity to the delay. Procurement, counterpart funding, contractor performance, technical changes, and external events

may also affect delivery. The report therefore uses case-specific accounts of constraints and responses without assigning a numerical share of total delay to E&S integration or comparing average delays across project groups.

4.3.2 E&S Expenditure and Resource Commitments

Information on E&S expenditure is interpreted in relation to its scope, timing, and purpose. Where disclosed, dedicated budgets, institutional grants, design measures, implementation resources, and monitoring commitments can show how risk-management obligations were resourced. They do not, on their own, measure preparation quality or the effectiveness of implementation.

A larger E&S allocation may reflect a larger project footprint, more substantial impacts, more comprehensive mitigation, or remedial action. An increase over an appraisal estimate may reflect revised scope, improved identification of affected people, changes in compensation requirements, or other factors. Conversely, spending less than budgeted does not establish better performance. Measures may have been reduced, deferred, funded elsewhere, or incompletely implemented. The meaning of expenditure differences therefore depends on the project documentation.

Amounts reported at different dates or for different components are not added or compared unless their scopes are compatible. Missing expenditure data are not treated as zero expenditure. Project infrastructure with E&S relevance is distinguished from a dedicated E&S budget, and overlapping allocations are not treated as separate incremental costs. The report does not estimate a cross-project relationship between expenditure and E&S performance.

4.3.3 Economic Performance and Financing Outcomes

Unresolved implementation risks can affect financing considerations through uncertainty about delivery, additional obligations, or the timing of operations. The relevance of these channels is considered qualitatively within the case narratives. No numerical reduction in financing costs, improvement in returns, or increase in investment attributable to E&S integration is estimated.

Economic returns and financial returns are distinguished. An economic appraisal considers costs and benefits from a wider economic perspective. A financial appraisal considers cash flows and returns relevant to the project company, lenders, or investors. An economic rate of return is therefore not used as a proxy for private investor returns, debt-service capacity, or willingness to invest. The report does not derive or compare return elasticities from project appraisal sensitivity scenarios.

Financing amounts are used to describe the structure of an operation, subject to the definitions and reporting dates in the relevant sources. MDB lending, concessional finance, guarantees, sponsor equity, commercial co-financing, and private capital mobilization are distinct categories. The presence of commercial finance does not by itself establish a measured private capital mobilization result. Expected amounts are distinguished from commitments or realized financing, and total financing is not attributed to E&S work merely because E&S requirements formed part of the transaction.

4.4 Cross-Case Synthesis and Implications for Bankability

The comparative synthesis examines whether similar mechanisms appear in different cases and how their operation depends on sector, institutional setting, financing structure, and timing. It links the five case questions in Section 4.2 to the four mechanisms in Table 4.1. The typologies in Chapter 6 organize the resulting interpretation and provide the basis for the operational implications in Chapter 7.

The contribution of E&S integration is considered within the wider package of project preparation and financing support. Offtaker arrangements, government commitments, tariffs, guarantees, concessional funding, sponsor capability, and market conditions may influence the same financing outcome. Where a case documents a specific E&S-related design change, contractual obligation, or management arrangement, this provides evidence of a contribution to project preparation or risk management. A further claim about investor behavior requires evidence supporting that link; it is not inferred from financial close alone.

The synthesis also considers continuing difficulties and qualifications. Financing readiness does not guarantee satisfactory outcomes for affected people, workers, or ecosystems. Compliance concerns, livelihood challenges, land disputes, or weaknesses in implementation may persist after approval or financial close. Such evidence informs the assessment of E&S integration and the need for monitoring and adaptive management, rather than being treated as incidental to the financing narrative.

In this framework, moving beyond compliance means using applicable E&S requirements to inform project and institutional decisions, translate commitments into implementable measures, and sustain risk management through delivery. It does not mean introducing additional standards. The report examines this proposition through documented decisions and management arrangements while recognizing that their financing contribution is enabling and context-dependent.

4.5 Limitations and Scope of the Conclusions

Several limitations govern the interpretation of the findings. First, documentary coverage differs across cases. Public disclosures may describe planned measures more fully than actual implementation or investor decision-making. A requirement or commitment is not treated as evidence that the intended result was achieved.

Second, the cases differ in scale, risk profile, maturity, and financing structure. Completed operations can provide implementation and outcome evidence that is unavailable for recently approved facilities or investments still being deployed. Expectations for the latter are distinguished from demonstrated results.

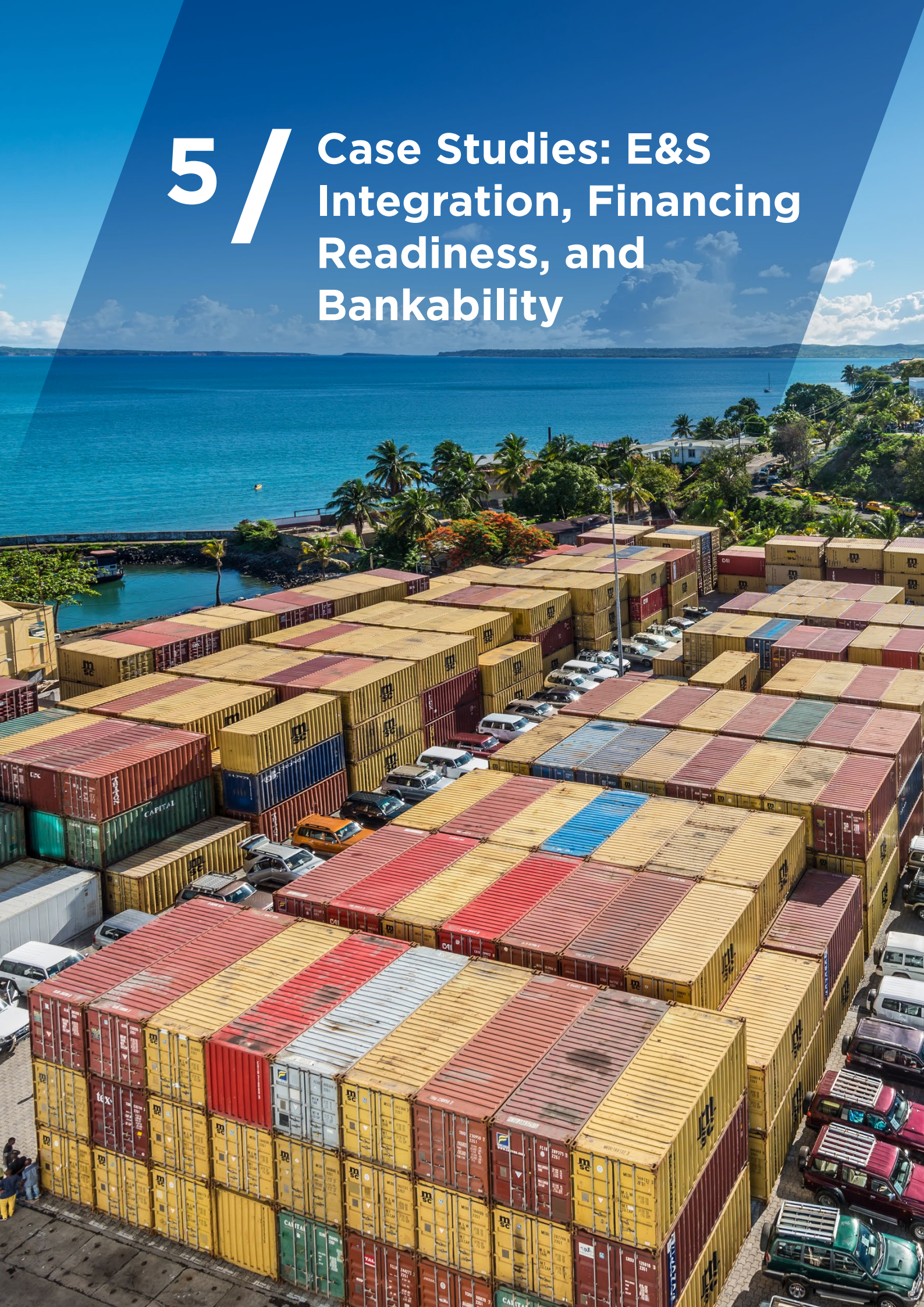
Third, the illustrative selection does not include a representative comparison group or an observable counterfactual showing what would have happened without E&S integration. Selection effects and the greater visibility of financed projects limit generalization. The report cannot estimate an average treatment effect or prove that a particular financing outcome would not have occurred without an E&S intervention.

Fourth, E&S work operates alongside other preparation, institutional, and financing measures. Their effects cannot be separated reliably using the evidence presented. The report consequently identifies documented contributions and plausible pathways rather than asserting that E&S integration independently causes capital mobilization.

Finally, numerical information remains case-specific. The report does not present a pooled project dataset, statistical correlations, sector-level estimates of delay or expenditure, or a quantitative ranking of E&S effectiveness. These limits apply to the executive summary, case synthesis, and conclusions as well as to this chapter.

The findings provide an analytical basis for understanding how E&S requirements can improve the quality and credibility of preparation and risk-management arrangements. Chapter 5 presents the case evidence, Chapter 6 compares recurring mechanisms, and Chapter 7 discusses their implications for MDB operations and PPFs.

5 / Case Studies: E&S Integration, Financing Readiness, and Bankability



Chapter 5: Case Studies: E&S Integration, Financing Readiness, and Bankability

The analytical framework presented in Chapter 4 identifies a set of pathways through which upstream E&S integration can influence project outcomes, including by reducing implementation delays, limiting cost escalation, strengthening risk management, and improving financing conditions. The case studies in this chapter examine these pathways in practice across a range of sectors, regions, financing structures, and E&S risk contexts. Although the cases do not test the analytical model in a causal sense, they illustrate how different forms of E&S integration influenced project preparation, implementation readiness, risk allocation, stakeholder management, and financing outcomes. The findings provide the basis for the cross-case analysis and typologies presented in the following chapter. Taken together, the cases examine the report's "beyond compliance" proposition by showing whether and how E&S requirements influenced substantive project decisions, implementation arrangements, risk allocation, and financing readiness.

5.1 Case Study 1: Noor Ouarzazate Solar Complex (Morocco)

Project Overview

The Noor Ouarzazate Solar Complex in Morocco is an example of large-scale renewable energy development supported by blended public, private, MDB, bilateral, and climate finance. Located near Ouarzazate, on the edge of the Sahara Desert, the complex comprises concentrated solar power (CSP) and photovoltaic (PV) technologies with a combined installed capacity of approximately 580 megawatts (MW). The complex includes Noor I, a 160 MW parabolic trough CSP plant; Noor II, a 200 MW parabolic trough CSP plant; Noor III, a 150 MW tower CSP plant; and Noor IV, a 72 MW PV plant.

The project was developed by the Moroccan Agency for Sustainable Energy (MASEN) as part of Morocco's broader renewable energy strategy. Noor Ouarzazate was designed not only to increase renewable energy generation but also to demonstrate the viability of CSP technology at scale, provide dispatchable renewable power during peak demand periods, reduce dependence on imported fossil fuels, and support Morocco's climate mitigation objectives.

Noor is included as a key case study because it illustrates how early E&S integration can influence project design, technology selection, land acquisition, community development arrangements, water resource management, contractor obligations,

lender coordination, and private sector participation in a complex infrastructure PPP. The case is particularly important because it demonstrates that renewable energy projects are not automatically low risk from an E&S perspective. Although Noor generated significant climate mitigation benefits, its E&S risk profile included large land requirements, communal land acquisition, seasonal pastoralist access, water demand in an arid basin, wastewater and hazardous materials management, biodiversity and habitat disturbance, OHS, community health and safety, worker management, associated facilities, and the E&S capacity of multiple project companies and contractors.



Financing Contribution Profile

The financing structure varied by phase and should not be presented as a single undifferentiated aggregate. Noor I, Noor II/III, and Noor IV had distinct financing packages, with common infrastructure serving the broader complex.

Noor I: Actual Capital Expenditure Financing

Noor I reached an actual capital expenditure (CAPEX) of approximately $853 million. The actual CAPEX financing structure is shown in Table 5.1.

Table 5.1: Noor I: Actual CAPEX Financing Structure

Financier/Source	Actual Contribution	Financing Type/Role
Agence Française de Développement	$103 million	Development finance debt
Kreditanstalt für Wiederaufbau (KfW)	$133 million	Bilateral development finance debt
African Development Bank	$133 million	Development finance debt
European Investment Bank	$103 million	Development finance debt
Clean Technology Fund	$197 million	Concessional climate finance
EU Neighbourhood Investment Facility	$17 million	Grant/concessional support
MASEN	$42 million	Public sponsor equity
Private investors	$126 million	Private sponsor equity
Total actual CAPEX	**$854 million**	

Source: Authors' compilation based on project documents.

Noor I was implemented through a PPP structure and constructed by ACWA Power Ouarzazate, the competitively selected private project company. Its structure combined concessional climate finance, MDB and bilateral finance, public sponsor equity, and private sponsor equity. This financing package helped reduce the high technology and cost risks associated with early large-scale CSP deployment.

Noor II and Noor III: Financing Package

Noor II and Noor III were developed under a larger multi-financier PPP structure. The estimated investment cost was approximately $1.1 billion for Noor II and $900 million for Noor III. The principal financing commitments are outlined in Table 5.2.

Table 5.2: Noor II and Noor III: Financing Package

Financier/Source	Actual Contribution	Financing Type/Role
African Development Bank (AfDB)	€100 million	Development finance debt
European Investment Bank	€150 million	Development finance debt
European Commission	€83 million	Grant/concessional support

World Bank/International Bank for Reconstruction and Development (IBRD)	€235 million + $80 million	Development finance and viability gap/cost-mitigation support
Agence Française de Développement	€50 million	Development finance debt
Kreditanstalt für Wiederaufbau (KfW)	€654 million	Bilateral development finance debt
Clean Technology Fund	$238 million, mobilized equally through AfDB and IBRD	Concessional climate finance
Private sponsor equity	Approximately $400 million	Private equity through the public-private partnership structure

Source: Authors' compilation based on project documents.

The World Bank Implementation Completion and Results Report (ICR) later recorded actual investment in the Noor Ouarzazate project of approximately $1.941 billion for the Noor II/III investment component, with an additional $199 million under the Noor Ouarzazate Cost Mitigation Mechanism. The Cost Mitigation Mechanism should not be treated as physical CAPEX or as E&S expenditure. It was a financial support mechanism to help MASEN manage the gap between the electricity price paid to project companies under the power purchase agreements (PPAs) and the resale price to ONEE.

The ex post evaluation by Kreditanstalt für Wiederaufbau (KfW) provides a useful breakdown of German and European Union (EU) financing across the phases of the complex, as shown in Table 5.3.

Table 5.3: KfW Contribution Across the Noor Complex

Phase/Item	KfW-Related Financing
Noor I	€40 million BMZ loan; €60 million BMZ loan; €15 million BMU grant
Noor II	€330 million BMZ loan; €33.44 million European Union/Neighbourhood Investment Facility grant
Noor III	€324 million BMU/DKTI loan
Noor IV	€60 million BMZ loan
Common infrastructure	€25 million reallocated residual funds

BMU = German Federal Ministry for the Environment, BMZ = German Federal Ministry for Economic Cooperation and Development, DKTI = German Climate Technology Initiative, KfW = Kreditanstalt für Wiederaufbau.

Source: Authors' compilation based on project documents.

The €25 million reallocated to common infrastructure is relevant to the E&S analysis because it supported water supply from the El Mansour Eddahbi reservoir, fencing, electronic safety systems and erosion control measures. However, it should not be described as a dedicated E&S budget. It is better characterized as common infrastructure with E&S relevance.

Identifiable E&S-Linked Expenditure

Publicly available documents do not disclose a consolidated E&S budget for the Noor Ouarzazate Complex, nor do they allocate E&S costs by financier. This is typical of MDB-supported infrastructure projects: many E&S costs are embedded within project preparation; engineering, procurement, and construction (EPC) contracts; operations and maintenance (O&M) arrangements; land acquisition; common infrastructure; lender supervision; Environmental and Social Management Plan (ESMP) implementation; contractor health, safety, and environment (HSE) obligations; wastewater management; hazardous materials controls; biodiversity and drainage measures; and MASEN's project management systems.

The most clearly identifiable E&S-linked expenditure is the MAD30.5 million paid by MASEN for the acquisition of collective land for the Noor Ouarzazate I, II, and III sites. Under Moroccan procedures, the proceeds were deposited with the Rural Affairs Directorate of the Ministry of Interior for the benefit of the affected communities. By April 2014, approximately 85% of this amount had been allocated to a pipeline of local development projects, including irrigation channels, new water wells, extensions of existing wells, irrigation pumping stations, drinking water infrastructure, a student hostel, an equipped ambulance, and other local infrastructure.

Other E&S-related expenditures were material but were not separately disclosed. These included those summarized in Table 5.4.

Table 5.4: Identifiable E&S-Linked Expenditure for Noor Ouarzazate

E&S Cost Area	Publicly Quantified?	How the Cost Was Reflected
Framework ESIA, site-specific ESIAs, ESMPs, RPF, LAPs, and ESAP	Not separately disclosed	Embedded in project preparation, lender due diligence, and sponsor obligations
MASEN ESMS and project-company ESMS implementation	Not separately disclosed	Embedded in MASEN, project company, EPC, and O&M management systems
Communal land acquisition and local development proceeds	Partly quantified: MAD30.5 million	Directly linked to collective land acquisition and community-development projects
Dry-cooling technology for Noor II and Noor III	Cost premium not separately disclosed	Embedded in plant CAPEX; reduced water demand in an arid basin
Water conveyance and raw-water infrastructure	Partly reflected in common infrastructure	Served both operational and E&S risk-management functions

Wastewater treatment, evaporation ponds, and hazardous-materials management	Not separately disclosed	Embedded in EPC design, ESMP implementation, and O&M controls
Fencing, electronic safety systems, and erosion control	Partly reflected in the €25 million common-infrastructure allocation	E&S-relevant common infrastructure
Contractor HSE, labor management, and OHS controls	Not separately disclosed	Embedded in EPC contracts, method statements, supervision, and reporting
Biodiversity, drainage, topsoil, spoil, and rehabilitation measures	Not separately disclosed	Embedded in construction ESMP implementation
Stakeholder engagement, grievance management, and social development planning	Partly reflected through land-related local development proceeds	Embedded in MASEN's local development and safeguard management arrangements
Lender E&S supervision and monitoring	Not separately disclosed as E&S-only	Embedded in MDB preparation and supervision budgets

CAPEX = capital expenditure, E&S = environmental and social, EPC = engineering, procurement, and construction, ESAP = Environmental and Social Action Plan, ESIA = Environmental and Social Impact Assessment, ESMS = Environmental and Social Management System, ESMP = Environmental and Social Management Plan, HSE = health, safety, and environment, LAP = Land Acquisition Plan, MAD = Moroccan dirham, MASEN = Moroccan Agency for Sustainable Energy, MDB = multilateral development bank, O&M = operations and maintenance, OHS = occupational health and safety, RPF = Resettlement Policy Framework.

Source: Authors' compilation based on project documents.

The case therefore illustrates a broader point for this report: E&S expenditure is often not visible as a single financing line, but it can be highly consequential for project preparation, financing readiness, and implementation risk management.

5.1.1 E&S Risk Classification, Instruments, and Scope of Assessment

Noor was treated as a high-risk infrastructure project from an E&S due diligence perspective, notwithstanding its renewable energy benefits. Under the World Bank's Safeguards Policy, the project was classified as Category A because of its size, scope, and complexity. The identified E&S risks included land acquisition and economic displacement, community and occupational health and safety, water availability and scarcity, the capacity of private sponsors to establish and implement satisfactory E&S management systems, and the capacity of ONEE to manage E&S risks linked to associated transmission lines.

The project's E&S documentation comprised complementary instruments addressing different risks, affected areas, institutional responsibilities, and stages of implementation. A Framework Environmental and Social Impact Assessment provided a complex-level assessment of baseline conditions, alternatives, cumulative impacts, and framework mitigation requirements. Phase- and technology-specific ESIAs and site-specific Environmental and Social Impact Assessments (ESIAs) were required to address the distinct risk profiles of parabolic trough CSP, tower CSP, and PV. ESMPs translated assessment findings into construction and operational controls. Land acquisition instruments documented collective land acquisition and community-development arrangements. A Resettlement Policy Framework was prepared for the associated Ouarzazate–Tazarte transmission line, with subsequent Resettlement Action Plans (RAPs) or Land Acquisition Plans (LAPs) required once land parcels and owners had been identified. An ESAP consolidated the obligations of MASEN, developers, contractors, and ONEE, including compliance with applicable safeguards, performance standards, and environmental, health, and safety guidelines.

These complementary instruments were important because Noor was not a simple, single-asset project. It was a multiphase program involving common infrastructure, associated facilities, separate project companies, multiple financing institutions, different technology choices, and several contractors. The E&S architecture therefore served not only as a safeguard compliance mechanism but also as a coordination platform for financiers, MASEN, private sponsors, EPC contractors, O&M contractors, and public authorities.

5.1.2 Timing and Integration of E&S Considerations

E&S considerations entered the project during the upstream identification and preparation stages, before key design, procurement, technology, and financing decisions were finalized. This timing was critical. It allowed E&S findings to influence site selection, layout, cooling technology, water infrastructure, associated facilities, land acquisition, community development, construction management requirements, and lender conditions.

The site was selected partly because it reduced the likelihood of physical displacement and disruption of agricultural livelihoods. However, the land should not be described simply as state-owned or unused. The main project site involved collective or communal land that was largely uninhabited, arid, and nonagricultural but was used seasonally by pastoralists for passage and grazing. The project avoided physical resettlement, but it did not avoid all social impacts. The relevant social risk was the loss or restriction of access to communal land used seasonally by pastoralists, combined with community expectations regarding compensation proceeds, employment, access roads, water, and local development benefits.

The E&S process also influenced decisions concerning technology and resource efficiency. Water use was one of the most material environmental risks because CSP requires water for steam-cycle processes, mirror washing, auxiliary systems, and, where wet cooling is used, cooling towers. In the Ouarzazate region, unmanaged water demand could have placed pressure on scarce water resources used for irrigation, drinking water, and industrial purposes. Noor I used wet-cooling technology and therefore had higher water requirements. For Noor II and Noor III, MASEN required dry cooling through air-cooled condensers, with maximum annual

water availability specified for each plant. This was a significant E&S-informed design decision. Rather than relying only on downstream operational controls, the project reduced water risk at the design stage by changing the cooling approach.

E&S considerations were also integrated into procurement and private sponsor selection. The projects were structured around competitively selected private sponsors responsible for engineering, financing, procurement, construction, ownership, operation, and maintenance. MASEN's procurement and structuring teams, supported by consultants, incorporated technical, environmental, and social requirements into the tendering and contractual framework. This helped ensure that E&S obligations were not treated as external conditions imposed after financial close but were embedded in the project delivery structure.

5.1.3 Principal E&S Risk Pathways and Management Measures

Land Acquisition, Communal Land, and Pastoralist Access

The principal social risk pathway was not physical displacement but communal land acquisition and restrictions on seasonal access. The site was sparsely populated and did not require household relocation. However, the land was part of a wider communal landscape used by pastoralists. This required attention to customary use, compensation governance, community benefit-sharing, and grievance management.

A LAP documented the land acquisition process, valuation, institutional responsibilities, and benefit arrangements. Compensation proceeds were deposited with the Rural Affairs Directorate for the benefit of affected communities and allocated to community development projects. These arrangements helped reduce land-related uncertainty, but they also illustrate why "no physical resettlement" should not be equated with "no social impact." From an MDB perspective, the better conclusion is that early site selection substantially reduced social risk by avoiding physical displacement and the acquisition of intensively used agricultural land, while targeted measures were still required to address communal land, seasonal users, compensation governance, and community expectations.

Water Use, Cooling Technology, and Wastewater Management

Water was the most material environmental issue for the CSP phases. The project depended on the Mansour Eddahbi Dam reservoir for industrial water, while the reservoir also served agricultural irrigation and drinking water needs. The E&S assessments therefore examined whether project water demand would be compatible with other uses and whether the technology design could reduce long-term pressure on water resources.

Noor II and Noor III incorporated dry cooling, which materially reduced water consumption relative to wet-cooled CSP. The minimum functional specifications also required water-saving design features, closed-loop auxiliary cooling systems, raw water treatment designed to minimize consumption, biological treatment of sanitary wastewater, and conveyance of treated wastewater to evaporation ponds. Mirror washing, water treatment, cooling systems, and plant processes still required careful management, but the technology choice reduced the potential for long-term operational conflict over scarce water resources.

Wastewater and liquid effluent management required particular attention because CSP plants can generate multiple wastewater streams, including cooling-system blowdown, reverse-osmosis concentrate, boiler blowdown, oily water, sanitary wastewater, water potentially contaminated with heat-transfer fluids, and sludge from treatment processes. The management approach included segregation of wastewater streams, treatment systems, evaporation ponds, oil and heat-transfer-fluid separation, and monitoring and prevention of uncontrolled discharge to soil, wadis, and stormwater channels.

The operational lesson is that climate-positive infrastructure can still create significant local environmental trade-offs. At Noor, the value of E&S integration was not limited to the project's GHG benefits. It also included the integration of water efficiency, wastewater controls, and process-specific environmental management into the project design and implementation framework.

Biodiversity, Habitat Disturbance, and Drainage

The project area was located in an arid plateau environment with sparse vegetation across much of the site. However, the E&S baseline did not treat the desert environment as ecologically empty. Wadis, escarpments, and drainage areas provided more meaningful habitat values, and construction across large land areas created risks of vegetation loss, soil compaction, drainage alteration, erosion, runoff changes, habitat disturbance, and impacts on fauna, including avifauna.

Mitigation measures included limiting disturbance to the approved footprint, managing drainage and erosion, preventing inappropriate disposal of spoil near wadis, controlling dust, inspecting areas where fauna could become trapped, applying bird-sensitive measures for transmission and evaporation pond risks, and rehabilitating disturbed areas where feasible. The assessments also required attention to pre-construction monitoring, seasonal bird movements, fly paths, and bird behavior, particularly in relation to tower CSP technology and associated power lines.

The technical importance of this issue is that the E&S process converted a broad assumption of "low biodiversity risk" into specific construction and operational controls. This reduced lender uncertainty by clarifying that biodiversity impacts were expected to be manageable, provided the mitigation measures were incorporated into ESMPs, contractor controls, and supervision.

Hazardous Materials, Pollution Prevention, and Process Safety

CSP technology creates a pollution-prevention and process-safety profile that differs from that of conventional PV. The Noor CSP plants required management of heat-transfer fluids, molten salts, fuels, oils, chemicals used in water treatment, reverse-osmosis membranes, filtration media, oily sludge, and other waste streams. Relevant risks included spills, leaks, fire hazards, soil and stormwater contamination, worker exposure, and emergency response.

The E&S management measures therefore needed to include hazardous-materials inventories, appropriate storage, secondary containment, spill prevention and response, segregation of contaminated runoff, oil-water and heat-transfer-fluid separation, licensed hazardous waste disposal, emergency preparedness and response, incident reporting, worker training, and HSE monitoring. Later

implementation experience, including storage tank leaks at Noor III, confirms that this risk area should be treated as material rather than peripheral.

This strengthens the analytical lesson from the case. E&S integration did not eliminate all technical or operational risks. Rather, it established systems to detect, report, correct, and supervise such risks. For MDBs and private investors, this is the distinction between document-based compliance and operational risk management.

Labor, Occupational Health and Safety, and Worker Management

Construction of the Noor complex involved large workforces, heavy equipment, electrical work, high-temperature systems, lifting operations, work at height, traffic movements, confined spaces, chemical handling, fire risks, and extreme heat exposure. These risks required contractor-level HSE procedures, including induction training, personal protective equipment, permit-to-work systems, traffic management, emergency response, incident reporting, subcontractor supervision, and occupational health and safety (OHS) monitoring.

Labor and OHS risks were particularly important because project delivery depended on EPC contractors and subcontractors. The E&S requirements therefore had to be embedded in procurement documents, EPC contracts, method statements, construction ESMPs, and supervision arrangements. This is a key point for financing readiness: when E&S requirements are translated into contractually enforceable contractor obligations, lenders have greater confidence that E&S performance is not dependent solely on borrower goodwill but is integrated into the delivery chain.

Stakeholder Engagement, Grievance Management, and Local Development

Consultations identified community concerns around land compensation, employment, water use, wastewater discharge, access roads, and local benefits. These concerns were technically relevant because they were directly linked to impact pathways and implementation risks. Land concerns were addressed through the land acquisition process, community development arrangements, and monitoring by MASEN and lenders. Water concerns were addressed through dry-cooling technology, wastewater controls, and information disclosure. Employment concerns were addressed through local hiring and training opportunities. Community benefit expectations were partly addressed through local development projects financed from land acquisition proceeds and additional MASEN community initiatives.

MASEN established grievance arrangements for communities and workers. Complaints and grievances were registered by MASEN's local development team, and grievance management was tracked during implementation. This was not merely a corporate social responsibility activity. It formed part of the project's social risk management architecture and reduced the likelihood that unresolved community concerns would escalate into construction delays, reputational issues, or political risks.

5.1.4 Institutional Arrangements and E&S Management Systems

One of the most important features of Noor was the institutionalization of E&S management within MASEN, project companies, and contractors. MASEN developed E&S management arrangements capable of coordinating multiple financiers, sponsors, and contractors. Developers and contractors were required to establish and implement satisfactory Environmental and Social Management Systems (ESMSs) and project-specific ESMPs. The ESAP consolidated the outstanding obligations of MASEN, developers, contractors, and ONEE, including compliance with applicable safeguards, performance standards, and environmental, health, and safety guidelines.

This arrangement mattered because Noor involved multiple lenders with overlapping but not identical requirements. Rather than treating each lender's safeguard requirements as a separate compliance exercise, the project moved toward a common E&S management platform. The ESMS and ESAP enabled MASEN and lenders to track commitments, supervise developers and contractors, monitor grievances, review field performance, and require corrective action when needed.

The World Bank's E&S supervision also provided a strong implementation support function. Environmental and social specialists were based in Rabat during implementation, field visits were carried out regularly, and findings were documented in supervision records. This was particularly important for a complex PPP in which the borrower, private sponsors, EPC contractors, O&M contractors, and associated facility operators all had roles in managing risk.

The operational lesson is that the quality of E&S integration depended not only on the ESIA documents but also on borrower capacity, lender supervision, contractual leverage over private sponsors and contractors, and systems for monitoring, reporting, and corrective action.

Box 5.1: Additional Environmental and Social Measures and Outcomes: Noor Ouarzazate Solar Complex

Beyond the main risk management measures discussed above, Noor incorporated additional E&S and development measures.

Local employment and skills development. The project generated significant construction and operational employment and supported local skills development in construction, plant operation, maintenance, HSE, and solar technologies. Local employment and training were important because employment opportunities were among the priorities raised by nearby communities during consultation.

Cultural heritage management. Baseline studies did not identify major cultural heritage resources on the main project site, but chance-find procedures and archaeological watching-brief requirements were incorporated into construction management.

5.1.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through five main channels.

First, it reduced land and resettlement risk. Early site selection avoided physical displacement and minimized disruption to agricultural livelihoods. The LAP and community development arrangements provided a documented process for collective land acquisition, compensation governance, and lender review. This reduced the likelihood that unresolved land claims would delay construction or undermine lender confidence.

Second, it influenced technology and design. The adoption of dry cooling for Noor II and Noor III was a direct response to water risk in an arid basin. Although dry cooling can involve cost and efficiency trade-offs, it reduced long-term water demand and helped address a risk that could otherwise have affected permits, community acceptance, and operational sustainability.

Third, it converted broad environmental risks into implementable controls. The E&S assessments identified risks related to drainage, erosion, biodiversity, wastewater, hazardous materials, labor, OHS, and community health and safety and translated them into ESMP, Construction Environmental and Social Management Plan, ESMS, monitoring, and reporting requirements. This improved implementation readiness by clarifying what had to be managed by MASEN, private sponsors, EPC contractors, O&M operators, and associated facility entities.

Fourth, it supported lender coordination. The framework ESIA, site-specific assessments, ESMPs, Resettlement Policy Framework (RPF), LAPs, ESAP, ESMS, and reporting arrangements provided a common due diligence platform for MDBs, bilateral development financiers, climate funds, and private sponsors. This reduced duplication and helped create a shared language for risk management across institutions.

Fifth, it strengthened social license and local benefit management. Consultations identified employment, water, land, and local development concerns early enough for these issues to be reflected in project design and implementation measures. Local development projects, grievance management, and MASEN's local development role helped convert community expectations into manageable commitments.

The case should not, however, be presented as an unqualified success. Noor also faced technology, cost, operational, and performance challenges associated with CSP deployment at scale, including the cost and performance implications of thermal storage and subsequent issues affecting Noor III. E&S integration improved preparedness and risk governance, but it did not eliminate all technical, financial, and operational risks.

5.1.6 Implications for Bankability and Financing

Noor illustrates the contribution of E&S integration to financing readiness in a large, complex renewable energy PPP. The project was bankable not simply because it was a renewable energy project but because climate benefits were combined with structured project preparation, concessional finance, government commitment, MDB participation, private sector sponsorship, risk allocation through PPAs and project agreements, and lender-compatible E&S instruments.

From a financing perspective, E&S integration contributed to bankability in four ways.

First, it reduced uncertainty surrounding key nonfinancial risks, which include environmental, social, institutional, legal, reputational, and implementation risks. Lenders had documented evidence of land acquisition, community development arrangements, water sourcing, stakeholder engagement, biodiversity, associated facilities, hazardous materials, wastewater, OHS, and monitoring. This made E&S risks more visible, bounded, and manageable.

Second, it supported financial close by embedding E&S requirements into legal, contractual, and implementation arrangements. Civil works and operations were linked to E&S instruments, developers and contractors were required to implement ESMPs and ESMSs, and reporting obligations provided lenders with oversight during construction and operation.

Third, it reduced coordination costs among financiers. In transactions involving MDBs, bilateral DFIs, climate funds, EU grant support, and private sponsors, a common E&S platform helped align due diligence, disclosure, supervision, and corrective action requirements.

Fourth, it strengthened the project's eligibility for concessional climate finance. The project's climate mitigation benefits were central, but concessional climate finance also required credible management of local environmental and social impacts. Noor therefore demonstrates that climate-positive infrastructure still needs robust local E&S risk management to be ready for financing.

The stronger analytical conclusion is not that E&S integration alone made Noor bankable. Rather, E&S integration formed part of a broader bankability package. It helped convert a high-profile but technically complex renewable energy program into a project that lenders and sponsors could appraise, structure, finance, and supervise with greater confidence.

5.1.7 Key Takeaways

The Noor Ouarzazate Solar Complex demonstrates that E&S integration creates the greatest value when it is introduced early enough to influence site selection, technology choice, associated facilities, contractor obligations, institutional arrangements, and lender coordination. The case also shows that renewable energy projects can carry material E&S risks, particularly when they involve large land footprints, water-intensive technologies, hazardous materials, complex construction activities, and multiple associated facilities.

The principal value of E&S integration in Noor was not limited to safeguard compliance. It improved the quality of project preparation by identifying risk pathways early, reducing uncertainty around land and water issues, establishing management systems for construction and operation, and providing a common framework for multiple financiers. For MDB staff, the operational lesson is that E&S due diligence should be treated as part of project structuring and financing readiness, not as a downstream compliance check.

Evidence Base for the Case Study

The case study draws on the World Bank Implementation Completion and Results Reports for Noor I and the Noor Solar Power Project, the World Bank Project Appraisal Document for Noor II and III, World Bank and MDB PPP documentation on Noor Ouarzazate II and III, and KfW's ex post evaluation of Noor Ouarzazate.

5.2 Case Study 2: Nam Theun 2 Hydropower Project (Lao PDR)

Project Overview

The Nam Theun 2 Hydropower Project is a 1,070 MW trans-basin hydropower project in central Lao PDR, developed under a build-own-operate-transfer PPP structure. The project was designed primarily to export electricity to Thailand while also supplying power to Lao PDR's domestic grid. Its core infrastructure includes a dam on the Nam Theun River, the Nakai Reservoir, a powerhouse, a downstream channel, and transmission lines connecting the project to the Thai and Lao grids. The Multilateral Investment Guarantee Agency (MIGA) described the project as including a 48-meter gravity dam, a 450 square kilometer (km^2) reservoir, a 130 km double-circuit 500 kilovolt (kV) transmission line to the Thai grid, and a 70 km single-circuit 115 kV transmission line to the Lao grid.



Nam Theun 2 is included as a key case study because it illustrates how E&S integration can influence the bankability of a high-risk, large-scale infrastructure PPP in a low-income country context. The project combined private sponsor equity, MDB and DFI support, ECA coverage, commercial bank lending, political risk guarantees, and a dedicated social and environmental financing architecture. At appraisal, the project was especially challenging because Lao PDR had limited experience developing large export-oriented hydropower projects, weak creditworthiness, and significant institutional capacity constraints. The estimated capital requirement of $1.45 billion was very large relative to Lao PDR's 2003 gross domestic product of approximately $2.1 billion.

The project was also one of the most environmentally and socially complex hydropower transactions financed by MDBs in the early 2000s. Its risk profile included physical resettlement of communities from the Nakai Plateau, downstream livelihood impacts associated with altered river flows, impacts on fisheries and aquatic ecology, water quality changes, biodiversity and forest conservation risks, impacts on ethnic minorities, occupational and community health and safety, transmission line impacts, construction workforce risks, and the need to manage project revenues transparently for poverty reduction and environmental protection. Under World Bank safeguard policies, the project was classified as Category A and triggered all 10 safeguard policies, reflecting the scale and complexity of its E&S risks.

Financing Contribution Profile

There are three relevant financing figures: the appraisal financing plan of $1.45 billion, comprising a $1.25 billion base project cost plus a $200 million contingency; the actual cost to the commercial operation date (COD) of approximately $1.308 billion; and the broader project cost at closing of approximately $1.589 billion. The World Bank's 2005 update reported that the equivalent of $1.45 billion had been committed by financing partners to fund the $1.25 billion base cost plus the $200 million contingency. The World Bank ICR later recorded actual project costs of $1.308 billion at the COD and $1.589 billion at closing.

Actual Financing Structure at the Commercial Operation Date

At the COD, the project was financed through a debt-equity structure of approximately 71% debt and 29% equity. Table 5.5 shows the financing breakdown reported in the World Bank ICR.

Table 5.5: Nam Theun 2 Actual Financing Structure at the Commercial Operation Date

Financier/Source	Amount at COD	Share of Total Financing	Financing Type/Role
Export credit agency-supported debt	$185 million	14.1%	Export credit agency-supported international debt
ADB PRG-supported debt	$39 million	3.0%	Political risk guarantee-supported debt

International Development Association PRG-supported debt	$39 million	3.0%	Partial risk guarantee-supported debt
Multilateral Investment Guarantee Agency-supported debt	$39 million	3.0%	Political risk insurance-supported debt
Subtotal: International commercial lenders and guarantors	**$301 million**	**23.0%**	Commercial debt supported by guarantees/insurance
ADB ordinary capital resources	$46 million	3.5%	DFI direct debt
Nordic Investment Bank	$31 million	2.4%	DFI direct debt
Agence Française de Développement	$28 million	2.1%	Bilateral development finance
Proparco	$28 million	2.1%	DFI/bilateral development finance
Export-Import Bank of Thailand	$28 million	2.1%	Export-import/development finance
Subtotal: DFIs	**$161 million**	**12.3%**	Development finance debt
Thai commercial banks	$462 million	35.3%	Thai baht-denominated commercial debt
Électricité de France	$131 million	10.0%	Private sponsor equity
Electricity Generating Public Company Limited	$93 million	7.1%	Private sponsor equity
Italian-Thai Development	$56 million	4.3%	Private sponsor equity
Government of Lao PDR/Lao Holding State Enterprise	$93 million	7.1%	Public sponsor equity
Subtotal: equity	**$374 million**	**28.6%**	Sponsor equity
Pre-COD project revenues	$11 million	0.9%	Pre-commercial-operation revenues
Total	**$1.308 billion**	**100.0%**	Total financing at COD

ADB = Asian Development Bank, COD = commercial operation date, DFI = development finance institution; PRG = political risk guarantee.

Source: World Bank ICR financing breakdown.

The guarantee structure was central to bankability. The World Bank approved an International Development Association (IDA) partial risk guarantee, an IDA grant for the Nam Theun 2 Social and Environment Project, and MIGA guarantees. ADB approved a private sector ordinary capital resources loan to Nam Theun 2 Power Company (NTPC), a political risk guarantee, and a public sector ordinary capital resources loan to the Government of Lao PDR. The 2005 World Bank update also records that more than 300 conditions precedent had to be satisfied before lenders would allow disbursement, illustrating the extent to which the financing package depended on a highly structured legal, technical, E&S, and risk allocation framework.

MIGA provided $91 million in political risk insurance, with $86 million covering a non-shareholder loan by Fortis Banque/Fortis Bank NV against risks including expropriation, breach of contract, war and civil disturbance, and transfer inconvertibility in Lao PDR and Thailand. MIGA stated that its guarantee lowered the project's risk profile, helped attract commercial financing at better rates, and gave investors the assurance needed to proceed.

Identifiable E&S-Linked Expenditure

Unlike many infrastructure PPPs, Nam Theun 2 has unusually visible E&S cost information (Table 5.6). E&S expenditure was reflected in the dedicated Nam Theun 2 Social and Environment Project, NTPC commitments under the concession agreement, E&S-related project infrastructure, monitoring and supervision arrangements, government capacity building, and longer-term watershed and livelihood programs.

Table 5.6: Identifiable E&S-Linked Expenditure: Nam Theun 2

E&S-Linked Cost Item	Publicly Quantified?	Amount	How the Cost Was Reflected
PAD Component 2: Management of Environmental and Social Impacts	Yes	$49 million estimated to COD; $73 million actual to COD; $141 million actual at closing	Dedicated project component for the management of E&S impacts
Environmental and social costs in the project cost table at COD	Yes	$79 million, or 6.0% of total COD project costs	E&S cost category within actual project costs at COD
International Development Association grant for Nam Theun 2 Social and Environment Project	Yes	$20 million	Counted as part of government equity; supported social and environmental management and monitoring

NTPC minimum E&S mitigation and management commitment	Yes	Approximately $88.1 million	Social measures, environmental measures, watershed management, and remediation fund
Social measures	Yes	$52.8 million	Resettlement, compensation, livelihood programs, and institutional capacity building on Nakai Plateau, project lands, and Xe Bang Fai
Environmental measures	Yes	$3.8 million	Fish studies, water quality monitoring, wildlife programs, public education, and institutional strengthening
Watershed management/ SEMFOP	Yes	$31.5 million	Long-term management of the Nakai-Nam Theun watershed and protected area
Regulating dam, downstream channel, and aeration weir	Yes, but not counted in the E&S budget	Approximately $60 million	E&S-informed infrastructure to reduce resettlement and downstream environmental impacts
NTPC E&S staff costs	Partly quantified	Approximately $6 million–$8 million, excluded from the $88.1 million figure	Internal staffing for E&S management
Social and Environment Remediation Fund	Yes	$7.5 million over the concession period	Remediation for residual or unforeseen E&S impacts
External monitoring, POE, IMA, LTA, and IFI supervision	Partly quantified/ embedded	Not fully consolidated as a single E&S amount	Monitoring and assurance embedded in project agreements, lender budgets, and Nam Theun 2 Power Company obligations

COD = commercial operation date, E&S = environmental and social, IFI = International Financial Institution, IMA = Independent Monitoring Agency, LTA = Lenders' Technical Advisor, PAD = Project Appraisal Document, POE = Panel of Experts, SEMFOP = Social and Environment Management Framework and Operational Plan.

Source: Authors' compilation based on project documents.

The World Bank ICR records that Component 2, Management of Environmental and Social Impacts, increased from an estimated $49 million to $73 million at the COD and $141 million by closing. It also notes that the $20 million IDA grant for the Nam Theun 2 Social and Environment Project was counted as part of the Government of Lao PDR's equity contribution to the overall project. Separately, the project cost table as of COD identified E&S costs of $79 million, equivalent to 6.0% of the total project cost of $1.308 billion.

The ESIA records that NTPC committed a minimum of approximately $88 million for E&S mitigation and management measures. This amount comprised social measures, environmental measures, and watershed management. Importantly, this figure excluded approximately $60 million for the regulating dam, downstream channel, and aeration weir, which were incorporated into project infrastructure to reduce resettlement and environmental impacts. It also excluded NTPC E&S staff costs estimated at $6 million–$8 million.

The case therefore provides more detailed information on E&S expenditure than many infrastructure cases. It shows that E&S integration was not merely a set of studies or disclosure documents. It was capitalized into the project through dedicated E&S budget lines, legally binding sponsor obligations, project design modifications, independent monitoring arrangements, and long-term institutional financing.

5.2.1 E&S Risk Classification, Instruments, and Scope of Assessment

Nam Theun 2 was appropriately treated as a high-risk project from an E&S due diligence perspective. Under the World Bank's Safeguards Policy, it was classified as Category A and triggered all 10 safeguard policies. The main safeguard issues included resettlement and livelihood restoration for approximately 6,300 people on the Nakai Plateau, protection of the Nam Theun 2 watershed as a biodiversity offset area, and mitigation of downstream impacts associated with changes in river flows.

The E&S documentation was structured as complementary instruments. The key instruments included the Environmental Assessment and Management Plan, the Social Development Plan, the Social and Environment Management Framework and First Operational Plan, a cumulative impact analysis, a hydropower sector environmental assessment, an environmental and social cost-benefit analysis, resettlement and compensation instruments, ethnic minority development measures, and downstream compensation frameworks. The ESIA states that the Environmental Assessment and Management Plan addressed environmental impacts and mitigation; the Social Development Plan (SDP) addressed resettlement, health, downstream impacts, and ethnic minority issues; and the Social and Environment Management Framework and Operational Plan addressed management of the Nakai-Nam Theun National Protected Area and corridors.

This suite of complementary E&S instruments was operationally important because Nam Theun 2 was not confined to a single project footprint. It affected the reservoir area, the resettlement area, the Nam Theun downstream reach, the Xe Bang Fai downstream system, protected areas and corridors, access roads, construction areas, transmission lines, and host communities. The scope of the E&S studies covered approximately 6,700 km^2, including around 4,025 km of river

systems, with an estimated 1,306 km^2 likely to be directly impacted by the project and approximately 3,950 km^2 of protected areas and corridors supported through the project as environmental compensation.

The E&S instruments therefore functioned not only as safeguard documentation but also as a coordination platform for NTPC, the Government of Lao PDR, MDBs, DFIs, ECAs, commercial lenders, contractors, affected communities, and independent monitors. They provided a common risk management framework for a transaction in which financing depended on the ability of lenders and sponsors to demonstrate that major environmental and social risks were identified, budgeted, allocated, monitored, and enforceable.

5.2.2 Timing and Integration of E&S Considerations

E&S considerations entered the project during identification, feasibility assessment, preparation, appraisal, and financing structuring. This timing was critical because the project's main E&S risks could not be managed through end-of-pipe mitigation alone. They required design choices, contractual obligations, financing commitments, livelihood programs, watershed management institutions, and long-term monitoring systems.

The E&S process influenced project design in several ways. The creation of the Nakai Reservoir required the impoundment of approximately 195 km of the Nam Theun River and the creation of a reservoir of around 450 km^2 at full supply level. The project also involved a major trans-basin transfer of water from the Nam Theun into the Xe Bang Fai system, with the ESIA identifying the inundation of the Nakai Plateau and the transfer of approximately 220 m^3/second of water as among the most significant environmental and social impacts.

These hydrological changes directly informed design and mitigation measures. The project incorporated a regulating dam, downstream channel, and aeration weir to manage flow, water quality, erosion, aquatic ecology, and downstream livelihood risks. These were not minor mitigation add-ons. They were E&S-informed infrastructure elements incorporated into the physical design of the project, with an estimated cost of approximately $60 million outside the core $88.1 million E&S mitigation and management budget.

E&S considerations also influenced financing readiness. The Common Terms Agreement established a common framework of conditions and E&S obligations, including Schedule 11, which defined NTPC's E&S obligations. The Lenders' Technical Advisor was funded by NTPC but managed on behalf of the financing institutions to monitor technical, environmental, and social performance during construction and operation until the commercial loans were repaid. The World Bank served as Representative IFI to consolidate and communicate IFI views on technical, environmental, and social issues.

The operational lesson is that early E&S integration did not merely improve the quality of mitigation plans. It created the conditions under which lenders could rely on a common legal, financial, monitoring, and reporting platform. In a complex PPP involving private sponsors, MDBs, DFIs, ECAs, and commercial banks, this was central to financial close.

5.2.3 Principal E&S Risk Pathways and Management Measures

Reservoir Creation, Hydrological Change, and Downstream Livelihoods

The principal environmental risk pathway was the transformation of the Nam Theun River system through reservoir creation and trans-basin diversion. The project permanently inundated approximately 450 km^2 at full supply level, altered riverine habitats, changed water quality dynamics, affected fisheries, and increased accessibility to ecologically sensitive areas. Downstream communities along the Xe Bang Fai and related watercourses were exposed to altered flow regimes, erosion risks, changes in fisheries, potential flooding, water quality changes, and effects on river-based livelihoods.

The ESIA identified water quality as a material risk because reservoir filling and operation could affect dissolved oxygen, nutrient concentrations, aquatic weeds, fisheries, domestic water use, and downstream ecological conditions. Mitigation measures included catchment management, biomass reduction before inundation, riparian releases, drawing of water from appropriate reservoir layers, aeration through cone valves and aeration structures, an aeration weir in the downstream channel, reservoir drawdown management, pest management, water quality monitoring, and management of domestic water supply alternatives for affected villages.

For downstream communities, the project established a Downstream Program that operated from 2008 to 2012 to compensate for lost land and provide infrastructure and livelihood training. A Village Income Restoration Fund was also established to provide loans for livelihood investments. The World Bank ICR notes that approximately 100,000 people lived in areas downstream of the dam and powerhouse and were vulnerable to changes in river flows, fisheries, land, and water quality.

The technical significance is that downstream impacts were not treated as a residual social issue. They were linked to hydrological modeling, engineering design, livelihood restoration, compensation, monitoring, and grievance management. This reduced lender uncertainty surrounding one of the most politically and reputationally sensitive aspects of the project.

Resettlement, Ethnic Minorities, and Livelihood Restoration

The principal social risk pathway was physical displacement from the reservoir area and livelihood disruption on the Nakai Plateau. The project required the resettlement of approximately 6,300 people from the reservoir area. This was completed before reservoir impoundment and with the concurrence of the Panel of Experts. By project closing, 100% of resettled households had achieved the income target, with 97% meeting income levels directly and 3% receiving additional in-kind support through safety net and special programs. The income target based on the rural poverty line was ambitious because it was approximately double pre-project incomes.

The Social Development Plan provided the operational framework for resettlement, compensation, livelihood restoration, ethnic minority development, public health, and downstream impacts. It included resettlement and compensation action plans, livelihood packages, household baseline data, asset and land surveys, entitlements,

institutional responsibilities, implementation schedules, and monitoring indicators. The SDP covered the plateau and reservoir area, Xe Bang Fai downstream areas, and other project lands.

Resettlement implementation was not limited to housing replacement. It included village infrastructure, land-use planning, livelihoods involving fisheries, agriculture, livestock, forestry and off-farm activities, support for vulnerable households, health services, education, water supply, roads, electricity, and community facilities. The ICR records improved access to basic public and social services in all resettlement villages and notes that resettlement outcomes were assessed as fully achieved.

However, the case should still be presented in a balanced manner. The ICR notes concerns regarding the sustainability of the forestry livelihood pillar, the long-term sustainability of reservoir fisheries, and livestock carrying capacity. These concerns contributed to a two-year extension of the resettlement program from 2015 to 2017, after which the Panel of Experts concluded that the concession agreement provisions relating to closure had been satisfied and that the project was on the road to overall sustainability.

Biodiversity, Watershed Management, and Conservation Offset

The principal biodiversity risk pathway involved the inundation of forests, wetlands, riverine habitats, savannah, and other habitats on the Nakai Plateau, combined with induced access risks to the Nakai-Nam Theun National Protected Area. The ESIA identified that 450 km^2 would be permanently lost through reservoir impoundment and that improved access to the protected area could increase hunting pressure and wildlife trade.

The project's biodiversity response included long-term financing and institutional support for the Nakai-Nam Theun watershed and protected area. The Social and Environment Management Framework and Operational Plan established the framework for protection of the watershed, biodiversity conservation, customary rights, livelihood support, and management of access restrictions. NTPC committed $31.5 million to watershed management, including $1 million per year over the 25-year concession period.

The Watershed Management and Protection Authority (WMPA) was created to protect and manage the Nakai-Nam Theun National Protected Area and the broader watershed. The World Bank ICR describes the WMPA as a first for Lao PDR, with guaranteed budgetary resources to support biodiversity protection. It also notes that the institution faced challenges because of the scale and complexity of its conservation objectives and limited national institutional capacity.

From an MDB perspective, the biodiversity lesson is twofold. First, risks to high-value biodiversity in hydropower projects require more than site-level mitigation. They require landscape-scale management, financing, institutional capacity, monitoring, and enforcement. Second, conservation offsets and financing for protected areas should not be presented as automatic success mechanisms. They require long-term governance, adaptive management, and credible enforcement to manage hunting, timber extraction, land-use pressure, and institutional weaknesses.

Construction EHS, OHS, and Community Health and Worker Management

The construction phase involved major dam works, river diversion, tunneling, powerhouse construction, access roads, quarries, cement batching, transmission lines, construction camps, and a large workforce. The World Bank's 2005 update records that preliminary construction activities included site mobilization, access roads, worker residences, aggregate quarries, cement batching, unexploded ordnance clearance, dam and tunnel excavations, powerhouse works, and downstream channel design. The workforce numbered around 2,300 at the time of the update and was expected to increase to around 4,000 by the end of 2005. Key construction EHS risks included erosion and sediment control, water quality, hazardous materials and waste management, road safety, disease prevention, medical emergency response, camp management, worker influx, traffic risks, tunnel safety, explosive and unexploded ordnance risks, and contractor environmental monitoring. The 2005 update records that environmental, safety, and health management measures were already in place, including erosion and sediment control, water quality monitoring, hazardous materials and waste management, road safety, disease prevention, and medical emergency arrangements.

The operational significance is that construction EHS obligations were not left to the general discretion of contractors. The head construction contractor's obligations were tied to the E&S plans, concession agreement, project implementation plan, annual implementation plans, and lender monitoring. This helped translate assessment findings into contractor-level controls, supervision, reporting, and corrective action.

Stakeholder Engagement, Disclosure, and Grievance Management

Stakeholder engagement was unusually extensive for Lao PDR at the time. The ESIA states that the public consultation and disclosure process was guided by the requirements of ADB, Agence Française de Développement (AFD), the World Bank, and the Government of Lao PDR. Its objectives were to ensure transparency in decision-making, involve stakeholders in resettlement site selection, inform project design, and determine appropriate remedial measures for affected people and communities.

Consultation activities began in 1995, and by October 2004, the project had held almost 400 public consultation and participation meetings and briefings. The ESIA states that this was the first time a large-scale public consultation process had been undertaken in Lao PDR and that consultation contributed to revisions of safeguard documents and project management plans.

The grievance architecture included resettlement and compensation committees, district working groups, the NTPC Resettlement Organization, and a Project Grievance Committee. The SESIA states that a grievance procedure was established to protect the basic rights of project-affected people, address concerns, and ensure delivery of entitlements. The ICR later noted that grievance redress mechanisms (GRMs) were established and monitored before Board approval, but also that they became less active in 2015–2016 and had to be reinvigorated and internalized into country systems.

This provides a balanced operational lesson. Early consultation and grievance systems can reduce uncertainty and improve project design, but their effectiveness must be sustained throughout implementation and transition. A grievance mechanism is not a one-time appraisal requirement; it is an adaptive management tool.

Revenue Management and Development Additionality

Nam Theun 2's E&S architecture extended beyond impact mitigation. The project was also designed to generate public revenues for poverty reduction and environmental protection. Revenue management was therefore part of the broader development risk framework. The World Bank ICR records that Nam Theun 2's revenues were allocated to education, health, public works, energy and mining, natural resources and the environment, poverty reduction funds, and provincial projects. It records total disbursements of $186.22 million, including $65.81 million for education and $62.14 million for health over the reporting period.

The ICR also notes that verifying additionality proved difficult because of the lack of a baseline, changes in budget classification, and the unavailability of timely budget data. Revenue management was part of the project's social development rationale, but it required public financial management reforms, audit systems, expenditure tracking, and transparency arrangements. It should therefore be presented as an institutional risk management measure, not simply as a development benefit.

5.2.4 Institutional Arrangements and E&S Management Systems

An important feature of Nam Theun 2 was the institutionalization of E&S management across the project company, government agencies, lenders, and independent oversight bodies. NTPC was responsible for implementing and financing E&S commitments under the concession agreement. The government established implementation bodies for resettlement, environmental management, watershed management, and revenue management. Lenders established coordinated supervision and monitoring arrangements.

The concession agreement and Common Terms Agreement were central to enforceability. The concession agreement incorporated E&S obligations, and the Common Terms Agreement created a common conditionality framework across lenders. NTPC was required to prepare progress reports covering construction, contractor environmental obligations, and the E&S responsibilities of NTPC and the government. Semiannual project progress reports, including E&S information, were to be disclosed publicly.

The independent oversight architecture included the Panel of Experts, independent monitoring agencies, the Lenders' Technical Advisor, the Government Engineer, the Dam Safety Review Panel, and IFI supervision missions. The ESIA states that the Panel of Experts was mandated to provide independent review and guidance on E&S issues, determine whether E&S safeguards and funding agency guidelines had been followed, and recommend remedial action in cases of noncompliance.

The project also established institutional arrangements for watershed management. The WMPA was responsible for conservation, biodiversity management, capacity building, livelihood support, forest protection, and watershed rehabilitation. These arrangements mattered because the project's biodiversity and watershed risks could not be managed solely by NTPC's construction contractors. They required government institutions capable of managing land use, access, forest cover, biodiversity, and community livelihoods over the concession period.

The operational lesson is that the quality of E&S integration depended not only on the quality of assessment documents but also on the conversion of assessment findings into institutional mandates, budgets, legal obligations, monitoring systems, and adaptive management mechanisms.

5.2.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through six principal channels.

First, it converted an initially high-risk hydropower concept into a structured, financeable PPP. The project's E&S risks were material enough to prevent financial close unless they were made visible, bounded, budgeted, contractually allocated, and independently monitored. The E&S process provided lenders with a clear understanding of resettlement, downstream impacts, biodiversity, watershed management, health, safety, and institutional capacity risks.

Second, it influenced project design. The regulating dam, downstream channel, aeration weir, riparian releases, water quality measures, and downstream mitigation programs show that E&S integration affected the physical and operational configuration of the project. The approximately $60 million allocated to regulating and aeration infrastructure demonstrates that E&S-informed design was embedded in project CAPEX and was not limited to plans or compensation programs.

Third, it improved implementation readiness for resettlement and protection of livelihoods. Resettlement was prepared through detailed household surveys, compensation frameworks, livelihood packages, pilot resettlement experience, institutional responsibilities, and independent monitoring. By project closing, all resettled households had achieved the income target, although sustainability concerns required extended support and continued monitoring.

Fourth, it created a long-term biodiversity and watershed financing mechanism. The project financed the WMPA and the Social and Environment Management Framework and Operational Plan, including protected area management, conservation, livelihood support, and institutional capacity building. This was a significant innovation, but the case also shows that conservation outcomes depend on long-term governance and enforcement, not only on budget allocations.

Fifth, it strengthened lender coordination. The Common Terms Agreement, Lenders' Technical Advisor, Representative IFI role, joint reporting, independent monitoring, and common supervision framework reduced fragmentation among MDBs, DFIs, ECAs, and commercial lenders. This was critical in a transaction involving many financing parties and more than 300 conditions precedent.

Sixth, it contributed to broader country systems. The project influenced Lao PDR's resettlement, environmental assessment, hydropower sustainability, environmental

protection fund, and revenue management reforms. The World Bank ICR notes that ADB and the World Bank made the Resettlement and Compensation Decree a pre-condition for financing support, and that Nam Theun 2 contributed to national policies on E&S sustainability in the hydropower sector.

The case should not be presented as an unqualified success. The ICR records that, by mid-2014, some safeguards were not in compliance and that a 2016 comprehensive safeguards review found partial compliance with some safeguard policies and noncompliance with Natural Habitats and Forests policies. Corrective actions and intensive implementation support enabled the project to close with all 10 safeguards rated satisfactory or moderately satisfactory. The stronger conclusion is that E&S integration created a robust adaptive management system, not that it eliminated all risks or implementation challenges.

5.2.6 Implications for Bankability and Financing

Nam Theun 2 demonstrates that E&S integration can contribute directly to bankability in high-risk infrastructure PPPs, but only when it is embedded in the broader financing structure. The project was bankable not because E&S risks were low but because they were identified early, incorporated into design, funded through dedicated budgets, allocated contractually, monitored independently, and linked to lender conditions.

From a financing perspective, E&S integration contributed to bankability in five ways.

First, it reduced uncertainty surrounding high-impact nonfinancial risks. Lenders had documented evidence of resettlement, livelihood restoration, downstream hydrology, fisheries, water quality, biodiversity, protected area management, ethnic minorities, stakeholder engagement, health and safety, grievance management, and revenue allocation. This made E&S risks more visible and manageable.

Second, it supported financial close by embedding E&S obligations into the legal and financing architecture. The Common Terms Agreement, concession agreement, Schedule 11 E&S obligations, lender conditions precedent, independent monitoring, and public reporting obligations converted E&S commitments into enforceable requirements. The fact that more than 300 conditions precedent had to be met before disbursement underscores the role of E&S and related legal conditions in financing readiness.

Third, it enabled commercial lending through risk mitigation instruments. IDA, MIGA, ADB, ECAs, and DFIs helped reduce political, contractual, sovereign, and implementation risks for commercial lenders. MIGA explicitly stated that its political risk insurance lowered the project's risk profile, helped attract commercial financing at better rates, and provided assurance to investors.

Fourth, it improved implementation credibility. The dedicated E&S budgets, NTPC obligations, $88.1 million E&S mitigation commitment, $60 million E&S-informed design infrastructure, and independent monitoring arrangements provided lenders with evidence that E&S risks were not merely identified but also resourced and operationalized.

Fifth, it reduced coordination costs among financiers. In a transaction involving MDBs, DFIs, ECAs, commercial banks, and private sponsors, a common E&S platform helped align due diligence, reporting, supervision, and corrective action. This reduced the risk of inconsistent lender requirements and provided a shared framework for monitoring performance through construction and operation.

The strongest analytical conclusion is not that E&S integration alone made Nam Theun 2 bankable. Rather, E&S integration formed part of a broader bankability package that included the Electricity Generating Authority of Thailand power purchase arrangement, build-own-operate-transfer concession structure, sponsor equity, MDB and DFI participation, political risk guarantees, ECA cover, revenue management arrangements, and common lender conditionality. The E&S contribution was to make one of the project's largest sources of uncertainty — E&S risk — sufficiently structured, funded, monitored, and enforceable for financiers to proceed.

5.2.7 Key Takeaways

Nam Theun 2 demonstrates that, in high-risk hydropower and PPP transactions, E&S integration creates the greatest value when it is embedded in project design, financing, legal agreements, institutional arrangements, monitoring systems, and long-term adaptive management. The project's E&S architecture went beyond appraisal-stage compliance. It influenced engineering design, resettlement planning, downstream livelihood programs, watershed management, biodiversity conservation, lender conditionality, public revenue management, and supervision arrangements.

For MDB staff, the operational lesson is clear: E&S due diligence should be treated as part of project structuring and financing readiness, not as a downstream compliance check. In Nam Theun 2, E&S integration helped convert a high-risk hydropower project in a country with limited institutional capacity into a transaction that could mobilize private equity, commercial debt, MDB guarantees, DFI finance, ECA support, and long-term lender confidence. At the same time, the case shows that robust E&S integration does not eliminate implementation risk. It creates the systems, budgets, obligations, and monitoring mechanisms needed to manage those risks over time.

Balanced Outcome

Nam Theun 2 became a reference point for E&S management in large hydropower PPPs, but it should be presented as a disciplined lesson in adaptive risk management rather than as a simple success story. The project achieved major resettlement, revenue, and financing outcomes, yet it also experienced safeguard compliance challenges that required corrective action late in implementation. Its strongest contribution to this report is its demonstration of how E&S integration can improve bankability when it is structured as a legally enforceable, financed, monitored, and adaptive project management system.

Evidence Base for the Case Study

This case study draws on the World Bank ICR for the Nam Theun 2 Hydroelectric Project and Nam Theun 2 Social and Environment Project; the ADB/NTPC Summary Environmental and Social Impact Assessment; the World Bank's 2005 financing update; MIGA's political risk insurance disclosure; and European Investment Bank (EIB) information on co-financing. These sources provide the basis for the project cost figures, financing contribution profile, E&S-linked expenditure, E&S instruments, resettlement and downstream livelihood outcomes, biodiversity and watershed management arrangements, and bankability analysis.

5.3 Case Study 3: Bogotá Metro Line 1 (Colombia)

Project Overview

Bogotá Metro Line 1 is one of the most significant urban transport investments in Latin America and Colombia's first metro project. The project is designed to address chronic congestion, improve public transport quality, expand access to jobs and services, reduce travel times, strengthen integration with Bogotá's wider mass transit system, and support the city's transition toward lower-emission urban mobility.



The first section of Line 1 consists of an approximately 24 km fully elevated metro corridor running from southwestern Bogotá toward the city's central business area. It includes 16 stations, a railyard, rolling stock, signaling, electrical systems, telecommunications, control and safety systems, fare collection systems, and integration with the TransMilenio Bus Rapid Transit network at multiple nodes. The system is expected to operate as a high-capacity electric urban rail line and serve some of the city's most congested and underserved mobility corridors.

The project is implemented by Empresa Metro de Bogotá S.A. under a design, finance, build, operate, maintain, and transfer concession model. The structure combines public financing, sovereign-backed MDB loans, and private sector participation through the concessionaire. The concession model includes construction-period payments, availability-style payment mechanisms during operations, and performance-linked obligations. This makes Bogotá Metro Line 1 a relevant case for this report because it shows how E&S integration can affect not only project mitigation measures but also project structuring, contractual risk allocation, implementation readiness, and investor confidence in a complex urban PPP.

The project is also important because it demonstrates that large urban public transport projects can carry substantial E&S risks, even when they generate major climate, accessibility, and road safety benefits. In Bogotá, the main risks were associated not with greenfield natural habitat conversion but with construction in a dense urban corridor. These risks included land acquisition, physical and economic displacement, impacts on formal and informal businesses, utility relocation, traffic disruption, noise and vibration, air quality, construction and demolition waste, occupational health and safety, community health and safety, risks of sexual exploitation and abuse and sexual harassment, impacts on urban trees and public space, chance finds and archaeological materials, and the management capacity of multiple public and private actors.

Financing Contribution Profile

Bogotá Metro Line 1 was prepared as a sequenced financing package combining public budget commitments, MDB financing, other debt sources, and private concessionaire financing.

The original project financing envelope for Line 1 was approximately $4.3 billion–$4.4 billion, excluding long-term O&M costs. The principal sources and uses of funds were structured broadly as shown in Table 5.7.

Table 5.7: Bogotá Metro Line 1: Financing Contribution Profile

Financing Source	Approximate Amount	Financing Type/Role
Bogotá District cash contribution	$0.7 billion	Public sponsor contribution, including direct investments by Empresa Metro de Bogotá
International Bank for Reconstruction and Development/World Bank	Up to $0.6 billion	Sovereign-backed development finance, split between Series 1 and Series 2 operations

Inter-American Development Bank	Up to $0.6 billion	Sovereign-backed development finance and lead procurement role under agreed arrangements with co-financiers
European Investment Bank	$0.48 billion–$0.50 billion	Sovereign-backed development finance
Other multilateral development banks, bilateral institutions, and/or financial markets	$0.9 billion	Additional debt financing to complete the financing package
Concessionaire equity and debt	$1.1 billion	Private-sector financing through the public-private partnership concession
Total capital financing envelope	$4.3 billion–$4.4 billion	Blended public, multilateral development bank, and private financing package

Source: Authors' compilation based on project documents.

The original World Bank-supported Series of Projects included an initial IBRD loan of $70 million and a subsequent planned operation of approximately $530 million. Later World Bank documentation for Series 2 confirmed a $530 million IBRD operation as part of a broader financing package that also included counterpart funding, IDB financing, and EIB financing. The project therefore illustrates a sequenced approach to financing: public and MDB resources helped finance preparation, early works, land acquisition-related readiness, utility relocation, project management, and construction, while private capital was mobilized through the concession structure.

In addition to the sovereign and MDB financing package, the concessionaire later mobilized private debt from international and local lenders. This included offshore and local currency credit facilities arranged to support the design and construction phase. This private financing is important to the bankability analysis because it demonstrates that the project moved beyond public and MDB financing to include private capital participation under a structured PPP framework.

Identifiable E&S-Linked Expenditure

Publicly available documents do not disclose a consolidated E&S budget for Bogotá Metro Line 1, nor do they allocate E&S costs by financier. As with many MDB-supported infrastructure projects, E&S costs are embedded in multiple budget lines and contractual obligations rather than presented as a single "E&S expenditure" category.

The most clearly identifiable E&S-linked expenditure categories include land acquisition, resettlement implementation, utility relocation, traffic management, E&S studies, management plans, stakeholder engagement, grievance management, supervision, contractor EHS requirements, OHS systems, community health

and safety measures, and monitoring. The original financing table identified approximately $0.4 billion for land acquisition and approximately $0.1 billion for utility network transfers as part of direct investments by Empresa Metro de Bogotá. These should be treated as E&S-relevant and implementation-readiness expenditures, but not as pure E&S budget lines, because they also served core project delivery functions.

Table 5.8: Identifiable E&S-Linked Expenditure: Bogotá Metro

E&S Cost Area	Publicly Quantified?	How the Cost Was Reflected
ESIA, ESMP, RPF, RAPs, and related studies	Not separately disclosed as a consolidated E&S budget	Embedded in project preparation, lender due diligence, sponsor obligations, and project management
Land acquisition and resettlement	Partly quantified through the broader land acquisition allocation	Reflected in direct investments by Empresa Metro de Bogotá and implemented through RAPs and related social management instruments
Utility relocation	Partly quantified as part of direct project investments	Required to enable construction and reduce implementation risks; also generated environmental, health, and safety and community-disruption risks
Traffic management	Not disclosed as a stand-alone E&S budget	Embedded in construction planning, permits, mobility authority approvals, concessionaire obligations and supervision
Construction noise, vibration, dust, and air quality controls	Not separately disclosed	Embedded in ESMPs, construction method statements, permits, monitoring, and contractor requirements
Occupational health and safety	Not separately disclosed	Embedded in concessionaire and contractor health, safety, and environment systems, supervision contracts, method statements, and reporting
Community health and safety, including road safety and site-interface management	Not separately disclosed	Embedded in traffic management plans, community protection measures, work-front management, and stakeholder engagement

Economic displacement and informal activity support	Partly reflected through RAPs and social management programs	Addressed through livelihood restoration, compensation, relocation, or transitional measures where applicable
Stakeholder engagement, information disclosure, and grievance management	Not separately disclosed	Embedded in project implementation arrangements, public attention centers, grievance redress mechanism systems, and reporting
Independent supervision and lender monitoring	Not disclosed as E&S-only	Embedded in project management office, supervision, and multilateral development bank implementation support arrangements

E&S = environmental and social, ESIA = Environmental and Social Impact Assessment, ESMP = Environmental and Social Management Plan, RAP = Resettlement Action Plan, RPF = Resettlement Policy Framework.

Source: Authors' compilation based on project documents.

The case therefore supports a broader point in the report: E&S expenditure is often not visible as a single budget line, but it can be central to implementation readiness and bankability. In Bogotá, land acquisition, utility relocation, traffic management, resettlement planning, E&S supervision, and contractual EHS requirements were not peripheral safeguard costs. They were part of the practical conditions needed for a dense urban rail PPP to be procured, financed, and implemented.

5.3.1 E&S Risk Classification, Instruments, and Scope of Assessment

Bogotá Metro Line 1 was appropriately treated as a high-risk infrastructure project from an E&S perspective. Under the World Bank's safeguard framework, the project was classified as Environmental Category A because of the scale of construction, the dense urban setting, the number of affected people and businesses, the complexity of implementation arrangements, and the potential for significant disruption during the construction stage. Later World Bank documentation for the subsequent operation continued to identify high E&S risk.

The principal E&S instruments included an ESIA, an ESMP, an RPF, an initial RAP, subsequent RAPs, stakeholder engagement processes, grievance redress arrangements, traffic management requirements, and contractual EHS obligations for the concessionaire and contractors. These instruments were not merely compliance documents. They formed part of the project's operational and contractual architecture by defining what Empresa Metro de Bogotá, the concessionaire, contractors, supervisors, and public authorities needed to do before and during construction.

The social safeguards architecture was particularly important. The RPF applied to the wider Line 1 investment. An initial RAP addressed critical properties needed for the alignment, while additional RAPs were required for remaining properties, metro stations, the railyard, and impacts on street vendors. This sequencing was appropriate because the final design, station locations, work fronts, and construction methods could affect the precise scope of land acquisition and economic displacement.

The environmental and community risk instruments addressed a broad set of urban construction risks. These included noise and vibration, dust and air emissions, construction and demolition waste, hazardous materials, soil and groundwater contamination risks, utility interruptions, traffic diversions, pedestrian access, public safety around work fronts, emergency preparedness, tree removal and replacement, impacts on public space, chance finds and archaeological procedures, and OHS risks for workers operating in a constrained urban corridor.

The project therefore provides a strong example of E&S due diligence at the project and activity levels. The E&S architecture included project-level assessment, site- and activity-specific management plans, resettlement instruments, concessionaire and contractor obligations, independent supervision, and lender oversight. This approach was necessary because Line 1 was not a simple public works contract. It was a multi-actor PPP involving a public implementing agency, national and district authorities, MDB co-financiers, a private concessionaire, subcontractors, utility companies, transport authorities, local communities, affected businesses, and users of the existing urban transport system.

5.3.2 Timing and Integration of E&S Considerations

E&S considerations entered the project during preparation, before procurement and full construction were locked in. This timing was critical because it allowed E&S issues to influence the practical structuring of the project, including land acquisition planning, the scope of early works, utility relocation, traffic management, stakeholder engagement, bidding documents, concessionaire obligations, and supervision arrangements.

The case should not be overstated as one in which E&S analysis alone determined the choice of an elevated rather than an underground design. The elevated option reflected a broader combination of technical, economic, seismic, construction-risk, scheduling, and financing considerations. The stronger and more defensible analytical point is that E&S due diligence tested the implications of the selected elevated alignment, identified the main urban impact pathways, and converted those risks into mitigation measures, contractual obligations, and implementation conditions.

The E&S process was especially relevant to alignment and station-interface management. In a dense urban corridor, small changes in alignment, station access, work front location, and construction sequencing can materially affect the number of properties acquired, the extent of business disruption, traffic diversion requirements, pedestrian safety, and the intensity of community complaints. Early E&S work therefore helped move the project from an engineering concept to an implementable urban infrastructure transaction.

E&S considerations were also integrated into procurement and the concession framework. The World Bank loan agreement required the concessiona ire contract to include obligations to comply with safeguard instruments and GRMs. It also required E&S obligations to be incorporated into bidding documents and contracts among the borrower, concessionaire, contractors, subcontractors, and supervision entities. This is a central lesson from the case: E&S requirements became part of the enforceable delivery chain rather than being treated as post-approval conditions outside the PPP structure.

5.3.3 Principal E&S Risk Pathways and Management Measures

Land Acquisition, Physical Displacement, and Economic Displacement

The most material social risk pathway was land acquisition and displacement in a dense urban corridor. The project required the acquisition of properties for the alignment, stations, railyard, access points, and associated works. It also affected businesses, informal economic activities, and street vendors. The risk was not limited to household relocation. It included the loss of commercial premises, temporary loss of access, income disruption during construction, relocation of vendors, and the potential for disputes over compensation, eligibility, and livelihood restoration. The RPF and RAPs provided the operational framework for identifying affected persons, defining eligibility, valuing assets, providing compensation at replacement cost, restoring livelihoods, and managing grievances. This reduced uncertainty for lenders and investors because land acquisition was treated as a structured implementation requirement rather than an unresolved political or social risk.

The implementation lesson is that urban rail resettlement is often less visible than rural displacement, but it can be equally complex. In Bogotá, affected parties included property owners, tenants, businesses, vendors, workers, commuters, and nearby residents. Managing these impacts required not only compensation but also sequencing, communication, legal support, access management, and continued engagement during construction.

Informal Economic Activities and Business Disruption

Urban transport corridors often support formal and informal economic activity. Construction can interrupt access to shops, reduce foot traffic, disrupt deliveries, change pedestrian movement patterns, and temporarily reduce sales. These impacts can generate significant grievances even where physical displacement is limited.

The Bogotá Metro case therefore required specific attention to business continuity, vendor relocation, temporary access measures, communication with affected businesses, and livelihood restoration where permanent or temporary economic displacement occurred. From a bankability perspective, this mattered because unresolved business and vendor impacts could result in complaints, legal action, political pressure, construction obstruction, and reputational risk for the implementing agency, concessionaire, and financiers.

Traffic, Mobility, and Access Disruption

Traffic disruption was one of the most important risks during construction. Line 1 is being built in corridors that are already critical to Bogotá's public transport and road network, including areas connected to the TransMilenio system. Construction

work fronts, road closures, utility relocation, and material movements can affect buses, private vehicles, pedestrians, cyclists, emergency vehicles, and local access. Traffic management plans were therefore a core E&S and implementation-readiness instrument. They were required to address public transport continuity, pedestrian safety, access to businesses and homes, construction vehicle movements, interactions with other infrastructure works, and approval by the relevant mobility authority. This illustrates an important operational point: in dense urban infrastructure, traffic management is not merely a construction logistics issue; it is an issue involving community health and safety, livelihoods, and risks to stakeholders.

Noise, Vibration, Air Quality, and Urban Amenities

Construction and operation of an elevated metro line create noise and vibration risks. During construction, piling, demolition, heavy equipment, truck movements, nighttime activities, and station works can affect residents, schools, businesses, and public institutions. During operation, train movements, station announcements, mechanical systems, and activity in public spaces can generate continuing noise concerns.

The ESIA process identified these concerns through consultation and translated them into monitoring, design, and mitigation requirements. These included construction noise controls, vibration monitoring, dust suppression, management of working hours, communication with affected communities, and operational design measures. Because the alignment is elevated, urban integration and visual impacts were also relevant. These included station design, pedestrian access, treatment of public spaces, landscaping, lighting, and safety.

Occupational Health and Safety

The project involves significant OHS risks, including work at height, lifting operations, heavy equipment, traffic interface, electrical and mechanical systems, confined spaces, construction near live utilities, night works, emergency response, and the management of a large workforce. These risks are heightened by the urban location and the involvement of multiple contractors and subcontractors.

The concessionaire and contractors were required to establish EHS management systems, develop procedures for specific activities, train workers, monitor incidents, manage subcontractors, and implement corrective actions. This was essential because construction-stage OHS performance affects not only worker welfare but also schedule reliability, contractor performance, lender supervision, and public confidence.

Community Health, Safety, and Security

Community health and safety risks included traffic accidents, unsafe pedestrian interfaces, unauthorized access to worksites, emergency events, utility interruptions, construction near schools or businesses, and public safety around stations and work fronts. These risks required fencing, signage, traffic marshals, safe pedestrian routes, emergency preparedness, public information campaigns, and coordination with city authorities.

Sexual exploitation and abuse and sexual harassment risks also required attention, especially given the scale of construction activity and workforce presence along populated corridors. Later project documentation identified the need for sexual exploitation and abuse and sexual harassment prevention measures, worker and community awareness, survivor-centered grievance arrangements, and coordination with Bogotá city's resources. This is an important addition to the case because it shows that urban transport E&S risk management increasingly extends beyond land, noise, and traffic to include gender, safety, and user experience.

Cultural Heritage and Archaeological Chance Finds

Excavation and utility works in a historic urban area can encounter archaeological materials or cultural heritage assets. The project therefore required chance-find procedures and coordination with the competent authorities. The implementation experience also showed that archaeological discoveries can affect schedules if they are not anticipated and managed through adaptive procedures. This is a useful lesson for MDB staff: cultural heritage risk in urban projects may appear limited at appraisal but can become material during construction.

Box 5.2: Additional Environmental and Social Measures and Outcomes: Bogotá Metro Line 1

Beyond the main risk management measures discussed above, Bogotá Metro Line 1 incorporated several additional E&S and development measures.

Gender and User Safety

The project included attention to gender-responsive transportation outcomes, including user safety, employment targets for women in the O&M phase, and measures to prevent sexual exploitation and abuse and sexual harassment during construction and operation. This is important because women, caregivers, and lower-income users often experience urban transportation systems differently from other users.

Implementation Lessons

Despite extensive preparation, the project experienced implementation challenges linked to land acquisition, utility relocation, archaeological discoveries, construction sequencing, and broader political debate over metro design. These challenges do not invalidate the E&S approach. They show why E&S supervision, adaptive management, and contractual leverage remain necessary throughout implementation.

Balanced Outcome

Bogotá Metro Line 1 should be presented neither as a simple success story nor as a case in which E&S solved all delivery risks. Its strongest contribution to this report is its demonstration of how E&S integration can improve the quality of preparation, support PPP risk allocation, reduce financing uncertainty, and provide a framework for managing residual risks during implementation.

Urban Trees, Public Space, and Biodiversity

Although the project corridor is highly urbanized, the E&S process did not treat it as environmentally irrelevant. Tree removal, vegetation management, changes to public spaces, and impacts on urban fauna required assessment and mitigation. Urban biodiversity and public space values matter because they affect community acceptance, heat-island conditions, landscape quality, and the perceived livability of the corridor. Measures such as tree inventories, compensation planting, landscaping, and restoration of the public realm were therefore part of the broader E&S management approach.

5.3.4 Institutional Arrangements and E&S Management Systems

A central feature of the Bogotá Metro case is the institutionalization of E&S responsibilities across the PPP delivery chain. Empresa Metro de Bogotá retained overall responsibility for project implementation and compliance with MDB requirements. The concessionaire was responsible for detailed design, construction, operation, and maintenance and therefore had to translate E&S obligations into practical construction and operational systems. Contractors and subcontractors were required to implement controls at work fronts, OHS procedures, traffic management, stakeholder communication, and environmental mitigation measures. Supervisory firms and the project management office provided oversight and reporting. MDBs provided due diligence, financing conditions, no-objection processes, implementation support, and supervision.

This institutional architecture matters because E&S risks in PPPs can fall between actors if responsibilities are not clearly allocated. In Bogotá, E&S requirements were incorporated into the concessionaire contract, bidding documents, contractor obligations, supervision arrangements, and grievance mechanisms. This strengthened enforceability and reduced ambiguity over responsibility for land-related measures, construction impacts, worker safety, community health and safety, traffic management, and monitoring.

The project also illustrates the importance of borrower capacity. Empresa Metro de Bogotá had to maintain technical, fiduciary, social, and environmental specialists acceptable to lenders. It also established social, communications, and legal capacity to manage resettlement, stakeholder engagement, and complaints. This was particularly important because project risks continued to evolve after financial close, as detailed design, the sequencing of work fronts, utility relocation, and construction conditions became more specific.

5.3.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through six main channels.

First, it reduced uncertainty surrounding land acquisition and displacement. The RPF and RAPs provided a structured framework for compensation, relocation, livelihood restoration, and grievance management. This helped convert one of the project's most material risks into a sequenced implementation process subject to lender review and monitoring.

Second, it improved implementation readiness. Early identification of property acquisition requirements, utility relocation needs, traffic management constraints, stakeholder concerns, and construction-interface risks helped prepare the project for procurement and construction. In an urban PPP, this readiness is critical because delays in land handover, permits, utility relocation, or traffic approvals can directly affect concessionaire performance and financing assumptions.

Third, it strengthened contractual risk allocation. By incorporating E&S obligations into concession and contractor documents, the project made E&S compliance part of the enforceable delivery framework. This reduced the risk that E&S requirements would remain outside the PPP contract and become a source of dispute after financial close.

Fourth, it supported lender coordination. The project involved multiple MDBs and financing institutions with overlapping but not identical requirements. The use of common E&S instruments, procurement arrangements, supervision mechanisms, and reporting requirements helped reduce duplication and establish a shared risk management platform.

Fifth, it improved stakeholder management. Public consultation identified concerns related to property acquisition, construction damage, noise, traffic diversion, tree removal, cultural assets, and construction sequencing. The project's stakeholder engagement and grievance mechanisms provided channels for receiving and addressing concerns during implementation. This contributed to social license and reduced the likelihood that unresolved concerns would escalate into more serious delivery risks.

Sixth, it helped link E&S management to inclusive urban development outcomes. The project's benefits include improved mobility, better access to jobs and services, lower emissions, road safety gains, and improved user experience. E&S integration helped ensure that these benefits were not pursued without attention to distributional impacts, gender, accessibility, business disruption, public safety, and community concerns.

The case should, however, be presented in a balanced way. E&S integration did not eliminate all implementation risks. The project experienced scheduling pressures and implementation complexities associated with utility relocation, land acquisition, archaeological discoveries, construction sequencing, and political debate over metro design choices. The stronger conclusion is that E&S integration improved the project's capacity to identify, allocate, and manage these risks but did not remove the need for adaptive management during construction.

5.3.6 Implications for Bankability and Financing

Bogotá Metro Line 1 illustrates how E&S integration can contribute to bankability in a complex urban PPP. The project was bankable not because E&S integration alone attracted private capital but because E&S due diligence formed part of a broader financing-readiness package that included sovereign support, future budget commitments, MDB participation, concession structuring, performance-based obligations, public sector implementation capacity, and private concessionaire financing.

From a financing perspective, E&S integration contributed to bankability in five ways.

First, it improved risk clarity. Lenders and investors had documented information on land acquisition, resettlement, traffic disruption, construction impacts, utility relocation, OHS, community health and safety, stakeholder engagement, and grievance management. This made nonfinancial risks more visible, bounded, and manageable.

Second, it strengthened implementation readiness. By addressing land acquisition, traffic management, utility relocation, and stakeholder issues before and during procurement, the project reduced the likelihood that unresolved E&S issues would prevent site access, delay works, or undermine concessionaire performance.

Third, it supported enforceability. E&S obligations were incorporated into concessionaire and contractor requirements. This gave lenders greater confidence that E&S commitments were not merely policy statements but contractual obligations linked to project implementation.

Fourth, it reduced coordination risk among financiers. A common E&S management platform helped align MDB expectations, procurement arrangements, disclosure, supervision, and corrective action requirements. This was particularly important because the project relied on a blend of national, district, MDB, and private financing.

Fifth, it helped support private capital mobilization. Private lenders and concessionaire sponsors needed confidence that land acquisition, permits, utility relocation, community interaction, and construction risks were manageable. E&S instruments and contractual controls helped reduce uncertainty surrounding these risks and therefore contributed to the conditions under which private financing could be mobilized.

The stronger analytical conclusion is not that E&S integration alone made Bogotá Metro Line 1 bankable. Rather, E&S integration was part of the bankability architecture. It helped convert a politically sensitive and technically complex urban rail project into a transaction that public authorities, MDBs, and private financiers could structure, finance, supervise, and implement with greater confidence.

5.3.7 Key Takeaways

Bogotá Metro Line 1 demonstrates that E&S integration can create significant value when it is introduced early enough to influence project preparation, procurement, PPP structuring, land acquisition planning, stakeholder engagement, traffic management, contractor obligations, and implementation supervision. In this case, the principal E&S value was not simply compliance with MDB safeguards. It was the conversion of complex urban risks into a practical delivery framework.

For MDB staff, the case provides three operational lessons. First, E&S due diligence in dense urban infrastructure should be treated as part of project structuring, not as a downstream clearance requirement. Second, land acquisition, economic

displacement, utility relocation, and traffic management are core bankability issues because they directly affect construction access, schedule risk, and concessionaire performance. Third, E&S obligations must be embedded in PPP contracts, contractor requirements, supervision arrangements, and grievance systems if they are to influence implementation.

The Bogotá Metro case therefore supports the central argument of this report: E&S standards can contribute to financing readiness when they help clarify risks, improve project design, strengthen implementation systems, allocate responsibilities, and create confidence among public authorities, MDBs, private sponsors, lenders, and affected communities.

Evidence Base for the Case Study

This case draws on the World Bank Project Appraisal Document and Implementation Status and Results Reports for Bogotá Metro Line 1, World Bank Series 2 documentation, EIB and IDB project information, public disclosure of E&S instruments, and recent public information on concessionaire financing and implementation progress.

5.4 Case Study 4: Benban Solar Park (Egypt)

Project Overview

The Benban Solar Park in Egypt is an example of portfolio-scale renewable energy development supported by private capital, MDB financing, DFI participation, climate finance, and political risk mitigation. Located near Aswan in Upper Egypt, the solar park was developed as a cluster of privately sponsored PV power plants



within a common desert site allocated by the New and Renewable Energy Authority (NREA). Rather than being structured as a single infrastructure asset, Benban was developed as a platform of separate special purpose project companies, each responsible for developing, financing, constructing, and operating an individual solar plant under Egypt's feed-in tariff (FiT) program.

Benban is included as a key case study because it illustrates a distinct form of E&S value creation: the use of a site-wide E&S architecture to make a portfolio of parallel private investments financeable at scale. The project was not environmentally and socially complex in the same way as a hydropower project, urban metro, or waste PPP. Individual solar PV plants were generally expected to have manageable site-specific impacts. However, the simultaneous development of dozens of plants in the same location created cumulative and coordination risks that could not be managed effectively by each developer acting alone. These risks included labor influx, worker accommodation, OHS, traffic and logistics, security, waste management, water supply, community expectations, grievance handling, cultural heritage chance finds, contractor management, and the consistent application of lender requirements across multiple sponsors.

The financing structure reflected the portfolio nature of the project. The Egyptian government provided the enabling policy framework through the FiT program, land allocation through NREA, grid evacuation arrangements through the Egyptian Electricity Transmission Company, and long-term power purchase arrangements. Private developers established project companies for individual plants. MDBs, DFIs, commercial banks, and political-risk insurers then financed different groups of projects within the broader solar park.

Identifiable E&S-Linked Expenditure

Publicly available documents do not disclose a consolidated E&S budget for Benban Solar Park, nor do they allocate E&S costs by individual financier. This is consistent with many MDB-supported infrastructure projects: E&S costs were embedded in the Strategic Environmental and Social Assessment (SESA), project-level EIAs, environmental and social due diligence, ESAPs, sponsor and EPC management systems, Facilities Management Contractor functions, labor and worker accommodation measures, traffic and security management, stakeholder engagement, grievance mechanisms, monitoring, and lender supervision.

The most clearly identifiable E&S-linked expenditure was the preparation and implementation of the site-wide SESA and associated ESAP. EBRD mobilized technical cooperation resources to support NREA in preparing the SESA for the Benban site. The SESA was not a physical CAPEX item, but it was highly material to financing readiness because it established the basis for managing cumulative risks across multiple projects.

Other E&S-related costs were material but were not separately quantified in public sources. These costs are presented in Table 5.9.

Table 5.9: E&S-Related Costs: Benban Solar Park

E&S Cost Area	Publicly Quantified?	How the Cost Was Reflected
Strategic Environmental and Social Assessment and site-wide ESAP	Not disclosed as a consolidated E&S budget	Supported by EBRD technical cooperation and embedded in the project-enabling framework
Project-level EIAs, environmental and social due diligence reports, and ESAPs	Not separately disclosed	Embedded in sponsor preparation costs, lender due diligence, and project approval conditions
FMC functions	Not disclosed as an E&S-only cost	Embedded in shared site services, including traffic, water, waste, security, stakeholder engagement, and grievance management
Benban Developers Association coordination	Not separately disclosed	Embedded in developer coordination and shared implementation arrangements
Labor and worker accommodation measures	Not separately disclosed	Embedded in EPC contracts, worker accommodation arrangements, FMC services, and labor management systems
OHS, emergency response, and traffic management	Not separately disclosed	Embedded in EPC management plans, site-wide traffic plans, lender ESAPs, and supervision
Community engagement and grievance mechanisms	Not separately disclosed	Embedded in FMC functions, sponsor obligations, and stakeholder engagement plans
Waste, wastewater, and water supply management	Not separately disclosed	Embedded in shared facilities, FMC arrangements, project-level ESMPs, and operational requirements
Security management	Not separately disclosed	Embedded in site-wide security management and project-level security risk assessments
Lender E&S supervision and monitoring	Not separately disclosed	Embedded in MDB and DFI supervision and monitoring budgets

DFI = development finance institution, EBRD = European Bank for Reconstruction and Development, EIA = Environmental Impact Assessment, EPC = engineering, procurement, and construction, ESAP = Environmental and Social Action Plan, ESMP = Environmental and Social Management Plan, FMC = Facilities Management Contractor, MDB = multilateral development bank, OHS = occupational health and safety.

Source: Authors' compilation based on project documents.

5.4.1 E&S Risk Classification, Instruments, and Scope of Assessment

Benban was treated as a moderate-risk renewable energy platform at the level of individual subprojects but as a coordination-intensive development at the level of the full solar park. Individual PV plants were generally expected to have limited, site-specific, and manageable impacts. The site was open desert land allocated by NREA, with limited vegetation and no physical displacement of households. Land acquisition and resettlement risks were therefore substantially lower than those associated with many transport, hydropower, urban infrastructure, or transmission projects.

However, the low-to-moderate risk profile of each individual plant did not eliminate the cumulative risk profile of the overall development. The simultaneous construction of many PV projects created a set of shared environmental, social, health, and safety risks that could not be managed adequately through isolated project-level EIAs alone. The most material cumulative issues included traffic and logistics, OHS, workforce sourcing, labor management, worker accommodation, waste management, water supply, security, community expectations, stakeholder engagement, and grievance handling.

The E&S arrangements operated at the site-wide and individual project levels. First, a site-wide SESA was prepared for the Benban solar site to assess baseline conditions, cumulative impacts, shared risks, and framework mitigation measures for the development of the broader solar park. It provided an overarching risk management platform for issues common to multiple developers.

Second, the SESA was linked to an ESAP. The ESAP identified actions required to manage cumulative and shared risks, including responsibilities initially held by NREA and subsequently transferred to or operationalized through the developers, the Benban Developers Association (BDA), and the FMC.

Third, each individual subproject remained subject to project-specific E&S due diligence. Project-level EIAs, ESHS management plans, E&S due diligence gap analyses, and lender-specific ESAPs were used to assess and manage risks at the level of each sponsor, project company, EPC contractor, and O&M contractor.

Fourth, common implementation arrangements were established through the BDA and the FMC. This was particularly important because cumulative risks required a single operational interface for shared services such as traffic management, waste management, stakeholder engagement, grievance management, worker accommodation, security, and coordination of community-related issues.

Fifth, lender requirements were aligned around international standards, including the IFC Performance Standards, EBRD Performance Requirements, and other DFI requirements. This alignment helped avoid fragmented E&S expectations across different lenders and sponsors.

5.4.2 Timing and Integration of E&S Considerations

E&S considerations were integrated early in the development of the Benban platform, before the full set of individual project financings and construction activities had been finalized. This timing was critical because the principal E&S challenge was not merely mitigating the impacts of one solar plant but designing a governance and coordination system for a multi-developer renewable energy platform.

The SESA was commissioned by NREA with EBRD support and developed in consultation with IFC and other lenders. It was prepared before most Round 2 projects entered construction and before several financing arrangements reached full implementation. The SESA was approved by the Egyptian Environmental Affairs Agency in March 2016 and became part of the environmental permitting and implementation framework for the site. This allowed the SESA findings to inform both the regulatory process and the project finance due diligence undertaken by MDBs, DFIs, and commercial lenders.

The timing of the SESA created three important benefits. First, it converted a dispersed portfolio of individual solar projects into an assessable development platform. Lenders did not have to rely solely on isolated project-level assessments. They could also review a site-wide assessment of cumulative risks and required mitigation measures.

Second, it reduced duplication during preparation. Because the SESA established a common baseline and cumulative impact framework, individual projects could prepare more targeted project-level EIAs and due diligence documents. This supported consistency and reduced the need for each developer to repeat the same site-wide baseline work and stakeholder engagement process.

Third, it allowed common implementation arrangements to be established before construction risks peaked. The BDA and FMC became the principal mechanisms through which shared risks were to be managed. This was particularly important for labor influx, traffic, worker accommodation, community engagement, grievance handling, security, and waste management during the construction period.

5.4.3 Principal E&S Risk Pathways and Management Measures

Cumulative Impacts and Platform-Level Coordination

The main E&S issue at Benban was cumulative risk. Each individual PV plant was relatively small compared with the entire solar park, but the simultaneous development of many plants created aggregate impacts that could have become significant if left unmanaged. These included construction traffic, workforce influx, pressure on local services, waste volumes, site security, local hiring expectations, dust, road safety, emergency response, and community grievances.

The SESA addressed this issue by identifying common issues and requiring a coordinated management approach. The BDA was formed to provide a collective developer platform. The FMC was expected to manage or coordinate mandatory shared services across the solar park, including site EHS management, traffic, waste, stakeholder engagement, grievance handling, and other common functions. This arrangement reduced the risk that each developer would manage shared issues differently or that gaps between project boundaries would leave risks unmanaged.

Labor, Worker Accommodation, and Working Conditions

Labor and worker welfare were among the most important social risks. Although PV projects are not labor-intensive during long-term operation, construction required a large temporary workforce across multiple project sites. Risks included inconsistent employment practices, contractor and subcontractor labor management, worker accommodation standards, transport of workers, OHS, worker grievances, heat stress, emergency preparedness, and potential tensions between local and non-local workers.

The site-wide E&S approach required common labor and worker relations arrangements, worker accommodation strategies, and coordination through the FMC. Developers and EPC contractors were required to align project-specific labor and ESHS management plans with site-wide requirements. Local labor recruitment was expected to be coordinated in a way that improved transparency and managed community expectations. Worker accommodation, water, sanitation, medical services, emergency response, and site access had to be managed consistently across developers.

From an MDB perspective, this was a critical implementation-readiness measure. It shifted labor management from a fragmented contractor-by-contractor issue to a coordinated platform-level obligation supported by project-level ESAPs and lender supervision.

Occupational Health and Safety, Traffic, and Emergency Preparedness

OHS risk was material because many contractors were constructing projects in parallel in a remote desert setting involving heavy vehicles, electrical equipment, civil works, lifting operations, extreme heat, road transportation, and multiple subcontractors. Without common traffic and emergency response systems, the solar park could have faced an elevated risk of accidents and inconsistent reporting. The E&S framework required project-level ESHS management plans, EHS officers, contractor controls, emergency preparedness and response plans, traffic risk assessments, and alignment with site-wide FMC procedures. The FMC's role was particularly important for traffic management, shared access roads, site security, emergency coordination, and common EHS expectations.

This helped create a more credible construction risk management environment for lenders. Instead of relying solely on each sponsor's internal systems, financiers could look to a coordinated site-wide mechanism supported by project-level obligations.

Community Engagement, Grievance Management, and Local Benefits

The Benban site itself was not densely populated, and the project avoided physical displacement. However, nearby communities had interests in employment, road safety, access to opportunities, management of construction impacts, local services, and community investment. In a multi-developer setting, unmanaged expectations could have become a source of reputational and operational risk.

The SESA and subsequent lender due diligence identified the need for coordinated stakeholder engagement. The FMC was expected to manage site-wide stakeholder engagement and grievance mechanisms, while individual sponsors retained responsibility for grievances linked to their own activities, contractors, or subcontractors. This created a two-tier grievance structure: a central mechanism for the overall solar park and project-level responsibility when a complaint was attributable to a specific developer.

The approach also supported more coherent community investment. Corporate social responsibility activities undertaken by individual developers could have been fragmented and duplicative. Through the BDA and FMC arrangements, community investment and local benefit measures could be better aligned with local priorities and managed in a way that reduced competition or inconsistent expectations among developers.

Security and Community Health and Safety

Security was another common risk. A large construction site with many developers required access control, asset protection, worker safety, coordination with public authorities, and appropriate conduct by private security personnel. If managed inconsistently, security arrangements could create community tensions, worker grievances, or reputational risks.

The E&S requirements called for site-wide and project-level security risk assessments and security management plans. Security personnel were expected to be trained and managed consistently with international standards, including requirements concerning appropriate conduct, proportional use of force, and respect for workers and communities. Security management therefore became part of the broader community health, safety, and security framework rather than a narrow asset protection function.

Water, Wastewater, and Waste Management

PV projects require less water than concentrated solar power projects, but water remains relevant during construction, dust suppression, operation of worker facilities, and panel cleaning. Benban's desert location made water sourcing and distribution a common operational issue. NREA and the relevant authorities were responsible for groundwater-related studies and permitting, while the FMC was expected to coordinate water supply and distribution arrangements across developers.

Waste management was also a cumulative issue because multiple construction sites generated waste at the same time. The FMC was expected to coordinate waste management services for the solar park, while individual developers and EPC contractors remained responsible for compliance with their project-level ESHS management plans. This reduced the risk of inconsistent disposal practices, uncontrolled waste accumulation, or unclear accountability for shared waste streams.

Cultural Heritage and Chance Finds

Baseline studies did not identify major cultural heritage resources within the project sites. However, given Egypt's archaeological sensitivity and the scale of earthworks across a large desert site, chance-find procedures were required. The practical value of this measure was not that it identified a major heritage issue but that it established a common response protocol if archaeological resources were encountered during construction. This reduced the risk that unexpected discoveries would be handled inconsistently across different project companies.

5.4.4 Institutional Arrangements and E&S Management Systems

The most important institutional feature of Benban was the creation of an E&S governance structure operating at the site-wide and individual project levels, linking public authorities, developers, lenders, contractors, and site-wide management arrangements.

NREA provided the land and was the principal public sponsor for the site-wide SESA. The Egyptian Electricity Transmission Company was responsible for grid connections, substations, and transmission-related infrastructure. Individual sponsors and project companies were responsible for developing, financing, constructing, and operating their respective plants. EPC contractors and subcontractors were responsible for day-to-day construction performance, subject to sponsor oversight and lender requirements. MDBs, DFIs, and commercial lenders provided due diligence, financing conditions, monitoring, and supervision.

The BDA provided a collective platform for developers to coordinate common issues, while the FMC was the operational mechanism intended to manage shared services and site-wide E&S requirements. The FMC's responsibilities included coordination of traffic, waste, water and wastewater services, security, stakeholder engagement, grievance management, worker accommodation, and other cross-cutting issues.

This institutional structure was important because it addressed a common weakness in multi-project infrastructure platforms: the absence of clear accountability for risks that fall between individual project boundaries. At Benban, cumulative risks were not left unassigned. They were allocated through the SESA, ESAP, BDA, FMC, project-level ESAPs, sponsor obligations, and lender monitoring.

The approach also improved the ability of lenders to supervise the portfolio. Financiers could conduct project-specific supervision while also reviewing site-wide arrangements for common issues. This reduced information asymmetry and strengthened confidence that E&S performance would not depend entirely on the weakest individual developer.

5.4.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through five main channels.

First, the SESA created a common due diligence platform. By assessing the solar park as a coordinated development rather than as isolated projects, the SESA helped lenders, sponsors, and authorities understand cumulative risks and agree on common mitigation measures. This improved the quality and consistency of project preparation.

Second, the site-wide approach reduced duplication. Individual developers still needed project-specific EIAs, environmental and social due diligence, and ESAPs, but they could rely on the SESA for shared baseline, cumulative impact, and stakeholder engagement issues. This reduced the need for each project to recreate the same site-wide analysis and supported faster, more consistent preparation across multiple transactions.

Third, the BDA and FMC converted cumulative risks into operational responsibilities. Labor, worker accommodation, traffic, security, community engagement, grievance handling, waste, and water management were no longer left to ad hoc coordination among developers. They were assigned to common arrangements, with individual sponsors retaining responsibility for their own sites and contractors. This reduced coordination risk and improved implementation readiness.

Fourth, the common E&S architecture supported lender confidence. Benban involved many financiers with overlapping requirements. A shared SESA and ESAP, alignment with IFC Performance Standards, EBRD Performance Requirements, and other DFI standards, and a common site-wide management structure helped lenders appraise and supervise projects with greater confidence. This was particularly important because financing was proceeding in parallel across multiple project companies.

Fifth, E&S integration strengthened the credibility of the overall investment platform. A failure by one developer to manage labor, OHS, security, or community grievances could have created reputational and operational risks for the entire solar park. The common E&S approach reduced this "weakest link" risk by establishing minimum expectations and coordinated oversight.

The case should not be presented as proof that E&S integration alone mobilized capital. Benban's bankability depended heavily on the FiT structure, government support, MDB and DFI participation, political risk mitigation, declining PV costs, sector reforms, and long-term PPAs. The stronger conclusion is that E&S integration helped make a large, multi-developer financing platform more coherent, lower-risk, and easier for lenders to appraise, approve, and supervise.

5.4.6 Implications for Bankability and Financing

Benban illustrates how E&S integration can contribute to bankability at the portfolio or platform level. This differs from the Noor case, in which E&S integration influenced site selection, technology, water management, and phased PPP structuring within a single complex. At Benban, the core added value was standardization and coordination across many private investments.

From a financing perspective, E&S integration contributed to bankability in five ways.

First, it reduced uncertainty surrounding cumulative risks. Lenders had a site-wide assessment of issues that could not be fully understood at the level of an individual plant. This made labor influx, worker accommodation, traffic, waste, security, community engagement, and grievance risks more visible and manageable.

Second, it clarified risk allocation. The SESA, ESAP, BDA, and FMC arrangements helped allocate responsibilities among NREA, the Egyptian Electricity Transmission Company, developers, EPC contractors, and shared service providers. This was important because unclear responsibility for common infrastructure and shared risks can delay financial close or weaken lender confidence.

Third, it reduced transaction costs. Common baseline information, mitigation measures, and shared implementation arrangements reduced duplication across individual projects. This made it easier for multiple developers and lenders to proceed in parallel.

Fourth, it supported lender coordination. MDBs, DFIs, and commercial lenders could refer to common site-wide instruments while still applying project-specific due diligence. This reduced fragmentation and helped create a shared language for E&S risk management across financiers.

Fifth, it strengthened implementation credibility. The BDA and FMC structure gave lenders greater confidence that site-wide risks would be actively managed during construction and operation. This credibility was relevant not only to MDBs and DFIs but also to commercial lenders and political risk insurers relying on MDB due diligence and monitoring.

Benban therefore demonstrates that E&S integration can support capital mobilization by improving the institutional and operational quality of the investment platform. It did not substitute for a bankable tariff, credible offtaker arrangements, political risk mitigation, or government reform. Rather, it complemented these conditions by reducing nonfinancial risks that could otherwise have undermined parallel financing, construction coordination, and investor confidence.

5.4.7 Key Takeaways

The Benban Solar Park demonstrates that E&S integration can create value not only at the level of individual projects but also across a portfolio of related investments. The project's E&S significance lies in the way a site-wide SESA, cumulative impact ESAP, BDA, FMC, and project-level ESAPs were used to convert a potentially fragmented group of solar projects into a more coherent, financeable investment platform.

The principal lesson for MDB staff is that renewable energy platforms with many sponsors and parallel construction schedules require more than project-by-project safeguard compliance. They require early identification of shared risks, common management arrangements, clear allocation of responsibilities, coordinated stakeholder engagement, consistent labor and OHS standards, and lender-compatible monitoring systems.

Benban's financing outcome was driven by a broader package of reforms, FiT arrangements, PPAs, government support, MDB and DFI financing, commercial lender participation, concessional climate finance, and political risk guarantees. Within that package, E&S integration helped reduce uncertainty, standardize requirements, lower coordination costs, and strengthen confidence that the solar park could be implemented consistently across multiple developers. The case therefore provides strong evidence for the report's core argument: upstream E&S integration can improve financing readiness when it is treated as part of project structuring and implementation architecture rather than as a late-stage compliance requirement.

Project Outcome

Benban became one of the world's largest solar PV developments and a flagship example of Egypt's renewable energy transition. Its most important contribution to this report is not simply that it delivered clean energy capacity but that it shows how coordinated E&S management can support large-scale capital mobilization when multiple private developers, MDBs, DFIs, and commercial lenders finance parallel investments within a shared infrastructure platform.

Evidence Base for the Case Study

The case study draws on IFC public information and disclosure documents for Benban/Nubian Suns subprojects, EBRD project documents for the Egypt Renewable Feed-in-Tariff Framework and Benban SESA/ESAP, AIIB project summaries for Egypt Round II Solar PV Feed-in Tariffs, World Bank Group documentation on Egypt's energy sector reform and private capital mobilization, MIGA information on political risk guarantees, and publicly available lender and developer materials.

5.5 Case Study 5: Scaling Solar in Zambia

Project Overview

Scaling Solar in Zambia is a useful case for this report because it illustrates an E&S-to-bankability pathway that differs from those of the single-asset PPPs and project finance transactions examined elsewhere. Its distinctive feature was not the scale of the individual solar plants but the creation of a standardized investment platform through which project preparation, procurement, contractual documentation, financing options, guarantees, and E&S requirements were bundled before projects were presented to the market.

Scaling Solar was developed by the World Bank Group, led operationally by IFC, as a "one-stop-shop" model to help governments procure privately financed, grid-connected solar PV power rapidly and competitively. The model combined IFC transaction advisory support, pre-prepared tender and contractual documentation, access to IFC financing, World Bank/IDA guarantee support, and the potential availability of MIGA political risk insurance. In Zambia, the program was implemented through the Industrial Development Corporation (IDC), with ZESCO serving as the power purchaser under long-term PPAs.



Zambia was the first country to implement the Scaling Solar model. The first round was launched against a background of power shortages, heavy dependence on hydropower, drought-related supply stress, and a need to diversify the generation mix. In August 2015, IDC and IFC Advisory entered into an advisory arrangement to develop two solar PV projects with a combined target capacity of up to 100 MW. IFC supported the government, IDC, and ZESCO in project preparation, procurement design, commercial structuring, and the preparation of tender documentation.

The first round attracted strong market interest. Forty-eight companies submitted requests for qualification, and 11 were prequalified. In May 2016, approximately nine months after the start of the World Bank Group's engagement, IDC awarded two solar projects with a combined alternating current (AC) capacity of 75.7 MW. The Bangweulu project, sponsored by Neoen, First Solar, and IDC, was awarded a flat 25-year tariff of US¢6.015/kWh. The Ngonye project, sponsored by Enel Green Power and IDC, was awarded a flat 25-year tariff of US¢7.839/kWh. At the time, these were among the lowest solar tariffs achieved in sub-Saharan Africa outside South Africa.

The projects were structured as independent power producers selling electricity to ZESCO under 25-year PPAs. Bangweulu had an installed capacity of 47.5 MW AC, or approximately 55 MW peak, while Ngonye had an installed capacity of 28.2 MW AC, approximately 34 MW peak. Both projects were located in the Lusaka South Multi-Facility Economic Zone, approximately 20 km south of Lusaka. The choice of an industrial zone was important from an E&S perspective because it reduced the likelihood of major risks related to biodiversity, physical displacement, or complex land acquisition. However, the sites were not free of risk. The E&S due diligence identified legacy resettlement issues linked to the broader industrial zone, community expectations, worker health and safety risks, traffic, waste management, hazardous materials management, project security arrangements, and the need for effective stakeholder engagement and grievance management.

Scaling Solar Zambia is included in this report because it demonstrates how E&S requirements can be built into a standardized project preparation and procurement platform in a way that reduces uncertainty for private investors. The case also provides an important point of caution: standardized preparation can accelerate transactions, but it cannot substitute for sufficiently detailed site-specific due diligence. In Zambia, E&S disclosure requirements delayed the processing of the Ngonye project, and the World Bank ICR later noted that pre-tender due diligence, particularly concerning land ownership, land rental arrangements, and geotechnical issues, should be sufficiently thorough to avoid surprises for developers and lenders after award.

Financing Contribution Profile

The financing structure should be presented carefully. Scaling Solar Zambia was not financed by a single MDB loan or grant. It combined private sponsor equity, development finance debt, World Bank/IDA guarantees, IFC-arranged financing, and project preparation support (Table 5.10). Publicly available documents do not disclose a consolidated E&S budget. E&S costs were embedded in project preparation, ESIA and ESMP preparation, IFC and World Bank due diligence, Environmental and Social Review Summaries (ESRSs), ESAP preparation, developer obligations, EPC and O&M contracts, construction HSE systems, community engagement, lender supervision, and monitoring.

Table 5.10: Financing and Risk Mitigation Structure: Zambia Scaling Solar Round 1

Financing/Risk Mitigation Element	Amount/Role	Relevance to Bankability
Total actual project cost for Bangweulu and Ngonye	Approximately $105.5 million	Capital cost of the two constructed IPPs, excluding undisbursed guarantee exposure
Multilateral and bilateral financing	Approximately $81 million	Development finance debt helped reduce financing risk and improve affordability
Private capital financing	Approximately $24.5 million	Private sponsor equity mobilized through the IPP structure
International Development Association payment guarantees	Up to $5.7 million in total; no disbursement recorded at closing	Credit enhancement for ZESCO payment risk; important market signal to bidders and lenders
IFC financing and arranging role	IFC A loans, IFC-Canada Climate Change Program support, and arranging role	Helped make financing terms more predictable for bidders and lenders
OPIC/DFC support for Bangweulu	Debt financing support	Helped close the financing plan for the first project

European Investment Bank support for Ngonye	EIB loan support alongside IFC and IFC-Canada financing	Helped complete the financing package for the second project
Multilateral Investment Guarantee Agency political risk insurance	Available as part of the Scaling Solar platform but not requested in Zambia Round 1	Provided optional risk mitigation within the standardized World Bank Group package
Donor-supported project preparation	Advisory and project development support from development partners through IFC Advisory	Reduced upfront development costs and helped prepare the projects for tender

DFC = United States International Development Finance Corporation, IFC = International Finance Corporation, IPP = independent power producer, OPIC = Overseas Private Investment Corporation.

Source: Authors' compilation based on project documents.

E&S-Linked Expenditure and Commitments

Public documents do not identify a single E&S budget for Scaling Solar Zambia, and it would be misleading to imply that each financier had a separately quantified E&S contribution. The E&S value of the program was instead embedded in the preparation and delivery model. The most relevant E&S-linked costs are summarized in Table 5.11.

Table 5.11: E&S-Linked Expenditure and Commitments: Scaling Solar Zambia

E&S Cost/Commitment Area	Publicly Quantified?	How Reflected in the Project
Site screening, pre-feasibility assessment, and project preparation	Not disclosed as E&S-only	Embedded in IFC Advisory support and donor-supported project development
ESIA/ESMP preparation and Zambia Environmental Management Agency permitting	Not disclosed as E&S-only	Required for national approval and lender due diligence
IFC/World Bank Environmental and Social Review Summary and ESAP	Not disclosed as E&S-only	Formed part of disclosure, appraisal, and financing readiness
ESMS for construction and operation	Not disclosed separately	Required through ESAP and EPC/O&M obligations
HSE Officer and Community Liaison Officer	Not disclosed separately	Required to strengthen implementation capacity and local engagement

Stakeholder Engagement Plan and grievance mechanism	Not disclosed separately	Required before construction and during implementation
Occupational health and safety plan and project labor procedures	Not disclosed separately	Required under Performance Standard 2 and contractor management arrangements
Community Development Plan for affected and neighboring communities	Not fully quantified in public sources	Used to address residual social risks linked to legacy displacement and local benefit expectations
Lender supervision and Annual Monitoring Reports	Not disclosed as E&S-only	Used to track implementation of ESAPs, safeguard compliance, and corrective actions

E&S = environmental and social, EPC = engineering, procurement, and construction, ESAP = Environmental and Social Action Plan, ESIA = Environmental and Social Impact Assessment, ESMP = Environmental and Social Management Plan, ESMS = Environmental and Social Management System, HSE = health, safety, and environment, IFC = International Finance Corporation, O&M = operations and maintenance.

Source: Authors' compilation based on project documents.

The important analytical point is that E&S expenditure is not visible as a single line item, but it was material to the risk profile of the transaction. The program's E&S contribution came from converting site, land, labor, community, environmental, and permitting uncertainties into defined studies, disclosure requirements, management plans, contractual obligations, and lender-monitoring arrangements.

5.5.1 E&S Risk Classification, Instruments, and Scope of Assessment

The Scaling Solar Zambia projects were classified as Category B/Partial Assessment, reflecting the expectation that impacts would be site-specific, limited, and manageable through mitigation. This categorization was appropriate for grid-connected solar PV projects located in a modified industrial zone setting, but it did not mean that the projects were free of E&S risk.

The World Bank applied OP/BP 4.03, Performance Standards for Private Sector Activities, and IFC led the E&S due diligence. For the Bangweulu project, the disclosed ESRS identified Performance Standards 1, 2, 3, 4, and 5 as relevant: assessment and management of E&S risks; labor and working conditions; resource efficiency and pollution prevention; community health, safety, and security; and land acquisition and involuntary resettlement. Performance Standard 6 was not considered applicable to Bangweulu because the area had already been modified by agricultural and other human uses, and no flora or fauna of conservation value were identified in the project area. For Ngonye, documentation indicated a similar Category B approach but with additional attention to biodiversity and land issues because the project site included land partly linked to the wider Lusaka National Park area, although it was outside the physical park boundary fence.

The E&S documentation and management architecture included:

- ESIAs and ESMPs prepared under Zambian regulatory requirements and submitted to the Zambia Environmental Management Agency;
- ESRSs prepared for disclosure and lender appraisal;
- ESAPs setting out actions required to close gaps against IFC and World Bank requirements;
- Project-level ESMSs for construction and operation;
- OHS plans, project labor arrangements, and worker grievance mechanisms;
- Stakeholder Engagement Plans (SEPs) and external grievance mechanisms;
- Community Development Plans to address residual social issues and local benefit expectations;
- Emergency preparedness and response procedures; and
- Monitoring arrangements, including HSE key performance indicators, Annual Monitoring Reports, and lender supervision.

The project's E&S scope covered air quality, hydrology and water quality, waste, noise, traffic, visual impacts, occupational health and safety, hazardous materials, community health and safety, labor conditions, project security, land and legacy resettlement issues, stakeholder engagement, and decommissioning considerations. This was a relatively broad E&S scope for a solar PV project, reinforcing a key message of this report: renewable energy projects may be climate-positive, but they still require disciplined local E&S risk management.

5.5.2 Timing and Integration of E&S Considerations

E&S considerations were introduced during project preparation and procurement, before bids were submitted and before financial close. This timing was central to the Scaling Solar model. Rather than asking each bidder to identify sites, negotiate bespoke contracts, and develop its own preliminary risk assessment from scratch, the program sought to prepare a defined investment opportunity with known site characteristics, a standard contractual structure, expected financing instruments, and lender-aligned E&S requirements.

This upstream integration occurred through several channels.

First, the sites were identified and prepared before tender. Locating the projects within the Lusaka South Multi-Facility Economic Zone reduced the probability of major land acquisition and biodiversity risks relative to a greenfield site in an unplanned rural area. It also simplified access to infrastructure and grid connection arrangements. However, due diligence later confirmed that the broader industrial zone had a legacy of government-managed resettlement before the Scaling Solar projects were awarded. The E&S process therefore had to distinguish between impacts directly attributable to the solar IPPs and residual social risks associated with previous land clearance and relocation.

Second, E&S screening, ESIA preparation, and disclosure were linked to appraisal and financing. The Ngonye project was not presented to the Board at the same time as Bangweulu, mainly because its E&S disclosure was not yet complete. This demonstrates that E&S disclosure and due diligence functioned as a gateway to the transaction.

Third, E&S requirements were embedded in financing and contractual arrangements. ESAPs were required under the financing agreements for both solar IPPs. The ESAPs required the developers and contractors to establish ESMSs, appoint qualified E&S and community liaison personnel, prepare SEPs, establish grievance mechanisms, develop labor and OHS procedures, and implement Community Development Plans where relevant. This moved E&S obligations from general commitments to operational and contractual requirements.

Fourth, the World Bank Group package created a common E&S reference point for investors, lenders, and government counterparts. Bidders competed on tariffs within a structure that included predefined contracts, possible access to World Bank Group financing and guarantees, and lender-compatible E&S requirements. This reduced uncertainty because investors could better understand which standards would apply, which disclosures would be required, and how E&S issues would be managed after award.

The timing was not perfect. The subsequent ICR identified the need for more thorough pre-tender due diligence on land ownership, land rental agreements, and geotechnical studies. The Ngonye project also faced an issue with boundary coordinates during detailed technical design, which contributed to delays between award and financial close. This does not undermine the Scaling Solar model. Rather, it clarifies the operational lesson: standardized upstream preparation is most valuable when combined with sufficiently detailed site-specific due diligence before bidding.

5.5.3 Principal E&S Risk Pathways and Management Measures

Land, Legacy Resettlement, and Industrial Zone Siting

The most important social risk pathway was not new physical displacement caused by the solar plants. The projects were sited within an existing industrial zone and were awarded as “clear and unencumbered” sites. However, World Bank Group due diligence found that the establishment of the broader Lusaka South Multi-Facility Economic Zone had involved earlier government-managed resettlement. This created a legacy risk: although the resettlement predated the Scaling Solar projects and was not directly attributable to them, communities affected by earlier land clearance remained relevant to the projects’ social license and stakeholder engagement.

The management response was pragmatic. The E&S process focused on households displaced from or near the specific project sites and communities in the surrounding area that could be affected by construction traffic, employment expectations, or community development commitments. A Community Development Plan was required to provide community-level benefits and livelihood-improvement measures for the relevant affected and neighboring communities. This was not a substitute for resettlement planning for the entire industrial zone, but it provided a targeted mechanism to address residual social risks that could affect the solar IPPs.

The land-risk lesson is important for MDB operations. Preselected industrial sites can reduce land acquisition risk, but they can also carry legacy liabilities. MDB and IFC due diligence should therefore examine not only whether a site is physically vacant at award but also how it became available, whether previous land acquisition created unresolved claims, and whether affected communities may still perceive the project as linked to earlier displacement.

Biodiversity, Site Sensitivity, and Modified Habitat

The Bangweulu site was assessed as a modified area with no significant biodiversity features requiring the application of Performance Standard 6. The Ngonye site required more careful attention because part of the project footprint involved land associated with the wider Lusaka National Park area, although it was outside the park's physical boundary fence. This illustrates why solar PV should not automatically be treated as low risk from a biodiversity perspective. The risk depends on site context, habitat condition, proximity to sensitive areas, drainage features, avifauna, and cumulative land use pressures.

The E&S approach relied on site screening, baseline assessment, impact assessment, mitigation measures, monitoring, and regulatory approval. The key bankability function was to clarify that biodiversity and habitat risks were expected to be manageable, provided that agreed mitigation measures were implemented through the ESMP, EPC contract, and lender monitoring.

Box 5.3: Additional Environmental and Social Measures and Outcomes: Scaling Solar Zambia

Environmental and Social Action Plans as Financing Instruments

The ESAPs were not merely compliance annexes. They identified actions required for project companies and contractors to meet World Bank/ IFC Performance Standards. They included requirements for ESMSs, HSE staffing, stakeholder engagement, grievance mechanisms, labor procedures, OHS plans, emergency response, and community development.

Pollution Prevention, Waste, and Hazardous Materials

Solar PV projects have a different pollution profile from thermal power or CSP projects, but they still require pollution prevention controls. The E&S documentation identified risks associated with solid and liquid waste, fuels, lubricating oils, cleaning chemicals, herbicides, dust, wastewater, stormwater, and the eventual management of used solar modules and electrical components at decommissioning.

Mitigation measures included waste management procedures, bunded storage for fuels and oils, controlled storage and handling of chemicals, dust suppression, runoff and drainage management, emergency preparedness, spill response, monitoring of water and wastewater parameters, and decommissioning principles to ensure the safe removal, disposal, or recycling of solar modules and associated components.

For lenders, these measures helped ensure that limited environmental impacts remained limited during construction and operation. The risk management value came from translating a generally manageable risk profile into specific contractor obligations and monitoring indicators.

Labor, Occupational Health and Safety, and Worker Management

Construction of the solar plants involved a temporary workforce, heavy equipment, transport movements, electrical work, lifting operations, work at height, site security, and exposure to heat and dust. The Bangweulu ESRS expected a construction workforce of up to approximately 200 workers, many of whom would be recruited from nearby communities. No worker accommodation was expected; workers would be transported to and from the project site.

The ESAP required labor and OHS measures, including project labor arrangements, human resources policies and procedures, worker grievance mechanisms, nondiscrimination provisions, OHS policies and procedures, training, reporting, and supervision. Contractors were required to appoint HSE personnel, and the project company was required to appoint a Community Liaison Officer. These measures were important because project delivery depended heavily on EPC and O&M contractors. E&S requirements therefore had to be embedded in the contractor delivery chain, not simply retained at the sponsor level.

Community Health, Safety, and Security

Community health and safety risks were expected to be limited but still required management. Construction traffic was one of the main risk pathways, particularly because equipment and personnel had to be transported to and from the site. The E&S documentation also considered fencing, access control, exposure to hazardous materials, and security arrangements.

Security personnel were expected to be trained and managed in accordance with good international practices. The project grievance mechanism was made available to communities in case concerns arose regarding security personnel, construction traffic, or other project impacts. This was particularly relevant because the broader Multi-Facility Economic Zone involved controlled access and security arrangements, including public and private security actors.

Stakeholder Engagement, Grievance Management, and Local Benefits

Stakeholder engagement was a central part of the E&S approach because the project area included neighboring villages, communities that had previously used the Multi-Facility Economic Zone area for farming, grazing, and access to natural resources, and households affected by earlier government-led land clearance. The ESAP required the preparation and implementation of a Stakeholder Engagement Plan and an accessible community grievance mechanism. The project also required a Community Liaison Officer to maintain local engagement and receive grievances. The Community Development Plan was significant because it translated residual social risk into a structured mechanism for providing local benefits. This helped manage expectations about jobs, local services, and economic opportunities. It also strengthened the project's social license by addressing the fact that communities could associate the solar projects with broader land use changes in the industrial zone, even where the solar project companies were not responsible for earlier displacement.

5.5.4 Institutional Arrangements and E&S Management Systems

The institutional structure of Scaling Solar Zambia was central to the E&S outcome. IDC was responsible for procurement and retained a 20% interest in each project company. ZESCO entered into the PPAs and was responsible for purchasing power. The Ministry of Finance provided government support arrangements and entered into guarantee-related agreements. IFC Advisory supported project preparation and tendering. IFC investment teams, IDA guarantee teams, and other lenders supported financing. The private sponsors and project companies were responsible for financing, construction, operation, and E&S implementation.

This structure required E&S obligations to be clearly assigned across the public and private sides of the transaction. IFC and World Bank due diligence established the E&S requirements; ESAPs translated gaps and commitments into actions; financing agreements made those actions binding; EPC and O&M contracts pushed implementation responsibilities into the delivery chain; and lenders monitored compliance through reporting and supervision.

The ESMS requirements were especially important. For Bangweulu, the project company did not yet have a project-specific ESMS at appraisal because it was a greenfield special purpose vehicle. The ESAP therefore required the EPC and O&M contractor to develop and implement an ESMS suitable to the project scale and aligned with Zambian law, World Bank/IFC Performance Standards, and World Bank Group EHS Guidelines. The system was required to include policies, an updated ESMP, emergency preparedness and response, emissions monitoring, HSE key performance indicators, and an external grievance mechanism. The company also had to demonstrate organizational capacity by appointing qualified personnel, including an HSE Officer and a Community Liaison Officer.

This matters for bankability because investors and lenders need confidence that E&S commitments will survive the transition from bid award to construction and operation. The Scaling Solar approach converted E&S requirements into an implementation system that lenders could monitor, rather than relying only on one-off ESIA documents.

5.5.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through five main channels.

First, E&S-informed site preparation reduced uncertainty before bidding. By identifying project sites in an existing industrial zone, the program reduced the likelihood of major greenfield land, resettlement, and biodiversity risks. This gave bidders a more defined opportunity and reduced the risk premium associated with unknown site conditions. However, the case also shows that site preparation must include careful review of legacy land issues, site boundaries, and prior resettlement history.

Second, E&S disclosure operated as a gateway to financing readiness. The Ngonye project was not processed at the same time as Bangweulu because its E&S disclosures were not yet complete. This shows that E&S requirements were not peripheral; they affected the transaction timetable and Board processing. In bankability terms, E&S disclosure and due diligence were part of the pathway to financial close.

Third, ESAPs translated lender requirements into implementable obligations. The ESAPs required project-specific ESMSs, HSE staffing, community liaison, stakeholder engagement, grievance mechanisms, labor procedures, OHS plans, emergency response, and community development measures. These requirements helped convert E&S risks into defined actions that could be assigned to project companies, EPC contractors, and O&M contractors.

Fourth, E&S requirements supported lender coordination within a standardized platform. Scaling Solar brought together advisory services, procurement documents, PPAs, government support agreements, IFC financing, IDA guarantees, and optional MIGA insurance. E&S requirements formed part of that standardized package. This reduced duplication by giving investors and lenders a common risk management framework while allowing project-specific ESIA, ESMP, and ESAP requirements to address local conditions.

Fifth, E&S integration supported confidence but did not alone explain the low tariffs. The projects achieved highly competitive tariffs and mobilized private capital, but this outcome should not be attributed to E&S preparation alone. The tariffs reflected a broader package: World Bank Group credibility, standardized documents, IFC-arranged financing, IDA guarantees, strong competitive procurement, concessional and development finance, donor-supported preparation, government commitment, and the use of predefined sites. The E&S contribution was to reduce nonfinancial uncertainty and make the transaction easier to appraise, not to single-handedly determine the tariff.

The implementation record was broadly positive. Both projects reached financial close, were constructed, and became operational by 2019. The World Bank ICR rated E&S compliance satisfactory, noted that ESAPs were under implementation, and reported that the 2019 Annual Monitoring Reports indicated compliance with applicable E&S requirements. It also noted good health and safety standards and the implementation of community development measures. At the same time, the case offers important implementation lessons: financial close took longer than expected, Ngonye faced an issue with boundary coordinates, generation licensing took longer than anticipated, and the ICR emphasized the need for sufficiently thorough pre-tender due diligence.

5.5.6 Implications for Bankability and Financing

Scaling Solar Zambia illustrates how E&S integration can contribute to bankability when it is embedded in a wider project preparation platform. The case is especially useful because the transaction was designed to reduce multiple categories of investor uncertainty simultaneously: site risk, documentation risk, procurement risk, financing risk, offtaker payment risk, and E&S risk.

From a financing perspective, E&S integration contributed to bankability in four ways.

First, it made the risk profile more visible and bounded. Investors were not bidding into a fully open-ended project development process. The sites were identified, the procurement process was structured, E&S risks had been screened, and the applicable standards were known. This allowed bidders to price risks more clearly.

Second, it reduced post-award due diligence uncertainty. The availability of ESIA, ESMP, ESRS, and ESAP documentation reduced uncertainty for developers and lenders. Although some post-award issues remained, the program provided a clearer route from bid award to financing and construction than a purely unsolicited or developer-led process.

Third, it strengthened lender confidence by aligning E&S requirements with financing agreements. The ESAPs were required under financing agreements, making E&S commitments part of the project's contractual and financial architecture. This helped lenders monitor compliance and require corrective action when needed.

Fourth, it supported transaction efficiency and replicability. Because E&S requirements were integrated into a standardized package, the approach could be replicated in other Scaling Solar countries. The model reduced the need to reinvent the entire project preparation process for each project. However, the Zambian experience also shows that replicability must not be confused with uniformity. Each site still requires adequate assessment of land, biodiversity, community, permitting, and technical risks.

The stronger conclusion is therefore not that Scaling Solar succeeded because of E&S alone. Rather, E&S integration was one part of a broader bankability package. Its contribution was to make solar IPPs easier for private developers and lenders to assess, price, finance, and implement. The case demonstrates that when E&S considerations are integrated into project preparation before tender, they can help transform infrastructure opportunities from abstract policy intentions into investable transactions.

5.5.7 Key Takeaways

Scaling Solar Zambia demonstrates that E&S integration can support private investment when it is built into a standardized, upstream project preparation platform. The distinctive feature of the case is that E&S was not treated as a stand-alone compliance exercise after investor selection. It was embedded in site preparation, tender documentation, disclosure, financing agreements, ESAPs, contractor obligations, stakeholder engagement, and lender supervision.

The case also provides a disciplined caution for MDBs and project preparation facilities. Standardization can reduce transaction costs, accelerate procurement, and improve investor confidence, but it does not eliminate the need for rigorous site-specific due diligence. The Ngonye disclosure delay, issue with boundary coordinates, and ICR lesson on pre-tender land and geotechnical studies show that the speed of a platform model must be balanced with the depth of preparation required for bankability.

For MDB staff, the operational lesson is clear: E&S due diligence can be designed as part of the investment product itself. When E&S screening, disclosure, ESAPs, and management system requirements are incorporated before tender, investors can price risks more accurately, lenders can appraise projects more efficiently, and governments can procure infrastructure with greater confidence. However, E&S preparation must be sufficiently detailed before bidding to avoid transferring unresolved site, land, or community risks to developers after award.

Balanced Outcome

Scaling Solar Zambia is best presented as a strong example of platform-based preparation, not as a simple success story. It showed that standardized procurement, World Bank Group risk mitigation, development finance, and E&S preparation can mobilize private investment and deliver competitively priced renewable energy. However, it also showed that unresolved land, boundary, permitting, and disclosure issues can still affect timelines. The central lesson is that upstream E&S integration improves financing readiness when it is both standardized enough to reduce transaction costs and detailed enough to identify project-specific risks before tender.

Evidence Base for the Case Study

This case draws on the World Bank Implementation Completion and Results Report for the Zambia Scaling Solar Energy Project; the World Bank Project Appraisal Document and Additional Financing Project Paper; IFC and World Bank Environmental and Social Review Summaries; EIB project documentation for Ngonye; IFC Scaling Solar program materials; and publicly available documentation on the Scaling Solar model, financing instruments, project preparation support, and implementation lessons.

5.6 Case Study 6: Belgrade Solid Waste PPP (Serbia)

The Belgrade Solid Waste PPP illustrates a distinct pathway through which E&S integration can support bankability: transforming a high-liability brownfield waste site into a structured, financeable municipal PPP. Unlike greenfield renewable energy cases, in which E&S analysis may primarily influence site selection, layout, biodiversity management, or community engagement, the Belgrade case shows how E&S requirements can help define the core investment proposition itself. The project involved not only financing a new waste-to-energy facility but also financing the closure, remediation, and long-term management of one of Europe's largest unmanaged landfills, together with the construction of new waste treatment infrastructure under a long-term PPP arrangement.



The case is therefore useful for this report because it shows how E&S due diligence, remediation design, resettlement planning, lender standards, and pre-construction action plans can reduce uncertainty in a project with substantial legacy pollution and social vulnerability. At the same time, the case demonstrates that E&S integration does not eliminate residual risk. The project remained contested, including concerns around waste hierarchy, incineration, stakeholder engagement, and livelihood restoration for affected waste pickers. This makes the case analytically useful: it shows both the value of E&S integration to bankability and the limits of compliance when social risks and public acceptance remain sensitive throughout implementation.

5.6.1 Project Overview

The Belgrade Solid Waste PPP is a large municipal infrastructure project developed to modernize waste management in Serbia's capital and address the environmental and public health risks associated with the Vinča landfill. The project was structured as a long-term design-build-finance-operate-transfer PPP between the City of Belgrade and Beo Čista Energija, a special purpose vehicle originally sponsored by SUEZ, ITOCHU, and Marguerite Fund, with Veolia later taking over SUEZ's role following its acquisition.

The project scope included six core components: closure and remediation of the existing Vinča dumpsite; construction of a new sanitary landfill; development of an energy-from-waste facility; construction of a facility to process construction and demolition waste; installation of leachate collection and treatment systems; and landfill gas capture and energy recovery. The existing Vinča site had operated for decades without modern sanitary controls, including lining, systematic leachate management, or landfill gas collection. Its location near the Danube River, the presence of untreated leachate, landfill instability, and periodic fires created significant environmental, health, and safety risks.

The project was financed through a combination of private sponsor equity, nonrecourse debt, concessional climate finance, and multilateral support. EBRD's project documentation reports a total investment of approximately €345.7 million, while the financial close announcement described a landmark €370 million PPP supported by a €290 million debt facility. The financing package involved EBRD, IFC, Oesterreichische Entwicklungsbank (OeEB), commercial lenders, concessional funds, and MIGA political risk guarantees. The project therefore represents one of the most significant municipal environmental infrastructure PPPs in Serbia and the wider Western Balkans.

From an E&S perspective, the project was classified as a high-risk Category A operation. The risk profile was not limited to construction impacts. It involved inherited environmental liabilities, closure and aftercare of a legacy dumpsite, groundwater and surface water contamination risks, landfill gas and air emissions management, landfill stability, worker and community health and safety, land access, resettlement, and livelihood impacts on people dependent on the landfill economy.

5.6.2 Timing and Integration of E&S Considerations

E&S considerations were introduced during project preparation and progressively translated into project design, lender due diligence, financing conditions, and implementation requirements. The project preparation process included E&S scoping, an ESIA, a RAP, an SEP, and an ESAP. These instruments were not treated as stand-alone compliance documents. They informed the technical scope, implementation sequencing, allocation of responsibilities between the city and the project company, and the conditions that had to be satisfied before construction and disbursement could proceed.

The timing of E&S integration was especially important because the project was a brownfield PPP with inherited liabilities. The key E&S question was not only whether the new facilities could be designed to meet applicable standards but also whether the legacy landfill risks could be identified, allocated, costed, and managed within a bankable PPP structure. The E&S process helped define the remediation package required to make the site suitable for long-term waste management operations and identify actions that needed to be completed before the project could proceed safely.

The ESIA and supporting studies identified several critical risks: uncontrolled leachate and potential contamination of groundwater and the Danube River; landfill gas emissions and fire risk; slope instability and possible waste-mass collapse; air emissions from the energy-from-waste facility; occupational and community health and safety risks; physical relocation of informal settlers; and economic displacement of waste pickers and others dependent on recycling activities at the landfill. The RAP and livelihood restoration measures addressed affected households and workers, while the ESAP specified management systems, construction and operational plans, monitoring requirements, and lender reporting obligations.

The operational relevance of the E&S process lay in sequencing. Certain mitigation actions were required before construction could proceed or full operations could commence. These included resettlement and livelihood measures, baseline monitoring, establishment of management systems, preparation of environmental and social management plans, and implementation of lender-agreed actions.

This converted E&S from an ex post compliance function into a pre-construction readiness framework.

5.6.3 How E&S Influenced Project Outcomes

Legacy Pollution Assessment Shaped the Investment Scope

The E&S process helped establish that the existing Vinča landfill was not simply an old municipal waste site requiring replacement. It was a major environmental liability requiring closure, stabilization, leachate control, landfill gas management, and long-term aftercare. This influenced the project scope by ensuring that remediation of the existing landfill was embedded in the PPP package rather than left as a separate public sector obligation.

This was critical to bankability. In a nonrecourse or limited-recourse project finance structure, lenders need clarity about the scope of work, inherited liabilities, responsibility for site conditions, and the costs associated with remediation. By integrating landfill closure, leachate treatment, gas capture, slope stabilization, and aftercare into the technical design, the project reduced uncertainty surrounding environmental liabilities that could otherwise have delayed construction, increased costs, or created future compliance risks.

E&S Due Diligence Converted Unmanaged Site Risks into Defined Mitigation Measures

The project's E&S studies translated broad environmental risks into specific design and management measures. Leachate risks were addressed through collection and treatment systems. Landfill gas risks were addressed through gas capture and energy recovery. Slope instability risks were addressed through reprofiling, stabilization, and retaining structures. Air emissions risks from the energy-from-waste facility were assessed against applicable Serbian, EU, and lender requirements, including standards linked to the EU Industrial Emissions Directive and best available techniques.

This conversion of uncertain risks into defined engineering and management measures was central to the project's financing logic. Lenders were not being asked to finance a project with open-ended environmental exposure. They were financing a defined remediation and waste management system with agreed mitigation measures, monitoring obligations, and lender oversight.

The ESAP Created a Pre-Construction Readiness Framework

The ESAP was one of the most important instruments connecting E&S integration to bankability. It specified actions required to bring the project into alignment with lender standards, including adoption of environmental, health and safety, labor, and social management systems; preparation of construction and operational management plans; monitoring and reporting requirements; and implementation of resettlement and livelihood-related measures.

This sequencing reduced implementation risk in three ways. First, it created a clear action plan for closing gaps between the project's status and lender requirements. Second, it provided an objective basis for monitoring whether the project was ready to proceed. Third, it created enforceable obligations that could be linked to financing agreements, disbursement, supervision, and lender remedies.

For MDBs and DFIs, this is a practical example of how E&S requirements can be used to strengthen project readiness. The ESAP did not merely record risks; it translated them into dated, monitorable, and contractually relevant actions.

Resettlement and Livelihood Restoration Were Central to Site Access and Social Risk Management

The social risk profile of the project was significant because the landfill was not only a waste disposal site but also a place where vulnerable groups lived or earned income. Some households were physically relocated, while waste pickers and workers linked to formal and informal recycling activities faced livelihood impacts as the landfill was closed and access conditions changed.

The RAP and livelihood restoration measures were therefore central to project implementation readiness. They clarified responsibilities, identified affected groups, and established measures to address physical and economic displacement. This was essential for lenders because unresolved resettlement and livelihood issues could have affected site access, generated grievances, delayed construction, and created reputational risk for the project and its financiers.

However, the Belgrade case also shows the limits of formal planning instruments. Subsequent complaints and reviews indicate that resettlement and livelihood restoration remained sensitive during implementation. This reinforces an important lesson for MDBs: RAP preparation and disclosure are necessary but insufficient. Livelihood restoration for vulnerable groups requires sustained monitoring, adaptive management, and credible grievance resolution beyond financial close.

Lender Standards Strengthened Enforceability and Monitoring

The project was structured to comply with Serbian law, applicable EU waste and industrial emissions requirements, EBRD Performance Requirements, and IFC Performance Standards. This alignment created a common reference point for lenders, the project company, and the City of Belgrade. It also enabled E&S obligations to be incorporated into financing documentation, monitoring arrangements, and reporting requirements.

This mattered for bankability because it reduced lender uncertainty. In complex PPPs, especially those involving legacy liabilities, lenders need confidence that mitigation measures will remain enforceable after financial close. By embedding E&S actions in the ESAP and financing framework, the project created mechanisms for lender supervision, periodic reporting, site visits, and corrective action.

Stakeholder Engagement Supported Implementation but Did Not Remove Controversy

Stakeholder engagement was carried out through ESIA scoping, disclosure of project documents, consultations, and grievance mechanisms. These processes provided affected communities, civil society, and other stakeholders with formal channels to review project information and raise concerns.

At the same time, the project remained controversial. Civil society concerns included the role of incineration in the waste management hierarchy, the adequacy of alternatives analysis, the relationship between guaranteed waste volumes and recycling objectives, the transparency of the PPP structure, and the adequacy of livelihood restoration for affected waste pickers. These controversies are important to the report because they show that E&S integration can improve project readiness and bankability without necessarily eliminating all social, political, or reputational risks.

5.6.4 Implications for Bankability and Financing

The Belgrade Solid Waste PPP demonstrates that E&S integration can contribute to bankability by converting a contaminated and socially complex municipal site into a structured, financeable investment. The project faced risks that would normally be difficult for private investors and lenders to accept: legacy pollution, landfill instability, uncontrolled leachate, landfill gas, public health concerns, vulnerable affected groups, and complex municipal responsibilities. Through E&S due diligence, these risks were progressively identified, allocated, mitigated, and monitored.

The most important contribution to bankability was the conversion of legacy environmental liabilities into a defined remediation and infrastructure package. By including landfill closure, leachate treatment, gas capture, stabilization, and aftercare within the PPP scope, the project reduced uncertainty surrounding who would manage the existing dumpsite and how future environmental obligations would be addressed. This helped make the project more suitable for long-term project finance.

A second contribution was implementation readiness. The ESAP, RAP, SEP, and related management plans created a structured pathway from appraisal to construction. This helped ensure that critical measures were not deferred until after major works had begun. In practical terms, the E&S process helped lenders assess whether the project had the management systems, institutional arrangements, and mitigation measures needed for implementation.

A third contribution was enforceability. E&S requirements were linked to lender standards, financing conditions, monitoring, and reporting. This provided financiers with greater assurance that identified risks would not remain unmanaged after financial close. In this respect, the Belgrade case shows how E&S requirements can operate as part of the project finance control framework, alongside technical due diligence, legal covenants, insurance, and public sector obligations.

The financing outcome cannot be attributed to E&S integration alone. The project's bankability also depended on the PPP contract, municipal support, sponsor capacity, waste and energy offtake arrangements, political risk mitigation, concessional climate finance, and MDB/DFI participation. However, without a credible E&S framework, it is unlikely that a project involving a major unmanaged landfill, vulnerable affected groups, and long-term environmental liabilities would have been acceptable to international lenders on the same terms.

5.6.5 Financing and E&S Contribution

The financing figures should be treated carefully because public sources report them in different ways: total project cost, total investment, debt facility, individual loans, syndicated loans, blended finance, and guarantees are not directly additive (Table 5.12). For this report, the safest formulation is that the project mobilized several hundred million euros in private, MDB, DFI, commercial, concessional, and guarantee support. EBRD reported a total investment of approximately €345.7 million, while financial close involved a €290 million debt facility for a €370 million PPP.

Table 5.12: Financing and E&S Contribution: Belgrade Solid Waste PPP

Financing/Risk Management Element	Approximate Amount or Role	Relevance to Bankability
Total investment reported in EBRD project documentation	Approximately €345.7 million	Indicates the scale of the PPP and the need for structured long-term financing
Financial close package reported by EBRD	€370 million project; €290 million debt facility	Demonstrates that the project reached bankable closure despite significant legacy E&S risks
EBRD financing and mobilization	EBRD own-account lending, syndicated lending, and concessional Green Energy Special Fund support	Helped anchor lender confidence and provide long-term finance for a complex municipal PPP
IFC financing	A loan, B loan, and blended climate finance	Supported private sector participation and strengthened alignment with IFC Performance Standards
Oesterreichische Entwicklungsbank financing	Long-term credit line of approximately €35 million	Added DFI participation and reinforced international lender standards
MIGA guarantee	Political risk guarantee for investor equity	Reduced exposure to noncommercial risk for private sponsors in a long-term municipal PPP
Private sponsor equity	ITOCHU, Veolia/SUEZ, and Marguerite Fund	Brought technical, financial, and operational capacity to a sector traditionally financed by the public sector
E&S instruments	ESIA, RAP, SEP, ESAP, management plans, monitoring, and reporting	Converted E&S risks into defined actions, conditions, responsibilities, and supervision requirements

DFI = development finance institution, E&S = environmental and social, EBRD = European Bank for Reconstruction and Development, ESAP = Environmental and

Social Action Plan, ESIA = Environmental and Social Impact Assessment, IFC = International Finance Corporation, MIGA = Multilateral Investment Guarantee Agency, PPP = public-private partnership, RAP = Resettlement Action Plan, SEP = Stakeholder Engagement Plan.

Source: Authors' compilation based on project documents.

5.6.6 Residual Risks and Limitations

The Belgrade case should not be presented as a simple success story in which E&S integration eliminated risk. Its value for this report is more nuanced. The project demonstrates that E&S requirements can support bankability by making risks more visible, allocable, monitorable, and contractually enforceable. However, it also shows that residual social and reputational risks can remain material, particularly in projects involving waste pickers, informal livelihoods, public concerns about incineration, and contested waste management policy choices.

Three limitations are particularly important.

First, livelihood restoration required continued attention after financial close. Waste pickers and other affected groups were vulnerable to income disruption, and the adequacy of support measures remained a sensitive issue. This underlines the need for post-resettlement monitoring and adaptive livelihood restoration rather than one-off compensation.

Second, the project raised broader policy questions concerning waste hierarchy, recycling incentives, and long-term waste volumes. These issues go beyond project-level mitigation and require alignment between PPP design, municipal waste strategy, recycling targets, and circular economy objectives.

Third, stakeholder engagement and grievance mechanisms were necessary but not sufficient to avoid controversy. In projects involving high public interest and contested technology choices, meaningful engagement must begin early, address alternatives transparently, and continue throughout construction and operation.

5.6.7 Key Takeaways

The Belgrade Solid Waste PPP shows that E&S integration can support bankability in complex municipal PPPs by transforming legacy E&S liabilities into defined, costed, sequenced, and enforceable project obligations. Its distinctive lesson is that E&S value was created not only through compliance with lender standards but also through project structuring: landfill remediation was embedded in the PPP scope; social impacts were addressed through resettlement and livelihood planning; technical risks were translated into design and monitoring measures; and ESAP commitments were linked to lender supervision and financing conditions.

For MDBs and DFIs, the case demonstrates the importance of using E&S due diligence as a tool for implementation readiness. Where infrastructure projects involve contaminated sites, informal livelihoods, or legacy liabilities, E&S instruments must do more than identify impacts. They must define responsibilities, establish sequencing, support site access, reduce uncertainty, and provide lenders with confidence that critical risks will be managed before and after financial close.

Project Outcomes

The project reached financial close, proceeded through construction, and entered commercial operation. Its E&S significance lies in the way remediation, resettlement, management systems, and monitoring were incorporated into the PPP and financing framework. Its main point of caution is that even well-structured E&S requirements do not remove the need for continued supervision when projects affect vulnerable livelihoods or involve contested waste management choices.

Case-Specific Lesson for the Report

Belgrade is best used as a case in which E&S enabled implementation readiness in a brownfield PPP. The project demonstrates how E&S integration can help make a difficult municipal infrastructure project financeable by reducing uncertainty around legacy liabilities, strengthening pre-construction preparedness, and giving lenders enforceable mechanisms for monitoring compliance.

5.7 Case Study 7: Lake Turkana Wind Power Project (Kenya)

Project Overview

The Lake Turkana Wind Power Project is a 310 MW onshore wind power project located in Marsabit County in northern Kenya, east of Lake Turkana. The project comprises 365 Vestas V52 wind turbines, internal medium-voltage collection lines, a project substation, internal roads, a project village, and associated operational infrastructure. It also included the rehabilitation of approximately 200 km of access roads from Laisamis to the wind farm site to allow the transportation of turbines, heavy equipment, and construction materials. Electricity from the project is sold to Kenya Power under a long-term power purchase agreement.



The project is included as a key case study because it illustrates how international E&S standards can support financing readiness in a large, privately financed infrastructure project while also showing the limitations of treating E&S standards only as a lender-signaling mechanism. Lake Turkana was one of the largest private investments in Kenya and one of the largest wind power projects in Africa. It mobilized a complex financing package combining sponsor equity, development finance, commercial bank debt, subordinated debt, export credit support, grant support, and MDB risk mitigation. AfDB acted as the mandated lead arranger, while EIB, the Dutch Entrepreneurial Development Bank (FMO), Proparco, DEG, Nedbank, Standard Bank, the East African Development Bank (EADB), PTA Bank, the Danish Export Credit Agency (EKF), and other financiers and sponsors participated in the transaction.

From an E&S perspective, the project was not a simple "green energy" investment. Its climate mitigation and energy security benefits were substantial, but the project also involved material environmental and social risks. These included land acquisition and community land tenure, impacts on pastoralist land-use systems, issues affecting Indigenous Peoples and vulnerable communities, physical and economic displacement, biodiversity and avifauna risks, access road impacts, occupational and community health and safety, traffic and security risks, and E&S management of an associated 400 kV transmission line. The transmission line was developed separately by the Kenya Electricity Transmission Company but was necessary to evacuate power from the wind farm and was therefore treated as an associated facility for E&S due diligence purposes.

The case is therefore useful for this report for two reasons. First, it shows how E&S assessment, site selection, road alignment, biodiversity studies, ESMS requirements, and lender coordination helped make a complex private project finance transaction more appraisable and finance-ready. Second, it shows that even when international standards are applied, residual social risks can remain material if land tenure, customary use, identification of Indigenous Peoples, and issues related to free, prior, and informed consent (FPIC) are not fully resolved at appraisal and financial close.

Financing Contribution Profile

Public sources present slightly different total cost figures for Lake Turkana depending on the date, currency, project scope and on whether road works, transmission line risk mitigation, and other associated costs are included. For the purposes of this report, the safest approach is to describe the project as a financing package of approximately €620 million–€685 million, while noting that EIB appraisal documentation recorded an approximate project cost of €613 million and other public sources cited €623 million at financial close and €685 million at inauguration. Table 5.13 summarizes the publicly disclosed contributions and roles of the principal financing participants.

Table 5.13: Financing Contribution Profile: Lake Turkana Wind Power

Financing Source/ Participant	Publicly Disclosed Contribution or Role	Financing Type/ Relevance
African Development Bank	Mandated lead arranger; arranged approximately €436 million in senior loan facilities and approximately €37.5 million in subordinated loan facilities; also provided a partial risk guarantee for the associated transmission-line delay risk	MDB arranger, coordination of senior debt and subordinated debt, and risk mitigation
European Investment Bank	Approximately €200 million in senior debt; EIB project records show signed amounts associated with the project totaling €225 million when EU-Africa Infrastructure Trust Fund support is included	Long-term development finance debt and EU-linked blended finance platform
EU-Africa Infrastructure Trust Fund	Approximately €25 million in preferred equity and support to close the financing gap	Blended finance and concessional support
Government of the Netherlands	Approximately €10 million in grant support linked to the access road	Grant support with relevance to logistics and community access
FMO, Proparco, DEG, EADB, PTA Bank, Standard Bank, Nedbank, Triodos, and other lenders	Participating development finance and commercial lenders within the syndicated financing package	Development finance and commercial debt
EKF	Export credit guarantee support, including support for lenders linked to the supply of Vestas turbines	Export credit risk mitigation
Sponsor equity group, including KP&P Africa, Aldwych/PAIDF, IFU, Finnfund, Norfund, Vestas/Wind Power Invest, and other investors	Sponsor equity and participation by development investors	Private and DFI equity

Kenya Power	20-year power purchase agreement	Revenue underpinning/ offtake structure
KETRACO/Government of Kenya	Associated 400 kV transmission line from the wind farm to Suswa	Associated facility required for power evacuation

DFI = development finance institution, EADB = East African Development Bank, EIB = European Investment Bank, EKF = Danish Export Credit Agency, EU = European Union, FMO = Dutch Entrepreneurial Development Bank, IFU = Investment Fund for Developing Countries, KETRACO = Kenya Electricity Transmission Company, PAIDF = Pan African Infrastructure Development Fund.

Source: Authors' compilation based on project documents.

This financing profile is analytically important because the project's bankability did not depend on one instrument. It depended on a combination of wind resource quality, a long-term PPA, private sponsor capacity, MDB coordination, DFI and commercial debt, export credit support, grant support for access infrastructure, and risk mitigation for the transmission line. E&S standards formed part of this broader bankability package by providing lenders with a common framework for assessing and managing nonfinancial risks.

Identifiable E&S-Linked Expenditure

Publicly available documents do not disclose a consolidated E&S budget for Lake Turkana, nor do they allocate E&S costs by financier. This is consistent with many privately financed infrastructure projects: E&S costs are embedded across feasibility studies, ESIA preparation, lender due diligence, IFC Performance Standards gap analysis, RAP preparation, community engagement, road redesign, ESMS implementation, biodiversity monitoring, contractor HSE obligations, security management, traffic management, grievance mechanisms, lender supervision, and monitoring during operations.

The most clearly identifiable E&S-relevant expenditure is the access road investment. The project rehabilitated approximately 200 km–208 km of road to transport equipment to the site. Public sources indicate that the road cost approximately €24 million, including a €10 million grant from the Government of the Netherlands. This should not be presented as a dedicated E&S budget because the road was essential logistics infrastructure for project construction. However, it had significant E&S relevance because road alignment, traffic safety, settlement avoidance, access improvement, and community impacts were central to the project's E&S risk profile (Table 5.14).

Table 5.14 Identifiable E&S-Linked Expenditure: Lake Turkana Wind Power

E&S Cost Area	Publicly Quantified?	How the Cost Was Reflected
Wind farm ESIA, road ESIA, and updated ESIA summary	Not separately disclosed	Embedded in project preparation, permitting, and lender due diligence
IFC Performance Standards gap analysis	Not separately disclosed	Embedded in lender due diligence and sponsor commitments
Ornithological and bat surveys	Not separately disclosed	Embedded in biodiversity assessment and lender requirements
Road realignment and rehabilitation	Partly quantified: approximately €24 million in road investment, including a €10 million grant from the Netherlands	Core logistics infrastructure with E&S relevance for settlement avoidance, traffic safety, and community access
Village resettlement and livelihood restoration	Not fully quantified in public sources	Embedded in RAP implementation and sponsor obligations
Transmission line RAP support and associated-facility oversight	Not separately disclosed	Embedded in lender conditions, direct agreement with KETRACO, and sponsor best-efforts obligations
ESMS, ESMP implementation, and operational management plans	Not separately disclosed	Embedded in sponsor, contractor, and operator management systems
Biodiversity and conservation management plan, carcass searches, and avifauna monitoring	Not separately disclosed	Embedded in operations-phase monitoring and lender supervision
Community engagement plan, grievance mechanism, and disclosure	Not separately disclosed	Embedded in project E&S management and social performance arrangements

Community development/Winds of Change program	Public documentation describes annual revenue-linked support but does not provide a consolidated lifetime budget in the available E&S documents	Corporate social investment complementary to mitigation, not a substitute for impact management

E&S = environmental and social, ESIA = Environmental and Social Impact Assessment, ESMP = Environmental and Social Management Plan, ESMS = Environmental and Social Management System, IFC = International Finance Corporation, KETRACO = Kenya Electricity Transmission Company, RAP = Resettlement Action Plan.

Source: Authors' compilation based on project documents.

The operational lesson is that E&S expenditure should not be assessed only by searching for a single "E&S budget line." In Lake Turkana, material E&S costs were embedded in design decisions, access road works, management systems, monitoring, resettlement, stakeholder engagement, and lender supervision.

5.7.1 E&S Risk Classification, Instruments, and Scope of Assessment

Lake Turkana was treated as a high-risk project for E&S due diligence purposes. Although the wind farm might normally have been treated as a lower-risk renewable energy project under some classification systems, AfDB assigned it Category 1, requiring a site-specific ESIA and detailed ESMP. The project was also assessed against World Bank Group/IFC Performance Standards, AfDB requirements, lender standards, the Equator Principles, and relevant environmental, health, and safety guidelines.

The principal E&S instruments included the wind farm ESIA, road ESIA, updated ESIA summary, IFC Performance Standards gap analysis, ornithological and bat survey reports, Environmental and Social Management Plan, Environmental and Social Management System, Community Engagement Plan, village RAP, stakeholder disclosure materials, biodiversity and conservation management measures, labor and OHS procedures, traffic and security management plans, grievance mechanisms, and monitoring arrangements.

The E&S scope also extended to associated facilities. The 400 kV transmission line from the wind farm to Suswa was not developed by Lake Turkana Wind Power but by the Kenya Electricity Transmission Company (KETRACO). Nevertheless, because the wind farm could not operate without it, the transmission line was considered in the overall E&S assessment. This distinction is important for MDB staff: associated-facility risks can affect project viability even when the borrower or project company does not fully control those facilities. At Lake Turkana, lenders required the promoter to support and oversee KETRACO on a best-efforts basis, particularly with respect to ESMP and RAP implementation.

5.7.2 Timing and Integration of E&S Considerations

E&S considerations entered project preparation before financial close and while key design decisions could still be adjusted. Wind resource measurements began

during early project development, and the initial ESIA and permitting process preceded the signing of the financing agreements. Subsequent updates, road ESIAs, lender gap analysis, ornithological surveys, and resettlement planning were prepared as the project moved toward bankability.

This timing mattered because E&S findings were able to influence three important design and structuring decisions.

First, the wind farm was sited away from the Lake Turkana shoreline. The project area was selected based on wind resource quality, remoteness, low population density, security, road access, water availability, and environmental considerations. The siting decision also reduced the risk of bird collisions by locating the wind farm several kilometers from the lake shore.

Second, the project layout preserved access to grazing areas. Although the concession area was large, the physical footprint of turbines and permanent infrastructure was small relative to the total leased area. The project adopted a dispersed and largely unfenced layout, which allowed continued pastoralist grazing access after construction. This was a critical design feature because the surrounding landscape is used by the Turkana, Samburu, Rendille, and El Molo communities, whose pastoralist livelihoods depend on mobility, grazing routes, and seasonal access to water and pasture.

Third, the access road alignment was modified to avoid settlement impacts. The road works were essential for transporting turbines and equipment from the port through northern Kenya to the project site. Consultations identified risks to settlements along the route, including Ngurunit, South Horr, and Kurungu. In response, route diversions were developed to avoid existing settlements and reduce the need for large-scale displacement. This helped reduce physical resettlement, traffic safety risks, construction disruption, and potential social conflict.

5.7.3 Principal E&S Risk Pathways and Management Measures

Land Acquisition, Community Land, and Pastoralist Access

The most material social risk pathway was land. The project involved a large concession area in a landscape used by pastoralist communities with customary and livelihood connections to land, grazing routes, and seasonal resources. Public E&S documentation described the wind farm site as sparsely populated and arid, but the area should not be treated as empty or unused. Its social value derived from pastoralist mobility, temporary encampments, access to pasture and water, cultural attachment, and intergenerational claims to community land.

The project sought to reduce disruption through a relatively small physical footprint, a dispersed turbine layout, and the avoidance of perimeter fencing that would have prevented access to grazing areas. These measures were important, but they did not fully resolve land-related risks. The subsequent land litigation demonstrates that the conversion, allocation, and leasing of community land remained contested. This is a critical point for the report: avoiding physical displacement is not the same as resolving land tenure risks. In pastoralist landscapes, mobility, customary rights, cultural attachment, and seasonal use need to be assessed as rigorously as permanent structures.

Indigenous Peoples, Vulnerable Communities, and Free, Prior, and Informed Consent

The project area is associated with the Turkana, Samburu, Rendille, and El Molo communities. During appraisal, these communities were treated primarily as project-affected people rather than as Indigenous Peoples requiring FPIC-type processes under international standards. EIB's completion documentation later acknowledged that the project attracted substantial criticism from civil society and the media because affected communities were not identified and recognized as Indigenous Peoples and FPIC was not implemented accordingly.

For the purposes of this report, Lake Turkana should not be presented as a simple success story in E&S signaling. A more technically accurate conclusion is that the project demonstrates both the value and the limitations of international E&S standards. The standards created a common due diligence platform for lenders and helped establish management systems, but the implementation of analysis of Indigenous Peoples and FPIC expectations was contested and created reputational, legal, and social risks after financial close.

Road Construction, Settlement Avoidance, and Community Health and Safety

The rehabilitation and strengthening of the approximately 200 km access road was necessary for construction logistics, but it created social and community health and safety risks. These included traffic risks, dust, noise, disruption to settlements, temporary access restrictions, impacts from borrow pits and road realignment, and potential resettlement along the route.

Stakeholder engagement influenced the road design. Route diversions were developed to avoid Ngurunit, South Horr, and Kurungu, reducing impacts on settlements and avoiding larger-scale displacement. The road also generated development benefits by reducing travel times, improving access to markets, health services, and education, and opening up a previously remote area. However, improved access can also produce induced impacts, including land use changes, inward migration, traffic risks, and changes in security conditions. These risks require active monitoring rather than being treated only as community benefits.

Village Resettlement and Livelihood Restoration

Although the project avoided large-scale resettlement, it did not avoid all physical and economic displacement. EIB completion documentation notes that a settlement near the wind farm was relocated because of health and safety concerns associated mainly with construction and transportation activities close to the main road. The relocation involved approximately 120 households and was implemented through a village resettlement process.

The operational point is that even when the permanent project footprint is small, construction-phase logistics can trigger resettlement and livelihood impacts. MDB due diligence should therefore examine the full delivery chain: turbine transportation, access roads, construction camps, laydown areas, borrow pits, transmission line corridors, security arrangements, and induced access impacts.

Biodiversity, Avifauna, and Bat Risk

The project's biodiversity risk profile centered on avifauna and bats, as well as habitat disturbance in an arid landscape. Lake Turkana and the surrounding region include bird species of conservation interest and migratory movements. Bird and bat surveys were therefore commissioned, and the project incorporated mitigation measures, including siting away from the lake shoreline, ornithological monitoring, carcass searches, biodiversity and conservation management planning, and monitoring of bird-strike risks during operation.

The technical importance of this issue is that the project did not rely only on the assumption that wind power is environmentally beneficial. The E&S process converted a generic biodiversity concern into specific design, monitoring, and management obligations. This helped lenders understand whether avifauna risks were likely to be manageable and which operational monitoring measures would be required.

Associated Transmission Line Risk

The transmission line was a major associated-facility risk. Although it was outside the direct scope of Lake Turkana Wind Power's construction responsibilities, the wind farm depended on the line to evacuate power. Delays in the line also created major financial and operational exposure. From an E&S perspective, the line required assessment of land acquisition, resettlement, livelihood impacts, stakeholder engagement, and grievance management along a long corridor.

EIB completion documentation notes that the transmission line RAP initially overlooked a number of affected households, resulting in difficulties and work interruptions. These issues were later addressed through improved RAP implementation, stakeholder engagement, and grievance resolution. For MDB staff, the lesson is direct: associated facilities should be treated as part of the bankability analysis, not as peripheral infrastructure. Even when they are legally separate, their E&S performance can affect construction timing, revenue commencement, reputational risk, and lender confidence.

Labor, Occupational Health and Safety, Traffic, and Security

Construction of the project involved heavy transportation, turbine erection, lifting operations, electrical work, work at height, high winds, road works, construction camps, contractor interfaces, security risks, and remote-area logistics. These risks required contractor-level OHS systems, traffic management, emergency preparedness, worker accommodation controls, community health and safety measures, security management, labor policies, incident reporting, and monitoring. The project's ESMS included environmental and social management, emergency response, traffic management, local recruitment, security management, labor policies, OHS standards, and biodiversity management. These measures were central to implementation readiness because the project's physical construction risks were largely driven by contractors. From a financing perspective, lender confidence depended not only on the ESIA but also on whether E&S obligations were embedded in contractor systems, project agreements, monitoring, and corrective action arrangements.

Stakeholder Engagement, Grievance Management, and Community Development

Stakeholder engagement was undertaken during project preparation and implementation, including engagement with local communities, public authorities, civil society groups, and affected households. Disclosure materials were prepared and translated, and a Community Engagement Plan was developed. Grievance mechanisms were used to address concerns related to land, resettlement, road works, transmission line impacts, access, benefits, and community impacts.

The project also established the Winds of Change program as a long-term community development initiative focused on sectors such as health, education, water, infrastructure, and job creation. This program is relevant to the project's broader development impact, but it should not be treated as a substitute for impact mitigation, compensation, livelihood restoration, or FPIC. The distinction is important: community development can strengthen local benefits and social license, but it cannot cure deficiencies in land acquisition, consultation, or rights-based due diligence.

5.7.4 Institutional Arrangements and E&S Management Systems

Lake Turkana's E&S management architecture was built around the project company, lenders, lender E&S advisors, contractors, and relevant government entities. The project was required to implement an ESMS throughout construction and operation. This ESMS provided the platform for implementing the ESMP, monitoring commitments, managing labor and OHS risks, addressing community health and safety, tracking biodiversity performance, managing grievances, and reporting to lenders.

The project also illustrates the importance of lender coordination. A transaction involving MDBs, DFIs, ECAs, commercial banks, and private sponsors requires a common risk-management language. IFC Performance Standards, AfDB requirements, EIB standards, Equator Principles, and World Bank Group EHS Guidelines helped create this common platform. The IFC Performance Standards gap analysis was particularly important because it identified areas in which national ESIA documentation needed to be supplemented to meet international lender expectations.

At the same time, the case shows that an ESMS and lender standards are only as strong as their application to the most material issues. The project had robust formal instruments, but land tenure and issues related to Indigenous Peoples and FPIC remained contested. The operational lesson is that E&S systems must be judged not only by the number of documents prepared but also by whether they correctly identify affected people, recognize relevant forms of land use, apply the appropriate standards to vulnerable or Indigenous communities, and create enforceable obligations before financial close.

5.7.5 How E&S Influenced Project Outcomes

E&S integration influenced project outcomes through six main channels.

First, it influenced site selection and turbine layout. The project site was selected partly based on environmental, social, technical, and commercial considerations, including low population density, road access, security, water availability, and distance from Lake Turkana. Siting the wind farm away from the lake's shore and maintaining a dispersed layout reduced risks related to avifauna, land use, and access to grazing areas.

Second, it influenced access road design. Community consultation and road impact assessment identified risks to settlements along the transport corridor. Alternative alignments were developed to bypass key settlements and avoid larger-scale displacement. This reduced construction-related social risks and improved implementation readiness.

Third, it converted biodiversity risks into operational monitoring requirements. Bird and bat studies, siting decisions, monitoring, carcass searches, and biodiversity management planning helped lenders assess collision risks and establish conditions for monitoring during operation.

Fourth, it provided a common due diligence platform for a complex lender group. The use of IFC Performance Standards, AfDB requirements, EIB standards, and Equator Principles helped reduce information asymmetry among lenders and created a shared framework for appraisal, disclosure, supervision, and corrective action.

Fifth, it brought associated-facility risks into the financing structure. The transmission line was legally separate but operationally indispensable. Treating it as an associated facility enabled lenders to identify land acquisition, RAP implementation, and other implementation risks and to require sponsor support and lender oversight. The AfDB partial risk guarantee also addressed transmission-line completion risk as a bankability issue.

Sixth, the project's later controversies improved the learning value of the case. Issues concerning land, Indigenous Peoples, and FPIC demonstrate that a compliance architecture and lender signaling do not automatically eliminate social risks. For MDBs, the lesson is that E&S integration must be rights-based, evidence-based, and operationally enforceable. Early E&S work can strengthen bankability, but only when it correctly identifies affected people, tenure systems, customary use, livelihood dependence, and consent requirements.

5.7.6 Implications for Bankability and Financing

Lake Turkana demonstrates how E&S integration can contribute to bankability in a privately financed renewable energy project, but it also shows why E&S performance should not be reduced to investor signaling.

From a financing perspective, E&S integration contributed to bankability in four ways.

First, it reduced uncertainty surrounding nonfinancial risks. Lenders had access to ESIAs, road assessments, ornithological studies, IFC Performance Standards gap analysis, resettlement documentation, ESMPs, ESMS requirements, and stakeholder engagement arrangements. These instruments made E&S risks visible, assessable, and monitorable.

Second, it supported lender coordination. The transaction involved multiple financiers with different mandates and risk appetites. A common E&S framework helped harmonize due diligence expectations and reduce the transaction costs that can arise when each lender applies separate requirements without a shared platform.

Third, it improved implementation readiness. Road realignment, settlement avoidance, village resettlement planning, ESMS implementation, biodiversity monitoring, and associated-facility oversight addressed risks that could otherwise have delayed construction, disrupted operations, or weakened lender confidence.

Fourth, it helped unlock private capital by aligning the project with internationally recognized standards. For commercial lenders and private investors, MDB and DFI participation provided confidence that E&S risks were being assessed and supervised using familiar standards. In this sense, E&S standards functioned as a credibility signal within the broader financing package.

However, the case should not be framed as evidence that E&S integration alone made the project bankable. The project's financing depended on wind resource quality, the PPA, sponsor capacity, government support, MDB leadership, DFI and commercial bank participation, export credit support, grant funding, and risk mitigation for the transmission line. E&S integration formed part of this broader bankability package.

Nor should the case be presented as an unqualified E&S success. The land litigation and controversies concerning Indigenous Peoples and FPIC show that unresolved rights and tenure issues can persist after financial close and create reputational, legal, and social risks even for projects financed under international standards. The stronger analytical conclusion is that E&S standards can materially improve financing readiness when applied early and rigorously, but their value depends on the quality of implementation, especially for land, customary use, Indigenous Peoples, and associated facilities.

5.7.7 Key Takeaways

The Lake Turkana Wind Power Project demonstrates that E&S integration can strengthen financing readiness by converting complex environmental and social risks into a structured due diligence, design, management, and monitoring framework. Biodiversity-informed siting, road realignment, settlement avoidance, ESMS implementation, lender coordination, and associated-facility oversight helped make a complex private renewable energy project easier to appraise and finance.

The case also provides a cautionary lesson. International standards can signal quality to lenders, but signaling is not enough. Where land tenure, customary use, recognition of Indigenous Peoples, and FPIC issues are not fully resolved, residual risks can remain material after financial close. For MDB staff, Lake Turkana's operational lesson is that E&S due diligence should be treated as part of project structuring and financing readiness, but it must be applied with sufficient depth to address the most material rights, land, and livelihood issues before they become legal, reputational, and implementation risks.

Box 5.4: Additional Environmental and Social Measures and Outcomes: Lake Turkana Wind Power Project

Access-road Benefits and Risks

The access road was essential for construction logistics and generated wider local benefits by reducing travel time and improving access to services and markets. At the same time, it introduced traffic, safety, induced access, settlement, and land use risks that required management through the road ESIA, design modifications, and community engagement.

Community Development

The Winds of Change program was established to support local development in areas such as health, education, water, infrastructure, and employment. These measures are development benefits, but they should not be treated as substitutes for E&S mitigation, compensation, livelihood restoration, or FPIC.

Balanced Outcome

Lake Turkana became a landmark renewable energy project and a major private infrastructure investment in Kenya. It also became a prominent example of the importance of addressing land, customary use, Indigenous Peoples, and consent issues in green infrastructure projects. Its strongest contribution to this report is its demonstration that E&S standards can improve project bankability and lender coordination while also showing that inadequate treatment of social rights and land tenure can remain a material residual risk.

Evidence Base for the Case Study

This case study draws on public documentation from EIB, AfDB, FMO, project E&S disclosure materials, the updated ESIA summary, the IFC Performance Standards gap analysis, ornithological and bat survey documentation, EIB completion documentation, and public reporting on the land litigation and controversies concerning Indigenous Peoples and FPIC.

5.8 Case Study 8: China EXIM Bank Green On-Lending Facility (China)

Project Overview

The China EXIM Bank Green On-Lending Facility provides an example of E&S integration at the financial intermediary (FI) and green finance platform level, rather than at the level of a single infrastructure asset. The project involved a non-sovereign-backed loan from AIIB to the Export-Import Bank of China (CEXIM), one of China's three state-owned policy banks, to finance green subprojects in China. The objective was to strengthen the impact of CEXIM's green loan portfolio by enhancing its ESMS and developing a GFF through the on-lending facility.

The project was approved by AIIB on 20 January 2022, with approved financing equivalent to $200 million in Chinese yuan. AIIB classified the operation as Category FI because the financing structure delegated subproject selection, categorization, appraisal, approval, and monitoring to CEXIM, subject to conditions agreed with AIIB and the application of AIIB's Environmental and Social Policy (ESP), Environmental and Social Exclusion List, and Environmental and Social Standards.

The preliminary pipeline included green subprojects involving renewable energy, including solar and wind; construction waste management; and other eligible green activities in China. These subprojects were expected to generate climate and environmental benefits, including avoided or reduced GHG emissions, but they also carried potential E&S risks related to community health and safety, sensitive habitats, ecosystem services, working conditions, and sub-borrower implementation capacity.



This case is included because it illustrates a distinct pathway through which E&S standards can support capital mobilization. Unlike the Noor, Bogotá Metro, or Belgrade cases, the CEXIM facility did not rely on the E&S assessment of a single project footprint. Its value lay in strengthening the institutional systems through which a financial intermediary identifies eligible green assets, screens out unacceptable activities, categorizes E&S risks, requires subproject-level assessments and management plans, establishes grievance arrangements, discloses information, reports portfolio-level performance, and transfers international good practice to domestic commercial lenders.

Financing Contribution Profile

The financing structure should be presented carefully because the available information distinguishes among the amount of AIIB's facility, MCDF-supported institutional capacity building, and reported commercial co-financing or mobilization (Table 5.15).

Table 5.15: Financing Contribution Profile: CEXIM Green On-Lending Facility

Financing Source/ Instrument	Amount	Role in the Transaction	E&S Relevance
AIIB non-sovereign-backed loan to CEXIM	$200 million equivalent in CNY	Core on-lending facility for eligible green subprojects in China	Financing was conditional on the application of an enhanced ESMS, a GFF, AIIB exclusion requirements, prior review, and portfolio reporting.
MCDF grant for CEXIM ESMS enhancement	$680,000	Technical assistance to strengthen CEXIM's ESMS and support the development and implementation of the GFF	Direct E&S-linked institutional capacity expenditure that supported ESMS enhancement, implementation, and knowledge sharing.
Commercial bank mobilization reported in the case template	$400 million	Domestic commercial lenders mobilized alongside subproject financing	Relevant to the capital mobilization pathway because domestic lenders joined transactions partly to learn from MDB-standard E&S policy application.

Additional capital mobilization noted in the template	$800 million	Reported at the top of the template as capital mobilized but not reconciled with the later $400 million figure

AIIB = Asian Infrastructure Investment Bank, CEXIM = Export-Import Bank of China, CNY = Chinese yuan, E&S = environmental and social, ESMS = Environmental and Social Management System, GFF = Green Financing Framework, MCDF = Multilateral Cooperation Center for Development Finance, MDB = multilateral development bank.

Source: Authors' compilation based on project documents.

The most conservative private capital mobilization ratio, using the $400 million figure reported in the case template, is 2.0x: $400 million in commercial bank capital mobilized divided by $200 million in AIIB financing.

Identifiable E&S-Linked Expenditure

As with the Noor case, there is no single consolidated E&S budget for the full facility. Most E&S costs are embedded in institutional systems, subproject due diligence, staff time, consultant support, sub-borrower assessments, disclosure, monitoring, and reporting. The clearly identifiable E&S-linked expenditure is the $680,000 MCDF grant for enhancing and implementing CEXIM's ESMS and developing a GFF that could be applied beyond the facility (Table 5.16).

Table 5.16: Identifiable E&S-Linked Expenditure: CEXIM

E&S Cost Area	Publicly Quantified?	How the Cost was Reflected
MCDF support for CEXIM ESMS enhancement and GFF development	Yes: $680,000	Direct E&S institutional capacity expenditure supporting policy, procedures, implementation, and knowledge-sharing functions
CEXIM enhanced ESMS implementation	Not separately disclosed	Embedded in CEXIM's internal systems, staffing, screening, appraisal, credit review, and portfolio monitoring
GFF development and application	Partly linked to MCDF grant; operating costs not separately disclosed	Embedded in eligibility criteria, green taxonomy alignment, subproject screening, and reporting

AIIB prior review of all subprojects	Not separately disclosed	Embedded in AIIB's project supervision and implementation support costs
Staff training across CEXIM departments	Not separately costed in public documents	Training covered on-lending, client management, credit management, and credit review and approval functions.
Subproject E&S assessments and management plans	Not separately disclosed	Expected to be prepared by sub-borrowers where required, including an ESIA, ESMP, or equivalent instruments
Project-level and subproject-level GRMs	Not separately disclosed	Embedded in CEXIM's enhanced ESMS and sub-borrower requirements
Portfolio database and semiannual reporting	Not separately disclosed	Embedded in CEXIM reporting systems and AIIB supervision arrangements

AIIB = Asian Infrastructure Investment Bank, CEXIM = Export-Import Bank of China, E&S = environmental and social, ESIA = Environmental and Social Impact Assessment, ESMP = Environmental and Social Management Plan, ESMS = Environmental and Social Management System, GFF = Green Financing Framework, GRM = grievance redress mechanism, MCDF = Multilateral Cooperation Center for Development Finance.

Source: Authors' compilation based on project documents.

The analytical implication is important: in an FI operation, E&S investment is not visible mainly through land acquisition, civil works mitigation, or contractor ESMP budgets. It is visible through institutional architecture: screening rules, categorization procedures, exclusion criteria, staff capacity, subproject appraisal templates, legal covenants, disclosure practices, grievance channels, portfolio databases, and supervision protocols.

5.8.1 E&S Risk Classification, Instruments, and Scope of Assessment

The project was classified as Category FI under AIIB's ESF because AIIB provided funds to CEXIM and delegated decision-making regarding eligible subprojects while requiring CEXIM to apply agreed E&S conditions. The relevant risk unit was therefore not a single construction site but a portfolio of future subprojects to be selected, appraised, and monitored by a financial intermediary.

The principal E&S instruments were CEXIM's enhanced ESMS and the GFF. AIIB's ESP, Environmental and Social Exclusion List, and Environmental and Social Standards applied to the facility. CEXIM's ESMS was enhanced and aligned with AIIB's ESP, while the GFF was developed and aligned with internationally recognized green catalogs, standards, and principles.

The scope of E&S management included subproject selection, categorization, appraisal, approval, monitoring, disclosure, grievance management, portfolio-level reporting, and AIIB supervision. Category A subprojects and activities on AIIB's Environmental and Social Exclusion List were ineligible. Coal mining, coal transportation, coal-fired power plants, and infrastructure exclusively dedicated to those activities were also excluded.

This architecture is technically significant because FI operations can create E&S risk through delegation risk. AIIB does not directly appraise every E&S issue at the level of the final asset in the same way it would for a directly financed project. Instead, the quality of E&S risk management depends on whether the intermediary's systems are strong enough to identify, classify, avoid, mitigate, monitor, and report risks across a changing pipeline. The enhanced ESMS was therefore not an administrative add-on but the core risk control mechanism of the facility.

5.8.2 Timing and Integration of E&S Considerations

E&S considerations were introduced early in the transaction cycle. The case template records screening in February 2021, concept review in June 2021, final review in November 2021, and AIIB Board approval in January 2022. This timing was important because the E&S work influenced the design of the facility before large-scale subproject financing began.

The early E&S intervention did not change the physical alignment, technology option, or project footprint. Instead, it changed the rules of the financing platform. The project team worked with CEXIM to strengthen its ESMS so that it would be materially consistent with AIIB's requirements and to develop a GFF aligned with recognized green finance standards. This converted the facility from a general green credit line into a structured on-lending operation with defined eligibility criteria, exclusion requirements, E&S screening, prior review, disclosure, grievance management, and reporting.

The timing also enabled capacity building before full portfolio rollout. Training was provided to CEXIM staff from the on-lending, client, credit management, and credit review and approval departments. This was essential because E&S risk management in FI operations depends on mainstreaming E&S responsibilities into credit decision-making rather than isolating them in a small sustainability unit.

The operational lesson is that, for FI transactions, the most important E&S design decision often takes place upstream: whether the intermediary's systems are strengthened before subprojects enter the pipeline. Once sub-loans are approved and disbursed, leverage over sub-borrowers is reduced. Early integration therefore allowed AIIB and CEXIM to define eligibility, appraisal, monitoring, and reporting expectations before the facility became operational.

5.8.3 Principal E&S Risk Pathways and Management Measures

FI Delegation Risk and ESMS Capacity

The central E&S risk pathway was delegation risk. AIIB funds were to be on-lent through CEXIM to subprojects that AIIB would not originate directly. Without a robust ESMS, E&S risks could be missed during credit appraisal, classified inconsistently, inadequately covenanted in sub-loan agreements, poorly monitored during construction or operation, or insufficiently disclosed to affected people.

The mitigation approach was to enhance CEXIM's ESMS and align it with AIIB's ESP requirements. The ESMS functioned as the operating manual for E&S risk management within the facility. It defined how subprojects would be screened, categorized, appraised, approved, monitored, and reported. This moved the project from transaction-level compliance to institutional risk governance.

Eligibility, Exclusion, and Avoidance of High-Risk Activities

The first level of mitigation was avoidance. Category A subprojects were excluded from the facility, as were activities on AIIB's Environmental and Social Exclusion List. Coal mining, coal transportation, coal-fired power plants, and infrastructure exclusively dedicated to such activities were also excluded.

This was a critical risk reduction feature. Renewable energy and waste management projects can still carry material risks, but the exclusion of Category A activities reduced the probability that the facility would finance projects with large-scale, irreversible, or unprecedented E&S impacts. It also made the facility more suitable for an FI structure, in which the effectiveness of risk management depends heavily on the intermediary's systems and supervision capacity.

Green Taxonomy Integrity and Avoidance of "Greenwashing" Risk

A second risk pathway was green finance integrity. The facility was intended to finance green subprojects, but green labelling alone does not ensure positive sustainability outcomes. A renewable energy, recycling, or construction waste project may still involve land acquisition, biodiversity impacts, worker safety risks, community nuisance, hazardous materials, pollution, or supply chain issues.

The GFF addressed this risk by aligning eligible activities with recognized green catalogs, standards, and principles. This strengthened the connection among the use of proceeds, environmental objectives, and portfolio reporting. It also provided greater comfort to AIIB and participating lenders that financed activities were not merely labelled green but were screened against a defined framework.

Renewable Energy Subproject Risks

Solar and wind subprojects may involve land acquisition, temporary construction impacts, contractor OHS risks, labor and working condition issues, traffic and logistics risks, biodiversity impacts, bird or bat collision risks in wind projects, panel or turbine component waste, electrical safety risks, and associated transmission-line impacts. AIIB specifically advised CEXIM of the importance of labor and working conditions in renewable energy investments.

The ESMS therefore needed to ensure that sub-borrowers identified site-specific risks, prepared appropriate E&S assessments and management plans, and implemented contractor controls. These controls should include labor management, OHS procedures, community health and safety measures, emergency preparedness, waste management, biodiversity screening, and stakeholder engagement proportionate to the level of risk.

Construction Waste Management Risks

Construction waste management subprojects can generate important circular economy benefits, but they may also involve dust, noise, traffic, sorting and crushing hazards, worker exposure to contaminated materials, improper handling of hazardous fractions, stormwater runoff, community nuisance, fire risk, and occupational injuries. These risks require subproject-specific screening, permitting due diligence, pollution prevention, waste stream segregation, contractor HSE arrangements, emergency response, and monitoring.

The technical value of the CEXIM ESMS is that it gives the financial intermediary a structured process for identifying such risks before credit approval and requiring corrective actions or covenants as part of the sub-loan conditions.

Stakeholder Engagement, Disclosure, and Grievance Management

CEXIM established a project-level GRM with contact channels and procedures in both Chinese and English. The GRM is intended to receive and handle E&S matters and is available to project-affected people and contracted workers. Under the enhanced ESMS, sub-borrowers are also required to establish suitable subproject-level GRMs and inform people in the project footprint of their availability.

This is particularly important in an FI transaction because project-affected people may not know that an MDB-backed facility is indirectly financing the subproject. The GRM requirement helps close this accountability gap by connecting affected communities and workers to subproject-level grievance channels and providing information about AIIB's Project-Affected People's Mechanism.

5.8.4 Institutional Arrangements and E&S Management Systems

The institutional arrangements are the core of this case. CEXIM, as borrower and financial intermediary, was responsible for applying the enhanced ESMS and GFF to eligible subprojects financed under the facility. AIIB retained oversight through prior review and approval of all subprojects, ongoing monitoring, post-reviews, potential site visits, and detailed review of selected E&S documentation.

AIIB's prior review function served three purposes. First, it provided quality control over subproject selection and categorization. Second, it supported knowledge transfer to CEXIM staff as they applied the enhanced ESMS. Third, it helped ensure that the GFF was operationalized in a manner consistent with recognized green finance standards.

CEXIM was also required to maintain a comprehensive E&S database and report semiannually to AIIB on the E&S aspects and performance of the project portfolio,

subject to applicable confidentiality requirements. This is technically important because FI supervision depends on reliable portfolio-level data. Without a database, the lender cannot easily track subproject risk categories, assessment status, covenants, incidents, grievances, corrective actions, or disclosure status.

The project also included an explicit capacity-building pathway. Training was provided to staff across relevant business functions, including on-lending, client management, credit management, and credit review and approval. This helped integrate E&S considerations into the credit cycle rather than leaving them as a stand-alone compliance review. The case template also notes that an annual bilateral seminar between CEXIM and AIIB could serve as a case study for the People's Bank of China and help create incentives for follow-through on E&S commitments.

5.8.5 How E&S Influenced Project Outcomes

E&S integration influenced the project through five main channels.

First, it converted a green credit line into a structured E&S-managed FI platform. The facility was not limited to providing liquidity for green subprojects. It required the enhancement of CEXIM's ESMS and the development of a GFF, thereby embedding E&S screening, categorization, appraisal, approval, and monitoring into the financing process.

Second, it reduced eligibility and reputational risks. By excluding Category A subprojects, activities on AIIB's Environmental and Social Exclusion List, coal mining, coal transportation, coal-fired power, and coal-dedicated infrastructure, the facility reduced the likelihood that AIIB resources would finance activities inconsistent with the project's green objectives or AIIB's E&S requirements.

Third, it strengthened institutional capacity within CEXIM. The involvement of on-lending, client management, credit management, and credit review departments meant that E&S requirements were introduced into business processes that determine whether subprojects are financed. This is a stronger model than training only a small E&S unit because it links E&S due diligence to credit risk, client selection, and approval authority.

Fourth, it created a clearer accountability structure for indirectly financed subprojects. The project-level GRM, sub-borrower GRM requirements, disclosure of E&S assessment documents, and reference to AIIB's Project-Affected People's Mechanism helped address a common accountability challenge in FI operations: affected people may be several steps removed from the MDB.

Fifth, it supported replication beyond the facility. The expected results included not only the amount of green finance leveraged and the quantity of greenhouse gas (GHG) emissions avoided but also the number of eligible green subprojects meeting the enhanced ESMS, the number of projects outside the facility financed by CEXIM that adopt the enhanced ESMS, the number of internal seminars conducted, and E&S training statistics. This shows that the project's intended development outcome included institutional spillover, not only subproject financing.

5.8.6 Implications for Bankability and Investor Confidence

The CEXIM case demonstrates a different pathway to bankability from those in the single-asset infrastructure cases. In Noor, bankability was strengthened through E&S due diligence on land, water, technology, biodiversity, OHS, and contractor controls. In CEXIM, bankability was strengthened by improving the credibility of a financial intermediary's green lending platform.

From a lender perspective, the enhanced ESMS reduced uncertainty in four ways. First, it clarified the rules for subproject eligibility. Commercial lenders and other market participants could see that the facility excluded high-risk and coal-related activities and applied defined green finance criteria.

Second, it strengthened appraisal discipline. Subprojects had to be screened, categorized, appraised, and monitored through a system aligned with AIIB requirements. This made the portfolio more transparent and reduced the risk that hidden E&S liabilities would undermine loan performance.

Third, it created oversight mechanisms. AIIB's prior review of all subprojects, semiannual reporting, portfolio database, post-reviews, and possible site visits gave lenders greater confidence that the ESMS would be implemented rather than merely adopted on paper.

Fourth, it helped domestic commercial lenders learn from MDB-standard E&S requirements. The case template notes that Chinese local commercial lenders were mobilized to participate in subproject financing to learn from the application of MDB-standard E&S policies. This is the key investor confidence feature of the case: E&S standards served not only as a compliance condition but also as a market learning mechanism.

The case should not be overstated. Publicly available evidence does not prove that E&S work alone caused all commercial bank mobilization. The stronger and more defensible conclusion is that E&S integration formed part of the credibility package that made the facility more acceptable to AIIB, supported CEXIM's institutional capacity for green finance, and helped create conditions under which domestic commercial lenders could participate in and learn from the transaction.

5.8.7 Implications for Capital Mobilization Outcomes

The causal pathway should be framed as follows:

Enhanced ESMS and GFF → clearer subproject eligibility and E&S risk controls → confidence arising from AIIB's prior review and supervision → improved credibility of the green on-lending platform → participation and learning by domestic commercial lenders → potential replication across other CEXIM business lines and among domestic financial market actors.

This pathway is credible because the project's expected results explicitly included the amount of green finance leveraged, the number of eligible green subprojects meeting enhanced ESMS requirements, the number of CEXIM projects outside the facility adopting the enhanced ESMS, the number of internal seminars, and E&S training statistics.

5.8.8 Key Takeaways

The CEXIM Green On-Lending Facility demonstrates that E&S standards can contribute to capital mobilization not only by de-risking individual infrastructure assets but also by strengthening the systems of financial intermediaries that originate, appraise, and monitor green investments. The case is distinctive because its primary E&S value added was institutional: enhancement of CEXIM's ESMS, development of a GFF, exclusion of high-risk and coal-related activities, prior review of subprojects, establishment of grievance arrangements, semiannual reporting, staff training, and knowledge transfer to domestic lenders.

For MDB staff, the operational lesson is clear. In FI operations, E&S due diligence should focus less on producing a single ESIA and more on assessing whether the intermediary has the systems, incentives, staff capacity, data architecture, disclosure practices, and contractual leverage needed to manage subproject risk across a portfolio. When these systems are strengthened early, E&S standards can support financing readiness, reduce lender uncertainty, improve green finance credibility, and create replication effects across the domestic financial sector.

Box 5.5: Additional Environmental and Social Measures and Outcomes: CEXIM Green On-Lending Facility

Replication Potential

The case template indicates that CEXIM has been actively seeking additional projects to which it can apply AIIB E&S standards and that domestic financial market actors have shown growing interest in replicating the cooperation model. This makes the case especially relevant to the report's argument that E&S standards can operate as a market-building mechanism rather than solely as a project-level compliance requirement.

Evidence Base for the Case Study

The case study draws on project documents and other related sources, including AIIB's project page for the China EXIM Bank Green On-Lending Facility, AIIB's May 2026 Project Summary Information update, and AIIB's MCDF grant summary for the China EXIM Bank Enhanced Environmental and Social Management Systems project.

5.9 Case Study 9: Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund

Project Overview

The Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund provides a useful example of environmental and social integration at the fund and portfolio level, rather than at the level of a single infrastructure asset. The Fund is a private equity infrastructure vehicle managed by Seraya Management Private Limited, a Singapore-based infrastructure fund manager focused on next-generation infrastructure in Asia. The Fund targets control-oriented, middle-market investments in energy transition and digital infrastructure, with a geographic focus on Southeast Asia, while also allowing exposure to China and Korea.

The Fund is included as a case study because it extends the report's analysis beyond conventional project finance and PPP transactions. Unlike Noor Ouarzazate, Bogotá Metro, Benban Solar Park, or Lake Turkana, where E&S risk management was organized around a defined physical project, Seraya demonstrates how E&S standards can be embedded in a private investment platform that will originate, acquire, develop, and manage multiple assets over time. In this structure, the primary E&S challenge is not the appraisal of one known asset but the creation of a governance system that can screen, categorize, appraise, approve, monitor, and improve a portfolio of future investments.



The Fund's target sectors include offshore wind farm vessels, green data centers, electric vehicle (EV) charging, transport electrification, and related low-carbon infrastructure. These sectors are climate-positive in their strategic intent, but they are not free of E&S risk. Offshore wind vessel platforms may generate risks related to marine pollution, vessel safety, labor, emergency response, crew transfers, and biodiversity interface. Green data centers may involve land acquisition, energy intensity, water use, cooling technology, standby fuel storage, fire safety, hazardous materials, e-waste, construction impacts, community disturbance, and supply chain risks. EV charging and transport electrification platforms may involve electrical safety, battery management, waste management, contractor OHS, traffic safety, and community health and safety issues. The relevance of the case therefore lies in showing how E&S frameworks can help investors manage the transition from a broad thematic mandate covering energy transition and digital infrastructure to bankable, implementable, and supervised private investments.

Financing and Investment Structure

The Fund was supported by AIIB as a non-sovereign financial intermediary investment. AIIB's project information describes the proposed investment as a commitment to the Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund, including a co-investment sleeve. Following a secondary transaction in 2026, AIIB's net commitment was reduced, with part of its fund interest sold to GenZero, a Temasek-owned decarbonization investment platform. This transaction is relevant to the report because it illustrates how MDB participation in a private infrastructure fund can help crowd in, validate, or recycle capital into climate-related infrastructure platforms. However, it should not be overinterpreted as proof that E&S integration alone caused the secondary investment. The more careful conclusion is that the Fund's thematic mandate, portfolio performance, governance arrangements, MDB participation, and E&S framework together supported investor confidence. Table 5.17 summarizes the Fund's financing and capital structure.

Table 5.17: Financing and Capital Structure of the Fund

Financing/Investor Element	Amount/Role	Relevance to This Case
AIIB approved/disclosed commitment	Initially structured as up to $120 million, including a co-investment sleeve; following the 2026 secondary transaction, AIIB's net commitment was reported as $30 million, plus up to $60 million in co-investment capacity	MDB anchor investment; required alignment of the Fund Manager's ESMS with AIIB's Environmental and Social Policy

Fund target size	Approximately $750 million in target commitment for the AIIB-supported Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund	Demonstrates the use of MDB capital to support a larger private infrastructure investment platform
GenZero secondary transaction	GenZero acquired 50% of AIIB's fund stake in 2026; transaction value not publicly disclosed	Illustrates private climate capital participation and potential MDB capital recycling, but causality should not be attributed solely to E&S
Other limited partners/ private investors	Not itemized in AIIB's public disclosures	Private capital participation is central to the Fund model, but individual investor contributions are not publicly disclosed
Co-investment sleeve	Up to $60 million	Allows additional capital deployment into specific portfolio opportunities alongside the Fund

AIIB = Asian Infrastructure Investment Bank, ESMS = Environmental and Social Management System, MDB = multilateral development bank.

Source: Authors' compilation based on project documents.

The Fund should therefore be understood as a blended private infrastructure platform in which MDB capital did not finance one physical project directly but instead helped establish a portfolio-level investment and risk management framework. This is a materially different financing pathway from project finance. In a fund structure, the MDB's E&S leverage is exercised through eligibility criteria, exclusions, ESMS requirements, investor reporting, supervision, post-review rights, and portfolio company obligations.

Identifiable E&S-Linked Expenditure

Publicly available documents do not disclose a consolidated E&S budget for the Seraya Fund. This is typical of private equity and financial intermediary investments. E&S expenditure is usually embedded in the Fund Manager's operating budget, investment due diligence costs, external advisor costs, legal documentation, portfolio company action plans, monitoring, reporting, training, grievance mechanisms, and platform-level management systems. It is therefore not possible to allocate a specific dollar amount to E&S activities from AIIB's commitment or the Fund's total commitments.

However, several E&S-linked cost categories can be identified from the Fund's disclosed ESMS and investor requirements, as summarized in Table 5.18.

Table 5.18: E&S-Linked Cost Areas of the Fund

E&S Cost Area	Publicly Quantified?	How the Cost Is Reflected
ESMS development and enhancement	Not quantified	Embedded in the Fund Manager's systems, policies, procedures, and investor conditions
ESG/E&S staffing	Not quantified	Reflected in the functions of the Head of Sustainability and ESG Committee, investment team responsibilities, and, in later related Seraya fund disclosures, dedicated ESMS officer/E&S coordinator requirements
External E&S due diligence advisors	Not quantified	Required or expected for medium-risk, higher-risk, greenfield, or brownfield investments where specialist technical input is needed
Sector-specific E&S guidance	Not quantified	Required to identify risks and mitigation measures for offshore wind vessels, electric vehicle infrastructure, transport electrification, and green data centers
Portfolio company E&S action plans	Not quantified	Implemented through investment conditions, corrective action plans, monitoring, and reporting
Construction-stage E&S monitoring	Not quantified	Reflected in construction progress reporting for greenfield and brownfield projects
GRM/external communication mechanism	Not quantified	Embedded in group-level and subproject-level grievance systems
Climate-risk assessment and disclosure	Not quantified	Reflected in climate risk management, greenhouse gas tracking, and portfolio reporting aligned with the Task Force on Climate-Related Financial Disclosures
Investor E&S monitoring and supervision	Not quantified	Reflected in annual reporting to AIIB, post-review of subprojects, possible site visits, and reviews of selected E&S documentation

AIIB = Asian Infrastructure Investment Bank; E&S = environmental and social; ESG = environmental, social, and governance; ESMS = Environmental and Social Management System; GRM = grievance redress mechanism.

Source: Authors' compilation based on project documents.

At the fund level, E&S expenditure is not visible as a single CAPEX line. Its value is expressed through governance architecture, transaction screening, risk pricing, investment decision gates, corrective action plans, disclosure, monitoring, and investor assurance. This makes E&S more difficult to quantify than it is in a single infrastructure project, but not less material to bankability.

5.9.1 E&S Risk Classification, Instruments, and Scope of Assessment

AIIB classified the investment as an FI project because the financing structure delegates subproject selection, appraisal, approval, and monitoring to the Fund Manager. This classification is appropriate because the final portfolio is not fully known at approval and the E&S risk profile depends on future investments. In this model, the key E&S instrument is not a single ESIA but the Fund Manager's ESMS.

The ESMS was upgraded to align with AIIB's ESP, Environmental and Social Standards, and Environmental and Social Exclusion List. The Fund Manager's ESG policy commits to applying host-country laws, IFC Performance Standards, International Labour Organization Core Labour Standards, the United Nations Guiding Principles on Business and Human Rights, and other applicable E&S requirements. The ESMS is designed to screen prospective investments against exclusion criteria, assign risk categories, conduct E&S due diligence, prepare action plans, monitor implementation, and report E&S performance to management and investors.

A critical feature of the Fund's E&S architecture is the exclusion of Category A subprojects. This materially limits the Fund's exposure to projects with significant, irreversible, cumulative, diverse, or unprecedented adverse E&S impacts. The Fund also excludes coal mining, coal transportation, coal-fired power generation, infrastructure services exclusively supporting coal activities, and gas-related subprojects. The exclusion of Category A activities does not eliminate all material E&S risks, but it narrows the eligible portfolio to assets whose impacts are expected to be site-specific, largely reversible, and manageable through good international industry practice.

5.9.2 Timing and Integration of E&S Considerations

E&S considerations were integrated at the Fund formation and investment cycle design stage, before the full deployment of capital in portfolio assets. This timing is central to the case. In a fund structure, E&S value is maximized when screening criteria, eligibility rules, investment committee procedures, documentation requirements, and monitoring obligations are built into the investment process before individual assets are approved.

For Seraya, E&S integration occurs at four decision points.

First, E&S is integrated at origination through sector eligibility and exclusion screening. This prevents the Fund from pursuing activities that are inconsistent with the agreed E&S and climate mandate.

Second, E&S is integrated into due diligence through risk categorization; assessment of environmental, health and safety, labor, human rights, community, governance, and security risks; and identification of gaps against applicable standards.

Third, E&S is integrated into investment approval through ESG Action Plans. When gaps or risks are identified, the action plan defines mitigation measures, responsibilities, deliverables, and timeframes. This turns E&S findings into investment conditions rather than post-investment recommendations.

Fourth, E&S is integrated during ownership through active monitoring, stewardship, incident reporting, portfolio company engagement, annual reporting, and investor supervision. This is especially important because the Fund targets control-oriented investments, which give the Fund Manager more influence over portfolio company systems than would typically be available through passive minority investments.

The timing of E&S integration is therefore analogous to early E&S integration in a project finance transaction, but the mechanics are different. For a project, early E&S integration may influence route alignment, site selection, design, technology choice, and contractor obligations. For a fund, early E&S integration shapes investment eligibility, due diligence scope, approval gates, shareholder influence, portfolio company governance, and exit readiness.

5.9.3 Principal E&S Risk Pathways and Management Measures

Portfolio-Level Risk: Delegated Decision-Making and Future Unknown Assets

The most distinctive E&S risk in the Seraya case is delegated decision-making. AIIB does not approve every investment directly before the Fund Manager deploys capital. This creates a financial intermediary risk pathway: the MDB's exposure depends on the Fund Manager's ability to apply E&S requirements consistently across future investments. The quality of the ESMS is therefore central to the transaction.

The management response is a structured ESMS that requires screening, categorization, due diligence, action planning, monitoring, and reporting. Category A activities are excluded. Medium-risk and higher-risk investments require more detailed due diligence and, where appropriate, external expert support. Greenfield and brownfield projects are assessed to determine whether an ESIA is required. The Fund Manager reports E&S performance to an ESG Committee and investors, while AIIB retains supervision through annual monitoring reports, post-reviews, and possible site visits.

This is the core technical lesson of the case: for infrastructure funds, MDB E&S leverage shifts from direct project appraisal to system assurance. The bankability question becomes whether the Fund Manager has the capacity, procedures, governance, staffing, and incentives to identify and manage E&S risks across the investment cycle.

Offshore Wind Farm Vessels and Marine Operations

Offshore wind farm vessels are a critical part of the energy transition value chain because offshore wind projects depend on specialized vessels for installation,

operations, maintenance, crew transfers, logistics, and support services. However, vessel operations create a distinct E&S risk profile. Potential impacts include marine pollution from fuel, lubricants, and waste streams; spill risks; waste handling; vessel collision and navigation-related hazards; worker transfer risks; emergency response challenges; occupational health and safety risks during offshore work; working conditions for crew; and potential disturbance to marine ecology.

The Fund's E&S framework addresses these risks by requiring sector-specific guidance, platform-level OHS management, compliance with host-country labor and safety laws, and alignment with international E&S standards. Particular attention is required for workers transported to offshore wind farm vessels, where safety risks include vessel transfers, exposure to adverse weather, fatigue, emergency evacuation, confined working environments, and contractor interface management.

From a bankability perspective, the relevant E&S issue is not simply whether offshore wind is climate-positive. It is whether the offshore wind supply chain can be scaled safely, with credible systems for marine safety, pollution prevention, emergency preparedness, labor management, and incident reporting.

Green Data Centers

Green data centers are a key part of the Fund's digital infrastructure mandate. They can support regional connectivity and technology-enabled infrastructure, but they present material E&S risks. Construction-stage risks include land access, permitting, contractor OHS, traffic, noise, dust, waste, and community disturbance. Operational risks include electricity consumption, cooling demand, water use where water-based cooling is applied, energy sourcing, backup generators, fuel storage, refrigerants, fire safety, battery systems, hazardous waste, e-waste, and cybersecurity-linked business continuity risks.

The Fund's ESMS requires these issues to be assessed during due diligence and managed through action plans, monitoring, and platform-level controls. For data centers, the most important E&S and climate indicators include access to renewable energy, energy efficiency, water efficiency, emergency preparedness, fire safety, waste management, battery handling, contractor management, and community interface controls. The Fund's results indicators include the percentage of data centers with access to renewable energy sources, which is important because the climate credibility of digital infrastructure depends heavily on energy sourcing and operational efficiency.

The case demonstrates a broader lesson for climate and digital infrastructure finance. "Green" data centers require more than efficient branding. They require measurable energy, water, waste, safety, and climate performance systems that are built into asset design, procurement, operations, and reporting.

Electric Vehicle Charging and Transport Electrification

Electric vehicle charging and transport electrification platforms can help reduce transport sector emissions, but they also involve site-level and operational E&S risks. These may include land and access arrangements for charging sites, electrical safety, battery safety, fire prevention, hazardous waste, e-waste, contractor OHS during installation, traffic and pedestrian safety, community disturbance, user safety, and emergency response.

The Fund's E&S due diligence process is relevant because EV infrastructure often involves multiple small sites rather than one large project. A weak E&S system could treat each site as immaterial, even though cumulative risks across a portfolio may become significant. The Fund's portfolio approach should therefore require standardized siting criteria, electrical safety procedures, contractor OHS requirements, incident reporting, waste management protocols, and community interface measures across multiple installations.

Labor, Occupational Health and Safety, and Contractor Management

Labor and OHS risks are material across all target sectors. Greenfield and brownfield infrastructure investments may involve contractors, subcontractors, equipment suppliers, vessel crews, facility operators, security personnel, and maintenance workers. Key risks include work at height, electrical works, lifting operations, confined spaces, marine transfers, heat stress, construction traffic, fire safety, chemical handling, battery safety, fatigue, and emergency response.

Seraya's policy framework requires investments to assess labor, OHS, community health and safety, and human-rights risks during due diligence. It also requires supplier and counterparty screening, responsible procurement, safe work statements for contractors and subcontractors in greenfield and brownfield projects, and monitoring through construction progress reports. These measures are important because many infrastructure E&S failures occur not because risks were unknown but because contractor obligations were not translated into enforceable procedures, supervision, and reporting.

Supply Chain and Responsible Procurement

The Fund's sectors depend on complex supply chains, including vessels, data center equipment, batteries, electrical systems, cooling systems, semiconductors, construction contractors, facility managers, and energy suppliers. Supply chain risks may include forced labor, child labor, poor working conditions, hazardous materials, unsafe subcontracting, biodiversity impacts from raw materials, and weak supplier governance.

The Fund's exclusion list and supplier code requirements are therefore central risk controls. The policy excludes forced labor and harmful child labor, illegal materials, certain hazardous substances, unsustainable marine practices, the destruction of high conservation value areas, coal-related activities, and other prohibited activities. Supplier due diligence and responsible procurement help extend the Fund's E&S standards beyond direct investee companies to the delivery chain.

This is operationally important because energy transition and digital infrastructure projects can shift E&S risks upstream into equipment, technology, and construction supply chains. A credible fund-level ESMS must therefore address not only the asset owner but also suppliers, contractors, and counterparties.

Climate Risk, GHG Accounting, and Transition Credibility

The Fund's investment mandate is climate-aligned, but transition credibility depends on measurable outcomes. The Fund's disclosed results indicators include the capacity of wind farms serviced, renewable energy access for data centers, carbon dioxide emissions abated through EV chargers, the percentage of fund investment aligned with climate finance, the share of female employees across platforms, and green credentials for transport assets.

The Fund Manager has also committed to climate risk management processes aligned with the recommendations of the Task Force on Climate-Related Financial Disclosures and to GHG tracking across the Fund and its portfolio companies, including Scope 1, Scope 2, and, where possible, Scope 3 emissions. This matters because private infrastructure investors increasingly need to demonstrate not only that capital is deployed in climate-themed sectors but also that portfolio companies are managing transition risks, physical climate risks, and emissions performance in a measurable way.

The E&S value added is therefore twofold. It protects against adverse impacts and strengthens the credibility of the Fund's climate and sustainability claims.

Information Disclosure, Grievance Management, and Accountability

The Fund's disclosure and grievance arrangements are important because financial intermediary investments can otherwise be opaque to affected communities. Seraya has disclosed an overview of its Environmental, Social, and Governance Management System and information on established platform companies. Platform companies are expected to disclose asset-level or project-level information, and higher-risk Category B subprojects are subject to annual E&S documentation disclosure, subject to legal, regulatory, and commercial limitations.

Seraya has also established an external communication mechanism and upgraded it to a group-level GRM. The GRM is available to project-affected people and contracted workers and requires subsidiaries to establish suitable subproject-level grievance mechanisms. The mechanism also provides information on AIIB's Project-Affected People's Mechanism.

This is significant because it creates an accountability pathway across three levels: the Fund Manager, the portfolio company or subproject, and the MDB's accountability mechanism. For an infrastructure fund operating across multiple jurisdictions and sectors, this layered grievance architecture is essential for maintaining social license, identifying implementation problems early, and protecting investor reputation.

5.9.4 Institutional Arrangements and ESMS Governance

The institutional structure is an important feature of the Seraya case. The ESMS is not limited to a policy statement. It includes governance roles, investment cycle procedures, oversight committees, internal responsibilities, external expert support, monitoring, reporting, and incident escalation.

The Fund's governance arrangements include board and senior management oversight, the integration of ESG considerations into Investment Committee processes, a Head of Sustainability function, an ESG Committee, investment team responsibilities, ESG due diligence, ESG Action Plans, quarterly and annual reporting, construction progress reporting, and material incident notification. The ESMS also allows for third-party E&S specialists or additional staff where needed, depending on the risk level of the investment.

This governance structure is important for three reasons.

First, it embeds E&S considerations into investment decision-making. E&S risks are assessed before investment approval, and the Fund may proceed only where identified risks can be managed through agreed measures.

Second, it creates a portfolio monitoring system. The Fund Manager must monitor investments after acquisition and report on E&S performance, action plans, incidents, and corrective measures.

Third, it supports active ownership. Because Seraya targets control-oriented investments, it can influence portfolio company governance, management systems, procurement, staffing, contractor controls, and sustainability performance more directly than a passive financial investor can.

The case therefore demonstrates that E&S integration in private equity infrastructure should be treated as an ownership capability, not merely as a compliance requirement at entry.

5.9.5 How E&S Influenced Project Outcomes

E&S integration influenced the Seraya Fund through five main channels.

First, it made delegated investment decision-making acceptable to an MDB. AIIB could participate in the Fund because the Fund Manager's ESMS was enhanced to align with AIIB's E&S requirements. Without such a system, the delegation of subproject selection and approval would create unacceptable E&S uncertainty.
Second, it narrowed the eligible investment universe. Exclusion criteria and the exclusion of Category A subprojects reduced exposure to activities with the highest adverse E&S risk profiles. This helped align the Fund's investment mandate with its climate and sustainability objectives.

Third, it converted thematic investment risks into operational controls. Energy transition and digital infrastructure are broad labels. The ESMS translates these labels into due diligence questions, sector-specific guidance, action plans, contractor controls, climate metrics, disclosure requirements, and monitoring obligations.

Fourth, it supported investor confidence. Institutional investors in infrastructure funds need assurance that E&S, governance, and climate risks will be managed consistently across the portfolio. The Fund's ESMS, ESG Committee, action plans, reporting requirements, and MDB supervision provide that assurance. Subsequent investor interest in Seraya's platform, including the GenZero secondary transaction and IFC's later participation in a related Seraya Southeast Asia fund structure, reinforces the conclusion that E&S governance is part of the investor confidence package, although it should not be presented as the sole cause of capital mobilization.

Fifth, it created a replicable model for platform-level sustainable infrastructure finance. The case shows how MDB E&S standards can influence private capital vehicles by embedding international standards into fund procedures rather than applying them only to individual sovereign or project finance operations.

5.9.6 Implications for Bankability and Private Capital Mobilization

The Seraya case is useful for this report because it illustrates a different pathway from E&S integration to private capital mobilization. In project finance, E&S integration improves bankability by reducing site, permitting, land, community, construction, and operational risks for a known project. In a private equity infrastructure fund, E&S integration improves bankability by reducing investor uncertainty about future portfolio selection, governance, disclosure, corrective action, and reputational risk. The Fund's E&S framework contributes to bankability in four ways.

First, it reduces information asymmetry. Investors do not know every asset the Fund will acquire or develop at the time of commitment. A credible ESMS provides assurance that future investments will be screened, categorized, assessed, and monitored according to agreed standards.

Second, it protects the Fund's thematic credibility. Energy transition and digital infrastructure funds are exposed to greenwashing, transition risks, and social license concerns. E&S requirements help demonstrate that climate-positive sectors are being developed with attention to local impacts, labor conditions, community safety, supply chains, and measurable climate outcomes.

Third, it strengthens governance and control. E&S integration is linked to Investment Committee processes, ESG Committee oversight, action plans, incident reporting, and portfolio company stewardship. This reduces the risk that E&S issues will remain outside core investment governance.

Fourth, it supports MDB and institutional investor participation. MDB involvement can give private investors confidence that international E&S standards are being embedded in the Fund's operating procedures. This is especially important for first-time or emerging market-focused fund strategies, for which investors may perceive higher governance, regulatory, and E&S risks.

The stronger analytical conclusion is not that E&S integration alone made the Seraya Fund bankable. Rather, E&S integration formed part of the Fund's broader bankability package, alongside its sector strategy, Fund Manager capability, control-oriented ownership, MDB participation, climate transition demand, and platform-building expertise.

5.9.7 Key Takeaways

The Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund demonstrates that E&S integration can support private capital mobilization not only at the project level but also at the fund or portfolio level. Its most distinctive contribution is showing how E&S standards can be embedded in a private equity fund's investment cycle through exclusion screening, risk categorization, E&S due diligence, ESG Action Plans, sector-specific guidance, portfolio monitoring, grievance management, disclosure, and MDB supervision.

The case also shows that climate-positive infrastructure funds are not automatically low risk. Offshore wind vessels, green data centers, EV charging platforms, and related digital infrastructure all carry E&S risks that require technical management. The value of E&S integration lies in converting these risks into investment decision gates, contractual obligations, portfolio company systems, monitoring indicators, and corrective action processes.

For MDB staff, the operational lesson is clear: when MDBs invest through funds and other financial intermediaries, the quality of the ESMS is central to financing readiness. E&S due diligence should focus not only on the first investments in the pipeline but also on whether the Fund Manager has the governance, staffing, procedures, incentives, and supervision arrangements needed to manage E&S risks throughout the full investment cycle.

Evidence Base for the Case Study

The case study draws on AIIB's Project Summary Information for the Seraya Southeast Asia Energy Transition and Digital Infrastructure Fund; Seraya's Environmental, Social, and Governance and Responsible Investment Policy; Seraya's public sustainability and grievance disclosures; AIIB's publication on offshore wind farm vessels; GenZero's announcement of its secondary acquisition of a stake from AIIB; and IFC's disclosure regarding the later Seraya SEA II investment.

5.10 Supporting Comparative Cases

In addition to the nine main case studies examined in detail in this chapter, two supporting cases were reviewed to provide comparative perspectives on how E&S integration can influence project preparation, financing readiness, and investment outcomes under different institutional and financing arrangements. These cases were not analyzed using the same level of detail as the main cases but were used to test and refine the cross-case findings and typologies developed in subsequent chapters of this report.

Box 5.6: Stakeholder Perspectives: Insights from Interviews
Access Road Benefits and Risks

Discussions with infrastructure finance practitioners and E&S specialists provided additional perspectives that broadly aligned with the findings emerging from the case studies. Participants included representatives from MDBs and DFIs, financial institutions, government agencies, project developers, and other stakeholders involved in infrastructure project preparation and implementation. These discussions were not intended as a formal research component of the study but helped contextualize and interpret the evidence presented elsewhere in the report.

Several MDB and DFI specialists emphasized the value of integrating E&S considerations during project identification and preparation rather than later in the project cycle. As one practitioner observed, “If we start working on E&S at project identification, it shapes better projects — you avoid the unbankable ones or redesign them into bankable ones.” Participants noted that upstream E&S work can help identify risks and implementation challenges before key decisions are finalized, improving project preparation and supporting financing readiness.

Interviewees also highlighted practical challenges. Several noted tensions between pressures to accelerate project preparation and the time required to undertake thorough E&S due diligence. At the same time, a number of participants observed that attitudes within DFIs are evolving, with E&S specialists increasingly viewed as contributors to risk management and project quality rather than solely as performing compliance functions.

Capacity building emerged as another recurring theme. Practitioners emphasized that strengthening the ability of government agencies and implementing entities to manage E&S issues can improve project preparation and implementation while increasing confidence among financiers and other stakeholders.

Participants also noted continuing efforts to improve coordination among MDBs and DFIs through harmonized approaches and common standards. While progress has been made, several observed that differences in institutional requirements and implementation practices can still create complexity for borrowers and project sponsors, particularly in projects involving multiple financiers. As one interviewee remarked, “We still have too many cooks in the kitchen on joint projects — aligning standards case-by-case. A common approach would certainly help mobilization.”

5.10.1 Nacala Corridor (Mozambique, Malawi, and Zambia)

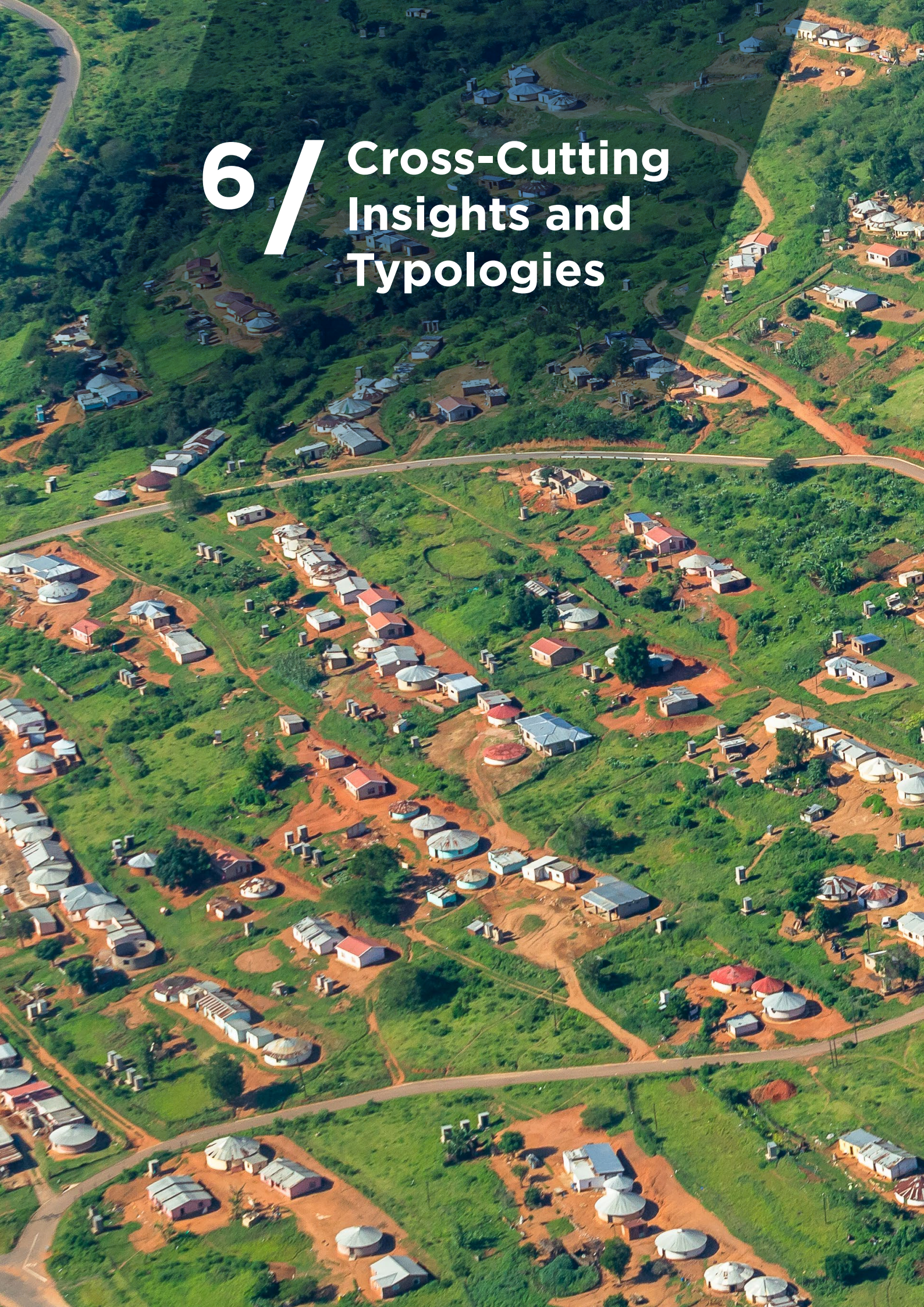
The Nacala Corridor project illustrates how upstream E&S integration can contribute to implementation readiness in complex regional infrastructure projects. Early stakeholder engagement, resettlement planning, and environmental risk management helped address E&S issues associated with corridor development and reduce implementation risks. While the project did not result in significant private capital mobilization at the project level, it provides evidence that E&S integration can improve project preparedness and risk management even when financing outcomes are driven primarily by the public sector.



5.10.2 Argentina RenovAr Program

The RenovAr renewable energy program demonstrates how standardized E&S requirements can be incorporated into a broader programmatic framework supporting multiple investments. Combined with financial guarantees and procurement mechanisms, these arrangements helped establish a common approach to environmental and social risk management across a large portfolio of renewable energy projects. The case illustrates how E&S integration can support financing readiness and investor confidence at the program level rather than only within individual projects.





6 / Cross-Cutting Insights and Typologies

Chapter 6: Cross-Cutting Insights and Typologies

This chapter qualitatively synthesizes evidence from the case studies to identify recurring mechanisms through which E&S integration influences project preparation, financing readiness, bankability, and financing outcomes. The analysis highlights common patterns across sectors, regions, and financing structures and develops a typology framework that describes the principal pathways through which E&S integration contributes to project outcomes.

Table 6.1 summarizes two additional cases used in the broader comparative analysis.

Table 6.1: Supporting Comparative Cases

Case	Context	Primary E&S Contribution	Relevance to Financing Outcomes
Nacala Corridor (Mozambique, Malawi, and Zambia)	Regional transport corridor involving rail and port infrastructure	Early stakeholder engagement, resettlement planning, and social risk management strengthened implementation readiness and reduced the likelihood of project disruption.	Demonstrates how upstream E&S integration can improve implementation readiness and reduce social risk, even where direct private capital mobilization is limited.
Argentina RenovAr Program	National renewable energy procurement program supported by guarantees and standardized project preparation arrangements	Standardized E&S screening and management requirements established a consistent framework across multiple projects.	Illustrates how common E&S frameworks can support investor confidence, transaction efficiency, and large-scale private investment when combined with broader risk-mitigation measures.

Source: Authors' compilation based on project documents.

The case studies reveal recurring patterns in how E&S integration influenced project preparation, implementation readiness, risk management, and financing outcomes. While each project reflects a distinct context, the comparative analysis identifies a set of common mechanisms through which these effects occurred. These mechanisms help explain how the conceptual pathways outlined in Chapter 4 manifest in practice and provide the basis for the typologies developed in this chapter.

6.1 Patterns Across Cases

A comparative review of the nine main case studies, ranging from single-asset infrastructure and portfolio-based renewable energy platforms to financial intermediary operations and private equity funds, reveals several recurring patterns in how E&S integration shapes project preparation, financing readiness, and bankability. The main and supporting cases reviewed elsewhere in the report are used to test and reinforce these patterns, but the findings below are grounded primarily in the nine main case studies. E&S assessments were undertaken early in the project cycle, consistent with MDB policy requirements. Early entry alone therefore does not distinguish meaningful contribution to financing readiness. The more relevant question is whether E&S considerations were integrated at a stage when key design, sequencing, and structuring decisions remained flexible enough to be influenced.

The case studies show that E&S integration appears to influence financing readiness through four recurring mechanisms:

1. Improving risk clarity by identifying and mitigating environmental and social risks before financial close, thereby reducing uncertainty for sponsors, lenders, and public authorities.
2. Strengthening implementation readiness by addressing land acquisition, resettlement, permitting, and stakeholder issues before construction begins, thereby reducing the likelihood of delays and associated cost escalation.
3. Contributing to transaction efficiency and coordination, especially in multi-financier settings, by aligning due diligence expectations and reducing information asymmetry.
4. Improving risk allocation and enforceability when E&S obligations are embedded in concession agreements, financing covenants, or supervisory frameworks, which can strengthen investor confidence.

These mechanisms matter financially and operationally because they can reduce the probability of cost overruns, delays, redesign, regulatory disruption, and reputational damage. In doing so, they contribute to financing readiness by improving risk clarity, implementation preparedness, and confidence that E&S risks can be managed effectively. The cases suggest that E&S integration supports bankability primarily through these indirect pathways rather than through direct effects on capital mobilization.

At the same time, the evidence indicates that E&S integration rarely acts as a stand-alone driver of investment decisions. Financing outcomes remain multifactorial and depend on broader conditions, including project economics, government commitment, market fundamentals, sponsor capability, risk-sharing arrangements, and the overall financing structure. E&S integration is therefore best understood as a strong component of a broader set of factors that influence investment decisions and financing outcomes. The institutional cases (CEXIM and Seraya) reinforce this pattern, demonstrating that E&S integration can also operate through financial intermediary systems and fund-level governance rather than only through project-level assessment.

Several cross-case findings stand out:

1. E&S integration is most effective when it is introduced early enough to influence project preparation, design, implementation arrangements, and risk allocation before core decisions are fixed.
2. E&S integration contributes to financing readiness by reducing uncertainty and strengthening confidence that project risks can be managed effectively.
3. The financing value of E&S integration is realized through practical risk-management mechanisms rather than compliance alone, including improved design choices, implementation readiness, contractual enforceability, stakeholder management, and monitoring arrangements.
4. Common E&S frameworks can facilitate coordination among multiple financiers, developers, and implementing institutions, particularly in complex multi-lender or programmatic investment structures.
5. E&S integration is rarely a stand-alone determinant of investment decisions, but it can materially improve the conditions under which financing decisions are made.

Table 6.2 summarizes these patterns across the detailed cases presented in Chapter 5.

Table 6.2: Comparative Summary of Cross-Case Patterns

Case	Timing of E&S Influence	Primary Typologies	Main Contribution to Financing Readiness and Bankability	Financial and Operational Implications
Noor Ouarzazate Solar Complex (Morocco)	Feasibility and project design stage	Design influence; coordination and signaling	Early E&S assessment influenced project design and facilitated coordination among multiple financiers	Reduced the risk of future redesign, improved due diligence efficiency, and supported large-scale blended financing
Nam Theun 2 Hydropower Project (Lao PDR)	Extended preparation period before financial close	Risk allocation and enforceability	E&S obligations were embedded in legal agreements, financing arrangements, and implementation structures	Strengthened the credibility and enforceability of commitments, supporting financing in a complex, high-risk context

Bogotá Metro Line 1 (Colombia)	Feasibility, design, and structuring stage	Implementation readiness; risk allocation and enforceability	Early management of land acquisition, resettlement, and stakeholder issues improved implementation preparedness	Reduced execution risks, clarified responsibilities, and strengthened confidence among project participants
Benban Solar Park (Egypt)	Program design and project preparation stage	Coordination and signaling	A common E&S framework and shared management arrangements supported coordination among multiple developers and financiers	Reduced transaction friction, improved consistency across projects, and facilitated large-scale renewable energy investment
Scaling Solar Zambia	Program and project design stage	Design influence	Early screening, site selection, and risk identification informed project preparation before procurement	Improved project preparedness, reduced uncertainty, and supported efficient project development and financing processes
Belgrade Solid Waste PPP (Serbia)	Project preparation, structuring, and pre-construction stage	Risk allocation and enforceability; implementation readiness	E&S requirements were integrated into contractual arrangements and implementation planning	Improved implementation readiness, strengthened compliance certainty, and reduced regulatory and execution risks
Lake Turkana Wind Power Project (Kenya)	Pre-feasibility through financial close	Design influence; coordination and signaling	E&S assessments informed project design decisions and supported coordination among lenders and stakeholders	Improved risk clarity, strengthened lender confidence, and supported the mobilization of private project finance

CEXIM Green On-Lending Facility (China)	Institutional design and capacity-building stage, before full portfolio rollout	Coordination and signaling; implementation readiness (institutional)	An enhanced ESMS, a GFF, and exclusion controls reduced uncertainty for AIIB and domestic commercial lenders, strengthened institutional capacity for green finance, and created replication effects across CEXIM and the domestic financial sector	Demonstrated FI-level E&S integration as a capital mobilization pathway; mobilized $400M (2.0x ratio) from domestic commercial lenders; and supported learning and replication
Seraya Southeast Asia Fund	Fund formation and investment-cycle design stage, before full portfolio deployment	Coordination and signaling; implementation readiness (institutional/ portfolio)	An enhanced ESMS and active ownership model reduced investor uncertainty about future assets; MDB anchor investment signaled quality to other investors; and exclusion criteria and sector-specific guidance protected thematic credibility	Demonstrates platform-level E&S integration; shows how MDB participation in private equity funds can embed international standards in fund governance; and supports investor confidence through portfolio-level risk management

AIIB = Asian Infrastructure Investment Bank, CEXIM = Export-Import Bank of China, E&S = environmental and social, ESMS = Environmental and Social Management System, FI = financial intermediary, GFF = Green Financing Framework, MDB = multilateral development bank, PPP = public-private partnership.

Source: Authors' compilation based on project documents.

6.2 Typologies of Catalytic E&S Interventions

Building on the cross-case analysis, the evidence suggests that the contribution of E&S integration to project bankability can be grouped into a set of recurring, mechanism-based typologies. These typologies provide an operational account of "beyond compliance" by showing how E&S interventions influence financial and operational outcomes rather than simply describing the completion of required E&S activities.

Four typologies emerge from these cases, each corresponding to a distinct pathway through which E&S affects project preparation and financing dynamics.

6.2.1. Design Influence Typology

This typology applies when E&S considerations are integrated early enough to shape core project design decisions, such as site selection, technology choice, or alignment.

- **Typical interventions:** early environmental assessments, alternatives analysis, and resource risk identification.
- **When most relevant:** at the pre-feasibility and feasibility stages, before key design parameters are fixed.
- **Primary mechanism:** avoidance of future risks through design choices.
- **Financial implication:** reduces the likelihood of costly redesign, regulatory delays, or operational inefficiencies, thereby improving expected project cash flows.

This typology is illustrated by cases such as Noor and Lake Turkana, where E&S assessments influenced site selection, project layout, and mitigation measures while key design parameters remained flexible. Similar dynamics are evident in Zambia's Scaling Solar program, where upstream screening, site selection, and project preparation helped identify and address potential E&S risks before projects were brought to market. In these cases, E&S integration contributed to financing readiness by influencing project design decisions at a stage when changes could be incorporated into project preparation and development processes.

6.2.2. Implementation Readiness Typology

This typology applies when E&S interventions focus on resolving land, resettlement, stakeholder, and permitting issues prior to construction.

- **Typical interventions:** resettlement planning, stakeholder engagement, grievance mechanisms, and land acquisition strategies.
- **When most relevant:** during late preparation and pre-construction stages.
- **Primary mechanism:** reduction of execution risk through early issue resolution.
- **Financial implication:** lowers the probability of construction delays, disputes, and associated cost overruns.

This typology is particularly evident in cases with significant social footprints, such as Bogotá, Belgrade, and Nam Theun 2. Across these projects, E&S interventions helped address land acquisition, resettlement, stakeholder engagement, and institutional coordination issues before construction commenced. In these cases,

E&S integration contributed to financing readiness by improving implementation preparedness and helping to reduce the likelihood of delays, disputes, and other execution risks during project delivery. The CEXIM and Seraya cases expand the implementation readiness typology beyond project-level preparedness to include institutional and portfolio-level readiness. In financial intermediary operations, implementation readiness depends on whether the intermediary has the systems, staff capacity, data architecture, and contractual leverage to manage E&S risks across a portfolio. In private equity fund structures, implementation readiness depends on whether the Fund Manager has the governance systems, due diligence procedures, approval gates, monitoring arrangements, and active ownership capabilities needed to manage future investments. The enhanced ESMSs in both cases provided this institutional foundation before capital was deployed, supporting financing readiness at the platform level rather than at the project level.

6.2.3. Risk Allocation and Enforceability Typology

This typology applies when E&S requirements are embedded in contractual and financing arrangements, including concession agreements, financing covenants, and supervision frameworks.

- **Typical interventions:** inclusion of E&S obligations in PPP contracts, loan agreements, and ESAPs.
- **When most relevant:** during project structuring and financial close.
- **Primary mechanism:** clarification and enforcement of responsibilities.
- **Financial implication:** helps clarify responsibilities and strengthen accountability for risk management, increasing confidence that E&S commitments will be implemented throughout the project life cycle.

This mechanism is central in PPP and project finance contexts, as seen in the Nam Theun 2 Hydropower Project, the Bogotá Metro project, and the Belgrade Solid Waste project. E&S obligations were incorporated into financing agreements, project structures, and implementation arrangements, helping clarify responsibilities and establish mechanisms for monitoring and compliance. In these cases, E&S integration contributed to financing readiness by strengthening accountability for risk management and increasing confidence that agreed mitigation measures would be implemented throughout the project life cycle.

6.2.4. Coordination and Signaling Typology

This typology applies when E&S frameworks facilitate coordination among multiple financiers or signal quality to investors.

- **Typical interventions:** adoption of the IFC Performance Standards and harmonization of MDB requirements.
- **When most relevant:** in multi-lender or private capital mobilization contexts.
- **Primary mechanism:** reduction of information asymmetry and transaction complexity.
- **Financial implication:** helps align expectations among financiers, reduce information asymmetries, and strengthen confidence in project preparation and risk management arrangements.

This typology is evident in cases such as Benban, Noor, Lake Turkana, and Scaling Solar, where common E&S frameworks helped facilitate coordination among multiple financiers, developers, and implementing institutions. The use of recognized standards and structured E&S processes helped align expectations, reduce information asymmetries, and provide investors with greater confidence in project preparation and risk management arrangements. In this way, E&S integration contributed to financing readiness by supporting coordination and signaling project quality in complex financing environments. The CEXIM and Seraya cases illustrate this typology at the institutional level. In CEXIM, an enhanced ESMS and a GFF signaled credibility to domestic commercial lenders, which participated partly to learn from the application of MDB-standard E&S policies. In Seraya, AIIB's anchor investment and enhanced ESMS signaled quality to other investors, contributing to subsequent participation by private climate investors through the GenZero secondary transaction. These cases show that signaling operates not only at the project level but also through institutional governance and market-building mechanisms.

A cautionary note from Lake Turkana remains relevant: While signaling can strengthen lender confidence, it is not a substitute for rigorous, rights-based due diligence on land, tenure, customary use, and consent requirements.

6.3 Cross-Typology Observations

The typologies are not mutually exclusive. In most cases, multiple mechanisms operate simultaneously, and their combined effect can contribute to project outcomes. Their effectiveness depends on timing, sequencing, and integration with broader project preparation and financing processes.

In particular:

- Design influence is strongest when applied before key parameters are fixed.
- Implementation readiness is critical in projects with significant land, resettlement, or stakeholder management challenges.
- Risk allocation mechanisms are most important in PPP and project finance structures in which responsibilities must be clearly defined and monitored.
- Coordination and signaling mechanisms are particularly relevant in complex, multi-financier transactions.

The case studies suggest that projects rarely rely on a single mechanism. Rather, financing readiness is typically strengthened through a combination of design influence, implementation readiness, risk allocation, and coordination effects. These patterns reinforce a broader finding of the report: the contribution of E&S integration depends not only on when it occurs but also on how it is embedded in project preparation, structuring, and implementation processes.

Institutional mechanisms operate at a different level from project mechanisms. In CEXIM and Seraya, E&S integration does not influence physical design, site selection, or contractor obligations. Instead, it influences the rules of the financing platform: eligibility criteria, exclusion controls, due diligence procedures, approval gates, portfolio monitoring, and active ownership. This demonstrates that E&S integration can contribute to financing readiness even when the final assets are not fully known at the time of financing approval.

Taken together, these findings suggest that MDBs should integrate E&S work into project preparation, transaction structuring, and institutional and portfolio governance, as well as compliance processes. Its contribution to financing readiness depends on how the relevant mechanisms are combined and applied in each context.

6.4 Supporting Evidence from Additional Cases

The supporting cases reviewed for this report provide additional evidence that the typologies identified above are not confined to a particular sector, geography, or financing modality. Argentina's RenovAr program reinforces the coordination and signaling typology through the use of standardized E&S requirements and supporting investment frameworks. The Nacala Corridor project illustrates implementation-readiness mechanisms through stakeholder engagement and resettlement planning undertaken prior to project implementation. While these cases were not examined in the same depth as the main cases, they provide additional support for the broader patterns identified in the analysis.

6.5 Implications for the Report's Core Hypothesis

The comparative analysis of the nine case studies provides preliminary support for the report's core proposition that early and robust E&S integration can contribute to financing readiness and project bankability. The patterns observed across the cases are also broadly consistent with the analytical framework presented in Chapter 4, which suggests that upstream E&S integration contributes to financing outcomes. However, the evidence suggests a more nuanced interpretation than a simple causal relationship between E&S integration and capital mobilization. Across the cases reviewed, E&S integration contributed most clearly by influencing project preparation, implementation readiness, risk management, and coordination among key actors. These effects, in turn, helped create conditions that supported financing decisions and project delivery.

The typologies developed in Section 6.2 provide a framework for understanding the mechanisms through which these effects occur. The findings below draw on both the cross-case evidence and the typology analysis.

Finding 1. E&S Integration Is Most Effective When It Influences Decisions Before Key Project Parameters Are Fixed

Across the case studies, E&S integration contributed most strongly when it informed project preparation, design, implementation arrangements, or risk allocation while meaningful decisions remained flexible. Cases such as Noor, Lake Turkana, Scaling Solar, and Bogotá demonstrate how E&S considerations influenced project design, site selection, infrastructure routing, project preparation, or implementation planning before major commitments had been finalized. The evidence suggests that timing matters not simply because E&S activities occur early but because they occur at a stage when project decisions can still be influenced.

Finding 2. E&S Integration Contributes to Financing Readiness by Reducing Uncertainty and Strengthening Confidence That Project Risks Can Be Effectively Managed

A recurring pattern across the cases is that E&S integration improved understanding of environmental and social risks and demonstrated how those risks would be managed. Projects such as Noor, Scaling Solar, Lake Turkana, Nam Theun 2, and Belgrade show how E&S assessments, management plans, monitoring arrangements, and mitigation measures helped clarify project risks and strengthen confidence among financiers and other stakeholders. While E&S integration did not eliminate project risks, it often reduced uncertainty regarding how those risks would be addressed, thereby contributing to financing readiness and lender confidence. The CEXIM and Seraya cases demonstrate this at the institutional level, where enhanced ESMS and governance frameworks reduced uncertainty for financiers and investors by establishing clear rules for portfolio selection and monitoring before capital was deployed.

Finding 3. The Financing Value of E&S Integration Is Realized Through Practical Risk-Management Mechanisms Rather Than Compliance Alone

The cases reviewed demonstrate that the contribution of E&S integration extends beyond compliance with safeguard requirements. Across the projects examined, E&S measures influenced outcomes through practical mechanisms such as improved project design, implementation planning, stakeholder engagement, institutional arrangements, contractual obligations, and monitoring systems. Cases including Nam Theun 2, Bogotá, Belgrade, and Benban illustrate how these mechanisms helped strengthen implementation readiness, clarify responsibilities, and support effective risk management. The findings therefore suggest that the financing value of E&S integration arises primarily through its influence on project preparation and delivery rather than through compliance alone.

Finding 4. Common E&S Frameworks Can Facilitate Coordination Among Multiple Financiers and Reduce Barriers to Investment at Scale

Several projects demonstrate the value of common E&S frameworks in facilitating coordination among financiers, developers, and implementing institutions. In Benban, Noor, Scaling Solar, and Lake Turkana, the use of recognized standards and structured E&S processes helped align expectations, support due diligence, and provide a common basis for assessing nonfinancial risks. These effects were particularly important in projects involving multiple financiers or complex financing structures, where coordination challenges and information asymmetries can increase transaction complexity. The evidence indicates that common E&S frameworks can therefore contribute to financing readiness by supporting coordination and strengthening confidence among participating institutions. The CEXIM and Seraya cases reinforce this finding at the institutional level, where common E&S frameworks, enhanced ESMSs, GFFs, and fund-level governance aligned expectations across multiple financiers and supported coordination across financing chains and investment portfolios.

Finding 5. E&S Integration Is Rarely a Stand-Alone Determinant of Investment Decisions, but It Can Improve the Conditions Under Which Financing Decisions Are Made

The nine main cases indicate that financing outcomes were influenced by a range of factors, including project economics, market conditions, government commitment, financing structures, sponsor capability, and risk-sharing arrangements. The evidence does not suggest that E&S integration independently drives investment decisions or capital mobilization. Rather, E&S integration contributes by improving project preparation, strengthening implementation readiness, reducing uncertainty, and increasing confidence that E&S risks can be managed effectively. In this way, E&S integration can help create conditions that are more conducive to investment while remaining one component of a broader set of factors that influence financing outcomes. The CEXIM and Seraya cases reinforce this finding: Enhanced ESMSs and governance frameworks strengthened institutional credibility, but capital mobilization also depended on broader factors, including policy bank mandates, Fund Manager capability, market conditions, and MDB participation.

A corollary to these findings is also evident from the cases: Formal compliance with E&S standards is not sufficient to eliminate all implementation or reputational risks. Lake Turkana's land litigation and FPIC controversy, Nam Theun 2's mid-project compliance challenges, and Belgrade's ongoing concerns over waste picker livelihoods demonstrate that E&S integration must be accompanied by sustained monitoring, adaptive management, and credible grievance resolution throughout implementation. The value of E&S integration lies not only in meeting standards at appraisal but also in creating systems that can manage risks as they evolve over the project life cycle. This is equally true for institutional mechanisms: An enhanced ESMS or fund-level governance system is only as strong as its implementation across the portfolio.

Collectively, the findings presented in this chapter indicate that the contribution of E&S integration to financing readiness is best understood as indirect and enabling rather than deterministic. The typologies developed in this chapter provide a framework for understanding the mechanisms through which these effects occur, while the case studies demonstrate how different combinations of these mechanisms operate in practice. Although the strength of the evidence varies across cases, the overall pattern is consistent across sectors, regions, and financing modalities.

7 / Implications for MDB Operations



Chapter 7: Implications for MDB Operations

This chapter draws on the findings from the case studies presented in Chapter 5 and the comparative analysis in Chapter 6 to identify implications for MDB operational practice. The focus is on practical entry points and changes in approach suggested by the evidence rather than prescriptive recommendations. While the evidence base remains illustrative rather than exhaustive, the consistency of patterns observed across projects, sectors, and financing structures provides a stronger basis for identifying operationally relevant insights.

The findings indicate that E&S integration contributes most effectively to financing readiness when it influences project preparation, design, implementation arrangements, and risk allocation before key decisions are fixed. This finding has implications both for facilities such as MCDF that operate upstream and for MDB teams involved in project preparation and structuring.

7.1 Strategic Entry Points for Project Preparation Facilities

Project preparation facilities (PPFs) are typically positioned primarily in the upstream project preparation space. The findings of this report suggest several potential entry points through which PPFs could strengthen their role in supporting upstream E&S integration as a driver of project design, implementation readiness, and financing outcomes.

1. Supporting E&S at the Concept and Feasibility Stages

The cases show that E&S assessments were most influential when conducted before core design and structuring decisions were finalized. PPFs can add value by ensuring that:

- E&S scoping and preliminary assessments are funded and undertaken at the concept and feasibility stages.
- Alternative analyses incorporate E&S dimensions alongside technical and financial criteria.
- Early risk screening identifies potential resettlement, biodiversity, land, and stakeholder risks before project parameters are fixed.

This principle also applies to financial intermediary and fund structures, as seen in the CEXIM and Seraya cases, where upstream institutional design strengthened ESMS and governance frameworks before capital deployment and provided the critical entry point for E&S influence.

2. Embedding E&S into Project Structuring

The cases demonstrate that catalytic effects arise when E&S obligations are embedded in concession agreements, financing covenants, and operational manuals. PPFs may therefore consider:

- Supporting the integration of E&S provisions into draft PPP and concession documentation.
- Facilitating coordination among legal, transaction, and E&S specialists during structuring.
- Promoting the harmonization of standards where multiple financiers are expected.

This type of integration appears particularly relevant to PPPs and blended finance operations, where clarity in risk allocation is central to investor confidence.

3. Strengthening Institutional E&S Systems

In several cases, the presence of a borrower-level ESMS improved implementation readiness and reduced information asymmetry for co-financiers. PPFs could:

- Support capacity building for implementing agencies to establish or upgrade ESMS frameworks.
- Encourage the early institutionalization of grievance mechanisms and stakeholder engagement processes.
- Facilitate knowledge sharing on good practices in sequencing and safeguard governance.

Such upstream institutional strengthening may enhance credibility and reduce execution risks in subsequent financing stages. The CEXIM and Seraya cases illustrate this at the institutional level, where enhanced ESMSs and governance frameworks embedded E&S considerations in credit decision-making and fund management processes, creating durable platforms for portfolio-level risk management.

4. Positioning Within the Project Preparation Ecosystem

The findings suggest that E&S integration operates most effectively when aligned with broader financing conditions, including sovereign backing, credit enhancement, and MDB participation. The comparative advantage of PPFs may lie in:

- Acting as convening platforms to align E&S, technical, and financial preparation streams.
- Identifying high-risk projects in which early E&S integration could be particularly catalytic.
- Complementing, rather than duplicating, downstream credit enhancement instruments.

7.2 Supporting Programmatic and Platform-Level Approaches

The supporting cases reviewed for this report provide additional evidence that E&S integration can also operate effectively through programmatic frameworks and investment platforms, not only at the level of individual projects. Argentina's RenovAr program illustrates how standardized E&S requirements, combined with broader investment support mechanisms, can help create conditions conducive to private investment across multiple projects. Similarly, the Seraya Southeast Asia Fund demonstrates how portfolio-level E&S screening, an ESMS, and governance

arrangements can contribute to investor confidence and risk management across a portfolio of investments. These cases reinforce the broader finding that E&S integration can support financing readiness through standardized approaches that operate across multiple projects or investments.

PPFs could therefore consider supporting the development of standardized E&S frameworks, screening tools, and governance systems that operate across project pipelines or investment platforms. Such approaches may help improve consistency across projects, facilitate coordination among financiers and implementing entities, and support the scalability of project preparation and investment activities.

The evidence also highlights the importance of proportionality across these entry points. While robust upstream E&S integration can improve risk management and financing readiness, overly complex or resource-intensive requirements may create barriers for smaller developers or less mature markets. The objective is therefore not to maximize E&S requirements but to ensure that E&S inputs are targeted, decision-relevant, and aligned with the scale and risk profile of the project or program. The CEXIM and Seraya cases reinforce this point, showing how standardized E&S frameworks at the institutional level can support scalability and investor confidence across investment portfolios.

7.3 Operational Implications for MDBs and Development Partners

The findings presented in Chapter 6 suggest that the primary challenge for MDBs is not whether E&S considerations are incorporated into project preparation but how effectively they influence project design, implementation arrangements, risk allocation, and financing structures while key decisions remain flexible. The evidence indicates that E&S integration contributes most effectively when it is embedded in broader project preparation and structuring processes rather than treated as a stand-alone compliance activity.

The implications outlined below build on the five findings presented in Chapter 6 and focus on practical considerations for MDBs and development partners seeking to strengthen financing readiness and project outcomes through E&S integration. In practice, this may require joint working arrangements, shared milestones, and clearer processes to ensure that E&S findings are incorporated into project design and contractual structures before procurement and financing decisions are finalized.

1. From Compliance to Decision-Relevant Integration

In all cases, E&S assessments were completed prior to approval. However, catalytic effects were more visible where E&S findings influenced design choices, contractual provisions, or sequencing decisions before financial lock-in. This distinction aligns with the broader finding that the financing value of E&S integration arises primarily through its influence on project preparation, implementation readiness, and risk management rather than through compliance alone.

2. Preserving Influence While Flexibility Remains

The cases indicate that influence depends on whether meaningful project variables remain adjustable when E&S findings are incorporated. This highlights the importance of:

- Aligning feasibility studies and safeguard workstreams so that E&S findings can inform core design choices.
- Avoiding situations in which E&S analysis is technically early but practically constrained by already-fixed design parameters.
- Sequencing procurement and structuring milestones in a way that preserves room for mitigation-driven design refinement.

The operational challenge is therefore to ensure that early assessment influences project decisions. The CEXIM and Seraya cases show that this principle also applies to institutional contexts, where E&S influence is greatest when embedded in the rules of the financing platform, whether an on-lending facility or an investment fund, before capital is deployed.

3. Integrating E&S into Structuring, Legal Arrangements, and Coordination Processes

Where E&S measures were embedded in concession agreements, financing covenants, or harmonized multi-MDB frameworks, transaction processes appeared more predictable and enforceable.

This suggests operational value in:

- Coordinating safeguard approaches among co-financiers early in preparation.
- Embedding E&S obligations in legal documentation rather than relying solely on stand-alone management plans.
- Linking E&S requirements to monitoring and reporting structures that reduce information asymmetry.

However, these measures operate alongside other structuring elements, including sovereign backing, guarantees, and sponsor quality. They should therefore be understood as part of a broader financing ecosystem. This reinforces the finding that common E&S frameworks can facilitate coordination and strengthen confidence among financiers, particularly in complex multi-lender transactions. The CEXIM and Seraya cases also suggest that institutional E&S mechanisms require sustained implementation and oversight to be effective across portfolios.

4. Maintaining Realistic Expectations of Financing Impacts

The cases do not demonstrate that early E&S integration independently drives private capital mobilization. Mobilization outcomes reflect multiple reinforcing factors, including macroeconomic conditions, credit enhancement instruments, policy frameworks, and sponsor strength.

At the same time, the evidence highlights trade-offs, including the potential for increased preparation time or higher compliance costs, underscoring the importance of proportionate and decision-relevant application. Operationally, this suggests that E&S integration should be viewed as a necessary but not sufficient condition for financing readiness. Its role is best understood as contributing to risk clarity, credibility, and implementation predictability, which in turn support broader mobilization efforts.

5. Strengthening Evidence, Learning, and Measurement

The findings also point to the importance of stronger documentation and measurement of E&S-related outcomes. MDBs could improve their ability to assess the value of upstream E&S integration by more systematically tracking its influence on project design, preparation timelines, cost overruns, dispute incidence, time to financial close, and levels of private capital participation. This would support more robust evaluation of E&S as an enabling factor in financing readiness and mobilization. Improved evidence generation would also help MDBs better understand which forms of E&S integration are most effective under different project, sectoral, and institutional conditions, supporting more targeted and proportionate application in future operations.

Future research could build on the typology framework developed in this report by examining a larger sample of projects and exploring how different combinations of mechanisms influence financing readiness under different sectoral, institutional, and market conditions.

Overall, the evidence in this report suggests that upstream E&S integration contributes most effectively when it is applied in a targeted and decision-relevant manner, influencing project preparation, implementation readiness, risk allocation, and coordination processes before key decisions are finalized. While not a stand-alone driver of investment decisions, E&S integration can strengthen financing readiness by reducing uncertainty, improving implementation preparedness, and supporting confidence among financiers and project stakeholders. The findings therefore point to the value of integrating E&S considerations more closely into broader project preparation, structuring, and implementation processes rather than treating them primarily as compliance requirements.

Conclusion



Conclusion

Using a qualitative, comparative approach, this report examined how the upstream integration of E&S standards influences project preparation, financing readiness, bankability, and private capital mobilization in MDB-supported infrastructure operations.

Drawing on the nine main case studies and a comparative analysis of supporting cases, the report identifies consistent patterns in how E&S integration contributes to project preparation and financing outcomes across different sectors, regions and financing structures. E&S integration contributed most clearly through changes to project design, implementation arrangements, risk allocation, and coordination. Early E&S work can strengthen financing readiness when its findings influence decisions before key project parameters are fixed, helping to reduce uncertainty, improve implementation preparedness, support coordination among key actors, and increase confidence that E&S risks can be managed effectively. Its contribution to private capital mobilization is enabling, and cannot be isolated from the wider financing and institutional package.

The report's central "beyond compliance" finding is that the financing value of E&S integration is realized through practical risk-management mechanisms, rather than through procedural compliance alone. Across the cases reviewed, E&S considerations influenced project outcomes through improvements in project design, stakeholder engagement, institutional arrangements, contractual obligations, and monitoring systems. These effects occur through a range of mechanisms, including design influence, implementation readiness, risk allocation and enforceability, and coordination and signaling.

At the same time, financing outcomes remain multi-factorial. Private investment decisions are shaped by a combination of project economics, government commitment, financing structures, risk-sharing arrangements, market conditions, and sponsor capability. The evidence does not suggest that E&S integration independently drives capital mobilization. Rather, E&S integration contributes by improving the conditions under which financing decisions are made and projects are implemented.

The cases also show that financing readiness does not guarantee satisfactory E&S performance during implementation. Continuing land, livelihood, and compliance challenges underline the importance of sustained institutional capacity, monitoring, adaptive management, and effective grievance resolution after financial close.

For MDBs and project preparation facilities, the practical priority is to fund E&S work while project alternatives remain open and translate its findings into design choices, costed measures, assigned responsibilities, and enforceable contractual commitments. Support should continue through implementation, with requirements proportionate to project risks and monitoring that records both E&S outcomes and effects on project delivery and financing readiness. When this occurs, E&S integration can contribute to stronger project preparation, more effective risk management, improved implementation readiness, and greater confidence among financiers and project stakeholders.

Scaling private capital for infrastructure will depend on a broad range of financial, institutional, and policy factors. Within this wider context, the findings of this report suggest that effective upstream E&S integration can play an important enabling role by strengthening financing readiness and supporting the development of more robust and bankable projects.

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Annex: Interpretation of Evidence for the Case Study Analysis

This annex accompanies the qualitative methodology in Chapter 4. It explains the distinctions used to interpret the case evidence and its implications for financing readiness. It does not introduce any separate statistical sample or quantitative estimates.

Analytical Scope

The nine main cases and two supporting comparative cases are identified in Section 4.2. They illustrate different project, program, financial intermediary, and fund structures. The supporting cases are not given the same evidentiary weight as the main cases. The analysis considers material E&S risks, the timing of E&S inputs, the decisions influenced, documented outcomes or continuing constraints, and their relevance to financing readiness.

Evidence and Stages of Implementation

Project appraisal and assessment documents record the risks identified and the measures proposed during preparation. Management plans specify intended actions. Financing and concession arrangements identify obligations and assign institutional responsibilities. Implementation and completion reporting, where available, provides information on delivery and continuing difficulties. Claims are interpreted in light of each document's date and purpose.

The existence of an assessment, budget, covenant, or management system establishes that a preparation or governance arrangement is in place. It does not demonstrate that the arrangement functioned effectively or that impacts were satisfactorily addressed. Where the available material concerns expected results, the analysis retains that prospective framing.

Assessing the Timing of Influence

Upstream influence is assessed in relation to a specific decision, such as site selection, design configuration, procurement, financing conditions, or portfolio eligibility. The relevant question is whether E&S findings informed that decision while the relevant choices remained open. A document completed before approval may nevertheless have had limited influence if those choices had already been fixed.

For implementation constraints, an E&S issue is described as a constraint on the critical path only where documentation indicates that a dependent project or component activity could not proceed until the issue was addressed. The need for land acquisition or resettlement by itself does not establish a scheduling constraint. The use of public land, an existing right-of-way, or a voluntary land arrangement does not automatically establish the absence of affected interests or displacement risk.

Interpreting Amounts and Outcomes

Financial information is interpreted according to the scope, reporting date, currency, and status as specified in the source. Approved financing, commitments, disbursements, guarantees, total project costs, and expenditure are distinguished. Figures covering different periods or overlapping components are not combined without reconciliation. Missing or undisclosed cost data are not treated as zero costs.

Dedicated E&S expenditure is distinguished from infrastructure expenditure with an E&S purpose or benefit. A budget increase or underspend is not treated as a measure of E&S effectiveness. Economic rates of return are distinguished from financial returns. Private capital mobilization is not inferred solely from the involvement of commercial lenders or from the total financing associated with a transaction.

Contribution and Attribution

The interpretation distinguishes between a documented E&S intervention and the decision it informed, on the one hand, and an inferred contribution to financing readiness, on the other. Investor confidence and financing outcomes may also reflect guarantees, revenue arrangements, public support, sponsor capability, and market conditions. The report does not attribute a percentage of financing, delay reduction, or improvement in returns to E&S integration.

The four mechanisms in Table 4.1 are used to organize the evidence rather than to score cases. Multiple mechanisms can apply to a single case. Unresolved impacts, compliance difficulties, and implementation weaknesses qualify the interpretation even where a transaction has reached financial close.

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The Multilateral Cooperation Center for Development Finance (MCDF) promotes high-quality connectivity infrastructure investment in developing countries through partnerships. MCDF advances this mission by providing grants and information and knowledge sharing to facilitate the application of International Financial Institution standards and good practices in cross-border connectivity projects to ensure they support sustainable development. MCDF's activities focus on project preparation, capacity building, and information sharing across four key connectivity sectors: transport, energy, telecommunications, and transboundary water resource management.

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