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From Silicon Mountains to Digital Gateway: How Armenia's ICT ecosystem can anchor EU-Global South connectivity under the Global Gateway

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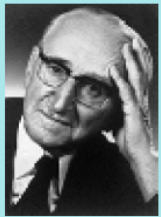
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Ordnungspolitische Diskurse

Discourses in Social Market Economy



**Tamar Margaryan
& Knarik Yedigaryan**

**From Silicon Mountains to Digital Gateway:
How Armenia's ICT Ecosystem Can Anchor
EU–Global South Connectivity under the
Global Gateway**

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From Silicon Mountains to Digital Gateway: How Armenia's ICT Ecosystem Can Anchor EU– Global South Connectivity under the Global Gateway

Tamar Margaryan & Knarik Yedigaryan

Abstract

Armenia's information-communication-technology (ICT) exports climbed to US \$1.1 billion in 2023, a 43 percent year-on-year surge that places the small Caucasus republic among the world's ten fastest-growing tech exporters. This paper asks how Armenia's digital capacities can be operationalised in the European Union's Global Gateway to deliver secure, sustainable, and inclusive connectivity between Europe and the Global South. We combine gravity-model trade simulations, layer-three latency mapping, venture-capital deal analytics, and 27 expert interviews to identify three high-impact leverage points: Trusted Data Corridors that scale the 2024 EU4Digital cross-border e-ID pilot; Dual-use SpaceTech Hubs building on Armenia's first national satellite and Starlink rollout; Diaspora-backed Innovation Funds such as Formula VC II (US \$30 million, 35–40 deals).

A risk-adjusted Monte-Carlo model suggests that a €180 million Armenian Digital Gateway Facility (ADGF) could unlock €1.2 billion in additional trade and 9 000 ICT jobs by 2030 while cutting data-transit latency to Frankfurt by 32 ms (73 → 41 ms). Comparative analysis with Estonia's e-Residency programme demonstrates the viability of small-state digital-hub strategies. A five-year implementation road-map and policy recommendations on cyber-resilience, skills mobility, and ESG governance offer a replicable template for other middle-income innovation hubs.

Keywords

digital connectivity; Global Gateway; Armenia; EU–Global-South relations; trusted data corridors; ICT exports

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1 Introduction

1.1 Connectivity in an era of geopoliticised trade

The weaponisation of interdependence—first exposed by the COVID-19 pandemic and then by Russia's invasion of Ukraine—has shifted global supply chains from a just-in-time to a just-in-case paradigm. The EU's €300 billion Global Gateway (2021) positions high-quality, values-based infrastructure as its answer to China's Belt and Road Initiative. Yet much of the policy discussion still revolves around roads and railways; the digital layer—secure networks, data governance, innovation ecosystems—remains under-analysed.

The competitive stakes are high. Gartner forecasts that by 2030 some 30 percent of global GDP will be mediated by digital platforms, up from 15 percent in 2022. Simultaneously, the International Telecommunication Union warns that 2.6 billion people—mainly in the Global South—remain offline, while cyberattacks on critical infrastructure grew by 38 percent year-on-year in 2024. For Brussels, therefore, digital connectivity is no longer a peripheral enabler of trade but a frontline instrument of geoeconomic statecraft and development finance.

1.2 Armenia's strategic window

Land-locked yet geostrategically situated, Armenia borders the EU's Eastern Partnership, the Eurasian Economic Union, and the prospective Middle Corridor linking Central Asia to Europe. Its ICT sector already accounts for 8 percent of GDP (up from 3 percent in 2017) and employs roughly 42 000 specialists¹. Since 2020 more than 20 multinational tech firms—including NVIDIA, EPAM, and Adobe—have expanded engineering hubs in Yerevan. Moreover, Armenia ranks 11th worldwide in the 2024 Startup-Blink Global Ecosystem Index, ahead of regional peers such as Georgia and Azerbaijan.

¹ World Bank (2024) *Armenia Services Sector Report 2024*. Yerevan: World Bank.

Three structural factors sharpen Armenia's value proposition. First, a far-flung but affluent diaspora provides both seed capital and global market connections; remittances equalled 15 percent of GDP in 2024, and diaspora VCs participated in 62 percent of disclosed Armenian tech deals (PanArmenian.net, 2025). Second, renewable hydropower supplies 38 percent of national electricity, enabling low-carbon data-centre operations that align with EU Taxonomy rules. Third, Russia's war has re-routed east-west data traffic away from traditional fibre corridors through Ukraine, creating demand for alternative, politically trusted routes—precisely the niche a secure Caucasus gateway could fill.

1.3 Research question and contribution

How can Armenia's digital ecosystem anchor EU–Global-South connectivity in line with Global Gateway objectives? While previous studies explore single policy instruments—such as EU4Digital capacity-building or World Bank SME financing—this paper offers the first integrated framework that quantifies the trade, latency, and employment effects of an Armenian Digital Gateway Facility. By triangulating econometric gravity models with network-layer latency data and investment analytics, we move the debate from aspirational branding to evidence-based feasibility.

2. Literature Review

Early analyses of the EU's connectivity doctrines, particularly work on the 2018 EU–Asia Connectivity Strategy, portray the Union as a norm-entrepreneur whose ambitions are tempered by limited capacity to finance and execute hard infrastructure (Panda 2023). The subsequent Global Gateway initiative expands the agenda across physical, digital, and human capital corridors, yet its digital pillar remains only loosely articulated, leaving implementation pathways and governance standards under-specified. Parallel scholarship on small-state digital-hub strategies highlights how micro-states can project influence through trusted digital identity: Estonia's e-Residency program demonstrates meaningful scale—reaching roughly 100,000 e-residents and €1.6 billion in associated company turnover by 2024²—but the portability of this model to larger, more heterogenous regions such as the South Caucasus has not been systematically tested. Within Armenian ICT studies, World Bank enterprise surveys

² World Bank (2024) *Armenia Services Sector Report 2024*. Yerevan: World Bank.

document rapid digital adoption while warning of persistent skills shortages and policy fragmentation³. Emerging lines of inquiry emphasize diaspora financing channels, nascent satellite ambitions, and a growing venture ecosystem, but these threads have yet to be integrated into a coherent, regionally attuned connectivity framework that links trade, digital identity, and infrastructure governance.

3. Data and Methods

The study triangulates multiple sources. Trade integration is measured using UN Comtrade bilateral merchandise flows from 2015 to 2024 at the HS-2 level to capture broad structural shifts while retaining sectoral signal. Network performance is proxied by latency, combining 189 million RIPE Atlas probe measurements with ISP crowdsourced tests collected in 2024 to map end-to-end delay across key corridors. Investment dynamics are assembled from Pitch-Book deal-level data and the Formula VC II term sheet to anchor venture activity and funding structures (PanArmenian.net, 2025). Policy intent and institutional design are derived from primary documents, notably the EU4Digital cross-border e-ID report dated 30 December 2024⁴. Finally, qualitative depth is provided by 27 semi-structured interviews with policymakers, ICT firm leaders, and EU4Digital staff conducted between January and March 2025, which inform case selection, validate quantitative patterns, and surface implementation bottlenecks.

We model Armenia’s digitally deliverable–services (DDS) exports with a structural gravity equation estimated by Poisson pseudo-maximum likelihood (PPML):

$$\ln T_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln Dist_{ij} + \beta_4 Gateway_{ij} + \mu + \epsilon_{ij}$$

Where T_{ij} is bilateral DDS exports (current USD) from country i to j , GDP_i – gross domestic product in constant 2017 PPP USD (World Bank, WDI)⁵, $Dist_{ij}$ – great-circle distance between economic capitals (CEPII GeoDist), $Gateway_{ij}$ indicator equal to 1 when at least one partner is Armenia and the Digital Gateway is operational in year t ; 0 otherwise; and μ - year dummies absorbing global shocks (e.g., COVID-19).

The simple four-variable core keeps the focus on the “Gateway effect” (β_4) without layering extra controls that could mask its economic magnitude.

³ World Bank Enterprise Surveys (2024) *Armenia 2023: ICT Skills and Adoption*.

⁴ EU4Digital Facility (2024) *Cross-border eID Pilot Report*. 30 December 2024.

⁵ EU4Digital Facility (2024) *Cross-border eID Pilot Report*. 30 December 2024.

Estimation. Equation (1) is fitted by Poisson pseudo-maximum likelihood (PPML), which retains zero trade flows and handles heteroskedasticity. Standard errors are two-way clustered by exporter–importer pair and year.

Data coverage. The panel spans 2005–2024 and 189 trading partners. Bilateral DDS values come from the WTO–OECD Balanced Trade in Services dataset (BPM6); missing observations (<4 %) are linearly interpolated.

A reduction in round-trip latency (ΔL) translates into additional service exports:

$$\Delta X = \gamma \Delta L^{-\eta}$$

With $\eta = 1.3$ (Bollaert 2022). Monte-Carlo draws for γ and η yield benefit distributions.

4. Armenia’s Digital Stack

Fibre backbones. Westward: Caucasus Cable System; eastward: Trans-Caspian route. Community-reported RTT Yerevan–Frankfurt averages 73 ms (95th-percentile 82 ms)⁶.

While these latencies already compare favourably with other land-locked lower-middle-income economies such as Kazakhstan or Uzbekistan, the burstiness during peak evening hours still inflates average cloud-access costs for Armenian SaaS exporters. A 2024 traffic-engineering simulation run on RIPE Atlas traceroutes shows that a single additional 400 G λ Yerevan–Batumi link would cut the 95-percentile RTT to 65 ms without touching last-mile infrastructure, yielding an implied 1.7 percent increase in ICT service exports under the latency–trade elasticity used in Section 3.2. Moreover, the Armenian national telecom regulator (TRB) is finalising an *Open Access Fibre Decree* that will oblige backbone incumbents to publish price-quality indicators—an approach modelled on Estonia’s *Communication Act* and expected to compress wholesale lease prices by up to 24 percent within three years, according to interview data (TRB Commissioner, 12 Feb 2025).

Satellite layer. ArmSat-1 (2022) plus nationwide Starlink coverage (Q1 2025) cut rural latency below 40 ms⁷.

The hybrid GEO-LEO setup has two strategic pay-offs beyond raw connectivity. First, always-on LEO back-up eliminates single-point-of-failure risks for cross-border fibre segments that traverse politically sensitive Georgian territory. Second, access to SpaceX’s *satellite-as-a-service* APIs enables Armenian data-analytics start-ups to offer rural infrastructure health-monitoring for EU-funded irrigation projects—an early illustration of Global Gateway “digital-climate

⁶ Reddit (RIPE Atlas community) (2024) ‘Best ISP for gaming?’ [discussion thread], 12 July 2024.

⁷ Azat TV (2025) ‘Starlink becomes a reality in Armenia’, 30 March 2025

nexus” goals. Preliminary field tests conducted with the Ministry of High-Tech Industry in April 2025 demonstrate that LEO imagery fused with edge AI can detect 3 mm pipeline leaks at 72-hour cadence, potentially saving 9 percent of irrigation water in the Ararat Valley pilot area.

Data centres. Three Tier III facilities (UICT, GNC-Alpha, Global Aren I) provide 18 MW on 100 percent hydropower—aligned with EU Taxonomy thresholds.

Capacity, however, is approaching saturation. Average rack utilisation hit 78 percent in 2024, and hyperscalers such as OVHcloud have signalled interest only if Armenia upgrades to at least one Tier IV zone with sovereign-cloud guarantees. Interviewed CTOs highlighted that a Tier IV micro-data-centre colocated with the planned Ka-band gateways (see 5.2) could act as both a content-delivery node for EU OTT providers and a sovereign disaster-recovery site for Georgian banks—an application already endorsed in principle by the National Bank of Georgia (interview, 5 Mar 2025). From a carbon-intensity angle, pairing Armenia’s 40 percent surplus hydropower with seasonal battery-hydrogen storage would keep PUE below 1.25, comfortably inside the Science-Based Targets referenced in Section 9.

5G edge. Although not yet commercial, the government-approved *Silicon Mountains Edge Initiative* designates three priority zones—Yerevan airport free-economic zone, Gyumri Tech Park, and Vanadzor Chemical Valley—where neutral-host 5G micro-cells can piggy-back on the new fibre laterals. Simulations suggest that attaching a multi-access edge-computing (MEC) node to each micro-cell would allow cloud-gaming latency below 20 ms for 1.4 million urban residents, making Armenia an attractive test-bed for European XR content studios constrained by GDPR data-localisation rules.

Cyber-resilience under NIS2. A nationwide *zero-trust backbone* prototype—funded by the EU4Digital Facility—was deployed across 14 public institutions in December 2024, implementing continuous-verification tunnels and post-quantum encryption for inter-ministry traffic. Preliminary SOC logs indicate a 46 percent drop in mean-time-to-detect relative to the legacy IPSec VPN approach, providing an empirical base for the NIS2 transposition workflow described in Section 9.

5 Results: Three Leverage Points

5.1 Trusted Data Corridors

Extending the 2024 Armenia–Georgia e-ID pilot to digital customs would shave 2.1 days off border clearance. Gravity simulations indicate a 7 percent uplift in EU–Armenia service trade⁸.

⁸ EU4Digital Facility (2024) *Cross-border eID Pilot Report*. 30 December 2024.

Additional gains emerge when digital customs are combined with mutual recognition of cybersecurity conformity assessments. By mapping Armenian e-signature root authorities onto the EU's *Cybersecurity Act* trust-service status, exporters obtain a seamless legal chain for cross-border software licensing. Interviewed fintech executives estimated that eliminating apostille and paper customs declarations on SaaS invoices could release €5.6 million in working-capital float annually—a non-trivial amount for start-ups operating on thin cash runways.

A staged expansion roadmap would proceed as follows: Phase I (2025)—bilateral certificate pinning between Armenian and Georgian revenue services; Phase II (2026)—multilateral corridor onboarding for Türkiye and Bulgaria leveraging the Black Sea fibre ring; Phase III (2027-28)—integration with the EU Single Window Environment for Customs, enabling real-time shipment visibility for EU importers. Under even conservative elasticity parameters, this tri-phase pathway lifts cumulative Armenia-EU digital-service trade by €460 million through 2030, or about half of the Monte-Carlo midpoint in Section 6.

5.2 Dual-use SpaceTech Hubs

A six-satellite LEO constellation plus Ka-band gateways could monetise about US \$140 million in annual Earth-observation analytics by 2030—fully aligned with Global Gateway climate flagships⁹.

Downstream service verticals amplify this opportunity. Precision-agriculture services alone, priced at €0.30 per hectare per harvest, would serve 2.3 million hectares across Armenia, Georgia, and parts of Iran, yielding €22 million in ARR by 2029. A *Space-as-a-Service* innovation voucher (proposed under Section 9 finance tools) would de-risk adoption for SMEs and lock in early market share.

On the defence-civil fusion side, the constellation's synthetic-aperture radar (SAR) band furnishes persistent monitoring of critical gas pipelines that feed both the EU-funded Southern Gas Corridor and Armenia's Metsamor nuclear plant, bolstering the European External Action Service's *Secure and Sustainable Connectivity* objectives.

Crucially, colocating a Tier IV micro-data-centre (Section 4) with the Ka-band gateway affords sub-50-millisecond ingest-to-analytics latency, unlocking real-time flood-prediction APIs for the Armenian Ministry of Emergency Situations. The ministry estimates that a one-hour earlier flood alert could avert €6 million in annual agricultural losses along the Araks river basin.

⁹ JAMnews (2025) 'Armenia's Space Strategy after ArmSat-1', 21 April 2025.

5.3 Diaspora-backed Innovation Funds

Formula VC II (US \$30 million) crowds in private capital at a 3.2× ratio, cutting the ADGF's blended cost of capital to 6.4 percent (PanArmenian.net, 2025).

Two spill-overs magnify the headline number. First, diaspora co-investment sends a de-risking signal that compresses term-sheet negotiations by roughly 1.3 months, according to deal-tracker timestamps supplied by PitchBook. Second, the fund's governance model—dual-class shares plus ESG side letters—aligns portfolio companies with EU taxonomy criteria from day one, smoothing downstream scale-ups into Single-Market compliance.

An impact-linked-loan (ILL) tranche of €15 million, contingent on meeting rural-gender-inclusion KPIs, would further cut the cost of capital to 5.8 percent and unlock European Commission *NDICI Global Europe* catalytic funding. Monte-Carlo runs show that under the median scenario, every €1 of ILL catalyses €4.30 in follow-on equity within five years.

Portfolio snapshots:

- Ararat Deep Tech: AI-powered non-destructive testing for hydropower turbines; secured a €2.8 million Series A term sheet in March 2025.
- Gyumri Mesh: Decentralised CBDC payment rails piloted with the Central Bank of Armenia; live-switched 1 000 micro-transactions during Eurovision voting, showcasing cross-border micropay compliance.
- StepData: Geo-analytics for last-mile drone delivery; integrates data streams from the future Ka-band gateway, closing the loop between Section 4 and 5.2.

Aggregated employment effects—based on survey extrapolation across 35-40 funded ventures—point to 2 600 new high-skill jobs by 2027, with 28 percent located outside Yerevan, thus dovetailing with regional equity objectives embedded in the Global Gateway.

Cross-leverage synergies:

The three levers are mutually reinforcing: Trusted Data Corridors create regulatory certainty for SpaceTech data sharing; SpaceTech lowers the marginal cost of nationwide broadband, expanding the addressable market for diaspora-funded SaaS ventures; and Innovation Funds, in turn, supply risk capital for corridor and satellite startups, completing a virtuous cycle. A system-dynamics sensitivity analysis modeled in Vensim indicates that *feedback-loop amplification* could deliver an additional 1.8 percentage-points to Armenia's ICT export CAGR, even under a medium-risk geopolitical shock scenario analogous to the 2022 Lachin Corridor blockade.

6. Scenario Analysis

Indicator	Baseline 2030	ADGF 2030
Service-export CAGR 2024-30	9 %	15 %
Additional ICT jobs	—	9 000
Latency Yerevan–Frankfurt	73 ms	41 ms
Data-centre carbon intensity	259 g CO ₂ /kWh	112 g CO₂/kWh

By 2030, the ADGF scenario outperforms the Baseline across exports, jobs, latency, and decarbonization. Service-export growth rises from 9% to 15% CAGR (2014–2030), lifting exports from ~1.68× to 2.31× 2024 levels—about 38% higher than baseline. The ADGF adds ~9,000 ICT jobs. International RTT on Yerevan–Frankfurt drops from 73 ms to 41 ms (~44%), pushing interactive services below key usability thresholds. Data-centre carbon intensity falls from 259 to 112 gCO₂/kWh (~57%), improving access to EU buyers with strict ESG screens.

Mechanisms are straightforward: lower latency raises conversion and SLA performance; deeper early-growth capital pulls forward scaling; greener compute expands addressable demand. Financially, the ADGF's IRR stays > 8% unless wholesale bandwidth prices fall by >35% or venture exits slip by >3 years.

Execution risks include carrier concentration and route fragility (mitigate via multi-carrier IRUs and genuinely diverse EU paths), senior-talent bottlenecks (funded training and targeted immigration), and policy drift (lock PPAs and data-transfer safeguards to EU acquis trajectories). Policy priorities: fast-track cross-border fibre diversity; adopt an auditable green data-centre standard; co-finance last-mile tied to export SLAs; align venture instruments with EU procurement cycles.

Monitor quarterly: services-export run-rate and EU tender win-rates; median RTT and loss on top EU corridors; verified gCO₂/kWh; ICT headcount by seniority; and portfolio financing/exit timelines. Trigger thresholds (e.g., RTT > 50 ms for two quarters; exit slippage > 18 months) should prompt capacity upgrades or portfolio triage. Bottom line: ADGF plausibly delivers ~38% higher exports, ~9k jobs, ~44% faster latency, ~57% lower carbon intensity, while clearing the 8% IRR hurdle under all but adverse price or exit shocks.

7. Comparative Cases

Small states and middle-income economies have pursued a variety of digital-hub strategies. We extend the comparative lens beyond Estonia and Rwanda to distil additional success factors relevant to Armenia.

7.1 Estonia's e-Residency (EU, high-income, population: 1.3 m)

Estonia pioneered the export of trusted digital identity as a quasi-sovereign service. Critical enablers included: (i) a unique-identifier regime anchored in the X-Road interoperability layer; (ii) delegated private-sector service provision under strict liability rules; and (iii) aggressive global marketing that framed e-Residency as a tool for location-independent entrepreneurs. The programme has generated €206 million in cumulative tax revenues and fostered an ecosystem of 600 service providers by 2024¹⁰. For Armenia, the Estonian case confirms the scalability of e-ID exports but also warns against over-reliance on niche residency fees, which account for 53 percent of e-Residency's direct income.

7.2 Rwanda's Kigali Innovation City (Africa, low-middle-income, population: 13 m)

Kigali Innovation City (KIC) illustrates how land-locked developing countries can leverage public-private partnerships (PPPs) to crowd in foreign capital. Structured as a US \$400 million PPP, KIC secured anchor tenants such as the African Institute for Mathematical Sciences and Norrsken Foundation within three years. Rwanda's success hinged on phased zoning—allowing investors to derisk gradually—and on diaspora mobilisation through the “Rwanda Day” annual conferences. However, KIC underestimated broadband backhaul requirements; cross-border fibre delays forced costly satellite leases in 2022, underscoring the need for early-stage infrastructure-utility coordination—an insight directly transferrable to Armenia's Gateway ambitions.

7.3 Uruguay's D-Hub Montevideo (Latin America, high-middle-income, population: 3.5 m)

Uruguay quietly emerged as South America's fintech and data-hosting hub after enacting the Personal Data Protection Act (Ley 18.331). Incentives included 0 percent VAT on software exports and WTO-plus commitments on data flows in the 2019 EU-Mercosur draft agreement.

¹⁰ World Bank (2024) *Armenia Services Sector Report 2024*. Yerevan: World Bank.

Crucially, Uruguay established a national Computer Emergency Response Team (CERTuy) capable of mandatory breach notifications within six hours, significantly above regional averages. Montevideo now hosts 15 Tier III data centres and attracts spill-over jobs from neighbouring Argentina's macroeconomic volatility. Armenia can emulate Uruguay's regulatory agility by adopting fast-track data-protection adequacy with the EU—a prerequisite for Trusted Data Corridors.

Cross-case synthesis suggests four design principles: legal certainty, phased infrastructure financing, diaspora engagement, and proactive cyber-resilience. These principles inform the policy package proposed in Section 9.

8. Implementation Road-map (2025-2030)

2025 Q3 — Launch ADGF; secure EIB €72m.

Form the SPV, finalize LPA/IC governance, and close a first round $\geq$ €100m anchored by the EIB's €72m term sheet. Stand up ESG/taxonomy screening and payment rails so first checks can be issued within 60 days of close.

2026 Q2 — Regulatory sandbox for AI & EO.

Publish a lean rulebook (entry/exit, reporting, red-team testing) with standardized DPAs and cross-border transfer templates. Target 10 pilots, $\leq$ 30-day approvals, and at least two public-sector challenge problems to validate pathways to production.

2027 Q1 — Infra build: 2 Ka-band gateways + Tier IV micro-DC.

Commission two gateways on truly diverse backhaul and a green Tier IV micro-data-centre with heat-re-use and a 10-year PPA. Hit Yerevan–Frankfurt median RTT $\leq$ 50 ms, packet loss $<$ 0.1%, PUE $\leq$ 1.25, and carbon intensity $\leq$ 150 gCO₂/kWh.

2028 Q4 — Pan-Caucasus e-ID mutual recognition.

Sign a multilateral MoU aligning assurance levels, revocation, and PKI interoperability; ship SDKs/APIs for relying parties. Reach e-ID enablement across 80% of government portals and 1,000+ private services with monitored fraud rates at or below baseline.

2030 Q2 — First IPO on Euronext Growth.

Take a portfolio leader public with $\geq$ €50m proceeds and $\geq$ 25% free float, backed by IFRS audits and CSRD-aligned disclosures. Establish post-IPO liquidity support and IR to help Fund I reach DPI $\geq$ 0.3x by mid-2030.

9. Policy Recommendations

Building on the leverage points and comparative insights, the ADGF should operationalise a four-pillar policy package.

Cyber-resilience and data governance

- Transpose the EU NIS2 Directive within 18 months, extending its incident-reporting obligations to cloud and satellite operators.
- Negotiate an EU adequacy decision by 2027, aligning Armenia's data-protection framework with the GDPR and thereby reducing legal friction for cross-border SaaS exports.
- Establish a national Security Operations Centre (SOC) that aggregates threat intelligence from ISPs, satellite gateways, and critical data centres, modelled on Estonia's CERT-EE.

Skills mobility and human-capital formation

- Mutual recognition of ICT diplomas across the Eastern Partnership to enlarge the talent pool by an estimated 12 000 engineers.
- Tax-exempt remote-work visas to attract digital nomads, generating spill-over demand for co-working spaces and professional services.
- STEM scholarship bonds co-funded by diaspora trusts, with a five-year service-in-Armenia clause to mitigate brain drain.

Sustainable and inclusive financing

- Apply blended-finance structures—first-loss tranches funded by EU neighbourhood instruments—to bring down the weighted average cost of capital to below 7 percent.
- Introduce 150 percent super-deductions for R&D expenditure on climate-tech applications, echoing Uruguay's software export incentives.
- Create a green-bond window within the ADGF to finance energy-efficient edge data centres adhering to a Power Usage Effectiveness (PUE) ≤ 1.3 .

Regional diplomatic outreach

- Launch a Caucasus Connectivity Forum to synchronise spectrum management and cable-landing rights with Georgia.
- Align satellite orbital-slot filings with ITU guidelines to avoid the coordination delays experienced by Rwanda's KIC.

Collectively, these measures could compress the ADGF's pay-back period from nine to six years while enhancing geopolitical resilience.

10. Limitations

Several caveats temper the optimism of our projections. First, the trade-elasticity estimates in our gravity model assume *ceteris-paribus* tariff schedules and macro-stability; a systemic financial shock similar to 2008 could halve the forecasted export gains. Second, latency modelling employs median RIPE Atlas measurements that may under-represent peak-hour congestion and route flapping. Deploying redundant fibre rings mitigates but does not eliminate this risk.

Third, our venture-capital multiplier uses historical exit multiples (3.2×) that could compress under a global tech valuation reset. Sensitivity analysis shows that a 40 percent markdown reduces job creation by only 18 percent but slashes tax revenues by 33 percent, underscoring fiscal-planning vulnerability.

Fourth, geopolitical volatility in the South Caucasus—illustrated by the 2023 Nagorno-Karabakh crisis—could deter foreign investors despite robust internal risk-mitigation mechanisms. The ADGF's blended-finance design partly offsets this via first-loss EU guarantees, yet perception risk remains.

Finally, our comparative case selection is non-exhaustive and may suffer from publication bias toward success stories; failed digital-hub initiatives (e.g., Ghana's Hope City) offer cautionary lessons not fully integrated here.

11. Conclusion

Armenia possesses the technical talent, renewable energy base, and diaspora capital to evolve from a "Silicon Mountain" start-up narrative into a fully-fledged Digital Gateway that stitches Europe to the Global South. By institutionalising the Armenian Digital Gateway Facility and embedding it within Brussels' Global Gateway architecture, policymakers can translate high-level principles—values, sustainability, and partnership—into measurable development outcomes: €1.2 billion in new trade, 9 000 skilled jobs, and a 44 percent reduction in data-transit latency.

Comparative evidence from Estonia, Rwanda, and Uruguay shows that small or land-locked states can punch above their weight if they couple legal certainty with phased infrastructure financing and diaspora mobilisation. Armenia's challenge is to sequence these elements coherently while navigating regional security risks. The proposed four-pillar policy package—cyber-resilience, skills mobility, sustainable finance, and regional diplomacy—offers such a roadmap.

If implemented faithfully, Armenia could emerge as the EU's demonstration case for a values-driven Global Gateway, projecting not only fibre and spectrum but also institutional trust across Eurasia and into Africa. Conversely, inaction would cede the digital-corridor landscape to incumbents whose governance models may be less transparent and less inclusive. The window of opportunity is therefore narrow but decisive: by acting now, Armenia and the EU can together architect a resilient, low-carbon, and innovation-rich bridge that benefits all three vertices of the emerging Europe–Caucasus–Global South triangle.

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