

AURUS INSTITUTE FOR RESOURCE DEVELOPMENT

Mine to Ship: Engineering and Governing Africa's New Mineral Corridors

Lessons from Simandou, Lobito and the Next Generation of Multi-User Rail-Port Systems

FLAGSHIP REPORT · BUILD

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Aurus Technical Committee



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Evidence before assertion.

MINING · INFRASTRUCTURE · ENGINEERING · ENVIRONMENT

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Thirty-six days that opened the corridor decade

Within thirty-six days at the close of 2025, Africa's two most consequential mineral-transport systems moved from promise to execution: the Simandou rail-port system in Guinea marked the start of operations on 11 November, and the U.S. International Development Finance Corporation signed its loan agreement for the Lobito Atlantic Railway on 17 December, completing the financing package that closed at US\$753 million. The mineral corridor, meaning mine, railway, port and power assessed, engineered and governed as one system, is now the defining resource-infrastructure form of the decade.

This paper reads the public record of both systems, and of the corridors that preceded and will follow them, as an engineering and governance casebook. It is written for corridor developers and owners weighing greenfield against brownfield phasing, and for the lenders and investors who will be asked to underwrite the next generation of multi-user rail-port systems.

The scale is unambiguous. The Simandou system pairs more than 600 kilometres of new multi-use railway spanning the country with a combined system capacity of up to 120 million tonnes of mined iron ore per year; within that system, the SimFer mine is designed to reach roughly 60 million dry tonnes per annum over its own published 30-month ramp to full capacity. The Lobito corridor runs 1,300 kilometres from the Port of Lobito to Luau on the DRC border, serving the mining regions of the DRC and Zambia, with multilateral investment backing that exceeds US\$10 billion.

Two governance archetypes now coexist. Simandou's infrastructure is owned and operated by the Compagnie du TransGuinée, a joint venture in which SimFer and Winning Consortium Simandou each hold 42.5 per cent and the Government of Guinea holds a 15 per cent free-carried interest. Lobito is run under a 30-year concession secured in 2023 by the Lobito Atlantic Railway consortium of Mota-Engil, Vecturis and Trafigura, extendable by 20 to 50 years conditional on construction of the roughly US\$1 billion, 259-kilometre Luacano-Jimbe branch. Chapter 5 reads these two structures as the poles of the multi-user governance spectrum every new corridor must locate itself on.

Finance has found the corridor. The Lobito Atlantic Railway's December 2025 close put a US\$753 million package of development financing on the concessionaire, from the U.S. International Development Finance Corporation and the Development Bank of Southern Africa; the United States had already allocated US\$1 billion through the Africa Finance Corporation to upgrade the Lobito rail line up to Zambia, an extension whose cost the African Development Bank estimates at US\$1.6 billion. The expected payoff is concrete: corridor transport capacity expected to increase ten-fold to 4.6 million tonnes and critical-minerals transport costs to fall by up to 30 per cent.

The demand engine is structural. On the IEA's STEPS scenario, copper demand grows about 30 per cent by 2040 while announced supply falls roughly 30 per cent short of 2035 demand; the DRC is the world's second-largest copper producer at an estimated 3.2 million tonnes in 2025, with Zambia at 0.94 million tonnes. Landlocked supply meets seaborne demand only through corridors.

The engineering is unforgiving. The TransGuinée railway threads 12 stations, 206 bridges totalling 79.2 kilometres and four tunnels totalling 27.6 kilometres: more than 100 of its roughly 670 published route-kilometres run on a bridge or through a tunnel. Chapter 3 unpacks what heavy-haul design discipline means on terrain like this; Chapter 4 examines the capex-light barge-and-transshipment port configuration through which Simandou's first ore moved.

The risks already have names. The OECD's corridor work registers customs inefficiency across three jurisdictions, regulatory misalignment, landmine-legacy contamination and monopolistic-pricing risk where concessions lack transparency. Chapter 7 sets the environmental and social envelope of linear infrastructure at corridor scale; Chapter 8 closes with the Aurus stage-gated corridor delivery framework, a capability instrument argued entirely from the cited public record of the preceding chapters.

CORRIDOR · in this paper, an integrated mineral-transport system: mine-gate handling, heavy-haul railway, port terminal and supporting power, road and institutional infrastructure, planned and governed as one asset. The OECD frames corridors as hard infrastructure plus institutions plus services.

What the record supports: five findings

- **The reference class has changed.** A greenfield system of continental scale reached operations and a brownfield concession reached financial close within thirty-six days of each other. Corridor strategy can now reason from operating evidence rather than cautionary tales.
- **Capacity is a staircase.** The published Simandou ramp is the SimFer mine's 30-month climb to its roughly 60 million dry tonnes a year, inside a system stated at up to 120 million tonnes; Lobito's published target is a ten-fold capacity uplift to 4.6 million tonnes. On both, every element must climb together, and the slowest sets the slope.
- **Structures dominate the engineering.** Bridges and tunnels account for some 107 of the TransGuinéen railway's roughly 670 published kilometres, a structural share near 16 per cent derived from the disclosed totals. That share is where corridor cost models are won or lost.
- **Governance is priced.** The CTG joint venture and the Lobito concession, with its extension conditional on a ~US\$1 billion branch build, show tenure, access and expansion being written as commercial instruments with owners, prices and triggers.
- **Development finance underwrites corridors as assets.** The US\$753 million Lobito package is the proof transaction for the class.

Who should read this paper

This report addresses two audiences. **Developers and owners**, meaning mining companies, infrastructure sponsors and state entities weighing corridor participation, will find in Chapters 2 through 5 an engineering and governance casebook, and in Chapter 8 a stage-gated framework to hold a program against. **Lenders and investors**, from development-finance institutions and export-credit agencies to private credit entering the corridor class, will find in Chapters 5 through 7 the governance, financing and environmental-social diligence record of the class's first modern transactions.

The paper's method is deliberately conservative: every figure is transcribed from a cited public source and archived in the paper's evidence dossier; ranges are preserved as published; and where the public record is silent, as it still is on several heavy-haul design parameters, the silence is stated rather than filled. The back-matter page Method and evidence records the full discipline, including the paper's declared derived values and sums and its register of open parameters, so that any figure here can be traced and re-verified without access to anything but the cited public record.

How to use this paper

Three reading paths serve three purposes. Read **front to back** for the casebook: the record of two systems, told in the order a program lives it. Read **Chapter 8 first** for the instrument: the stage-gated framework and its ten-question diagnostic, then trace any gate discipline back into the chapters that evidence it. Or read **by exhibit**: the twenty-three exhibits and five stat tiles, together with the chapter-cover tiles that restate their figures, carry the paper's entire quantitative content, each with its source line burned in, and the exhibit index in the back matter maps every one to its references.

Five figures that frame the corridor moment

UP TO

120 Mt/yr

COMBINED SIMANDOU SYSTEM CAPACITY: MINED IRON ORE, BOTH CONSORTIA

Rio Tinto, Simandou start-of-operations release, 2025

1,300 km

LOBITO CORRIDOR RAIL AND INFRASTRUCTURE, PORT OF LOBITO TO LUAU

OECD, 2025; U.S. International DFC, 2025; Trafigura, 2025

US\$753 m

LOBITO ATLANTIC RAILWAY FINANCING CLOSED, DECEMBER 2025

Amount: Trafigura, press release, 2025. Signing, 17 December: U.S. International DFC, 2025

>US\$10 bn

MULTILATERAL INVESTMENT BACKING ACROSS THE LOBITO CORRIDOR

OECD, 2025, citing Financial Times, 2024

UP TO

-30%

TARGETED REDUCTION IN CRITICAL-MINERALS TRANSPORT COST, LOBITO CORRIDOR, AS PUBLISHED ("BY UP TO 30 PERCENT")

U.S. International DFC, 2025

HOW TO READ THIS PAGE

Each figure is transcribed from the cited institution's own publication and re-appears, in context, in the chapters that follow. Ranges, qualifiers and scenario labels are preserved as published.

How this paper is organised

| CHAPTER | THE QUESTION IT ANSWERS | ANCHOR EVIDENCE |
|---------------------------|--|--|
| 1 · The corridor moment | Why now? The demand engine and the capital behind the corridor decade | IEA, 2025; USGS, 2026; DFC, 2025 |
| 2 · System design | How is a mine-to-ship chain capacity-modelled and phased as one system? | Rio Tinto, 2025/2026; OECD, 2025 |
| 3 · Heavy-haul railway | What does the new railway actually contain, and what drives its cost? | Trade-press project disclosures, 2024/2025 |
| 4 · Port and marine | When is the deep-water berth justified, and what comes before it? | Rio Tinto, 2025; OECD, 2025 |
| 5 · Governance | Who owns the bottleneck, what does the state hold, how is growth priced? | Rio Tinto, 2025/2026; OECD, 2025 |
| 6 · Financing | What did the first modern corridor close look like, actor by actor? | DFC, 2025; Trafigura, 2025 |
| 7 · E&S at corridor scale | What is the environmental and social envelope of linear infrastructure? | OECD, 2025 |
| 8 · The delivery model | How does a program hold itself to the record? A stage-gated framework | Chapters 1 through 7, cited record |

What this paper is, and is not

It is an engineering and governance casebook, built entirely from the cited public record of two operating corridor systems and the corridors around them. It is not a market forecast, a project prospectus or a ranking. Every figure carries its institutional source; ranges, floors, qualifiers and scenario labels are preserved as published; and where the public record is silent, this paper names the silence rather than filling it. The twenty-three exhibits and five stat tiles carry the paper's quantitative argument, and the chapter-cover tiles restate their figures in the context of the chapter that earns them.

1

BUILD · THE CORRIDOR MOMENT

The corridor moment (2025–2030)

Two mega-systems entered service and finance thirty-six days apart. The corridor is the decade's defining resource-infrastructure form.

11 Nov 2025

SIMANDOU START OF OPERATIONS MARKED (RIO TINTO, 2025)

17 Dec 2025

DFC LOAN AGREEMENT SIGNED FOR THE LOBITO ATLANTIC RAILWAY (U.S. DFC, 2025)

+30%

COPPER DEMAND GROWTH TO 2040 (IEA STEPS, 2025)

For forty years, the phrase “African mineral corridor” described either a colonial-era railway in decline or a feasibility study in waiting. In the thirty-six days between 11 November and 17 December 2025, it came to describe two operating realities. On 11 November 2025, the Simandou partners marked the start of operations, with testing and commissioning of the integrated rail-port system underway and both consortia transporting ore on the main line; the first shipment departed in December 2025, moving through the WCS port via the SimFer rail spur. Thirty-six days after the start of operations was marked, on 17 December 2025, the U.S. International Development Finance Corporation signed a loan agreement for the Lobito Atlantic Railway covering rail rehabilitation and a brownfield mineral port, completing a US\$753 million financing package with the Development Bank of Southern Africa.

Neither event is an isolated project milestone. Together they mark a structural shift in how mineral infrastructure on the continent is conceived, financed and governed: as **multi-user systems** whose engineering, commercial and institutional architectures are designed together, from the mine gate to the ship’s hold.

Thirty-six days that reset the reference class

Infrastructure classes change when their reference projects change. Until 2025, every African corridor conversation reasoned from cautionary tales: underused rehabilitations and stalled greenfield alignments. The events plotted in Exhibit 1 replaced that reference class. A greenfield system of continental scale was brought from construction into operation; a brownfield concession attracted blended development financing at investment scale; and an institutional agenda, from the OECD’s corridor framework to its draft scoreboard for measuring corridor connectivity, began codifying what “good” looks like.

EXHIBIT 1

Three years of build, then thirty-six days that turned the corridor from thesis to operating reality

Selected public milestones, Simandou and Lobito corridor systems, 2023–2025



Source: OECD, Background Note: The Lobito Corridor, 2025; Rio Tinto, 2025; International Railway Journal, 2025 (archived; 78-unit order and value); U.S. International DFC, 2025; Trafigura, 2025.

The demand engine

The corridor moment is not a construction-cycle accident; it is the infrastructure expression of a supply gap. On the IEA’s Stated Policies (STEPS) scenario, copper demand grows roughly 30 per cent by 2040, while announced supply falls about 30 per cent short of projected 2035 demand. The geography of that gap is the geography of the corridors: the DRC holds an estimated 70 per cent of world cobalt reserves and is the world’s second-largest copper producer (OECD, 2025, citing USGS; USGS’s own 2026 summaries attach the roughly 70 per cent share to mine production, with the reserve share nearer one-half), with an estimated 3.2 million tonnes of mined copper in 2025 against Zambia’s 0.94 million tonnes (USGS, 2026). Both are landlocked at the point of production. Iron ore tells a parallel story on the price side: the 62 per cent Fe bench-

mark averaged US\$100.2 per dry tonne in 2025, with the World Bank’s April 2026 outlook at US\$97.0 for 2026 and US\$95.0 for 2027, a price environment in which transport cost per tonne decides which deposits clear the market.

EXHIBIT 2

Copper’s supply gap is the corridor’s demand engine

IEA STEPS scenario trajectory and 2025 mined-copper output, selected producers

+30%

Copper demand growth by 2040
IEA STEPS scenario, 2025 vintage

-30%

Announced supply vs 2035 demand
IEA Global Critical Minerals Outlook, 2025

Mined copper, 2025 estimate (Mt)

DR Congo, world no. 2 producer



Zambia



Both producing regions are landlocked at the point of production:
supply reaches seaborne demand only through corridors.

Source: IEA, Global Critical Minerals Outlook, 2025 (STEPS scenario); USGS, Mineral Commodity Summaries, 2026. Forecast attributions as published; ranges and scenario labels preserved.

STEPS · the IEA’s Stated Policies scenario: a projection from policies actually in force rather than from announced ambitions. Scenario labels of this kind are preserved wherever this paper cites a forecast.

What the price deck implies for corridors

The iron-ore price outlook sharpens the same conclusion from the revenue side. With the 62 percent Fe benchmark averaging US\$100.2 per dry tonne in 2025 and the World Bank’s April 2026 forecast easing to US\$97.0 in 2026 and US\$95.0 in 2027, no producer entering this market can plan on price doing the work that cost discipline must do. That is precisely the arithmetic behind the Lobito program’s published ambition of critical-minerals transport cost reduced by up to 30 percent: in a flat-to-easing price deck, the corridor is the producer’s margin defence.

Two commodities, two corridor economics

The two case systems also bracket the two economic logics a corridor can serve, and the distinction disciplines every demand case built on them. The Simandou system is a **margin-defence corridor**: iron ore is abundant and its price deck is flat to easing, so the corridor’s job is to land a high-grade product at a delivered cost that clears the market whatever the benchmark does. Its demand case is a cost curve. The Lobito corridor is a **supply-gap corridor**: copper’s projected demand growth against announced supply means the constraint is getting existing and expanding production out of a landlocked region at all, and the corridor’s job is capacity, reliability and routing optionality for tonnes the market already wants. Its demand case is a throughput forecast. The diligence consequence is direct: a margin-defence corridor is tested against price scenarios, a supply-gap corridor against volume scenarios, and a corridor pitched with the wrong test attached has misread its own commodity.

The codification has begun

A further marker of the corridor moment is institutional: the corridor now has a literature of its own. The OECD’s 2025 Lobito background note frames the asset class as hard infrastructure plus institutions plus services, and applies its draft Scoreboard for Measuring Corridors Connectivity, a common measurement grammar for governments and lenders; the OECD’s 2026 agenda for corridors, trade and local development carries that codification to the continental scale. When an asset class acquires a scoreboard, it has stopped being an experiment.

Who is funding the corridor decade

The capital answering that demand signal is deliberately plural. The United States allocated US\$1 billion through the Africa Finance Corporation under the Partnership for Global Infrastructure and Investment to upgrade the Lobito rail line up to Zambia. The African Development Bank estimates the Zambia extension requires US\$1.6 billion, has committed US\$500,000 to date and leads further fundraising. The European Union's Global Gateway, a €300 billion public-and-private mobilisation target for 2021–2027, frames the EU-Zambia memorandum of understanding of 2023. And the December 2025 close put US\$753 million of development financing on the Lobito Atlantic Railway itself. Exhibit 3 sets the corridor-specific figures side by side.

PGII · the G7 Partnership for Global Infrastructure and Investment, the framework under which the United States allocated corridor funds through the Africa Finance Corporation in 2023.

EXHIBIT 3

Development finance now prices the corridor itself

Corridor-attributed financing figures, Lobito corridor system, US\$ billion, as published 2023–2025



Source: OECD, 2025, citing AfDB, 2023 and European Commission, 2023; Trafigura, 2025; U.S. International DFC, 2025. Context: the EU Global Gateway's €300 bn mobilisation target (2021–2027) frames the EU-Zambia MoU and is programme-wide, not corridor-specific; it is therefore not drawn as a bar. The OECD source names the "African Finance Corporation"; this paper uses the institution's own styling, Africa Finance Corporation, and records the correction in its evidence dossier. Bar fill encodes status: outlined = requirement estimate; grey = allocation; gold = closed package. The three figures are different instruments at different stages, never a like-for-like comparison.

The chapters that follow read the two operating systems as a casebook: system design and phasing (Chapter 2), heavy-haul railway engineering (Chapter 3), port and marine engineering (Chapter 4), multi-user governance (Chapter 5), financing (Chapter 6) and the environmental and social envelope (Chapter 7). Chapter 8 distils the record into the Aurus stage-gated corridor delivery framework, the house instrument this series closes every paper with.

What the record does not yet show

Honesty about the reference class requires naming its youth. The Simandou system's evidence is commissioning-stage: operations were marked in November 2025 with testing and commissioning underway, and the published 30-month ramp has barely begun; no full year of operating throughput exists yet for either system. The Lobito package's lender split is unpublished, several heavy-haul design parameters remain outside the archived public record, and the Simandou program's all-in cost is a published silence (Chapter 6). This paper therefore reads the record as a casebook of decisions and structures, which are fully public, rather than of outcomes, which are still being earned. The distinction matters most in Chapter 8, where the delivery framework is argued from what the first movers did, never from results they have not yet reported.

Five questions the next five years will answer

The record will thicken quickly, and the watching brief writes itself from the chapters that follow. First, does the Simandou ramp hold its published 30-month climb, and what does the system's first full operating year reveal about the narrowest element (Chapter 2)? Second, is Lobito's ten-fold uplift delivered across the published upgrade program, terminal by terminal (Chapter 4)? Third, does the multi-user promise survive

contact with a third shipper: are access terms exercised, contested or renegotiated (Chapter 5)? Fourth, does the Zambia extension move from estimate to close at anything near the AfDB's US\$1.6 billion requirement, and on which instruments (Chapter 6)? Fifth, does the TAZARA revival negotiation convert the eastern counterfactual back into a competitor, restoring the routing optionality this continent's producers once lost the hard way? Each question has a measurable answer, and later editions of this series will be able to score them against the record rather than against anyone's promises.

THE WATCHING BRIEF

Five questions, five measurable answers

The chapter's watching brief restated as tests a later edition can score

| QUESTION THE RECORD WILL ANSWER | THE MEASURABLE TEST | WHERE ARGUED |
|---|---|--------------|
| Does the Simandou ramp hold? | The published 30-month climb against reported throughput | Chapter 2 |
| Is the Lobito uplift delivered? | The published ten-fold target, tracked across the upgrade program | Chapter 4 |
| Does multi-user access survive contact? | Access terms exercised, contested or renegotiated by a third shipper | Chapter 5 |
| Does the Zambia extension close? | Instruments raised against the AfDB's US\$1.6 bn requirement estimate | Chapter 6 |
| Does TAZARA return as a competitor? | The reported ~US\$1 bn rehabilitation negotiation converting to a close | Chapter 5 |

A reading instrument, not an exhibit of record: each test restates a figure already cited in this chapter, and none adds a claim.

METHOD ASIDE

How to read a corridor announcement

The corridor decade will be narrated in press releases, and Exhibits 1 and 3 model the discipline this paper applies to them. **Operations marked** is not first revenue: Simandou's November milestone announced commissioning underway, with the first shipment following in December. **Signed** is not disbursed: a loan agreement dates the commitment, and drawdown follows the works. **Allocated** is not committed to a project: an allocation names an envelope and an intent. **Estimated** is not funded: a requirement estimate prices a task someone must still finance. And a **pipeline total** aggregates all of the above. Each class is real information; the analytical error, which this paper's exhibits are drawn to prevent, is letting one class borrow another's certainty.

FINANCIAL CLOSE · the point at which a project's financing agreements are signed and effective so that funds can draw. This paper dates the Lobito close to the parties' own published signing and release dates.

Stated once, plainly: the corridor thesis of this paper is falsifiable, and that is its strength. If the published ramps stall, if multi-user access is never exercised by a party outside the founding consortia, or if the estimated extensions never convert to closes, then the corridor decade will have been a construction cycle with better branding, and a future edition of this paper will say so.

The corridor is no longer the risky annex to a mining project. It is the asset class, and the mine is one of its users.

THE ARGUMENT OF THIS PAPER

2

BUILD · SYSTEM DESIGN

System design: mine-to-ship capacity modelling and phasing

A corridor fails or clears at its narrowest element. Capacity, ramp and phasing are one design problem.

120 Mt/yr

COMBINED SYSTEM CAPACITY, BOTH CONSORTIA (RIO TINTO, 2025)

30 months

PUBLISHED SIMFER RAMP TO ITS ~60 MDTPA FULL CAPACITY (RIO TINTO, 2026)

×10

LOBITO CAPACITY-UPLIFT TARGET, TO 4.6 MT (U.S. DFC, 2025)

Every mineral corridor is a chain of capacities, from mine output through loading, line-haul, port stockyard and berth to the ship itself, and the system clears at the narrowest of them. The design discipline that matters is therefore not the optimisation of any single element but the honest modelling of the chain, stage by stage, under a phasing plan that admits what will be ready when. The two systems this paper follows made opposite phasing choices from the same logic.

The corridor system, mapped

Exhibit 4, the signature map of this paper, places the two case-study systems on one equal-area map of the continent: the TransGuinéen system crossing Guinea from the Simandou range to the Morebaya coast, and the Lobito corridor running from the Atlantic port at Lobito through Luau on the DRC border towards the Copperbelt, with the TAZARA line to Dar es Salaam drawn as the eastern counterfactual. The map is deliberately spare: corridors are drawn as engineered links between producing regions and deep water, at the altitude at which corridor strategy is actually decided.

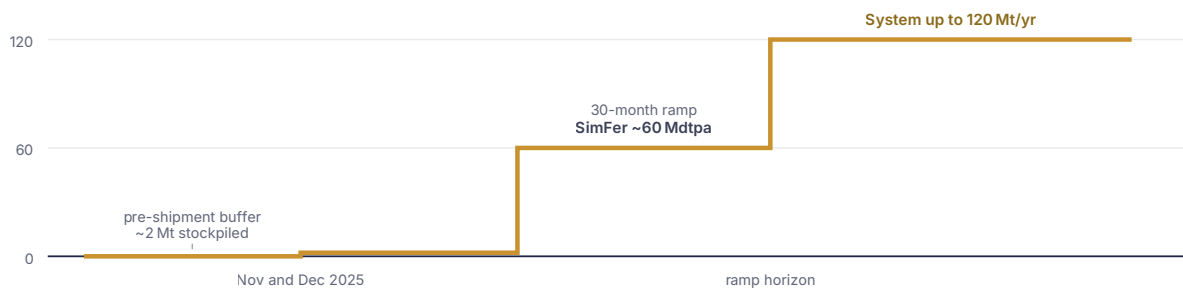
Capacity is a staircase

The Simandou system’s published figures illustrate the staircase. The SimFer mine is designed for approximately 60 million dry tonnes per annum at full capacity, 27 million dry tonnes being Rio Tinto’s share, reached over a 30-month ramp. The combined system, counting both consortia’s mines on the shared infrastructure, is stated at up to 120 million tonnes per year of mined iron ore. Roughly 2 million tonnes were stockpiled ahead of a reported mid-November shipment window (Reuters, via Mining.com, 2025), with the first shipment departing in December, a reminder that early-phase corridors buffer with stockpiles while the line learns its duty.

EXHIBIT 5

The plateau is promised; the ramp is designed

Published capacity staircase, Simandou system, million tonnes per annum



Source: Rio Tinto, Simandou operations page, 2026 (mine capacity, 30-month ramp); Rio Tinto, 2025 (system capacity “up to 120 million tonnes per year”); Reuters, via Mining.com, 2025 (~2 Mt pre-shipment stockpile). Staircase geometry is schematic between published anchors; the ~2 Mt stockpile step is drawn to the axis scale.

The staircase stands on reserves

A capacity staircase is only as bankable as the orebody beneath it. Here too the public record is explicit: SimFer’s published Ore Reserves stand at approximately 1.5 billion tonnes, comprising 0.2 billion tonnes at 66.4 per cent Fe in the Proved category and 1.3 billion tonnes at 65.0 per cent Fe Probable. This is the SimFer blocks’ reserve statement, reported under recognised conventions; trade-press accounts of the whole Simandou deposit cite larger, differently scoped resource figures of 1.8 to over 2 billion tonnes, which this paper does not use in place of the categorised reserve. Reserve disclosure of this class, categorised, graded, and reported under recognised conventions, is what lets a lender read a 30-month ramp as an engineering

schedule rather than an aspiration. For corridor planners the implication runs in both directions: the corridor’s capacity case borrows its credibility from the mine’s reserve statement, and a corridor sized beyond its anchor reserves is a stranded-capacity risk in waiting.

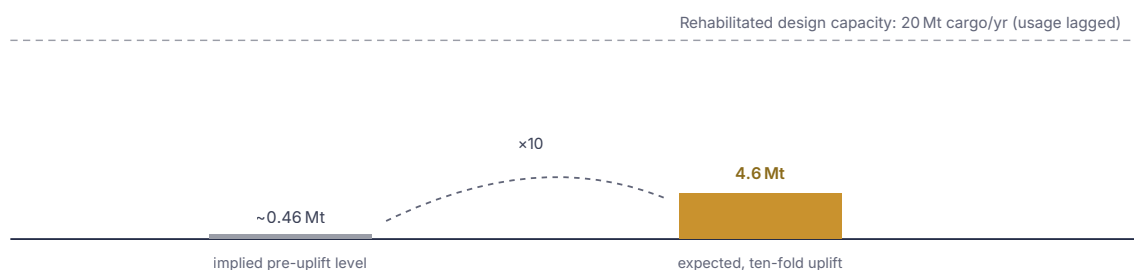
Brownfield uplift: the other staircase

Lobito’s numbers describe the brownfield equivalent. The Benguela railway, completed in 1931 and once central Africa’s main mineral export route, was rebuilt from 2004 under a US\$2 billion oil-for-infrastructure arrangement, with full rehabilitation by 2014; the rehabilitated line carries 67 stations, a 90 km/h design speed and a design capacity of 20 million tonnes of cargo and 4 million passengers a year, though actual usage lagged expectations (OECD, 2025, citing World Bank, 2019, and UNDP, 2024). The concession-and-finance package now aims to convert that latent capacity: transport capacity expected to increase ten-fold to 4.6 million tonnes and critical-minerals transport cost to fall by up to 30 per cent.

EXHIBIT 6

Brownfield corridors sell latent capacity

Lobito corridor throughput uplift against rehabilitated design capacity, million tonnes per annum



Source: U.S. International DFC, 2025 (transportation capacity expected to increase ten-fold to 4.6 million metric tons); OECD, 2025, citing UNDP, 2024 (rehabilitated-line design parameters). The ~0.46 Mt pre-uplift level is the single derived point value in this paper: the published 4.6 Mt divided by the published ten-fold multiple, shown for scale and labelled as implied. Chart drawn to a common tonnage scale.

Phasing: rehabilitate, build, or stage both

The two systems bracket the phasing decision every new corridor faces. Greenfield building buys alignment, gauge and capacity designed for the task, at the price of the full construction risk of more than 600 kilometres of new railway. Brownfield rehabilitation buys time-to-market and an existing right-of-way, at the price of inherited geometry and the obligation to upgrade while operating. The Lobito concession embeds the hybrid path explicitly: its 20-to-50-year extension is conditional on constructing the 259-kilometre Luacano-Jimbe greenfield branch, at a reported cost near US\$1 billion, while the African Development Bank’s US\$1.6 billion estimate prices the further greenfield extension into Zambia.

BROWNFIELD / GREENFIELD · work on an existing asset and right-of-way versus new-build on a new alignment. Corridors mix the two: Lobito is a brownfield concession carrying a greenfield extension obligation.

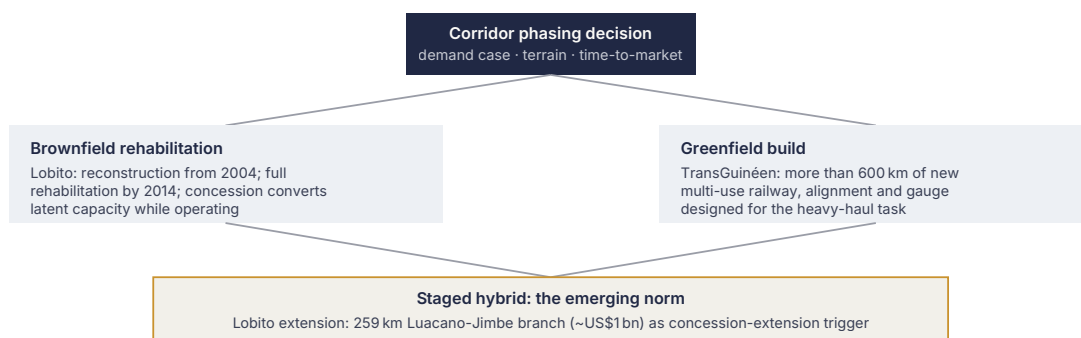
The phasing lesson generalises beyond the two case systems. Every corridor now in planning will face the same three-way choice under its own terrain, demand and institutional conditions, and the record’s deeper message is that the choice is never made once. Lobito was a greenfield build in 1931, a rehabilitation in 2004–2014, and is a staged hybrid today; corridor phasing is a permanent operating posture rather than a construction-era decision. Exhibit 7 closes the chapter with the decision drawn as it is actually taken: a staged option, revisited at every gate.

RAMP-UP · the staged climb from first production to nameplate capacity. On a corridor the ramp is a system property: mine, line-haul and port must climb together, and the slowest element sets the slope. The record’s one published ramp, 30 months, belongs to the SimFer mine.

EXHIBIT 7

The phasing decision is a staged option, not a binary

Corridor phasing archetypes with their published case anchors



Source: OECD, 2025 (rehabilitation history, citing World Bank, 2019; concession extension trigger); Rio Tinto, 2025 (new-build scope); OECD, 2025, citing AfDB, 2023 (Zambia extension estimate).

METHOD ASIDE

Reading a corridor capacity model: seven elements, one clearing rate

A lender-grade corridor capacity model is a chain audit, element by element: **mine gate** (can the pit and plant feed the railhead at the claimed rate, in the claimed product?); **loadout** (surge capacity and loading rate against train cycle times); **line-haul** (paths per day under the signalling and crossing-loop plan, at the design axle load); **yards and interchange** (where multi-user traffic merges, the queueing discipline); **port stockyard** (stacking, recovery and blending rates, and the buffer the ramp will lean on); **ship-loading** (berth or transshipment cycle, Chapter 4); and **the marine window** (weather and draft constraints on the export tempo). The published ramps of Chapter 2 are the visible sum of seven such audits; the model that cannot name its narrowest element has not yet been finished. Chapters 3 and 4 take the two most capital-intensive elements of the chain in turn.

METHOD ASIDE

Four ways corridor capacity models fail

The failure modes are as recurrent as the models. **Interface optimism**: each element modelled generously at its boundary, so the chain's losses vanish in the hand-offs that no single discipline owns. **Averaged structures**: bridges and tunnels blended into a per-kilometre rate, importing a precision the register cannot support (Chapter 3). **Forecast-led marine capital**: the deep-water berth justified on projected rather than demonstrated throughput, inverting the option logic of Chapter 4. **Single-user arithmetic in a multi-user system**: capacity allocated as if the anchor tenant were alone, leaving access commitments (Chapter 5) unpriced. Every one of these is cheaper to catch at a stage gate than at commissioning.

Phasing, in other words, is the capacity model stretched over time: each stage of Exhibit 7's decision tree commits a different subset of the chain to fixed capital, and the staged option stays honest only when every stage re-runs the model on demonstrated, rather than forecast, throughput. That discipline, visible in the record of both case systems, is the second of the five gate disciplines Chapter 8 formalises.

EXHIBIT 4 · SIGNATURE MAP

Mine to ship: Africa's new mineral corridors link landlocked supply to seaborne demand

Operating and case-study corridor systems drawn on an equal-area base · schematic alignments between published anchor points



Method: Lambert azimuthal equal-area projection, chosen for area fidelity, so footprint and catchment comparisons stay honest. Distances are true only from the projection centre, and corridor lengths are therefore never read off this map; route kilometres in this paper come from the cited sources. Corridor alignments are schematic lines between published anchor geography.

Source: route anchors from Rio Tinto, 2025 (trans-Guinean rail, Morebaya coast); OECD, Background Note: The Lobito Corridor, 2025 (Port of Lobito to Luau, DRC/Zambia mining regions); OECD, 2025, citing Jeune Afrique/FT, 2024 (TAZARA, drawn as a schematic context line to Dar es Salaam; its inland terminus is not pinned to a named anchor). Map base data: Natural Earth (public domain).

Reading the corridor map

Western routes shorten the Atlantic path. Lobito and its planned Zambian extension shorten the distance from the central African Copperbelt to Atlantic ports serving European and American demand; the eastern counterfactual, TAZARA to Dar es Salaam, carries the same producing regions the long way to a different demand basin.

The corridor set is complementary, not redundant. Eastern and western routes serve different markets and give producing regions routing resilience, the strategic lesson of the years when conflict cut Benguela operations to just 34 kilometres and Zambian copper diverted to Beira and Dar es Salaam.

The empty spaces are the option value. The basins with no modern corridor are where the next generation of systems, and this paper’s Chapter 8 framework, will be tested.

ROUTE LENGTHS, FROM THE RECORD

Corridor lengths come from the cited sources, never from the map

Published route-length anchors for the mapped systems

| SYSTEM | PUBLISHED LENGTH | SOURCE LINE |
|--|------------------|---|
| TransGuinéen system (new build) | >600 km | Rio Tinto, 2025 (trade-press project reporting: ~670 km, Beyla to the Port of Morebaya; IRJ, 2025) |
| Lobito corridor (Port of Lobito to Luau) | 1,300 km | OECD, 2025; DFC, 2025; Trafigura, 2025 |
| Luacano - Jimbe branch (extension trigger) | 259 km | OECD, 2025 |
| Zambia greenfield link (estimated requirement) | | · OECD, 2025, citing AfDB, 2023 (US\$1.6 bn estimate; length not re-published here pending primary capture) |


Equal-area projection note: the map preserves areas, not distances; length figures are transcription, not measurement.

EQUAL-AREA PROJECTION · a map projection that preserves relative areas at the cost of distance fidelity. On corridor maps it keeps footprint and catchment comparisons honest; distances and route lengths must always come from the cited record, never from the ruler.

**A corridor fails or clears at its narrowest element.
Everything else in this paper is commentary on that sentence.**

The corridor is one system. It is governed, financed and engineered as one system, or not at all.

THE PREMISE OF THIS CASEBOOK



3

BUILD · HEAVY-HAUL RAILWAY ENGINEERING

Heavy-haul railway engineering

A new railway is not a line on a map. It is two hundred and six bridges, four tunnels and a fleet designed as one machine.

206

BRIDGES ON THE
TRANSGUINÉEN LINE,
TOTTALLING 79.2 KM (IRJ, 2025)

27.6 km

FOUR TUNNELS ON THE SAME
LINE (IRJ, 2025)

78

HEAVY-HAUL LOCOMOTIVES IN
THE 2024 ORDER, US\$277 M
(IRJ, 2025)

Heavy-haul railways are the most engineering-dense element of any mineral corridor, and the least forgiving of optimism. The published anatomy of the TransGuinéen line makes the point better than any textbook: on difficult West African terrain, about 16 per cent of the route length runs on a bridge or through a tunnel, a share derived from the disclosed totals.

What the new railway actually contains

The Simandou partners describe more than 600 kilometres of new multi-use rail spanning the country, plus the SimFer spur; trade-press project reporting puts the Beyla-to-Morebaya line at about 670 kilometres. The same reporting puts the line’s structural content at 12 stations, 206 bridges totalling 79.2 kilometres and four tunnels totalling 27.6 kilometres. Set against the published route length, that is a structural share of about 16 per cent, derived from the disclosed totals and rounded, never an independently published figure. Numbers of this kind are the difference between a corridor cost model and a corridor guess: structures dominate cost and schedule risk long before track kilometres do.

EXHIBIT 8

On hard terrain, about 16 per cent of the route is a structure

Published engineering anatomy, TransGuinéen line

~670 km

Beyla-Morebaya route (trade press)

12

stations

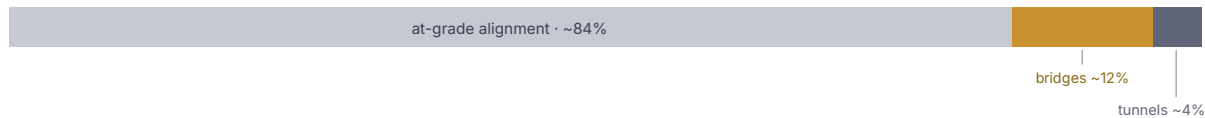
206

bridges · 79.2 km

4

tunnels · 27.6 km

Route composition by length



Bridges and tunnels together: some 107 route-kilometres, about 16% of the line. That structural share drives cost and schedule.

Source: Rio Tinto, 2025 (route scope); International Railway Journal, 2025, archived capture (12 stations; 206 bridges, 79.2 km; 4 tunnels, 27.6 km; ~670 km route). Component shares are derived from the published totals and rounded; they are not independently published figures.

The rolling fleet is part of the civil design

Heavy-haul economics couple the fleet to the alignment: axle loads size the bridges, train lengths size the loops and yards, and motive power fixes the ruling grade the alignment must respect. The published procurement record shows the coupling at work. In July 2024, a US\$277 million order placed by SimFer on behalf of the infrastructure company covered 78 dual-cab ES43ACi heavy-haul locomotives, each carrying a 4,500-horsepower Evolution Series engine. In January 2025, WCS confirmed a further US\$248 million order for 65 ES43ACmi units of the same family. On the Lobito corridor, the concessionaire procured an initial batch of 275 new container wagons from a South African manufacturer: 13.5-tonne wagon weight, load capacity of up to 60.5 tonnes, each carrying one 40-foot or two 20-foot containers.

HEAVY-HAUL · railway practice optimised for very high axle loads and unit-train tonnage rather than speed or mixed traffic; the discipline’s reference body is the International Heavy Haul Association (IHHA).

EXHIBIT 9

Fleet procurement discloses the corridor's design intent

Published motive-power and rolling-stock orders, both corridor systems

| CORRIDOR | ORDER | UNITS | PUBLISHED SPECIFICATION | VALUE |
|----------------------------|---|-------|--|---------------|
| TransGuinéen (Jul 2024) | ES43ACi dual-cab heavy-haul locomotives (SimFer order, on behalf of CTG) | 78 | 4,500 hp Evolution Series engine | US\$277 m |
| TransGuinéen (Jan 2025) | ES43ACmi dual-cab heavy-haul locomotives (WCS order) | 65 | 3.3 MW Evolution Series engine | US\$248 m |
| Lobito | Container wagons, South African manufacture (initial batch) | 275 | 13.5 t wagon weight; up to 60.5 t load; 1 × 40 ft or 2 × 20 ft containers | not disclosed |

Source: International Railway Journal, 2025, archived captures (78-unit order and value; 65-unit WCS order); Wabtec, press release, 2025 (ES-43ACi specification); OECD, 2025, citing Lobito Corridor Investment Promotion Authority, 2024. Values as published; the wagon order's value and order date were not disclosed (2024 is the citing publication's year). Wagon weights: the OECD note prints "tons", rendered here in this paper's metric styling (tonnes/t). Locomotive designations follow the manufacturer's own styling; the evidence dossier records archived trade-press variants. Engine rating is quoted in each source's own units: the 4,500 hp Evolution Series engine (Wabtec) equals about 3.36 MW, the same power class the IRJ order reports as 3.3 MW; both orders describe one engine family, not two ratings.

Read as design disclosures, the two corridors' orders say different things. The TransGuinéen book, two orders whose published counts sum to well over a hundred units of a single dual-cab Evolution Series family, describes a dedicated heavy-haul operation: one traffic, one consist architecture, fleet homogeneity bought deliberately for availability and maintenance simplicity. The Lobito wagon order, container-configured with one 40-foot or two 20-foot boxes per wagon, describes a multi-commodity corridor hedging between mineral concentrates and general freight. A corridor's order book is, in effect, its demand thesis written in steel.

Structures set the schedule as surely as the cost

The structural share drives the program as well as the estimate. Two hundred and six bridges and four tunnels sum to two hundred and ten discrete construction fronts, each with its own geotechnical conditions, access constraints and seasonal windows, and the longest of them, not the plain-line track kilometres, sit on the critical path. A corridor schedule that averages structures into a per-kilometre production rate has already failed; the disciplined model treats the structure register as a portfolio of mini-projects and lets the slowest define the opening date. That is also why fleet orders arrive years early: rolling stock is procured against the structures schedule rather than the trackwork schedule.

METHOD ASIDE

The structure register as an economics object

A register of two hundred and six bridges and four tunnels is not a line item; it is a portfolio with its own statistics. Unit rates disperse widely across a register of that size: span class, pier height, foundation conditions and access distance can move a single bridge's cost by multiples, so the honest estimate prices the register bridge by bridge and carries the dispersion, never a blended rate times a total length. Geotechnical variance concentrates in the tunnels, where a single fault zone can absorb a season. Access is its own sub-program: many structures need haul roads built before the structure itself, and those roads sit on the critical path unpriced in a per-kilometre model. And the seasonal window binds everything: foundation work in major river crossings happens in the dry months or waits a year. This is why lender technical advisers read the structure register before the alignment drawings, and why the estimate class the register supports, in AACE terms, is the estimate class the corridor supports. A corridor whose structures are priced at reconnaissance grade is a reconnaissance-grade corridor, whatever its trackwork estimate says.

Design parameters: what is public, and what is not yet

A corridor owner comparing systems wants the classic heavy-haul parameter set: gauge, axle load, train length, ruling grade, loop spacing. For the systems studied here, only part of that set is in the archived public record, and this paper declines to guess the rest. Exhibit 10 states what is published, including the gauge fixed in the project's published BOT Convention, and marks the still-open parameters explicitly; the evidence dossier pre-registers an IHHA conference-literature pull to close those before this paper's next edition.

EXHIBIT 10

Publish the parameters you have; name the ones you do not

Heavy-haul design-parameter panel, TransGuinéen system · published values only

| PARAMETER | PUBLISHED VALUE | STATUS |
|------------------------|---|---|
| Structural content | 206 bridges (79.2 km); 4 tunnels (27.6 km); 12 stations | Published (IRJ, 2025, archived capture) |
| Motive power | 78 × ES43ACi, 4,500 hp; 65 × ES43ACmi, 3.3 MW | Published (IRJ, 2024/2025; Wabtec, 2025) |
| Track gauge | 1,435 mm standard gauge | Published (Simandou BOT Convention, Appendix 7, 2014; archived capture) |
| Track configuration | Double track | Published (IRJ, 2025, archived capture) |
| Axle load | Not yet in the archived public record | Open; IHHA literature pull pre-registered |
| Train length / consist | Not yet in the archived public record | Open; IHHA literature pull pre-registered |
| Ruling grade | Not yet in the archived public record | Open; IHHA literature pull pre-registered |

Source: as per rows above. Editorial rule of this series: no engineering specification is ever inferred, averaged or "remembered"; open parameters are named as open.

What general heavy-haul practice does establish, ahead of the project-specific disclosures, is which parameters matter and why they travel together. Axle load sizes every bridge deck and sets the rail section and sleeper spacing; train length sets loop spacing, yard geometry and the signalling headway that line capacity is computed from; ruling grade couples the alignment to the locomotive count per consist, which is why motive-power orders are readable as alignment disclosures; and gauge fixes the interoperability boundary with every neighbouring network. The discipline's reference literature, from the International Heavy Haul Association's conference corpus, treats these as one coupled design space rather than a specification list, and that is exactly how a corridor owner should read Exhibit 10's open cells: not as missing trivia but as the unpublished half of a coupled design whose published half already constrains it.

AXLE LOAD · the weight transmitted to the track by one axle: the master variable of heavy-haul design, sizing structures, rail section and maintenance regime together.

**A corridor's cost model lives and dies in its structures:
the hundred-plus kilometres of bridge and tunnel, not
the plain line.**



4

BUILD · PORT AND MARINE ENGINEERING

Port and marine engineering

The cheapest berth is the one first ore does not wait for. Simandou's published configuration is barges and transshipment vessels, shipping while construction of the SimFer port is finalised; the trade press reports a new deep-water port in the project's scope.

Barge + TSV

PUBLISHED PORT CONFIGURATION ON THE MOREBAYA, FORÉCARIAH COAST (RIO TINTO, 2025)

Dec 2025

FIRST SHIPMENT VIA THE WCS PORT AND SIMFER SPUR (RIO TINTO, 2026)

2

NEW FREIGHT TERMINALS IN THE LOBITO-LUAU UPGRADE SCOPE (OECD, 2025, CITING WORLD BANK, 2024)

Marine works are where corridor capital goes to concentrate: berths, dredging and materials-handling plant are lumpy, long-lead and unforgiving of demand error. The port choices visible in the two case systems are therefore phasing choices as much as engineering ones, and both systems chose to start light.

Capex-light first ore: the transshipment configuration

Simandou’s published port solution is barge and transshipment-vessel facilities on the Forécariah coast at the Morebaya (reading that description as the first-ore configuration is editorial; Rio Tinto’s text names no berth class); trade-press project reporting names the railhead as the Port of Morebaya and puts a new deep-water port there in the project’s scope. Ore railed to the coast is barged to transshipment vessels and loaded offshore into ocean carriers; the first shipment of December 2025 moved through the WCS port via the SimFer rail spur, while construction of the SimFer port is finalised. The configuration trades operating cost per tonne for a radical reduction in initial marine capital and, critically for a 30-month mine ramp, for time: transshipment capacity can arrive in service increments that track the ramp, where a deep-water quay must arrive whole.

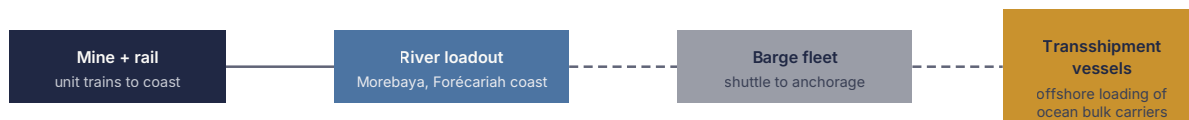
TRANSSHIPMENT VESSEL (TSV) · a self-loading vessel that receives ore from barges inshore and loads ocean bulk carriers at anchorage, substituting floating plant for fixed deep-water berth capital in a corridor’s early phases.

DEMURRAGE · the daily compensation owed to a vessel’s owner when loading exceeds the agreed laytime: the price at which a marine chain’s cycle-time slippage is invoiced.

EXHIBIT 11

Transshipment turns a berth into a schedule option

First-ore marine configuration, Simandou system (schematic)



First ore ships through floating plant and the WCS port while the SimFer port is completed (trade press: a new deep-water port in project scope); the incremental reading of that staging is editorial, not a published rule.

Source: Rio Tinto, 2025 (barge and transshipment-vessel facilities, Forécariah coast); Rio Tinto, Simandou operations page, 2026 (first shipment through the WCS port while construction of the SimFer port is finalised); International Railway Journal, 2025, archived captures (Port of Morebaya as the rail terminus; project scope reported to include a new deep-water port at Morebaya). Rio Tinto’s own port description names no berth class; the banner’s staging reading is an editorial reading of the public record, as in Exhibit 20; no staging intent is attributed to any operator. Diagram schematic.

Brownfield marine: upgrading while operating

Lobito’s marine scope is the brownfield mirror image. The corridor’s published upgrade program (OECD, 2025, citing World Bank, 2024) covers two new freight transit terminals at Lobito and Luau, expanded workshops at Lobito, Huambo, Cubal and Luau, a transport training centre at Huambo, and rehabilitation of the mineral terminal; the December 2025 DFC loan is framed separately as rail rehabilitation plus a brownfield mineral port. That World Bank scope list predates the December close, and no published source ties it to the DFC-DBSA financing, so the two are kept distinct here. On a working corridor, throughput is bought in workshops, terminals and training as much as in track.

DWELL TIME · the time cargo or wagons spend stationary at a terminal, border or interchange; the corridor-scale measure that terminal investment and institutional reform act on.

EXHIBIT 12

Brownfield throughput is bought in terminals, workshops and people

Published Lobito-Luau corridor upgrade program (OECD, 2025, citing World Bank, 2024)

| SCOPE ELEMENT | LOCATIONS | FUNCTION IN THE CAPACITY CHAIN |
|---------------------------------|-----------------------------|---|
| New freight transit terminals | Lobito; Luau | Dwell-time reduction at the corridor's two interchange ends: the port gateway at Lobito, the DRC border at Luau |
| Expanded workshops | Lobito; Huambo; Cubal; Luau | Fleet availability: the hidden multiplier on line capacity |
| Transport training centre | Huambo | Operating-workforce depth for a rising train count |
| Mineral-terminal rehabilitation | Port of Lobito | Ship-loading rate and stockyard recovery at the marine interface |

Source: OECD, 2025, citing World Bank, 2024 (scope; the World Bank corridor project predates the December 2025 close, and no published source identifies this list with the DFC-DBSA financing); U.S. International DFC, 2025 (loan framing: rail rehabilitation and brownfield mineral port). Selection note: the OECD-published program also lists two new passenger train stations, omitted here as outside the mineral-freight capacity chain. Function column: editorial reading of the same public record, as in Exhibit 20; no engineering specification is inferred.

The deep-water decision

Both configurations converge on one eventual question: when is the fixed deep-water berth justified? The published record reports works, not a trigger, and this paper infers none. What it shows is sequence: the trade press puts a new deep-water port in the Simandou project's scope, and first ore moved through floating plant and the WCS port while construction of the SimFer port is finalised; revenue tonnes moved before the port works were complete. Lobito's answer is rehabilitation first: restore the existing mineral terminal to its design duty before debating new berths, with the DFC loan framed as rail rehabilitation plus a brownfield mineral port. Read side by side (an editorial reading, as in Exhibit 12), both records stage marine capital; neither publishes the test for further fixed capacity.

Transshipment economics: the cycle is the capacity

What a transshipment configuration buys in deferred capital it pays for in operating arithmetic, worth stating even where the case systems publish no parameters. A barge-and-TSV chain's throughput is set by cycle time: barge loading rate, river or coastal transit, TSV loading rate at anchorage, and the return leg, multiplied across the fleet. Weather, draft and tide gate each leg differently, and the ocean carrier's laytime turns any cycle slip into demurrage. The design questions are therefore fleet-sizing and buffer questions, and the honest model prices the marginal transshipment tonne against the berth's capital cost at each phase of the ramp. The crossover point, where the operating premium of floating plant exceeds the carrying cost of fixed marine works at demonstrated throughput, is the deep-water trigger: an evidence test rather than a calendar date. The test is this paper's framing instrument, not a published decision rule of either case system.

The transferable lesson of the two marine records is sequencing. The port choice is a phasing choice (Chapter 2's logic at the waterline), and staged marine capital is part of what made Chapter 6's financing legible to lenders: commitments sized to the evidence available at each phase.

Marine capital should arrive in increments that track the ramp. The deep-water berth should be an option exercised on evidence.

5

BUILD · GOVERNANCE

Multi-user and open-access governance

Two archetypes now anchor the spectrum: the infrastructure joint venture with a free-carried state, and the long concession with an extension option priced in constructed kilometres.

42.5 / 42.5 / 15

CTG OWNERSHIP: SIMFER, WCS, GUINEA FREE-CARRIED (RIO TINTO OPERATIONS PAGE, 2026)

30 yr

LOBITO ATLANTIC RAILWAY CONCESSION, 2023 (OECD, 2025)

+20–50 yr

EXTENSION CONDITIONAL ON THE LUACANO-JIMBE BRANCH (OECD, 2025)

Multi-user infrastructure lives or dies on its governance. The engineering question (can two operators share a line?) is trivial beside the institutional one: who sets access terms, who carries expansion risk, and what does the state hold? The two systems in this casebook answer with opposite instruments.

Archetype one: the infrastructure joint venture

Simandou vests its shared rail and port in the Compagnie du TransGuinéen (CTG), an infrastructure owner-operator held 42.5 per cent by SimFer, 42.5 per cent by Winning Consortium Simandou, and 15 per cent by the Government of Guinea as a free-carry equity stake. Above it, the mine-side entities are themselves consortia: SimFer’s ownership runs through the Government of Guinea at 15 per cent and Simfer Jersey at 85 per cent, the latter split between Rio Tinto at 53 per cent and Chalco Iron Ore Holdings at 47 per cent, while WCS pairs Winning International Group and Weiqiao Aluminium at 51 per cent with Baowu Resources at 49 per cent. The structure’s logic: both anchor users co-own the bottleneck, so neither can hold the other hostage, and the state’s free-carried equity aligns sovereign interest with throughput rather than with tariff extraction.

Archetype two: the concession with a build option

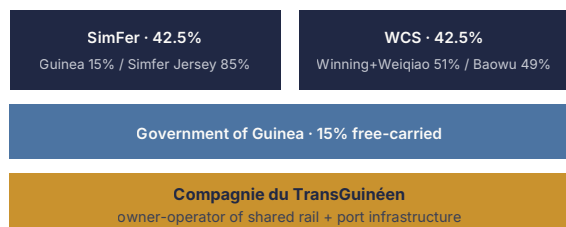
Lobito runs on the older instrument, renewed. The Lobito Atlantic Railway consortium of Mota-Engil, Vecturis and Trafigura secured a 30-year concession in 2023 to operate the railway and mineral terminal, committing US\$455 million of investment in Angola and US\$100 million in the DRC. The concession’s most instructive clause prices growth: extension by 20 to 50 years is conditional on constructing the 259-kilometre Luacano-Jimbe branch, at roughly US\$1 billion. Tenure is earned by building, on terms the contract names in advance.

EXHIBIT 13

Same problem, opposite instruments: the JV and the concession

Published ownership and control structures, both corridor systems

CTG: infrastructure joint venture (Guinea)



Anchor users co-own the bottleneck; the state's free carry aligns sovereign interest with throughput.

LAR: concession (Angola / DRC)



Committed investment: US\$455 m Angola + US\$100 m DRC. Tenure follows delivered construction.

Source: Rio Tinto, 2025 (SimFer, WCS, CTG ownership); Rio Tinto, Simandou operations page, 2026 (free-carry status of the state's CTG holding); OECD, 2025, citing Trafigura, 2023 (concession, committed investment); OECD, 2025 (extension condition).

OWNER-OPERATOR · an infrastructure company that both holds the asset and runs it, as CTG does for the shared rail and port: the structure through which anchor users co-own the bottleneck they depend on, rather than renting access to it.

EXHIBIT 14

The concession's growth clause prices expansion into tenure

Published Lobito Atlantic Railway concession terms

| TERM | PUBLISHED VALUE | READING |
|----------------------|--|--|
| Base tenor | 30 years (2023) | Long enough to amortise rolling stock and terminal works |
| Committed investment | US\$455 m (Angola) + US\$100 m (DRC) | Two-jurisdiction commitment mirrors the corridor's legal geography |
| Extension trigger | 259 km Luacano-Jimbe branch, ~US\$1 bn | Expansion risk transferred to the party best able to price traffic |
| Extension reward | +20 to +50 years | Tenure scales with the scale of the build actually delivered |

Source: OECD, Background Note: The Lobito Corridor, 2025, citing Trafigura, 2023.

FREE-CARRIED INTEREST · state equity carried without cash contribution, as in the Government of Guinea's 15 per cent stake in CTG: the sovereign participates in the infrastructure company's upside without funding calls, aligning its interest with throughput.

The institutional stack above the asset

Neither instrument works alone: both sit inside an institutional stack that the OECD's corridor work makes explicit, framing corridors as hard infrastructure plus institutions plus services. On Lobito, two 2023 instruments built the agency layer: a seven-party memorandum of understanding for infrastructure investment, and the Lobito Corridor Transit Transport Facilitation Agency Agreement of January 2023, under which sits the LCTTFA, headquartered in Angola and supported by SADC. Above them sit the 2023 DRC-US-Zambia memorandum tying the corridor into the electric-vehicle battery value chain and the 2022 DRC-Zambia agreement on a regional battery-manufacturing hub; and above those, the continental trade architecture and the OECD's draft corridor-connectivity scoreboard.

EXHIBIT 15

A corridor is governed at four altitudes at once

Institutional stack, Lobito corridor, as published



Source: OECD, 2025 (seven-party MoU; LCTTFA Agency Agreement; corridor framework); OECD, 2025, citing US State Department, 2023 and ECA, 2022 (value-chain agreements).

The counterfactual corridor

The spectrum has a cautionary pole. TAZARA, built in the 1970s with a US\$500 million interest-free Chinese loan, now operates at a fraction of its former capacity; a roughly US\$1 billion rehabilitation-and-concession arrangement with CCECC is under negotiation between Zambia and Tanzania. Angola's own history doubles the warning: the civil conflict of 1975–2002 cut Benguela operations to just 34 kilometres, pushing Zambian copper to the Beira and Dar es Salaam corridors. Infrastructure without durable institutions is a stranded asset with a timetable.

EXHIBIT 16

TAZARA: what a corridor becomes without its institutional stack

Published trajectory of the eastern counterfactual

| ERA | PUBLISHED FACT | LESSON FOR NEW CORRIDORS |
|----------------------|---|--|
| 1970s | Built with a US\$500 m interest-free Chinese loan | Concessional construction finance does not by itself create an operating institution |
| 1975–2002 (regional) | Angolan conflict cut Benguela operations to 34 km; Zambian copper diverted to Beira and Dar es Salaam | Corridor demand re-routes fast, and takes decades to win back |
| 2020s | Operating at a fraction of its former capacity; ~US\$1 bn CCECC rehabilitation/concession under negotiation | The concession instrument returns as the recovery vehicle |

Source: OECD, 2025, citing Jeune Afrique/FT, 2024 (TAZARA); OECD, 2025, citing FT, 2024 (Benguela wartime contraction and diversion).

What the archetypes teach structuring teams

For a team structuring the next corridor, the two archetypes reduce to three transferable questions. First, **who owns the bottleneck?** The JV answer puts anchor users inside the infrastructure company; the concession answer puts a specialist operator on a term lease, and each allocates expansion incentive differently. Second, **what does the state hold?** Free-carried equity aligns sovereign interest with throughput; concession royalties align it with tariff, a difference that surfaces exactly when access pricing is contested. Third, **how is growth priced?** The Lobito extension clause shows expansion written as a contractual obligation with a named branch, a named cost class and a named reward; a corridor whose growth path lives in a policy paper rather than a contract clause has not answered the question.

For the region's wider pipeline, the survey altitude of this chapter is deliberate: beyond the named operating systems, Central and West Africa's prospective corridor-scale programs are treated here in aggregate, as basins and route families rather than project profiles, because governance lessons generalise while project particulars change hands.

CONCESSION · a time-bound grant to operate, and usually to invest in, public infrastructure. The Lobito instrument shows its modern corridor form: a 30-year base with extension mechanics written as construction obligations.

One further reading of the spectrum deserves stating: the two archetypes are converging instruments rather than rival ideologies. The JV writes multi-user discipline into ownership; the concession writes it into obligations; and each borrows the other's logic at the margin, as when a concession's extension clause makes the operator behave like an owner of the corridor's growth. What the next corridor should copy is neither structure wholesale but the property both share: every party's incentive is written down, priced and tied to throughput. Governance that must be renegotiated when traffic arrives was never finished.

Tenure earned by building, throughput shared at the bottleneck, and a state aligned with volume: that is what “open access” means in practice.

CHAPTER 5 · THE GOVERNANCE SPECTRUM

Infrastructure without durable institutions is a stranded asset with a timetable.

CHAPTER 5 · THE GOVERNANCE SPECTRUM

6

BUILD · FINANCING CORRIDORS

Financing corridors

December 2025 proved that development finance will price a mineral corridor as an asset. The stack, the actors and the honest cost picture.

US\$753m

DFC AND DBSA PACKAGE FOR THE LOBITO ATLANTIC RAILWAY (TRAFIGURA, 2025)

17 Dec 2025

DFC LOAN AGREEMENT SIGNED; PACKAGE CLOSED THE SAME DATE (DFC, 2025; TRAFIGURA, 2025)

>US\$10bn

MULTILATERAL BACKING ACROSS THE LOBITO CORRIDOR (OECD, 2025, CITING FT)

Mining projects have always been financeable; the corridors between them and the sea rarely were. The December 2025 close on the Lobito Atlantic Railway is therefore more than a transaction. It is evidence that the corridor has become an underwritable asset class, with its own stack, its own actor set and its own diligence questions.

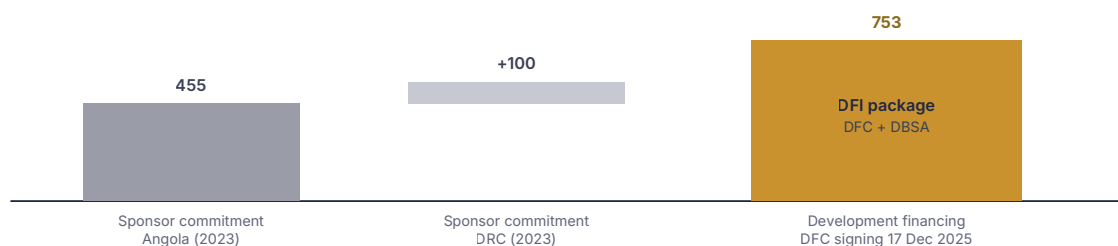
Anatomy of the first modern corridor close

The package is compact and legible. On 17 December 2025 the U.S. International Development Finance Corporation signed a loan agreement with the Lobito Atlantic Railway for rail rehabilitation and the brown-field mineral port; with the Development Bank of Southern Africa participating alongside, the total financing package closed at US\$753 million. The institutions did not publish the split between the two lenders, and neither does this paper. The financing lands on a concessionaire whose sponsors had already committed US\$455 million in Angola and US\$100 million in the DRC: sponsor skin ahead of institutional financing, in the sequence lenders like to see.

EXHIBIT 17

Sponsor commitment first, institutional financing second

Lobito Atlantic Railway financing sequence, US\$ million, as published



Source: Trafigura, press release, 2025 (US\$753 m total, DFC and DBSA); U.S. International DFC, press release, 2025 (signing and loan framing); OECD, 2025, citing Trafigura, 2023 (sponsor commitments). The lender split within the US\$753 m package was not published and is not shown. Sponsor bars shown for sequence, not stacked into the DFI package total.

The actor matrix

No single institution finances a corridor; the instrument mix is the strategy. Exhibit 18 arranges the published Lobito-corridor commitments by actor and instrument: development financing closed on the concessionaire (the DFC and DBSA package), sovereign-adjacent allocations (the US\$1 billion PGII allocation through the Africa Finance Corporation), anchor estimates and fundraising leadership (the AfDB's US\$1.6 billion Zambia-extension estimate, with US\$500,000 committed and a mandate to raise the rest), and framework mobilisation (the EU's Global Gateway umbrella over the EU-Zambia MoU). The corridor-wide total, multilateral investment backing exceeding US\$10 billion across US, EU, AfDB and private consortia, is best read as a pipeline figure, not a closed-transactions sum.

BLENDED PACKAGE · financing combining more than one institutional lender or instrument class in a single close, as in the DFC-DBSA package: the parties disclose the total and the purposes; internal splits publish only if the parties choose.

**A corridor is financed by instruments in sequence,
never a single cheque.**

EXHIBIT 18

The corridor-finance actor set spans four instrument classes

Published Lobito-corridor commitments by actor and instrument

| ACTOR | INSTRUMENT CLASS | PUBLISHED FIGURE | STATUS AS PUBLISHED |
|-----------------------------------|--|----------------------|---|
| U.S. International DFC with DBSA | Development financing (blended package) | US\$753 m | Package closed Dec 2025; lender split not published |
| US via Africa Finance Corporation | Sovereign - adjacent allocation (PGII, 2023) | US\$1.0 bn | Allocated to upgrade the Lobito rail line up to Zambia |
| African Development Bank | Anchor estimate + fundraising lead | US\$1.6 bn | Requirement estimate; US\$500,000 committed to date; leads further fundraising |
| European Union (Global Gateway) | Framework mobilisation | €300 bn | Programme - wide 2021–27 target framing the EU - Zambia MoU |
| Corridor - wide backing | All classes | >US\$10 bn | Backing across US, EU, AfDB and private consortia; read in the body as a pipeline figure |

Source: U.S. International DFC, 2025; Trafigura, 2025; OECD, 2025, citing European Commission, 2023, AfDB, 2023 and FT, 2024.

What corridor lenders actually diligence

The Lobito record makes the corridor lender's diligence set legible. Behind the published transaction sit six questions this paper's other chapters unpack: the demand case and its scenario labels (Chapter 1); the system capacity model and its narrowest element (Chapter 2); the structural share of the alignment and the credibility of its cost basis (Chapter 3); the phasing of marine capital (Chapter 4); the governance instruments protecting multi-user revenue, from access terms to state participation and extension mechanics (Chapter 5); and the environmental and social envelope whose covenants development finance carries by mandate (Chapter 7). A sponsor who can answer all six in the language of the published record has, in substance, pre-cleared the credit committee's agenda.

The honest cost picture

Corridor cost disclosure remains imperfect, and a lender's first diligence task is to respect that. For the Simandou program, the partners publish no single all-in investment figure; this paper therefore reports none, and treats the discipline itself as the lesson. Where the public record offers a floor, a range or a silence, the underwriting must carry exactly that shape: the Lobito corridor's published >US\$10 billion multilateral backing is a floor and a pipeline reading, not a closed sum, and a Simandou all-in figure is, as of this writing, a silence. The habit this trains, pricing the shape of the disclosure before pricing the asset, is the cheapest discipline in this chapter, and Exhibit 19 draws it.

PIPELINE FIGURE · an aggregate spanning allocations, requirement estimates and closed transactions at different stages, like the corridor-wide >US\$10 billion backing: read as a floor and a direction of intent, never as committed capital.

REQUIREMENT ESTIMATE · a published costing of a task not yet financed, like the AfDB's US\$1.6 billion Zambia-extension figure: it prices work someone must still fund, and is never additive to closed packages.

EXHIBIT 19

Underwrite the shape of the disclosure: floors as floors, silences as silences

Published program-cost disclosure, both corridor systems, US\$ billion



Source: OECD, 2025, citing FT, 2024 (>US\$10 bn backing). The dashed extension marks a published floor with no published ceiling; the axis runs to US\$12 bn only to give that open end room, not to imply a ceiling. Press estimates of the Simandou total exist but fall outside this paper's pre-enumerated source classes and are not reported.

THEMATIC ASIDE

Project finance for mining: where corridor debt meets the study ladder


Corridor debt prices the same fundamentals as mine finance (reserves, ramp, offtake) plus one more: multi-user traffic risk. Lender diligence therefore reaches back into the study ladder (PFS, DFS/BFS, AACE-class estimates) that sized the corridor's demand case, and into the environmental and social covenants that Chapter 7 describes. The Aurus library treats mining project finance as its own subject; within this paper, the point is narrower: a corridor that cannot show lender-grade studies of its demand case will borrow at the price of that silence.

From transaction to template

The durable value of a first transaction is that it becomes a template, and the Lobito close hands the next corridor sponsor a legible one. Its sequence, sponsor commitment in two jurisdictions first, institutional financing second, is the order every corridor stack will now be tested against. Its scope discipline, financing attached to the named brownfield works the loan releases themselves publish, the rehabilitated rail line and the mineral port, shows development finance underwriting published works rather than a concept. And its silences are instructive too: the unpublished lender split is a reminder that blended packages disclose what the parties choose, and that a diligence process must price the package as published rather than reverse-engineer a decomposition the record does not support. The next corridor's financing memorandum will be drafted against this transaction; the sponsors who study its shape before they need it will draft faster.

December 2025 did for corridors what the first project-financed mines did for orebodies: it proved that the asset class can be priced.

CHAPTER 6 · FINANCING CORRIDORS



7

BUILD · ENVIRONMENT AND SOCIAL

Environment and social performance at corridor scale

A corridor's environmental and social envelope is linear, trans-jurisdictional and permanent. It is also, done properly, the asset's licence to exist.

50/100 m

RIGHT-OF-WAY EACH SIDE,
URBAN / RURAL, LOBITO
CORRIDOR (OECD, 2025)

186

BRIDGES IN THE
COMPLEMENTARY ROAD
PROGRAM (OECD, 2025, CITING
LOBITO CORRIDOR IPA)

3

JURISDICTIONS IN ONE
CORRIDOR E&S ENVELOPE
(OECD, 2025)

Linear infrastructure multiplies every environmental and social question a mine site raises: a corridor’s footprint is hundreds of kilometres long, crosses jurisdictions with different regimes, and touches every community along the alignment. The corridor E&S envelope is therefore not a permitting annex. It is a design input of the same rank as grade and gradient.

The named risk register

The OECD’s corridor work names the risk set plainly: customs inefficiency across the corridor’s three jurisdictions; regulatory misalignment between them; landmine-legacy contamination along parts of the alignment; and monopolistic-pricing risk where concessions lack transparency. None of these is exotic; all of them are corridor-specific in scale. Exhibit 20 maps the published register to its engineering and governance controls.

EXHIBIT 20

Every published corridor risk has an engineering or governance control

Corridor risk register as published, with the control class each risk points to

| PUBLISHED RISK (OECD, 2025) | CLASS | CONTROL THE RECORD POINTS TO |
|---|-----------------------|--|
| Customs inefficiency across three jurisdictions | Institutional | Corridor transit agency with treaty backing (the LCTTFA model) |
| Regulatory misalignment between jurisdictions | Institutional | Harmonised corridor agreements; single E&S envelope across borders |
| Landmine-legacy contamination | E&S / engineering | Clearance and chance-find protocols embedded in the works program |
| Monopolistic pricing absent transparent concessions | Commercial-governance | Published access terms; multi-user obligations written into tenure |

Source: OECD, Background Note: The Lobito Corridor, 2025 (risk register). Control column: editorial reading of the same public record; no proprietary data.

CATEGORY A · the Equator Principles / IFC classification for projects with potentially significant, diverse or irreversible environmental and social impacts: the default category for new mineral corridors.

The linear footprint, quantified

The corridor’s physical envelope is public on Lobito: a right-of-way of 50 metres each side in urban areas and 100 metres in rural areas, with some sections requiring greenfield development; around it, a complementary road program of €381.5 million repairing or constructing 186 bridges across the Angola-DRC-Zambia links. Numbers of this kind convert “E&S risk” from an abstraction into a designable object: a strip of land whose width, length and crossings are known, and whose baseline, impacts and mitigation can be engineered to lender standards. Adjacent corridor disciplines are active in the Aurus practice today, including road-corridor engineering under mandate in Central Africa, alongside the port and terminal feasibility disciplines described in Chapter 4.

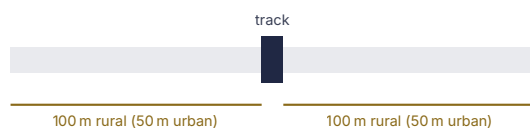
Once its width, length and crossings are known, an environmental envelope stops being a risk narrative and becomes an object that engineering can price.

EXHIBIT 21

The E&S envelope is a designable object with published dimensions

Linear-footprint parameters, Lobito corridor, as published

Right-of-way cross-section (schematic)



Some sections require greenfield development within the corridor.

Complementary road program

€381.5 m

road upgrade across Angola-DRC-Zambia links

186

bridges repaired or constructed in the program

Source: OECD, 2025 (right-of-way); OECD, 2025, citing Lobito Corridor Investment Promotion Authority, 2024 (road program). Cross-section schematic, not to scale.

Cumulative and induced impacts: the corridor's second footprint

A corridor's direct footprint is the right-of-way; its second footprint is what the corridor induces. New rail and road access opens land to settlement, agriculture and artisanal activity that would not otherwise have reached it; terminals and workshops draw in-migration to towns whose services were sized for less; and the corridor's own complementary programs, like a 186-bridge road campaign, multiply the access effect across an entire region. Lender frameworks treat these induced and cumulative effects as first-order scoping questions precisely because they dwarf the direct footprint over an asset life measured in decades, and because they are cheapest to shape early, when alignment and siting choices are still open. The practical consequence for a corridor program is a wider baseline, engaged institutions in three jurisdictions rather than one, and a monitoring obligation that outlives construction by design.

Practice: one envelope, lender-grade, from day one

The marine interface belongs in the same envelope. Aurus's own marine practice sits exactly at the interface Chapter 4 describes: **bankable feasibility and Category-A ESIA practice for deep-water port and terminal infrastructure**, the discipline of proving, to lender standard, when the deep-water phase is justified and what its environmental envelope must be.

The practice lesson from Category-A work on linear systems generalises. First, scope the corridor as one environmental and social envelope even where it crosses borders: impacts, baselines and commitments that stop at a boundary post protect no one and satisfy no lender framework. Second, run multi-season baselines early: linear projects cannot retrofit a wet-season baseline after alignment freeze. Third, apply the mitigation hierarchy (avoid, minimise, restore, offset) at alignment stage, where avoidance is still cheap. Fourth, engineer the social interface, from land access and resettlement planning to community consultation and grievance mechanisms, with the same stage-gate discipline as the earthworks, because schedule risk lives there. These are the disciplines of IFC Performance Standards and Equator Principles Category-A practice applied to a moving footprint; the corridors that financed fastest are the ones that treated them as design disciplines from the first field season.

AURUS PRACTICE NOTE · ASSESSING THE CORRIDOR AS ONE SYSTEM

This chapter's envelope discipline is the discipline on which Aurus was built. The firm authored a ~1,550-page environmental and social impact assessment, aligned with the IFC Performance Standards and Equator Principles (Category A), for a US\$10-billion-class integrated iron-ore program in Central Africa (open-pit direct-shipping-hematite deposits, a heavy-haul rail corridor and a deep-water mineral terminal assessed as one system), with resources and reserves framed to JORC/NI43-101 conventions.

METHOD ASIDE

Sequencing the E&S program against the engineering

The envelope disciplines above are calendar disciplines. Multi-season baselines must bracket at least one full wet season before alignment freeze, or the freeze inherits an unquantified flood, sediment and habitat record. Scoping and disclosure must run ahead of land access, because consultation conducted after commitments reads as notification and forfeits the trust the grievance mechanism will later need. The mitigation hierarchy's cheap moves, avoidance by realignment, exist only while the alignment is soft, which is why corridor E&S work procured after route selection has already spent its best option. And lender review sits at the end of the chain: a Category-A package assembles over years rather than quarters, and a financing timetable that discovers this late discovers it as schedule risk. The sequencing rule of thumb is simple: the E&S program starts when the engineering does, and gates when it gates.

THEMATIC ASIDE

ESIA for linear systems: what changes at corridor scale

Corridor ESIA differs from site ESIA in kind: cumulative and induced impacts dominate (roads open land; terminals draw in-migration); the affected-community set is a settlement string hundreds of communities long; and jurisdictional seams create duplicate consultation and disclosure obligations. The lender frameworks, IFC Performance Standards 1–8 and the Equator Principles for Category-A projects, treat these as first-order scoping questions. The Aurus library examines ESIA excellence for mining projects as its own subject; this paper's narrower point is that corridor E&S work must be procured as early, and governed as tightly, as the engineering.

The E&S diligence record a lender will ask for

Chapter 6's diligence set ends here, because the environmental and social record is the part of a corridor file a development-finance institution reads with its own mandate in hand. The record the first financings point to is concrete: a single envelope scoped across every jurisdiction; baselines that predate alignment freeze; a mitigation hierarchy applied where avoidance was still an option; a social interface, land access, resettlement, consultation and grievance, run to the same stage gates as the earthworks; and named risks, like the OECD's register in Exhibit 20, answered with named controls rather than adjectives. None of these documents is exotic; each exists in any disciplined program's files, and the only question a lender's reviewers ever really ask is whether they were produced at the gate or reconstructed for the data room. A program that can put that record on the table has not merely prepared an ESIA; it has demonstrated that it governs the corridor as one system, which is the very trait Chapter 8's framework is built to test.

CHAPTER CLOSE · THE FILE, NOT THE ADJECTIVES

The corridor E&S record, in five documents

One envelope: a single scope spanning every jurisdiction the alignment crosses. **One calendar:** multi-season baselines that predate alignment freeze. **One hierarchy:** avoidance, minimisation, restoration and offset decisions recorded while realignment was still open. **One social program:** land access, resettlement, consultation and grievance run to the same stage gates as the earthworks. **One register:** named risks answered with named controls, as in Exhibit 20. Five documents, one test: does the program govern the corridor as one system?

**What the record supports is stated.
What it does not support is named.
That is the only authority the closing
framework claims.**

BEFORE THE HOUSE FRAMEWORK



8

BUILD · THE HOUSE FRAMEWORK

The Aurus corridor delivery model

A stage-gated development framework from pre-feasibility to ramp-up, distilled from the public record of the corridor decade's first movers.

6

STAGES, PRE-FEASIBILITY TO RAMP-UP (AURUS DELIVERY MODEL)

5

GATE DISCIPLINES APPLIED AT EVERY STAGE (AURUS DELIVERY MODEL)

1

SYSTEM: MINE, RAIL, PORT AND LICENCE TOGETHER (AURUS DELIVERY MODEL)

Chapters 1 through 7 read the corridor decade’s public record. This closing chapter converts it into an instrument: a stage-gated corridor delivery framework a developer, owner or lender can hold a program against. It introduces no new data; every gate discipline below is traceable to a lesson already cited.

The framework

The model runs six stages (corridor pre-feasibility, system feasibility and ESIA, structuring and financing, construction, commissioning, and ramp-up) and holds five disciplines at every gate: **demand honesty** (underwrite published floors and ranges, never invented points: the lesson of Exhibit 19); **system capacity modelling** (the chain clears at its narrowest element: Chapter 2); **phasing realism** (staged marine capital and hybrid brownfield-greenfield paths: Chapters 2 and 4); **governance before steel** (access terms, state participation and extension mechanics settled at structuring: Chapter 5); and a **single E&S envelope** (Category-A discipline across every jurisdiction from alignment stage: Chapter 7).

EXHIBIT 22

The Aurus corridor delivery model: six stages, five gate disciplines

Stage-gated development framework for multi-user mineral corridors (capability instrument · no project data)



Source: Aurus corridor delivery model, a capability framework. Every gate discipline traces to the cited public record of Chapters 1–7; the framework itself contains no project or market data.

The six stages, gate by gate

Stage 1, corridor pre-feasibility, screens the demand case and the route families: whose tonnes, on what published forecasts, to which coast. Its gate output is a demand screen honest enough to survive Exhibit 19’s test, with floors and ranges underwritten as published. **Stage 2, system feasibility and ESIA**, runs the engineering and the environmental envelope together, to lender standard, as one program: bankable studies of the chain’s every element, and a single Category-A-grade E&S envelope across every jurisdiction, with multi-season baselines started before alignment freeze.

Stage 3, structuring and financing, writes the governance before the steel: tenure and access instruments, state participation, extension mechanics, then the financing stack, with sponsor commitment sequenced ahead of institutional financing. **Stage 4, construction**, is managed on the structural share: the bridges-and-tunnels fraction is where cost and schedule live, and the gate discipline is quantity-tracked cost control on structures rather than route-kilometre averages.

Stage 5, commissioning, tests the corridor as an integrated system, mine gate to ship’s hold under load, both operators where the system is multi-user. **Stage 6, ramp-up**, climbs the published staircase with buffer stocks doing the early work, holding the discipline that the slowest element sets the slope and that nameplate is a destination still to be earned.

Using the model: the readiness diagnostic

The companion diagnostic asks ten questions of any corridor program, at any stage. Scored honestly, it locates a program on the framework and names its next gate, which is all a stage-gate model is for.

EXHIBIT 23

Ten questions locate any corridor program on the model

Corridor-readiness diagnostic (framework instrument)

| # | DIAGNOSTIC QUESTION | DISCIPLINE |
|----|---|------------------|
| 1 | Is the demand case built on attributed, scenario-labelled forecasts, and underwritten as a range? | Demand honesty |
| 2 | Has the mine-rail-port chain been capacity-modelled as one system, element by element? | System capacity |
| 3 | Does the phasing plan state what is staged or deferred (marine works, branch lines) and what triggers each phase? | Phasing realism |
| 4 | Is the structural share of the alignment (bridges, tunnels) quantified and priced, not averaged? | System capacity |
| 5 | Are multi-user access terms, tariff governance and dispute mechanics written before financial close? | Governance first |
| 6 | Is state participation structured to align sovereign interest with throughput? | Governance first |
| 7 | Is expansion priced into tenure, as an extension obligation someone is contractually holding? | Governance first |
| 8 | Is there one E&S envelope across all jurisdictions, scoped to lender frameworks from alignment stage? | One E&S envelope |
| 9 | Are multi-season baselines and community engagement running ahead of alignment freeze? | One E&S envelope |
| 10 | Does the financing stack sequence sponsor commitment ahead of institutional financing? | Demand honesty |

Source: Aurus corridor-readiness diagnostic, a capability framework; contains no project or market data.

Two rules govern honest use of the diagnostic. First, it is scored on evidence, never on intention: a question earns its answer when the program can point to a document, an instrument or a measurement, never to a plan to produce one, which is the same standard this paper applies to its own sources. Second, a “no” is a finding, never a failure: the diagnostic’s purpose is to name the next gate’s work while the work is still cheap, and a program that scores itself honestly at four out of ten knows more, and will spend better, than one that scores itself at nine on optimism.

Who this model is for

Developers and owners use it as a program spine: the six stages sequence procurement, studies and structuring, and the diagnostic names the next gate. **Lenders and investors** use it as a diligence lens: the five disciplines are, in effect, the questions the corridor decade’s first financings answered in public. Both audiences inherit the same premise: the corridor is one system, and it is governed, financed and engineered as one system or not at all.

The model travels because it is anchored in the record rather than in any single project’s circumstances: a greenfield iron-ore system, a brownfield copper-route concession and a half-century-old counterfactual all answered the same five disciplines, well or badly, in public. The next corridor, whatever its commodity, coast or instrument, will answer them too. The only open question is whether it answers them early, at the gate, or expensively, in the field.

What this framework does not do

Three limits are stated so the instrument cannot be oversold. The framework carries no benchmarks: it does not say what a corridor should cost, how long a stage should take or what a structure register should price at, because numbers of that kind belong to studies rather than frameworks, and this paper invents none. It does not substitute for the study ladder: a gate answered “yes” on the diagnostic still needs its

bankable document behind it. And it does not rank corridors: two programs at different gates are at different gates, nothing more. What the framework does is narrower and more useful: it makes the state of a program legible to its own sponsors and lenders in one page, in a discipline vocabulary the record of this paper has already made concrete.

The practice behind the model

The framework is not academic. Aurus designed the preliminary-engineering (APS) program for an integrated mine-to-market logistics chain in Central Africa: mineral-port siting, railway alignment and high-voltage transmission routing structured as a single system, staged from field reconnaissance and multi-disciplinary site characterization through the global development scheme, structural sizing, execution drawings and cost estimates. That staging discipline (reconnaissance before characterization, characterization before scheme, scheme before sizing) is the same discipline the delivery model generalises.

The team behind it brings combined decades of experience in geology, geophysics, geochemistry, drilling, ESIA, scoping studies, PFS, DFS, NI43-101, JORC and AACE-class estimating: the study-ladder fluency that corridor bankability runs on.

Frameworks do not deliver corridors; disciplined programs do. A framework only tells you, gate by gate, whether yours is one.

The model, held against the record

Run the two case systems through the six stages and the framework's realism shows. Simandou's record reads as a textbook stage sequence: reserves categorised and graded to recognised conventions (Chapter 2), governance settled in an infrastructure joint venture before operations (Chapter 5), a structures-dominated construction program (Chapter 3), integrated commissioning with both consortia on the main line (Chapter 1), and a ramp buffered by stockpiles (Chapter 2). Lobito's record reads as the brownfield permutation: a rehabilitation inherited at stage 4, a concession written at stage 3 with expansion priced into tenure (Chapter 5), and institutional financing arriving against a named rail-and-port program (Chapter 6). Neither program will have followed any outside framework, and this model claims no influence on either; the claim runs the other way. The framework is a distillation of what the public record shows disciplined corridor programs doing, which is precisely why a new program can be held against it.

CHAPTER CLOSE · USING THIS PAPER

Taking the model to work

A corridor program can put this chapter to use in one afternoon: score the ten questions of Exhibit 23 on documents rather than intentions; name the next gate the scores point to; and list the evidence, study, instrument or baseline, that the gate requires. Then repeat at every gate, against the record as it thickens. The framework's promise is deliberately modest: it will not deliver the corridor, but it will keep the program telling itself the truth, gate by gate, which is the discipline the public record of Chapters 1 through 7 shows the first movers holding in common.

References

Citation policy of this series: every market or project statistic in this paper is transcribed from a cited public source and attributed by institution, publication and year, in the sentence, the exhibit source line or this list, and traces to an archived source in the paper’s evidence dossier. Forecasts carry their scenario and vintage labels as published. Statistics cited by the OECD from third parties are reported as “OECD (2025), citing [source, year]” and are not independently re-attributed. Ranges and qualifiers are preserved as published; no point figure is derived from a published range, and the few shares or sums computed from published totals are labelled as derived where they appear.

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16. Natural Earth: map base data for Exhibit 4 (public domain).
17. Republic of Guinea and Simfer S.A., Simandou BOT Convention (agreed English version of the Convention BOT executed 26 May 2014), Appendix 7, published by Rio Tinto (riotinto.com; archived capture).

Exhibit source index

Each exhibit’s primary sources, by reference number above. Framework exhibits (22, 23) are capability instruments and carry no data sources by design.

| EXHIBIT | SUBJECT | REFERENCES |
|---------|---|------------------|
| 1 | Corridor milestone timeline, 2023–2025 | 1, 2, 3, 5, 6, 9 |
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| 3 | Corridor-attributed financing figures | 3, 5, 6, 15 |
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| 11 | Transshipment configuration | 1, 2, 9 |
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| 21 | Linear-footprint parameters | 3, 15 |
| 22 | Aurus corridor delivery model | · (framework) |
| 23 | Corridor-readiness diagnostic | · (framework) |

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Archived captures. Every reference above marked “archived capture” is held as a saved page or document copy in the paper’s evidence dossier, together with the transcription of each figure in its exact published form and the review corrections applied to it. The dossier’s verification trail records the retrieval date of every artifact.

Exhibit conventions. Across all exhibits: gold marks the operating and financed case-study systems; grey marks context and counterfactual elements; outlined bars mark requirement estimates as against allocations or closed packages; dashed strokes mark open-ended floors, schematic context lines or region-aggregate elements; and every value derived rather than transcribed is labelled as derived at the point of use. Framework exhibits carry no data by design and say so in their source lines.

Corrections and re-verification. Figures that could not be re-verified against their archived artifact during review were withdrawn rather than repaired, and the withdrawals are recorded in the dossier. Dated operational facts, entry into service, ramp status, financing closes, carry their as-published dates; readers should treat those as snapshots at press time, not a maintained database.

Archived captures held with the evidence dossier

Retrieved and archived 8 July 2026 unless noted; Wayback Machine snapshots are used where a trade-press page has changed since first publication.

- Rio Tinto: Simandou start-of-operations release (2025); Simandou operations page (2026)
- Republic of Guinea / Simfer S.A.: Simandou BOT Convention, English version (2014), via riotinto.com
- U.S. International DFC: Lobito Atlantic Railway loan-signing release (2025)
- Trafigura: Lobito Atlantic Railway financing release (2025)
- OECD: Background Note, The Lobito Corridor (2025); Corridors, Trade and Local Development in Africa (2026), both as published PDFs
- International Railway Journal, via Wayback Machine: locomotive-order pieces of July 2024 and January 2025, and the first-arrival piece of 2025
- Wabtec: first-locomotive unveiling release (2025)
- Reuters, via Mining.com: Simandou stockpile report (October 2025)
- IEA, USGS and World Bank commodity outlooks (references 11 to 13): the reused market figures are archived in this series’ shared commodity dossier, cross-referenced from this paper’s dossier, rather than in this paper’s own source folder.

Method and evidence

Every figure in this paper was transcribed, archived and audited before it was typeset. This page records how, so that a reader, or a lender's technical adviser, can test the paper the way the paper tests corridors.

The evidence chain

Each statistic traces through three layers. First, a **source line** in the sentence or exhibit where it appears, naming institution, publication and year. Second, an entry in the paper's **evidence dossier**, which transcribes the figure in its exact published form, with the source's own wording preserved, and records every correction made during review. Third, an **archived artifact**: a saved capture of the source page or document, held with the dossier so the citation survives live-source changes. Sources outside the standing whitelist were admitted through a recorded extension protocol; trade-press figures render with explicit publisher attribution, never blended into Aurus analysis.

Derived values and sums, declared

This paper computes six values from published figures, and no others: three derived quantities and three qualitative sums of published counts, each labelled as derived, or phrased as a sum, where it appears.

| DERIVED VALUE OR SUM | COMPUTED FROM | WHERE USED |
|---|--|---|
| Structural share, about 16 per cent (bridges ~12%, tunnels ~4%) | Published bridge and tunnel totals over the published ~670 km route | Executive summary; Chapter 3; Exhibit 8 |
| Implied pre-uplift throughput, ~0.46 Mt | Published 4.6 Mt divided by the published ten-fold multiple | Exhibit 6, labelled as implied |
| Thirty-six days | Arithmetic between two cited dates, 11 November and 17 December 2025 | Executive summary; Chapter 1 |
| Three qualitative sums: some 107 structure-kilometres; 210 construction fronts; "well over a hundred units" | 79.2 + 27.6 km; 206 + 4; 78 + 65 locomotives, all as published | Executive summary; Exhibit 8; Chapter 3 |

Open parameters, named

Where the archived public record is silent, this paper states the silence rather than filling it. As of this edition the open set is: axle load, train length and ruling grade for the TransGuinéen system (Exhibit 10); berth and transshipment capacity for the Morebaya marine works; the length of the estimated Zambia greenfield link; the lender split within the US\$753 million Lobito package; and any all-in Simandou program cost. Track gauge, open in the prior draft, was closed for this edition by an archived primary capture of the published BOT Convention rather than by inference. IHHA-literature pulls are pre-registered to close the remaining engineering set in a future edition; none of these silences is bridged by estimation.

How to re-verify any figure in this paper

Four steps, no privileged access required: read the source line where the figure appears; find the institution, publication and year in the References; consult the archived capture named in the evidence dossier, or the shared commodity dossier the References point to for reused market figures; and compare. A difference the dossier does not record is a defect this series commits to correcting.

What this paper never does

No figure is remembered, averaged from undisclosed sources, or inferred from a map. Ranges, floors, qualifiers and scenario labels are preserved exactly as published. Client-derived data appears nowhere. Where review found a transcription that could not be re-verified against its artifact, the figure was withdrawn rather than repaired.

Glossary of corridor terms

The standards vocabulary used in this paper, stated precisely. Terms marked with a chapter number also appear as margin definitions at first use.

APS (AVANT-PROJET SOMMAIRE) · preliminary engineering design: the staged discipline running from reconnaissance and site characterization to a global development scheme, structural sizing, execution drawings and cost estimates. (Ch. 8)

AXLE LOAD · the weight transmitted to the track by one axle; the master variable of heavy-haul design, sizing structures, rail section and maintenance regime together. (Ch. 3)

BLENDED PACKAGE · financing combining more than one institutional lender or instrument class in a single close; internal splits publish only if the parties choose. (Ch. 6)

BROWNFIELD / GREENFIELD · work on an existing asset and right-of-way versus new-build on a new alignment; modern corridors stage combinations of both. (Ch. 2)

CATEGORY A · the Equator Principles / IFC classification for projects with potentially significant, diverse or irreversible environmental and social impacts. (Ch. 7)

CONCESSION · a time-bound grant to operate (and usually invest in) public infrastructure; the Lobito instrument, with extension mechanics conditional on construction. (Ch. 5)

CONSIST · the assembled set of locomotives and wagons run as one train; ruling grade fixes the motive power a loaded consist requires. (Ch. 3)

CORRIDOR · an integrated mineral-transport system (mine-gate handling, heavy-haul railway, port terminal and supporting infrastructure) planned and governed as one asset; per the OECD, hard infrastructure plus institutions plus services. (Exec. summary)

DEMURRAGE · compensation owed to a vessel's owner when loading exceeds agreed laytime; the invoice on marine cycle-time slippage. (Ch. 4)

DFI · development finance institution: the DFC, DBSA, AfDB and AFC class of lenders and allocators active on the Lobito corridor. (Ch. 6)

DWELL TIME · the time cargo or wagons spend stationary at a terminal, border or interchange; the corridor-scale measure customs and institutional reform acts on. (Ch. 4)

FREE-CARRIED INTEREST · state equity carried without cash contribution, as in the Government of Guinea's 15 per cent "free carry equity stake" in the CTG infrastructure company (Rio Tinto, Simandou operations page, 2026). (Ch. 5)

HEAVY-HAUL · railway practice optimised for very high axle loads and unit-train tonnage; reference body: the International Heavy Haul Association. (Ch. 3)

LAYTIME · the loading or discharge time a charter party allows a vessel; exceeding it triggers demurrage, the invoice on marine cycle-time slippage. (Ch. 4)

LCTTFA · the Lobito Corridor Transit Transport Facilitation Agency, established by the January 2023 Agency Agreement, headquartered in Angola and supported by SADC. (Ch. 5)

MITIGATION HIERARCHY · avoid, minimise, restore, offset; applied at alignment stage, where avoidance is still cheap. (Ch. 7)

MULTI-USER / OPEN ACCESS · infrastructure whose access terms admit more than one shipper on published, governed conditions. (Ch. 5)

NAMEPLATE CAPACITY · the design throughput of an asset at full, sustained operation; reached by ramp, never assumed at entry into service. (Ch. 2)

OWNER-OPERATOR · an infrastructure company that both holds the asset and runs it, the CTG structure through which anchor users co-own the bottleneck. (Ch. 5)

PGII · the G7 Partnership for Global Infrastructure and Investment, framework of the 2023 US corridor allocation through the Africa Finance Corporation. (Ch. 1)

PIPELINE FIGURE · an aggregate spanning allocations, estimates and closed transactions at different stages; read as a floor and a direction, never as committed capital. (Ch. 6)

RAMP-UP · the staged climb from first production to nameplate capacity; on a corridor, a system property in which the slowest element sets the slope. (Ch. 2)

RIGHT-OF-WAY · the legally secured land strip containing the alignment; on Lobito, 50 m each side urban and 100 m rural. (Ch. 7)

RULING GRADE · the steepest gradient on an alignment, which fixes the motive power a loaded consist requires; a coupling between civil and mechanical design. (Ch. 3)

STAGE GATE · a decision point at which a program must evidence defined outputs before capital for the next stage commits; the organising device of Chapter 8. (Ch. 8)

STEPS · the IEA's Stated Policies scenario: projection from policies in force rather than announced ambitions; one of the scenario labels this paper preserves as published. (Ch. 1)

TRANSSHIPMENT VESSEL (TSV) · a self-loading vessel that receives ore from barges inshore and loads ocean carriers at anchorage, substituting floating plant for fixed berth capital. (Ch. 4)

AURUS INSTITUTE FOR RESOURCE DEVELOPMENT

Mine to Ship: Engineering and Governing Africa's New Mineral Corridors

A Flagship Report in the Aurus white paper library, on the Build pillar. Prepared by the Aurus Technical Committee, July 2026.

Every market and project statistic in this paper traces to the cited public sources listed in the References; forecasts carry their institution, scenario and vintage as published; ranges are preserved as published. Nothing in this paper draws on client-derived data, and none of the cited figures is Aurus analysis.

Set in Fraunces (display), Source Serif 4 (text) and Inter (captions and data).

Imagery generated and art-directed in-house.

Map base data: Natural Earth (public domain).

Working draft 10: series template pilot; adversarial certification pending.

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