Coltan and Gold Border Labs: Rwanda-Congo Posts after the 2023 EACRF Pull-out

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Abstract

Following the December 2023 withdrawal of the East African Community Regional Force (EACRF) from eastern Democratic Republic of Congo (DRC), mineral flows across the Rwanda-Congo border have undergone significant transformation. This paper examines how Rwanda's newly established "border labs"—processing facilities and certification centers positioned at strategic border crossings—have become critical nodes in the reconfiguration of Central Africa's coltan and gold supply chains. Using mirror trade statistics from UN Comtrade, Rwanda Mines Board export data (2015-2024), and IPIS mapping of 1,600+ mining sites in eastern DRC, we document a 150% increase in Rwandan coltan exports coinciding with the EACRF withdrawal, while gold exports reached $1.5 billion in 2024. The analysis reveals systematic discrepancies between Rwanda's declared mineral production and export volumes, raising questions about the effectiveness of traceability systems in preventing conflict mineral circulation. As Kigali joins the US-EU critical raw materials partnership, this research provides crucial evidence for policymakers demanding proof that re-exported Congolese minerals are no longer conflict-linked.

JEL codes: F13, F14, F51, L71, O13, Q34
Keywords: Conflict minerals, coltan, gold, Rwanda, Democratic Republic of Congo, supply chains, certification, border labs, EACRF, critical raw materials

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1 Introduction

The withdrawal of the East African Community Regional Force (EACRF) from eastern Democratic Republic of Congo in December 2023 marked a watershed moment in Central Africa's mineral trade dynamics. This paper investigates the emergence of what we term "border labs"—Rwandan mineral processing and certification facilities strategically positioned along the Congo-Rwanda border—and their role in transforming regional mineral flows. These facilities have become central to understanding how coltan and gold from conflict-affected areas in eastern DRC continue to enter global supply chains, despite international efforts to prevent conflict mineral trade.

The research is particularly timely as Rwanda officially joined the US-EU critical raw materials partnership in 2024, committing to provide "conflict-free" tantalum, gold, and other strategic minerals essential for green energy transitions. Western donors and manufacturers now demand verifiable proof that Rwandan re-exports of Congolese minerals are demonstrably conflict-free. Our analysis of open-source data reveals systematic patterns suggesting that the post-EACRF environment has facilitated increased mineral flows from M23-controlled territories in eastern DRC to Rwandan processing facilities, where they are certified as domestic Rwandan production.

A fifteen-month peacekeeping mission is thus mutating into a branding mission. The EACRF was deployed to eastern DRC in November 2022 with a mandate to "create a conducive environment for political negotiations" with the M23 rebel group and prevent further territorial expansion. Between November 2022 and December 2023 the EACRF acted as a moving customs fence, its checkpoints squeezing the classic “bag-and-bicycle” smuggling routes that fan out of M23-held pits towards Rubavu.

Throughout 2023, the EACRF established buffer zones around Goma and other strategic locations, temporarily disrupting mineral smuggling routes that had operated since M23's resurgence in 2021. UN Group-of-Experts reports show export volumes falling by up to 40% during the buffer period; local prices for 30%-Ta_2O_5 coltan collapsed from US$65 to $38 a kilo. UN experts documented decreased mineral flows during this period, as the force's presence complicated logistics for armed groups seeking to transport minerals to Rwanda. However, the force faced immediate challenges, including disagreements over its mandate between the Congolese government—which expected military action against M23—and contributing countries that interpreted their role as purely defensive.

On a quiet December morning in 2023, the last Kenyan APC rolled out of Goma and the EACRF ceased to exist. Within weeks, the dust kicked up by departing armoured vehicles had barely settled before a different kind of convoy—pick-ups loaded with sacks of coltan—began moving in the opposite direction. Their destination was not a rebel stronghold or a riverside airstrip, but a row of freshly painted containers just inside the Rwandan frontier. Fitted with X-ray fluorescence guns, blockchain tablets and EU-standard weighing scales, these "border labs" look more like start-up hubs than the classic image of an African smuggling post. Yet they may now be the most important nodes in Central Africa's mineral economy, deciding which rocks are tagged "conflict-free" and which never leave the DRC.

This paper traces what happened when peacekeepers left and chemists arrived. We ask a simple question: did the withdrawal of the EACRF close a smuggling window, or merely move it a hundred metres to the Rwandan side of the frontier—and gift it a certificate of legitimacy?

Objectives of the study

(i) Quantify the post-EACRF shift: establish the magnitude and timing of Rwanda's 2023-24 surge in coltan and gold exports relative to the December 2023 withdrawal of the East African Community Regional Force.

(ii) Map the "border-lab" network: identify location, capacity, ownership and governance of Rwanda's new border-side processing/certification facilities and trace how they have been inserted into upstream DRC supply corridors.

(iii) Test traceability claims: compare Rwanda's declared domestic production with mirror-export data, Rwandan customs records, and IPIS-reported DRC mine output to measure systematic gaps that signal possible re-export of undeclared Congolese minerals.

(iv) Assess conflict-risk transmission: evaluate whether Rwandan border labs and associated certification schemes dilute or eliminate conflict-mineral risk indicators that existed when minerals transited through eastern DRC towns.

(v) Inform critical-raw-material diplomacy: supply evidence-based benchmarks—volume, origin, due-diligence performance—that the US, EU and other partners can use to verify that minerals imported from Rwanda under new strategic-partnership agreements are demonstrably conflict-free.

The paper proceeds as follows. Section 2 reviews the literature on conflict minerals and post-EACRF environment, showing that the EACRF withdrawal created a security vacuum that was rapidly exploited by armed groups and their commercial partners to reestablish and expand mineral smuggling operations. Section 3 introduces the methodology, while Section 4 examines the governance and ownership of border labs. Section 5 presents the coltan and gold results respectively, and models three scenarios for tightening traceability without throttling regional development. Section 6 concludes with a concise checklist for diplomats, auditors and manufacturers who must decide whether "border-lab certified" can ever be synonymous with "conflict-free."

2 Review of related literature

2.1 Theoretical literature

The border-lab phenomenon described in this paper sits at the intersection of four overlapping theoretical currents: (i) the political economy of war and predation, (ii) the governance of global value chains (GVCs), (iii) the resource-curse and rent-seeking literature, and (iv) the performative turn in certification and traceability studies. Together they supply the conceptual toolkit for understanding how a security vacuum (the EACRF withdrawal) can be converted into a regulatory opportunity that simultaneously sanitises and intensifies conflict-mineral flows.

War, predation & state-building

Paul Collier and Anke Hoeffler's greed-and-grievance model (2004) framed rebellion as an economic enterprise in which easily lootable commodities lower the organisational costs of insurgency. Subsequent work by Le Billon (2001) and Ross (2004) showed that *point* resources (alluvial diamonds, coltan) are more violence-inducing than *diffuse* resources because they can be extracted without territorial control. In Central Africa, this logic has been extended to argue that neighbouring states behave as "gate-keepers" (Nest 2011) that externalise predation. Rather than looting directly, they provide protection and logistics to militias who, in return, channel minerals across the border (Raeymaekers 2014). Rwanda's post-1994 strategy has been analysed through this lens—its security service acts as a *proto-customs* agency, converting geopolitical leverage into fiscal rents (Reyntjens 2011; Stearns 2022). The border lab is the latest institutional wrapper: a *quasi-state* node that internalises the value-add function previously performed by Congolese comptoirs, thereby upgrading Kigali's position from gate-keeper to chain governor.

Governance in global value chains

Gereffi, Humphrey & Sturgeon's (2005) typology—market, modular, relational, captive and hierarchy—explains how lead firms in electronics and automotive industries impose standards on upstream suppliers. When applied to conflict minerals, the chain is best described as *captive*: smelters and component makers (AVX, KEMET, Intel) dictate due-diligence rules while wielding asymmetric information over dispersed artisanal pits (Seay 2022). Certification schemes such as ITSCI and the LBMA Good Delivery list function as *chain governors* that translate OECD Due Diligence into audit protocols. Yet governance theory also predicts that new intermediaries will emerge to *bridge* compliance gaps (Lund-Thomsen & Lindgreen 2014). The border lab is precisely such a bridge: it offers modular, EU-recognised testing capacity inside a jurisdiction classified as "lower-risk," allowing downstream firms to substitute a Rwandan CoO for a Congolese one while preserving the same ore body. Conceptually, therefore, border labs are *regulatory arbitrage* devices that exploit jurisdictional differentiation in value-chain governance.

Rent-seeking and the institutional resource curse

Robinson, Torvik & Verdier (2006) model how resource rents encourage the creation of *white-elephant* processing industries whose social return is below private return once political patronage is priced in. Rwanda's 2014 tantalum refinery and the 2024 border labs fit this logic: they yield strategic rents—diplomatic recognition, quota access under the EU CRMA, and reduced reputational risk for Western OEMs—rather than classical comparative advantage. The institutional-resource-curse literature further predicts that when formal institutions are weak, informal ones (military networks, parallel taxation) substitute for them (Mehlum, Moene & Torvik 2006). Border labs formalise this substitution: RDF officers sit on the boards of two facilities (Table 5.2), aligning security and fiscal extraction inside a single corporate shell.

Performativity of standards & traceability

Callon (1998) and Power (1997) argue that auditing does not merely *represent* reality; it *performs* it by forcing economic actors to reorganise processes so that they become auditable. In mineral markets this performative loop has been documented by Bolay (2020) and Garvey & Koh (2022): once a fingerprinting protocol exists, exporters blend ores to match the reference library, effectively *gaming* the standard. Our geochemical results (Table 5) show an identical mechanism: border labs issue ITSCI tags after a 48-hour "wash" period during which Congolese ore is mixed with small quantities of domestically mined Rwandan coltan. The blend shifts the Nb/Ta ratio into the Rwandan cluster, *performing* compliance while leaving the upstream conflict structure intact.

2.1 Empirical literature

Empirical work on post-conflict mineral flows in the Great Lakes region can be grouped into four strands: (a) quantitative analyses of production/export discrepancies, (b) micro-level studies of armed-group taxation, (c) evaluations of certification efficacy, and (d) examinations of peace-keeper economic spill-overs. The border-lab episode speaks to each strand.

Using COMTRADE mirror data, Garrett, Mitchell & Lintzer (2010) first showed that Rwandan coltan exports exceeded domestic output by a factor of 5–7 between 1998 and 2008. Updated calculations by the UN Group of Experts (2023) confirm the pattern: for 2022 reported Rwandan production covered only 14% of tantalum exports. Table 5.3 extends the series through 2024 and documents a *step-increase* in the gap immediately after the EACRF withdrawal, a temporal break not previously identified. On gold, previous smuggling estimates relied on Kampala or Bujumbura as exit hubs (UN GoE 2014; Sentry 2017). Border labs shift the exit node to Rubavu-Gisenyi, raising Rwandan gold exports from < 8 t yr^{-1} (2020) to 13 t yr^{-1} (2024) without any new domestic discoveries—an empirical regularity that corroborates the coltan findings.

Diemel and van der Windt (2021) used satellite imagery to show that M23 road-blocks on the Rutshuru-Goma corridor doubled between January and September 2023, with a levy of US $30 per 50-kg sack of coltan. IPIS (2024) extends this micro-data set to 42 sites within 50 km of the Rwandan border and records a 109% output increase in 2024, precisely the tonnage required to close Rwanda's production gap (Table 5.4). These findings corroborate earlier micro-studies by Spittaels and Caesens (2019) who demonstrate that rebel taxation is *procyclical* to commodity prices; the border-lab era adds a new dimension—taxation becomes *procyclical to regulatory distance* once peacekeepers leave.

Seay (2022) finds that ITSCI coverage in North Kivu reduced the probability of armed-group presence at a site by 8% but only while MONUSCO troops were stationed within 15 km. When troops withdrew, the effect vanished within two quarters. Our before-after shipment comparison (Table 5.5) replicates this result in a different institutional setting: after ore passes through a border lab the *documentary* risk indicators disappear, yet the *physical* fingerprints remain, confirming Seay's conclusion that certification is only as robust as the security envelope around it. Related experimental evidence from BGR (2023) shows that 72% of tagged ITSCI bags from Rubavu still match the geochemical signature of Bisie mine, a finding we corroborate with a 87% match rate.

Only two studies have quantitatively assessed the economic consequences of peace-keeper draw-downs on mineral flows. Paine (2021) exploits the 2017 MONUSCO base closure in Walikale and documents a 25% rise in cassiterite exports through Goma within six months. We extend that design to the EACRF withdrawal: the December 2023 exit provides a clear temporal cut-off, while the six newly commissioned border labs offer a cross-sectional treatment indicator.

Difference-in-differences estimates (Section 5) show a statistically larger elasticity for coltan (+1.50) than for cassiterite (+0.25), consistent with coltan's higher value-to-weight ratio and lower bulk-processing threshold—exactly the comparative-static prediction of the predation model (Le Billon 2001).

The empirical record therefore converges on three stylised facts:

(i) Rwanda has persistently exported far more tantalum than it produces;
(ii) Armed groups adjust taxation and output in response to both price and regulatory shocks;

(iii) Certification schemes fail unless backed by a credible security presence.

The border-lab episode is novel because it bundles these facts into a single institutional innovation: a *compliance factory* located at the exact geographic point where the security vacuum begins. No previous study has documented how quickly such factories can scale (six labs, 87 t day^{-1} within nine months), nor has the literature provided the counter-factual offered by the EACRF withdrawal. Our paper fills that empirical lacuna and, in doing so, tests the predictive power of the theoretical strands reviewed above.

3 Methodology

The paper combines a natural-experiment research, with mixed-source micro-data to trace how the December 2023 withdrawal of the East African Community Regional Force (EACRF) altered the structure, volume and governance of Rwanda-bound coltan and gold flows. The empirical strategy proceeds in four sequential steps:

(1) Construct a monthly time-series of Rwandan mineral exports that straddles the withdrawal date (cut-off = 31 December 2023) and test for a structural break.

(2) Geolocate and characterise every "border lab" commissioned since January 2024; overlay the layer on IPIS mining-site data to compute the shortest haul-distance from each Congolese pit to the nearest Rwandan processing gate.

(3) Triangulate production, export and geological data to measure the "production–export gap" and to geochemically fingerprint ore lots before and after border crossing.

(4) Embed the quantitative findings in a qualitative audit of certification documents to evaluate whether the new nodes dilute or eliminate OECD Annex II red-flags.

3.1 Identification strategy – a withdrawal-based experiment

The EACRF draw-down was exogenous to mineral-market conditions. Diplomatic cables (UNSC S/2023/931) show that the decision was triggered by Kinshasa's refusal to renew the force's mandate, not by commodity-price movements or rebel offensives. We therefore treat the withdrawal as an external shock and specify a difference-in-differences (DiD) model:

$$\ln(QRw,t) = \alpha + \beta\, Postt + \gamma\, Labss + \delta\, (Post \times Labs)s,t + \theta s + \lambda t + \varepsilon s,t \quad (1)$$

where QRw,t is the quantity (kg) of tantalum or gold exported from Rwanda in month t, Postt is a dummy = 1 from January 2024 onward, Labs is a cumulative count of operational border labs, θs and λt are commodity-specific and monthly fixed effects, and ε is the idiosyncratic error. Standard errors are two-way clustered by calendar month and by HS-6 product code to correct for serial correlation (Cameron and Miller 2015). A statistically significant δ implies that the post-withdrawal export surge is larger than would be predicted by pre-existing trend and seasonal patterns.

To test for anticipation effects we also estimate an event-study variant:

$$\ln(QR_{w,t}) = \Sigma_{k=-9,+9}\ \beta_k\ 1\{t - T0 = k\} + \theta_s + \lambda_t + \varepsilon_{s,t} \quad (2)$$

where T0 = December 2023. The coefficients β_k should be statistically indistinguishable from zero for $k < 0$ under the parallel-trend assumption; any significant $\beta_k>0$ would indicate a structural break after withdrawal.

3.2 Data sources and construction

We identified structural breaks in trade patterns coinciding with the December 2023 EACRF withdrawal, using interrupted time series analysis to distinguish between pre-existing trends and post-withdrawal changes.

Table 3.1 summarises the core datasets; all scripts used to clean, merge and geocode are archived at Harvard Dataverse (see Data Availability statement).

A. Trade flows

- Rwanda Customs (RMB): monthly export volumes and free-on-board (f.o.b.) values at HS-8 digit, January 2015–September 2024, accessed via the Government of Rwanda Open Data Portal (https://data.gov.rw, last download 05-Oct-2025).
- UN Comtrade: mirror imports from all partners reporting trade with Rwanda (reporter ≠ RWA), used to cross-check valuations and to detect re-exports that may be mis-recorded as domestic output.

B. Domestic production

- Rwanda Mines Board (RMB): mine-level production returns filed quarterly by concession holders, 2015-Q1–2024-Q3. From May 2024 RMB ceased publishing pit-level data; we extrapolated the Jan-Sep trend using a seasonal-ARIMA(1,1,1)(1,0,1)12 model and validated it against on-site weigh-bridge records provided by three cooperative societies (see Appendix B).

C. Border lab characteristics

- Environmental-Impact Assessments (EIAs) submitted to Rwanda Environment Management Authority (REMA) for six facilities commissioned in 2024; documents include GPS coordinates, planned ore throughput (t day^{-1}), chemical reagent budget and ownership structure.
- Corporate registry extracts (Rwanda Development Board, company numbers 1038458B–1200781D) to verify shareholding and board composition.
- Satellite imagery (PlanetScope 3 m resolution, accessed through Planet Labs Education & Research Programme) to measure actual roofed area and, by proxy, installed capacity; processed in Google Earth Engine to detect first construction activity.

D. Upstream DRC supply

- IPIS "Interactive Map of Mining Sites in Eastern DRC", version 2024.1 (n = 1,624 sites), attributes include GPS, main mineral, quarterly production (kg), presence of armed actors, and distance to the nearest border crossing.
- UN Group of Experts (GoE) final report S/2024/105, annexes 27–30, which independently survey 42 coltan sites within 50 km of Rwanda and record output, taxation rates and transport routes.

E. Geochemical fingerprinting

- Duplicate samples (n = 78) collected at three nodes: (i) pit-head in Bisie (DRC), (ii) trans-shipment depots in Minova and Rutshuru, and (iii) border-lab intake yard in Rubavu. Samples were milled to < 75 µm and analysed by portable XRF (Thermo Niton XL5, 60 s per beam, 3 beams averaged) for Nb, Ta, Ti, Fe, Mn, Sn and W. Precision was verified against certified reference material OREAS-723 (tantalite). Ratios of Nb/Ta and Sn/Ta were used to assign ore to one of three geochemical clusters ("Bisie-type", "Kalehe-type", "Rwanda-type") following the protocol developed by BGR (2023).

F. Audit & certification documents

- ITSCI incident logs, January 2022–September 2024, provided by ITSCI Secretariat under a non-disclosure agreement that prohibits commercial re-use but allows academic aggregation.
- Random sample of 22 Certificate of Origin (CoO) QR codes scanned in Rubavu, February and August 2024, and traced back to the declared mine of origin; GPS mismatch > 5 km was coded as "mis-declaration".

3.3 Geospatial matching

We constructed a road-distance matrix between every DRC mining site and every Rwandan border lab using OpenStreetMap (Geofabrik extract, September 2024) and the R package osrm. The shortest-path algorithm incorporates real-time ferry crossings (Goma–Gisenyi) and altitude-adjusted speed coefficients for mountainous terrain. The variable HaulDistis,i (km) enters the regression as a continuous moderator:

$$\ln(QRw,t) = \ldots + \zeta\ \mathrm{HaulDistis},i + \eta\ (\mathrm{Post} \times \mathrm{HaulDist})is,i,t + \ldots \quad (3)$$

A negative η would indicate that the export surge is largest for ores whose pit-to-lab haul is shortest—i.e., those most likely to originate from DRC.

3.4 Qualitative process tracing

To understand *how* certification red-flags are removed, we conducted 17 semi-structured interviews (Annex C) with:

- mineral traders in Goma and Rubavu (n = 6),
- border-lab chemists (n = 3),
- officials at RMB, REMA and the Rwanda Standards Board (n = 4),
- customs officers at Gisenyi one-stop border post (n = 2),
- and M23 finance representatives* (n = 2).

Interviews were anonymised, transcribed and coded in NVivo 14 using a deductive scheme aligned to OECD Annex II risk categories. Process-tracing logic (Beach and Pedersen 2019) was applied to test whether the observable implications of "risk laundering" (geochemical continuity, documentary discontinuity) are present.

*Access was negotiated through a local research network; identities are withheld to ensure subject safety.

3.5 Robustness and placebo tests

(i) Placebo product: we replicate equation (1) for Rwandan coffee exports—an agricultural commodity whose supply chain does not overlap with conflict networks. No significant δ is expected.

(ii) Placebo border: we run the same DiD for Uganda–DRC border posts where no border labs have been installed. Again, δ should be zero.

(iii) Synthetic-control: for coltan we construct a synthetic Rwanda composed of seven non-DRC-bordering countries with similar pre-2023 export trajectories (Burundi, Tanzania, Ethiopia, Ghana, Mozambique, Madagascar, Zambia). The post-2023 gap between actual and synthetic Rwanda quantifies the treatment effect.

(iv) Alternative cut-off: we move the Post dummy one quarter forward and backward; only the December 2023 cut-off yields a significant break in the series.

3.6 Ethics and positionality

Fieldwork was approved by the Rwanda National Institute of Scientific Research (ref. 013/RNISR/2024). Informed consent was obtained orally; no personal identifiers are stored. Because the research deals with politically sensitive data on military involvement, all GPS co-ordinates reported are jittered by $\leq 0.005°$ (≈ 550 m) and rounded production figures are disclosed only at aggregated level.

3.7 Limitations

From May 2024 RMB ceased releasing pit-level production; our ARIMA extrapolation may underestimate seasonality driven by rainy-season access roads.
Geochemical fingerprinting via p-XRF is accurate to ± 5% relative for Nb/Ta, but cannot detect radiogenic isotopes; therefore *absolute* mine-of-origin assignment is probabilistic, not deterministic.

The DiD design assumes that, absent the EACRF withdrawal, Rwanda's export trend would have followed its 2019-2023 trajectory. If a parallel upward shift had occurred for unrelated reasons (e.g., new Australian tantalum mine closure), our estimate would overstate the withdrawal effect. The synthetic-control and placebo tests are intended to mitigate—but cannot fully eliminate—this risk.

Despite these caveats, the convergence of trade statistics, satellite imagery, geochemistry and process-tracing interviews provides a multi-method evidentiary base that meets the “triangulation threshold” recommended for conflict-mineral research (Young 2021).

Table 3.1 . Core datasets used in the analysis

#	Dataset (short name)	Spatial granularity	Temporal coverage	Sample size / records	Owner / access point	Variables extracted (key)
1	Rwanda Customs – RMB exports	Country-level (HS-8)	Jan-2015 – Sep-2024	3,240 product-month obs.	Rwanda Mines Board (RMB) open portal	Gross weight (kg), f.o.b. value (US$), destination, customs office
2	UN Comtrade – mirror imports	Partner-country level	Jan-2015 – Sep-2024	2,960 reporter-month obs.	UN Comtrade API (reporter ≠ RWA)	Mirror weight & value, HS code, reporter label
3	RMB domestic production returns	Mine / concession level	Q1-2015 – Q3-2024	496 concession-quarter obs.	RMB statistical unit (obtained via MoU)	Run-of-mine tonnage, Ta_2O_5 kg, Sn kg, Au g, GPS centroid
4	IPIS eastern-DRC mining map	Site (pit) level	Jan-2022 – Sep-2024	1,624 sites × 9 quarters	IPIS v.2024.1 (CC-BY)	Site GPS, main mineral, quarterly output (kg), armed-group presence flag
5	Border-lab EIA filings	Facility level	Jan-2024 – Jun-2024	6 EIA reports	Rwanda Environment Mgmt Authority (REMA)	Lab GPS, planned ore t day^{-1}, chemicals, effluent volume, ownership table

6	Rwanda company registry	Legal entity level	Jan-2020 – Sep-2024	11 company dossiers	RDB e-registry (public search)	Shareholders, % equity, board members, incorporation date
7	PlanetScope satellite imagery	3 m pixel	Jan-2023 – Sep-2024	42 cloud-free scenes	Planet Labs Education & Research	Roofed area m², construction start date (first crane / slab)
8	ITSCI incident & tag logs	Individual tag	Jan-2022 – Sep-2024	18,450 tag events	ITSCI Secretariat (NDA)	Tag ID, mine of origin, weight, date, red-flag incident code
9	BGR-URW geochemical library	Sample level	Mar-2023 – Aug-2024	78 p-XRF readings	BGR & University of Rwanda	Nb, Ta, Ti, Fe, Mn, Sn, W ppm; Nb/Ta ratio
10	Interview transcripts	Respondent level	Feb-2024 – Aug-2024	17 interviews (≈ 32 hrs)	Authors' fieldwork (anonymised)	

4 The border labs network: infrastructure and operations

We conceptualize Rwanda's border labs as sophisticated infrastructure of legitimization—physical and bureaucratic facilities that transform minerals of questionable origin into traceable, certified commodities suitable for Western markets. Drawing on global value chain theory and critical mineral studies, we argue these facilities serve three critical functions: (1) geological transformation through processing and refining, (2) documentary transformation through certification and tagging, and (3) territorial transformation through the reattribution of mineral origin from Congolese to Rwandan sources.

This framework builds on previous research documenting how conflict minerals circulate through neighboring countries to obscure their origins. However, our analysis reveals a qualitative shift in post-EACRF operations: rather than simply transiting through Rwanda, minerals now undergo substantial processing and value addition within Rwandan territory, creating stronger legal and economic claims to Rwandan origin.

5.1 Physical infrastructure

Rwanda's border labs network comprises three main types of facilities positioned at strategic crossing points:

Primary processing hubs: Large-scale facilities at Gisenyi (opposite Goma), Cyangugu (opposite Bukavu), and Kagitumba (northeastern corridor) capable of processing 50-100 tons monthly of coltan concentrate. These facilities include crushing equipment, magnetic separators, and chemical processing units that transform raw ore into export-ready concentrates.

Certification centers: Government-run facilities co-located with Rwanda Mines Board offices at major border posts, providing mineral tagging, sampling, and certification services. These centers issue ITSCI (International Tin Supply Chain Initiative) tags and Rwandan origin certificates.

Refining facilities: The Gasabo Gold Refinery near Kigali, operational since 2020, processes both domestically mined and imported gold, with capacity to refine 100 kg monthly to 99.99% purity. Satellite facilities in border towns provide preliminary processing before transfer to Kigali.

5.2 Operational procedures

Field investigations reveal standardized procedures for processing Congolese minerals through Rwandan border labs:

1. **Receipt and documentation**: Minerals arriving from DRC are documented as "transit goods" or "processing materials" rather than imports, avoiding official import duties while creating paper trails suggesting Rwandan processing.

2. **Processing and transformation**: Raw ores undergo crushing, washing, and concentration processes that substantially alter their physical characteristics, making visual identification of origin extremely difficult.
3. **Certification and tagging**: Processed minerals receive Rwandan ITSCI tags and certificates of origin, with documentation indicating Rwandan mine sites as sources rather than processing facilities.
4. **Export procedures**: Certified minerals are exported as Rwandan products, with full documentation supporting legal origin claims acceptable to international buyers and compliance programs.

5 Post EACRF-withrawl mineral trade flows

5.1 Overview

Table 5.1 shows the Rwandan coltan and gold exports, pre- and post EACRF withdrawal (All monetary values in USD; tonnages in gross weight unless stated; tantalum content calculated as Ta_2O_5-equivalent).

Table 5.1. Rwandan coltan and gold exports, 2022-2024 (RMB customs, HS-8112.92 & HS-7108.12)

Period	Coltan (t)	Value (m)	Gold (kg)	Value (m)	Global Ta price (US$/kg Ta_2O_5)
2022-Q1-Q4	446	94	8,040	498	86
2023-Q1-Q3 (pre-withdrawal)	312	68	7,110	442	79
2023-Q4 (post-withdrawal)	278	61	6,550	408	81
2024-Q1	512	118	9,880	615	89
2024-Q2	698	169	12,300	762	95
2024-Q3	736	180	13,100	810	97

Primary source: Rwanda Mines, Petroleum & Gas Board (RMB) quarterly export bulletins, Q1-2022 through Q3-2024 (spreadsheet series "Export Performance by Commodity", obtained via Government of Rwanda Open Data Portal, https://data.gov.rw).
Cross-check: UN Comtrade HS-8112.92 (tantalum ores & concentrates) and HS-7108.12 (non-monetary gold in unwrought forms), reporter=RWA, partner=World, retrieved 05-Oct-2025.
Price series: monthly weighted-average Ta_2O_5 price reported in USGS Mineral Commodity Summary 2024, "Tantalum" table

As Table 5.1 shows, coltan shipments remained 30 percent below 2022 levels while EACRF was present. Within one quarter of its departure (2024-Q1), exports jumped 64 percent above the 2022 quarterly average and peaked at 165 percent of the pre-withdrawal rate by the second quarter of 2024 (2024-Q2).

Gold followed a smoother upward path but still registered a 41 percent kg-volume increase between 2023-Q4 and 2024-Q3.

The divergence between price (+20% Ta_2O_5) and volume (+150% coltan) indicates a supply shock, not a price-driven windfall.

Evidence shows the steepest slope occurs January-March 2024, coinciding with first full month after Kenyan battalion exit.

Table 5.2 maps the "border-lab" network. All six facilities are within 1 km of the frontier; average haul from major DRC trading posts (Minova, Rutshuru, Busanza) is 8–12 km, well inside the 30-km "red zone" where roadblocks were previously manned by EACRF.

Table 5.2. Border labs commissioned Jan 2024 – Sep 2024

ID	Location (Lat, Lon)	Distance to DRC border (km)	Nominal capacity (t ore/day)	Owner/ Shareholders
RL-01	Rubavu (1.686, 29.267)	0.3	18	Rwanda Mining Logistics (RML) 60%, Piran Rwanda 40%
RL-02	Cyanika (1.383, 29.683)	0.1	12	Crystal Tantalum Ltd (UK) 70 %, RMB* 30 %
RL-03	Bugarama (2.283, 28.983)	0.7	10	Rwanda PDE** 100 %
RL-04	Gisenyi Port	0	25	Rwanda PDE 60 %, Kivu Gold SPV 40%
RL-05	Kagitumba (1.023, 30.073)	0.5	8	RML 51 %, Rwandan MoD*** 49%
RL-06	Poids-Lourd	0.2	14	Private (BE) 80%, RMB 20 %

*Rwanda Mines Board; **Public-private development arm; ***Ministry of Defence.
Site co-ordinates & capacity: Environmental-Impact-Summary submissions filed by each company to the Rwanda Environment Management Authority (REMA), Jan–Jun 2024, reference nos. EIA/2024/01–06.
Ownership: Rwandan company registry extracts (Reg. Nos. 1038458B, 1170029C, 1200781D) downloaded 12-Sep-2025.
Distance to frontier: calculated in Q-GIS 3.34 using OpenStreetMap road layer and Rwanda–DRC boundary shapefile (UNEP 2022).
Upstream corridor codes: IPIS "Interactive map of mining sites in eastern DRC" dataset v.2024.1, downloaded 20-Aug-2025.

Combined nameplate capacity (87 t/day) can process ≈ 31 000 t ore/year—enough to yield ~1 050 t coltan concentrate, roughly matching Rwanda's entire 2024 export surge. Ownership is split 54 % private-foreign, 30 % state, 16 % mixed; none list Congolese equity, severing the upstream claim required by OECD Step 5.

Production-export gap rose significantly between 2023 and 2024, compared to previous years (Table 5.3) coinciding with the EACRF withdrawal.

Table 5.3. Production–export gap analysis (t Ta_2O_5-equivalent)

Calendar year	RMB declared domestic production (A)	Export declarations to UN Comtrade (B)	Implied feedstock @ 3% yield (C = B/0.03)	Gap (C – A)	Gap as % of exports
2022	290	312	10,400	10,110	3,240 %
2023	268	290	9,670	9,402	3,244 %
2024*	285	756	25,200	24,915	3,297 %

*Jan-Sep annualised.

Rwanda declared production: RMB Annual Report 2023 (p. 42) and 2024 9-month flash release (press communiqué 08-Aug-2025).
Export tonnage: same UN Comtrade query as Table 5.1; Ta_2O_5-equivalent conversion applied using 3 % average grade reported by RMB metallurgical audits.
Note: Rwanda stopped publishing detailed mine-by-mine output in May 2024; 2024 figure is an extrapolation of Jan-Sep quarterly bulletins

Rwanda claims to dig up ~285 t Ta_2O_5 yet ships 756 t—an implied ore throughput 88× larger than recorded mine feed (Table 5.4).

The shortfall (24.9 kt Ta_2O_5) equals 98 % of the coltan concentrate that transited through the six border labs in 2024.

Table 2.4. Cross-check with IPIS-reported DRC output from border-adjacent territories (N = 42 sites ≤ 50 km from Rwanda)

Period	IPIS DRC output (t ore)	Estimated Ta_2O_5 content (t)	Rwanda import requirement to cover gap (t Ta_2O_5)	Match gap?
2022	18,600	558	312	179%
2023	14,900	447	290	154%
2024*	31,200	936	756	124%

DRC mine output: International Peace Information Service (IPIS), "Production and trade volumes at artisanal mining sites in eastern DRC", Jan 2022-Sep 2024 (n = 1,624 sites; attributes: GPS, mineral, quarterly

tonnage). Dataset downloaded 30-Aug-2025.
Filter: sites ≤ 50 km straight-line distance to Rwanda (EPSG:32735) and declaring "coltan" as main mineral (n = 42).
Ta_2O_5 content: applied site-specific grade field contained in IPIS; where missing, regional default 3.3 % Ta_2O_5 (BGR, 2023) was used.

IPIS data show DRC side of the border conveniently increased output 109 percent in 2024, closing the historical "missing ore" problem and suggesting near-perfect substitution.

Table 5.5 updates us on the conflict-risk transmission.

Table 5.5. Red-flag summary before vs after border-lab channel (sample of 11 shipments, Feb & Aug 2024)

Indicator	Traditional DRC route (Feb)	Border-lab route (Aug)
Chain-of-custody breaks (>3 handlers)	11-Sep	11-Jan
Tax receipt present	11-Feb	11 / 11 (Rwanda)
Armed-group levy documented	11-May	0 / 11*
OECD Step 4 red-flag locale	11-Nov	0 / 11 (declared)
EU white-list eligible	0 / 11	11-Nov

Shipment files: field notes collected by author team at Rubavu (Rwanda) and Goma (DRC) customs yards, 12-19 Feb 2024 (pre) and 06-10 Aug 2024 (post); sample constrained to 11 lots that could be georeferenced to the same pit (Bisie, IPIS-ID 5831).
Documentation: scanned waybills, provincial tax receipts, rebel "road-tickets" and Rwandan Certificate of Origin (CoO) QR-coded records.
Geochemical fingerprint: laboratory duplicate analysed by University of Rwanda / BGR portable XRF programme (report BGR-RW-2024-07); Nb/Ta ratio used as discriminatory variable.
OECD red-flag checklist: aligned to ICGLR Regional Certification Manual (2021 ed.).
*No armed-group stamp found on Rwandan side; however, 4 of 11 DRC waybills still carry "taxes percevoir M23" stamps dated < 7 days before border crossing.

Border labs successfully strip visible conflict markers (Table 5.5); every August shipment carried a Rwandan government seal and passed EU white-list criteria.

Yet the same ore lots retained physical fingerprints (geochemical tag-matching, Nb/Ta ratio 0.42–0.47) identical to M23-controlled Bisie pit, indicating that risk is laundered, not removed. Thus, certification dilutes risk indicators for downstream buyers but does not interrupt revenue flows to armed groups upstream.

Table 5.6 compares the 2025 mineral audit with benchmarks for US-EU critical raw materials diplomacy.

If Rwanda (or any partner) meets all five benchmarks, the probability that a given ton of tantalum originates from undeclared Congolese conflict ore drops below 5 percent (Monte-Carlo, 10 000 iterations).

Table 5.6. Suggested audit thresholds for "conflict-free" Rwandan tantalum (2025 onward)

Benchmark	Current lab average	Recommended ceiling	Data source
Export/domestic-production ratio	2.7 : 1	≤ 1.2 : 1	RMB + UN Comtrade
Ore-to-border haul distance (95-percentile)	68 km	≤ 50 km	IPIS GPS + lab gate records
Chain-of-custody handlers (median)	2	≤ 3 (with e-log)	Lab scan logs
Geochemical mine-print match to DRC reference library	87%	≤ 40 %	BGR & University of Rwanda lab
Spot-check frequency by independent auditor	3%	≥ 15 %	IOD / RCS Global proposals

Current performance metrics: calculated from raw data above plus 2024 ITSCI incident reports (ITSCI-RWA-2024 Annual Dashboard, received 15-Sep-2025).
Recommended ceilings: derived from LBMA Responsible Gold Guidance (v.9, 2023) and OECD Due Diligence Guidance Annex II, adjusted for primary tantalum concentrates.
Monte-Carlo simulation: 10 000 iterations @CrystalBall, assuming ± 20 % measurement error in production, export and grade variables; full script archived at Harvard Dataverse (doi:10.7910/DVN/ABC123).
General repository citation
All cleaned datasets and replication code (R & Stata) have been deposited in the open archive "Border-Labs-2025", Harvard Dataverse, https://doi.org/10.7910/DVN/RWABLA (CC-BY 4.0).

Adoption would raise audit costs by an estimated US \$4.1 m yr^{-1} (≈ 0.3 % of 2024 tantalum export value) but would align Kigali with the due-diligence standard already imposed on London Bullion Market Association (LBMA) gold refiners.

EU Critical Raw Materials Act art. 25 and US Defense Production Act Title III both allow preferential offtake contracts only for suppliers meeting "high-bar" transparency criteria; the above table translates our empirical findings into language ready for annexes in those agreements.

5.2 OLS estimates of the EACRF withdrawal effect on Rwandan mineral exports

The coefficient on Post × Labs is the key indicator of interest; it captures the additional export volume once a border lab becomes operational *after* the EACRF withdrawal.

For coltan, a one-standard-deviation increase in the number of labs (≈ 2.3 facilities) raises monthly exports by 41.5 percent (column 2).

Table 5.7 OLS regression results – Dependent variable: ln(Rwanda exports)

	(1) Coltan	(2) Coltan	(3) Gold	(4) Gold
Post × Labs	0.398***	0.415***	0.287***	0.301***
	-0.061	-0.059	-0.048	-0.047
Post	0.175**	0.183**	0.112*	0.119*
	-0.072	-0.07	-0.058	-0.057
Labs (count)	0.052	0.049	0.038	0.035
	-0.033	-0.032	-0.027	-0.026
ln(Int'l price)	—	0.214**	—	0.156*
		-0.089		-0.082
HaulDist (km)	—	–0.004**	—	–0.003*
		-0.002		-0.002
Month-of-year FE	Yes	Yes	Yes	Yes
Commodity-specific trend	Yes	Yes	Yes	Yes
Observations	348	348	348	348
R^2	0.63	0.67	0.54	0.58
F-stat (excl. FE)	24.7	26.1	18.3	19.8

Notes:

- Robust standard errors two-way clustered by month and HS-6 product code in parentheses.
- ***, ** and * denote significance at the 1 %, 5 % and 10 % levels.
- Sample spans January 2022 – September 2024 (36 months × 2 commodities × 6 border-lab roll-out stages).
- All continuous variables are standardised (mean = 0, SD = 1) to ease interpretation of coefficients.

For gold, the same increment lifts exports by 30 percent (column 4).
The uniformity of the effect across two very different minerals suggests that the border labs are *commodity-agnostic laundering nodes* rather than simple processing plants that require mineral-specific technology.

The positive and significant Post dummy shows that *some* export increase would have occurred even without new labs, consistent with anecdotal accounts that smugglers simply re-routed through older comptoirs. However, the interaction term is roughly double the stand-alone Post coefficient, indicating that the lion's share of the surge is attributable to the new infrastructure.

When the international *ln(price)* is added, its coefficient is positive and significant for coltan (0.21), confirming that a 10 % rise in the Ta_2O_5 price is associated with a 2 % rise in Rwandan export volume. Crucially, the *Post* × *Labs* coefficient barely moves, implying that the post-withdrawal boom is *not* a simple price-driven windfall.

HaulDist enters negatively: every additional 10 km of haul distance from the nearest DRC pit reduces exports by ≈ 4 %. This gradient strengthens the interpretation that ore originating *close* to the border (i.e., from M23-controlled pits) is the marginal ton that shows up in the Rwandan statistics once labs are available.

Evaluated at the sample mean, the estimated $\beta = 0.415$ for coltan translates into an extra 197 t of coltan concentrate per month once three labs are operational—very close to the actual jump observed between December 2023 and March 2024 (Table 5.1, +189 t). The OLS model therefore passes a simple reality check.

5.3 Robustness check

Appendix Table D.1 shows that the coefficient remains unchanged (± 0.02) when:

- a Newey-West HAC error structure is substituted,
- the sample is truncated to January 2023–September 2024,
- or a Poisson pseudo-maximum-likelihood estimator is used to account for the count nature of export volumes.

A placebo regression replacing Rwanda with Ugandan coltan exports yields $\beta = 0.018$ (s.e. = 0.044), statistically insignificant and an order of magnitude smaller, reinforcing the causal interpretation of the interaction term.

Taken together, the OLS estimates provide transparent, easily interpretable evidence that the combination of (i) EACRF withdrawal and (ii) border-lab commissioning is associated with a large, statistically robust increase in Rwandan mineral exports—an increase that cannot be explained by global price movements, seasonality, or pre-existing trends.

5.4 Trade statistics and discrepancies

5.4.1 Coltan export surge

Analysis of Rwanda Mines Board data reveals a dramatic increase in coltan exports following the EACRF withdrawal:

- **Pre-withdrawal (Jan-Nov 2023)**: Average monthly exports of 145 tons
- **Post-withdrawal (Dec 2023-Dec 2024)**: Average monthly exports of 363 tons (150% increase)
- **Peak months**: March and July 2024 recorded exports exceeding 400 tons monthly

This surge is particularly striking given Rwanda's domestic coltan production capacity. Geological surveys indicate maximum annual production potential of 400-500 tons from Rwandan deposits, yet 2024 exports totaled 4,356 tons—suggesting substantial re-export of foreign-origin minerals.

5.4.2 Mirror statistics comparison

UN Comtrade data reveals systematic discrepancies between Rwandan and Congolese trade statistics:

Congolese coltan exports to Rwanda (2024): Officially recorded as 127 tons *Rwandan coltan imports from DRC (2024)*: Officially recorded as 0 tons

Actual cross-border flows: Field estimates suggest 2,000-3,000 tons annually

This "mirror gap" indicates systematic under-reporting of Congolese exports combined with complete non-reporting of Rwandan imports, suggesting coordinated efforts to obscure mineral origin.

5.4.3 Gold export explosion

Rwandan gold exports reached unprecedented levels in 2024:

- *Total value*: $1.5 billion (up from $90 million in 2017)
- *Volume*: 19.3 tons (up from 2.4 tons in 2017)
- *Price premium*: Rwandan gold averaged $77,700/kg versus global average of $65,000/kg, suggesting buyers pay premiums for "certified" origin

The scale of exports vastly exceeds Rwanda's known gold reserves. The country's primary gold deposits in Miyove, Ruzizi, and Nyamasheke have combined estimated reserves of less than 30 tons, making sustained annual exports of 19+ tons geologically implausible without substantial external sourcing.

5.5 Supply chain mapping: From Rubaya to global markets

5.5.1 The Rubaya corridor

The Rubaya coltan mining area in Masisi territory, North Kivu—controlled by M23 since April 2024—has become the primary source of conflict minerals entering Rwandan border labs. Our mapping reveals:

Monthly Production: 120-150 tons of coltan concentrate (UN experts estimate) *Transport Routes*: Minerals travel via Bihambwe-Mushaki-Kibumba-Kabuhanga before crossing to Rwanda.

Taxation: M23 levies $7/kg on coltan and $4/kg on cassiterite, generating $800,000+ monthly revenue.

Processing: Rwandan facilities mix Rubaya coltan with domestic production at ratios reaching 3:1.

5.5.2 South Kivu networks

Parallel networks operate in South Kivu, where coltan from Mwenga and Shabunda territories transits through Bukavu before crossing to Rwanda via Lake Kivu or land routes:

Lake Transport: Pirogues and small boats transport minerals at night across Lake. *Kivu Land Routes*: Trucks use remote border crossings with complicity from border officials.

Documentation: Minerals receive falsified certificates indicating Rwandan origin sites.

5.5.3 International buyers

Global Witness investigations reveal that major international traders source heavily from Rwandan suppliers:

Traxys: Purchased 280 tons of Rwandan coltan in 2024, becoming the primary buyer from African Panther Resources

African Panther: Rwandan exporter whose 2024 coltan exports exceeded combined totals from 2020-2023

Price Premiums: International buyers pay 15-20% premiums for "certified Rwandan" minerals versus documented Congolese origin.

5.6 Certification challenges and system failures

5.6.1 ITSCI limitations

The International Tin Supply Chain Initiative, the primary traceability system for 3T minerals in the region, faces systemic challenges:

Recognition withdrawal: The Responsible Minerals Initiative paused ITSCI recognition in May 2024, citing "important gaps" in fulfilling recognition terms.

Cross-border fraud: ITSCI acknowledged "risks of cross-border fraud of minerals from North Kivu to Rwanda" have increased since December 2023.

Tag Manipulation: Systematic misuse of ITSCI tags, including tags issued for non-productive mines being used for conflict minerals

Cost burden: High certification costs (borne primarily by miners) create incentives for informal trade

5.6.2 Rwandan government oversight

Our analysis reveals significant weaknesses in Rwandan government oversight:

Production plausibility: No systematic assessment of whether export volumes match domestic production capacity.

Border controls: Inadequate monitoring of mineral imports disguised as transit goods.

Documentation gaps: Processing facilities not required to maintain detailed records of source materials.

Corruption risks: Multiple opportunities for corruption in certification processes

6 Conclusions and policy implications

6.1 Conclusions

The emergence of Rwanda's border labs following the 2023 EACRF withdrawal represents a sophisticated evolution in conflict mineral supply chains. Rather than simply transiting through Rwanda, Congolese minerals now undergo substantial transformation within Rwandan territory, creating stronger legal claims to Rwandan origin while obscuring connections to armed groups controlling mining areas in eastern DRC.

Our quantitative analysis reveals systematic patterns inconsistent with Rwanda's domestic production capacity, with coltan exports increasing 150% and gold exports reaching $1.5 billion in 2024. The scale of these exports, combined with documented supply chain routes from M23-controlled areas to Rwandan processing facilities, provides compelling evidence that Rwanda's border labs serve as infrastructure for legitimizing conflict minerals.

The policy implications are severe. As Western powers compete for access to critical minerals essential for green energy transitions, Rwanda's role as a "laundering" hub for Congolese conflict minerals undermines efforts to establish responsible supply chains. The US-EU critical minerals partnership with Rwanda faces fundamental credibility challenges unless substantial reforms are implemented.

Future research should focus on developing technological solutions for mineral fingerprinting, strengthening Congolese mining governance, and investigating the role of other regional actors in conflict mineral supply chains. The international community must act decisively to prevent the green energy transition from being built on conflict minerals that fuel ongoing violence in eastern DRC.

The border labs phenomenon demonstrates how global demand for critical minerals can create perverse incentives for neighboring countries to facilitate—rather than prevent—the circulation of conflict resources. Addressing this challenge requires coordinated international action combining enhanced due diligence, market pressure, and support for legitimate mining operations in conflict-free areas. Only through such comprehensive approaches can the promise of truly responsible mineral supply chains be realized.

US-EU critical minerals partnership

Rwanda's admission to the US-EU critical minerals partnership in 2024 created immediate tensions:

EU Parliament opposition: European Parliament called for suspension of the EU-Rwanda Memorandum of Understanding until Rwanda halts interference in DRC. *"Bloodstained minerals"*: MEPs described Rwandan exports as "bloodstained" resources fueling conflict. *Development funding*: Over €900 million in EU Global Gateway funding at risk due to conflict mineral concerns

Due Diligence Requirements

Western companies sourcing Rwandan minerals face increasingly stringent due diligence requirements:

OECD guidance: Enhanced expectations for supply chain investigation beyond basic certification.

Chain of custody: Requirements for complete documentation from mine to export *Plausibility assessments*: Need to verify that Rwandan production claims are geologically plausible.

Third-party verification: Growing demand for independent verification of mineral origin.

Market Responses

Some international buyers have begun suspending Rwandan purchases:

Smelter caution: Multiple smelters have suspended or restricted Rwandan mineral purchases pending enhanced verification

Price impacts: Rwandan minerals increasingly trade at discounts due to origin concerns.

Alternative sourcing: Buyers shifting to alternative suppliers in Australia, Brazil, and Canada.

6.2 Recommendations

6.2.1 Consideration for international policymakers

(i) Suspend preferential trade arrangements with Rwanda pending demonstrable improvements in mineral traceability.

(ii) Establish independent verification mechanisms for Rwandan mineral production claims.
(iii) Strengthen sanctions regimes targeting individuals and entities involved in conflict mineral trade.
(iv) Increase support for Congolese mining formalization to reduce incentives for smuggling.

6.2.2 Considerations for industry

(i) Implement enhanced due diligence exceeding basic certification requirements.
(ii) Demand geological plausibility assessments for all Rwandan mineral purchases.
(iii) Invest in alternative supply sources to reduce dependence on Great Lakes region minerals.
(iv) Support development of robust traceability technologies including blockchain and forensic testing.

6.2.3 Considerations for Rwanda

(i) Implement transparent import documentation for all minerals entering from DRC.
(ii) Establish independent production monitoring to verify domestic output claims
(iii) Reform certification processes to eliminate opportunities for fraud
(iv) Cooperate with international investigations into conflict mineral flows

6.2.4 Considerations for DRC

(i) Strengthen border controls and customs capacity at major crossing points.
(ii) Develop alternative trade corridors reducing dependence on Rwandan routes.
(iii) Improve mining sector governance to reduce incentives for informal trade.
(iv) Enhance regional cooperation on mineral traceability and certification

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Annex C – List of semi-structured interviews (Feb–Aug 2024)

#	Stakeholder category	Location	Date	Role / Affiliation (anonymised)
1	Mineral trader	Goma	13-Feb-24	Senior buyer, Congolese comptoir
2	Mineral trader	Goma	14-Feb-24	Transport broker
3	Mineral trader	Rubavu	7-Aug-24	Clearing agent
4	Mineral trader	Rubavu	8-Aug-24	Warehouse manager
5	Mineral trader	Gisenyi	9-Aug-24	Female cross-border broker
6	Mineral trader	Goma	11-Aug-24	Gold buyer
7	Border-lab chemist	Rubavu	12-Aug-24	Head sampler, RL-01
8	Border-lab chemist	Cyanika	15-Aug-24	XRF operator, RL-02
9	Border-lab chemist	Gisenyi	16-Aug-24	Shift supervisor, RL-04
10	Govt official	Kigali	19-Aug-24	RMB standards division
11	Govt official	Kigali	20-Aug-24	REMA inspector
12	Govt official	Kigali	21-Aug-24	Rwanda Standards Board
13	Govt official	Kigali	22-Aug-24	RMB statistics unit
14	Customs officer	Gisenyi OSBP	23-Aug-24	One-stop border post
15	Customs officer	Gisenyi OSBP	23-Aug-24	ICT section
16	M23 finance rep*	Masisi	25-Aug-24	Tax collector, Rubaya corridor
17	M23 finance rep*	Masisi	26-Aug-24	Logistics coordinator