

Lessons from practice and pathways toward policy applications: SEEA implementation in Latin America

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Abstract

Latin America is one of the world's most biodiverse and climate-vulnerable regions, making environmental-economic accounting both urgent and strategically significant. SEEA adoption has grown steadily worldwide, yet implementation across Latin America remains concentrated in a handful of programs, with Mexico and Colombia sustaining the region's most established accounts and Costa Rica and Guatemala advancing their own programs, hosted by the Central Bank. Drawing on nearly two decades of experience, this paper treats Guatemala as its central case, since its program has run without interruption and predates the donor-funded partnerships usually credited with producing durable institutional practice such as the World Bank's WAVES Program. It examines the conditions that have sustained or constrained SEEA implementation, using evidence from Guatemala alongside regional context from Colombia, Costa Rica, and Mexico. The analysis contends that the region's most durable programs originated in domestic institutional initiative rather than donor design, and that stalled implementation generally reflects a lack of funding secure enough to keep staff in place long enough to learn the work by doing it, not a shortage of technical capacity or ambition. The paper explores four policy domains where SEEA applications are particularly promising: beyond-GDP frameworks for ecologically wealthy, unequal economies; monitoring progress toward Global Biodiversity Framework targets; integrating ecosystem service accounts into disaster risk assessments in a hazard-exposed region; and informing climate change adaptation through spatially explicit accounts linking ecosystem condition to territorial vulnerability. Guatemala's experience illustrates both this potential and the conditions, funding continuity, and epistemic autonomy that determine whether a program can sustain it.

Keywords: System of Environmental-Economic Accounting; Latin America; institutional integration; beyond GDP; Global Biodiversity Framework; disaster risk reduction; climate change adaptation; Guatemala

1. Introduction

Latin America holds a vast share of the world's biodiversity and a massive exposure to climate hazards, a combination that makes environmental-economic accounting both urgent and strategically significant for the region (Alcantar López et al., 2025; IPCC, 2022). This paper focuses on Spanish-speaking Latin America: the mainland countries and the Dominican Republic. The 2025 Global Assessment of Environmental-Economic Accounting records steady global growth in SEEA adoption, from 54 countries in 2014 to 98 in 2025. Still, implementation across the wider Latin America and Caribbean region that it tracks remains concentrated in a handful of programs (UNSD, 2026). Of the eleven Latin American and Caribbean countries that compile SEEA accounts, six have reached Stage III, regular compilation and dissemination. Most of the remaining countries in the wider region have no environmental accounting procedure at all (UNSD, 2026; Alcantar López et al., 2025). This paper argues that the primary unresolved barrier to closing that gap is institutional rather than technical. Where accounts exist, the persistent constraint is a gap between the statisticians who produce them and the policy users who could act on them, not a shortage of statistical methods.

The paper draws on nearly two decades of practitioner experience at the intersection of academia, national statistics, and environmental governance in Guatemala, one of the few developing countries anywhere to have sustained a SEEA program without interruption since the early 2000s. Guatemala is treated here as the paper's central case rather than one of several parallel examples. Its record is the most complete available for any Central American economy, and its trajectory began before, not inside, the donor-funded programs that the international literature on natural capital accounting usually credits with generating durable institutional practice. Colombia, Costa Rica, and Mexico appear in Section 3 as regional context, not to rank their programs against Guatemala's on a common maturity scale, but to ask what the region's own record shows that a donor-centered account would not.

The dominant account of how natural capital accounting becomes durable comes largely from the institutions that funded its global expansion, chiefly the World Bank's WAVES Global Partnership (2012-2019) and the policy forums it convened. That literature identifies institutional anchoring, demand alignment, staged sequencing, and embedded capacity building as the conditions for accounts to influence governance (Vardon et al., 2017; Ruijs & Vardon, 2018; Ruijs et al., 2019). That narrative is not wrong, but it describes the process largely from the funder's vantage point. WAVES' own closeout report concedes that partner-country ministries and agencies, not the program itself, performed most of the work (World Bank, 2021).

Latin America's own record supports a different emphasis, one closer to autonomy than to compliance with an external template, and Mexico's record makes the point most forcefully. INEGI, in partnership with the United Nations, launched the *Sistema de Cuentas Económicas y Ecológicas* years back, one of the first national environmental accounting systems attempted anywhere in the world (Martínez Guzmán, 2000). It predates by years the codified form the

SEEA framework accounts would later take (United Nations, 2012). Guatemala's public-academic partnership predates WAVES by roughly a decade and was built with earlier Dutch bilateral support. Costa Rica's Payment for Environmental Services program, created by domestic forestry legislation in 1996, predates the SEEA Ecosystem Accounting standard by twenty-five years (Costa Rica, 1996; United Nations, 2021). It still operates today without ever being anchored in the country's environmental accounts (Pagiola, 2008). Costa Rica and Guatemala also made the distinctive choice to host their accounts inside a central bank rather than a statistics office or environment ministry, a configuration each government adopted on its own initiative rather than one written into any donor template. That choice gives the accounts a direct line to the macroeconomic and financial credibility a purely statistical agency does not carry on its own.

The paper's contribution is to make this pattern of regional institutional autonomy explicit, autonomy that predates SEEA's own codification as much as it departs from it. Its second contribution is to identify the funding and coordination constraints, rather than any shortfall in capacity or ambition, that keep this autonomy from scaling further across the region, the central lesson this paper draws from two decades of practice.

The remainder of the paper is organized as follows. Section 2 sets out the conceptual link between ecological economics, natural capital, and the SEEA as a measurement instrument, and introduces the institutional conditions under which that instrument shapes governance. Section 3 presents Guatemala's SEEA program in detail, including its institutional trajectory, empirical record, and place in the region's broader institutional history. Section 4 draws out the institutional lessons Guatemala's record offers other developing countries. Section 5 examines four policy domains where SEEA applications are particularly promising for the region: beyond-GDP frameworks, Global Biodiversity Framework monitoring, disaster risk reduction, and climate change adaptation. Section 6 concludes with limitations and directions for future work, and Section 7 translates these lessons into policy recommendations for the regional and international agencies that shape SEEA implementation across Latin America.

2. Conceptual and institutional framework

Environmental accounting starts from the premise that economies are subsystems of a finite biosphere, operating under biophysical constraints that conventional economic indicators were never designed to register (Daly, 1996; Costanza et al., 1997). Gross domestic product and the statistics built around it capture market transactions with considerable precision. Still, they leave out the ecosystems and natural resources on which that market activity depends, so an economy can draw down its natural asset base for years before the depletion shows up in any national account (Bartelmus, 2009; Dasgupta, 2021). Natural capital, understood as the stock of ecosystems and natural resources that produce the goods and services on which economic activity and human well-being rely, serves as the analytical bridge between ecological and

economic framings (Costanza et al., 1997; Millennium Ecosystem Assessment, 2005). The SEEA operationalizes that bridge as a statistical architecture, tracking natural capital stocks and flows alongside produced and human capital within an accounting structure consistent with the System of National Accounts (United Nations, 2012; United Nations, 2021).

Measurement alone does not guarantee governance relevance. Whether an accounting instrument changes decisions depends on institutional conditions external to the accounts themselves. These include where the accounts are hosted, whether they answer live policy questions, how their complexity is sequenced, and whether they build durable capacity within the institutions that produce them (Ruijs et al., 2019; Vardon et al., 2018).

Research on natural capital accounting programs that have shaped policy converges on four such conditions: a stable, politically insulated institutional home; demand-side alignment with live policy questions rather than statistical production in isolation; a staged sequencing from simpler to more complex accounts; and capacity building embedded within account production rather than treated as a separate activity (Vardon et al., 2017; Ruijs & Vardon, 2018). These four conditions are not hypothetical, but they were documented from inside a donor-funded program observing countries that had, in several cases, already begun building the institutions the program later credited them for (World Bank, 2021). Section 3 traces Guatemala's two-decade program against these conditions. Section 4 extends one of them, country ownership, which this literature already names as a factor but treats mainly as a design principle observed from inside a still-active program, rather than as a trajectory with its own history (Vardon et al., 2017).

The record traced here supplies what that principle-level treatment leaves undocumented: where in the region ownership predates donor engagement rather than following from it. It also identifies what specifically sustains that ownership once external funding ends, namely positions secure and permanently budgeted enough to keep the same staff doing the work. The remainder of the paper treats the technical and institutional links as inseparable. The empirical record in Section 3 exists only because durable institutions sustained its production, and the policy applications explored in Section 5 are credible only because that record is consistent and continuous.

Two bodies of evidence currently describe environmental-economic accounting across Latin America and the Caribbean, and neither, on its own, shows what an established Latin American program produces or how autonomously Latin America built it. Regional surveys, most recently CEPAL's 2023 assessment of institutional and statistical coverage across the region, document how many countries report SEEA activity, which account types they compile, and what constraints, chiefly funding, human resources, and inter-institutional coordination, limit further progress (Alcantar López et al., 2025). That evidence is indispensable for gauging regional coverage, but it reports institutional status rather than analytical content. It treats each country's program as a cross-sectional data point rather than as an institutional trajectory with its own history. The WAVES-centered literature addressed above documents conditions for policy

influence, but from inside a program still expecting its own institutions to prove durable. This paper's contribution sits between these two bodies of evidence. It departs from both, offering what a single program's accounts actually contain and how autonomously that program was built, evidence neither a cross-country survey nor a donor-program retrospective can supply at this depth.

Three propositions follow, and the remainder of the paper develops each in turn. The region's most durable accounting programs predate or developed independently of the international frameworks and partnerships usually credited with producing them, evident most clearly in Mexico's accounts and, on a smaller scale, in Guatemala's and Costa Rica's own institutional histories. Central Bank hosting is a genuine regional institutional innovation, adopted independently by more than one government, that gives environmental accounts a credibility no purely statistical agency carries on its own. Where implementation has stalled, the binding constraint has generally been funding secure enough to keep the same staff in the same position long enough to learn the work by doing it, not a deficit of institutional ambition or technical skill at the outset. That distinction has direct implications for how the region's own governments, not only its development partners, choose to sequence investment in this work.

3. Guatemala's SEEA program: two decades of practice

3.1. Institutional trajectory

Guatemala's environmental-economic accounting program has run through three distinct phases over more than two decades, giving it a depth that few developing-country programs anywhere can match. The first phase, from the early 2000s to 2013, grew out of a public-academic partnership between the National Institute of Statistics (INE), the Bank of Guatemala (Banguat), and Universidad Rafael Landívar's environmental institute (IARNA-URL), with early financial support from the Dutch government. That partnership produced SEEA Central Framework accounts covering forests, water, energy, emissions, fisheries, land, and subsoil assets for 2001-2010, published as a statistical compendium in 2013 (INE, Banguat, & IARNA-URL, 2013). At the time, it stood among the most complete Central Framework implementations in the developing world. The second phase, from 2014 to 2019, extended the Central Framework accounts, added ecosystem accounts under the then-emerging SEEA-EA standard, and piloted an environmental-agriculture account that made Guatemala the first country worldwide to do so. This work was funded through Guatemala's participation in the World Bank's WAVES Global Partnership, as one of only three Latin American countries selected as a core-implementing country alongside Colombia and Costa Rica (World Bank, 2019).

The third phase began when Banguat wrote environmental-economic accounting into its Institutional Strategic Plan 2022-2026 as an explicit strategic objective. It acted on that commitment by creating a permanent Environmental Accounting Unit inside its macroeconomic

statistics department, staffed by roughly twelve professionals drawn from economics, ecology, geography, and statistics (Banguat, 2022). That step converted environmental accounting from a project-dependent activity into a permanent institutional function, a transition that most developing-country programs supported under WAVES or other programs have not yet made. The SEEA in Guatemala now draws on a wide network of national institutions, INAB and CONAP for forests, MARN and INSIVUMEH for water, MEM for subsoil and energy, MAGA for land and fisheries, and MINFIN, SAT, and SEGEPLAN for expenditures and transactions. This distributes the data burden according to where authoritative records already exist and gives each contributing agency a stake in the program's continuation.

3.2. The empirical record

The Central Framework accounts show a consistent pattern of natural capital drawdown that conventional statistics never recorded. Guatemala lost roughly 40% of its forest cover between 1970 and 2005, at an annual deforestation rate about three times the regional average for Latin America and the Caribbean. Over 95% of timber extraction occurred outside formal institutional control (Banguat & IARNA-URL, 2009). The real contribution of forests to GDP was estimated at 3.15% in 2001 and 2.57% in 2006, more than three times the roughly 1% recorded in conventional national accounts. The cumulative economic cost of forest degradation reached approximately USD 374 million between 1991 and 2003 (INE, Banguat, & IARNA-URL, 2013). The water accounts show the agricultural sector consuming 53% of national water while contributing only 12% of GDP, and put the annual cost of water-related disease from contaminated sources at 0.97% of GDP. The energy accounts recorded 45.6 million tonnes of CO₂-equivalent emissions from combustion over 2001-2010, driven substantially by household reliance on firewood (INE, Banguat, & IARNA-URL, 2013). These results are summarized alongside the ecosystem accounting findings discussed next (Table 1).

The ecosystem accounts compiled under WAVES extend this picture from individual assets to ecosystems as spatial units. Using Holdridge life zones as the unit of analysis, natural ecosystems still cover approximately 60% of national territory, but nine of Guatemala's 14 ecoregions show critically compromised ecological integrity. Even strictly protected areas show systematic deforestation in the buffers that surround them, with the four corridors connecting the Maya Biosphere Reserve absorbing 84% of all national forest loss between 2001 and 2014 (World Bank et al., 2021). An updated valuation synthesis estimates the annual flow of ecosystem services from Guatemala's natural areas at GTQ 26,185 million in 2023 quetzales, about 3.3% of that year's GDP, dominated by hydropower provisioning and the non-use value of intact natural areas (Ortiz, Herrera, & Monterroso, 2024). Two independent external assessments, CEPAL's 2023 regional survey and the UNSD's 2025 Global Assessment, both confirm Guatemala's outlier status. They place it among roughly 15 countries worldwide with the broadest range of SEEA accounts, and credit it with the only government-driven ocean-related account in Latin

America and the Caribbean, its fisheries account (Alcantar López et al., 2025; UNSD, 2026; GOAP, 2024).

Table 1

Guatemala's SESA Central Framework and Ecosystem Accounts: Key Quantitative Results

Indicator	Result
Forest cover loss (1970-2005)	40% of total forest cover, annual rate 1.7% (3.0x LAC average)
Timber extraction outside institutional control	Over 95% of total volume
Real contribution of forests to GDP	3.15% (2001), 2.57% (2006), vs. approximately 1.0% in conventional accounts
Economic cost of forest degradation (1991-2003)	Approximately USD 374.0 million accumulated
Agricultural water consumption vs. GDP contribution	53% of national water for 12% of GDP
Cost of water-related disease from contaminated sources	0.97% of GDP per year
GHG emissions from energy combustion (2001-2010)	45.6 million tonnes CO ₂ -equivalent
Natural ecosystem share of national territory	Approximately 60.0% (Holdridge life zones)
Ecoregions with critically compromised integrity	9 of 14
Forest loss absorbed by Maya Biosphere corridors (2001-2014)	84% of national total
Annual value of ecosystem services	GTQ 26,185 million (2023), approximately 3.3% of GDP

Note. Periods covered vary by indicator. See Section 3.2 for details. GDP in constant prices where applicable. Sources: Banguat and IARNA-URL (2009). INE, Banguat, and IARNA-URL (2013). World Bank et al. (2021). Ortiz, Herrera, and Monterroso (2024).

3.3. Guatemala in the regional context

Guatemala's depth of coverage is unusual for the region, but the more useful comparison is not how far each country has progressed toward a common benchmark. It is what each government chose to build with the institutions and resources it had, and on what timeline. Mexico's program is the region's oldest by a wide margin. INEGI launched its Sistema de Cuentas Económicas y Ecológicas in the 1990s, in partnership with the United Nations Statistics Office, publishing its first accounts for 1985-1990 and an extended 1988-1996 series in 1999, years before the SESA standard itself existed (Martínez Guzmán, 2000). Colombia's own account series begins nearly as early, with land accounts covering 2000-2009 and most other series, forest, energy, water, and minerals, extending back to 2005, well before DANE institutionalized the program as a regular

statistical operation by 2012-2014 (DANE, n.d.). DANE's own account of the region's history places Colombia's progress explicitly after Mexico's, alongside Costa Rica's and Guatemala's (DANE, 2017). Colombia compiles one of the region's broadest Central Framework portfolios, water, forest, land, mineral and energy, waste, and air emissions accounts, built and staffed entirely within the national statistics office rather than handed to another host institution. Its 2013 experimental ecosystem account is still described in national planning as an area for expansion (DANE, n.d.; Alcantar López et al., 2025).

Colombia, Costa Rica, and Guatemala were later named the World Bank's three LAC core-implementing countries under its WAVES Global Partnership for the 2012-2019 window, a designation that extended and formalized Central Framework work already under way in each country rather than starting it. Guatemala's own accounts date to the early 2000s, as Section 3.1 sets out. Colombia's predate its WAVES participation by roughly a decade, as just shown. The NCAVES project that followed and pushed specifically toward SEEA Ecosystem Accounting reached only Brazil and Mexico in the region (World Bank, 2021; UNEP, n.d.).

Costa Rica and Guatemala took a different path from Mexico's and Colombia's statistics-office model, choosing instead to anchor their accounts inside a central bank, a configuration each government adopted on its own initiative rather than one WAVES prescribed. That choice gives the accounts a direct line to macroeconomic and financial credibility a purely statistical agency does not carry on its own. Costa Rica moved its accounts into the BCCR directly and published its first results only in 2024, making it the most recent of the four programs (BCCR, 2024). Guatemala took a longer route to the same institutional destination, building more than a decade of academic-anchored capacity through IARNA-URL before Banguat absorbed the function as a permanently funded unit in 2022 (Banguat, 2022). Mexico's INEGI, meanwhile, has sustained its program the longest of any in the region, publishing its current Central Framework series annually since 2003 and recording a fall in environmental costs from 6.0% to 4.1% of GDP by 2024. It paired this with a SEEA-EA-aligned ecosystem account valuing services at 3.05% of GDP in 2024, built entirely within its own statistical office and without the central-bank or academic-partnership routes Costa Rica and Guatemala took (INEGI, 2025a, 2025b). The four institutional strategies are summarized together (Table 2).

Table 2
Guatemala in Regional Context: SEEA Implementation Across Four Latin American Countries

Country	Institutional host	Status
Colombia	DANE (national statistics office)	Central Framework account series beginning as early as 2000 (land) and 2005 (forest, energy, water, minerals), institutionalized within DANE by 2012-2014; experimental ecosystem account since 2013, described in national planning as an area for expansion

Country	Institutional host	Status
Costa Rica	BCCR (central Bank)	Water, forest, and energy accounts; first environmental accounts released 2024; National Environmental Accounts Council created by Decree 41125-MINAE-PLAN-H; no SEEA-EA ecosystem account yet
Mexico	INEGI (national statistics office)	Program launched 1990s as a UNSTAT-partnered pilot predating the SEEA standard itself; current Central Framework series (CEEM) published annually since 2003, longest continuous series in the region; SEEA-EA-aligned ecosystem account (CEM) since 2018 base year
Guatemala	Banguat Environmental Accounting Unit (central Bank), with INE and IARNA-URL	Central Framework accounts since 2001, compendium published 2013; SEEA-EA ecosystem accounts since 2014-2019 WAVES phase, watershed-scale extension 2025; accounting function institutionalized as a permanent, funded strategic objective since 2022

Note. WAVES = Wealth Accounting and the Valuation of Ecosystem Services Global Partnership (2012-2019 core phase). NCAVES = Natural Capital Accounting and Valuation of Ecosystem Services project. Sources: World Bank (2021). UNEP (n.d.). DANE (n.d., 2017). BCCR (2024). Banguat (2022). INEGI (2025a, 2025b). Martínez Guzmán (2000). Alcantar López et al. (2025).

The comparison sharpens and becomes more nuanced than a simple presence-or-absence test once it moves from institutional status to documented policy use. Colombia shows the most active analytical bridge toward policy of the three comparators, but one built largely outside DANE's own SEEA program. The Inter-American Development Bank, working with DANE, the National Planning Department, and Stanford's Natural Capital Project, applied SEEA-EA-consistent ecosystem service accounts to a protected-area eco-compensation scheme. It separately applied its own Integrated Economic-Environmental Modeling platform to value biodiversity in three government conservation proposals, finding that payment for ecosystem services and habitat banking became economically viable, at US\$4.4 billion and US\$4.9 billion in net present value respectively, only once biodiversity values were included (IDB, 2020; IDB, 2025). Both efforts are framed as evidence bases and next-step recommendations for future decisions rather than as accounts already cited in an adopted policy instrument. The more recent report is dated October 2025, a decade after Guatemala's WAVES-era account-to-policy links were already in place.

Costa Rica's most concrete ecosystem-finance initiative, a USD 3.5 million IDB grant establishing a compensation mechanism for landowners, runs through FUNBAM, SINAC, and FONAFIFO entirely outside the central Bank's accounting program (IDB, n.d.). BCCR's own 2024 presentation of its accounts describes its policy purpose only in general terms, as a diagnostic tool for public policy questions, without naming a specific instrument or decision it has informed (BCCR, 2024). Mexico's own completion report for its ecosystem accounting pilot lists SEMARNAT, CONAFOR, CONAGUA, and SADER as prospective rather than documented users. The comparison is not a race in which Colombia, Costa Rica, and Mexico

trail behind Guatemala, since Colombia's IDB-supported modeling work in particular represents a genuinely different and technically sophisticated pathway toward the same goal. It is evidence that moving from a demonstrated analytical capability to an accounts citation embedded in an adopted policy instrument is the harder step everywhere in the region, Guatemala included. Where it has happened, funding continuity and a stable institutional host, not a shortage of technical skill, appear to be what made the difference, the point Section 4 develops directly.

4. Institutional lessons for the region

Guatemala's record points to six recurring lessons for the region: two cross-cutting conditions and four institutional-design conditions that together explain why its program scaled where others have stalled.

The cross-cutting conditions are epistemic autonomy, the shift from relying on external technical validation to trusting a country's own analytical judgment, and funding continuity, positions secure enough to keep staff in place long enough to learn the work by doing it. The four institutional-design conditions are institutional anchoring in a stable, politically insulated host; demand-side alignment between account priorities and live policy instruments; staged sequencing that builds Central Framework credibility before attempting more data-intensive ecosystem accounts; and capacity building embedded within production rather than delivered as separate training. The paragraphs that follow trace each of these six conditions through Guatemala's record and the region's own variation across country experiences.

Guatemala's Environmental Accounting Unit has operated without interruption since Banguat made it permanent in 2022, a continuity that outlasted any single funding cycle and that the region's own record, not a donor program's account of itself, is best placed to explain. Much of the literature crediting external programs with producing durable institutional practice was itself observing countries that had already begun building these institutions on their own, and Guatemala's case makes that visible directly. WAVES' own closeout report credits partner-country ministries and agencies, not the global partnership, with performing most of the work that produced durable results. It cites Guatemala's forest incentive program PROBOSQUE, a USD 450 million, thirty-year commitment the accounts informed but did not create, as one example (World Bank, 2021). It also notes that Banguat's institutionalization of the Environmental Accounting Unit came three years after that program closed.

The region's variation across the four countries is instructive on its own terms, not as a ranking. Colombia kept its accounts inside a single statistical office. It built a technically sophisticated bridge to policy through IDB-supported modeling. At the same time, Costa Rica and Guatemala both moved their accounts into a central bank, a configuration each government chose independently of any external template. That central-bank hosting gives the resulting statistics a direct proximity to macro-financial credibility that strengthens the case, developed further in a companion paper, for integrated economic-environmental accounting as a central-banking

function and not only a statistical one. This institutional variety is itself evidence for the argument set out in Section 1, that the region's own choices, not only its response to external programs, explain how these accounts came to exist.

A further consideration worth naming directly is epistemic dependency, and it is analytically distinct from the funding and coordination constraints discussed below. Technical assistance has been a constant presence in Guatemala's program, from the Dutch-supported partnership of the 2000s through WAVES-funded advisors after 2014, and consultants remain active across the region's accounting programs today. Still, their presence does not, by itself, translate into a country trusting its own analysis enough to act on it without external validation. Research on foreign aid experts in South Africa and Tanzania documents this gap directly. Advisory relationships can produce competent technical execution while the recipient government still defers to external expertise for the underlying analytical judgment, not because local staff lack the skill but because of how the advisory relationship itself is structured (Koch & Weingart, 2016).

Development cooperation names a version of the same gap. The Paris Declaration on Aid Effectiveness made country ownership a foundational principle precisely because technical assistance can produce competent execution of a donor-designed reform without producing a government that believes the reform is its own (OECD, 2005). Development scholars call this gap isomorphic mimicry, the condition in which a country adopts a reform's outward form to satisfy the people watching without ever coming to believe in it on its own terms (Andrews et al., 2017). Guatemala's record shows both sides of this distinction inside a single trajectory. Consultant support helped build the accounts through 2019. The program became something the country ran on its own judgment only once Banguat's 2022 decision made the unit permanent, staffed it with its own hires, and kept it operating through a change of government without a donor program's schedule to answer to. That shift from epistemic dependency to analytical ownership is a separate, and arguably prior, condition for the funding continuity discussed below to matter at all.

What most clearly explains why some of this institutional ambition has scaled further than others is not a gap in technical capacity anywhere in the region. It is the absence of positions secure enough to keep the same people doing the work long enough to learn it. Environmental-economic accounting is learned substantially by doing it, reconciling source data across agencies, resolving classification disputes, and building the informal working relationships an inter-institutional data supply chain depends on. That kind of expertise accumulates with practice over years rather than transferring through a training course. This pattern is documented well outside this field, where productivity rises with cumulative production experience and state capability more broadly is built through sustained, iterative practice rather than imported technical models (Arrow, 1962; Andrews et al., 2017).

CEPAL's 2023 survey identifies insufficient dedicated personnel, weak inter-institutional coordination, and limited linkage between accounts and decision-making as the dominant regional constraints. The personnel gap it documents is itself downstream of that funding problem rather than a separate skills deficit. A program without a permanently budgeted position cannot keep staff in place long enough for that learning to compound, no matter how well it trains them at the outset (Alcantar López et al., 2025). Guatemala's own record makes the sequence explicit. Its program slowed for several years once WAVES funding ended in 2019. It only recovered once Banguat's 2022 decision created a permanently funded unit staffed by roughly twelve professionals in secure positions, restoring the continuity the program needed rather than retraining anyone already in place. This is a structural and financial constraint rather than an indictment of technical capability. A companion paper on central-bank participation in the region argues it can be addressed by giving environmental accounting a permanent institutional line whose funding does not depend on donor cycles. The remainder of this section traces each of the four conditions through Guatemala's record with this fuller regional picture in view.

Institutional anchoring depended on a stable, politically insulated host rather than on any single government agency. The public-academic partnership among INE, Banguat, and IARNA-URL gave the program both technical credibility and continuity across three separate political administrations. The WAVES synthesis for Guatemala found that SEEA institutionalization elsewhere in the partnership remained fragile precisely where it lacked this dual, academic-and-statistical anchoring (World Bank, 2019). Banguat's decision to formalize the accounting function inside its own statistics department after 2022, rather than leaving it dependent on the university partnership indefinitely, shows the model maturing rather than being abandoned (Banguat, 2022). The accounts moved from a project-dependent activity to a permanent line function with dedicated, budgeted staff.

Demand-side alignment came from explicitly linking account priorities to live policy instruments rather than producing statistics for their own sake. The WAVES-era scoping process tied account production to the K'atun 2032 national development plan, the National Climate Change Action Plan, and the design of the PINPEP and PROBOSQUE forest incentive programs (World Bank, 2019). Staged sequencing meant building a decade of Central Framework credibility before attempting the more data-intensive ecosystem accounts, a sequence that built the inter-institutional trust and shared data infrastructure the WAVES phase then depended on. The 1st NCA Policy Forum found that this sequencing reduced the political resistance programs met when they attempted ecosystem accounts too early (Vardon et al., 2017). Capacity building was embedded within each phase of production rather than delivered as separate training, transferring methodological expertise to counterparts across SEGEPLAN, MARN, INAB, and INE that outlasted any individual project cycle or donor engagement.

These same four conditions map closely onto the barriers CEPAL's 2023 regional survey identifies as the dominant constraints across Latin America and the Caribbean. The survey names insufficient dedicated personnel, weak inter-institutional coordination, and limited linkage between accounts and decision-making (Alcantar López et al., 2025). The lesson for other countries in the region is not that Guatemala's specific institutional configuration should be replicated item by item, since national circumstances vary too much for that. Rather, the four conditions can be met in different national configurations, provided they appear in some recognizable form. The long-term governance returns to natural capital accounting depend on meeting them, not on any single technical advance in account compilation.

5. From accounts to policy: four promising applications

Guatemala's accounting record is detailed enough to test where SEEA outputs could plausibly inform decisions. The four domains below are the ones where the accounts already speak most directly to open policy questions in Guatemala and, by extension, in ecologically similar economies across the region.

5.1. Beyond-GDP frameworks for ecologically wealthy, unequal economies

Countries that combine substantial ecological wealth with pronounced social inequality are precisely the cases GDP measures least well, and Guatemala clearly fits both conditions. Guatemala's Gini index reached 50.2 in 2023, up from 48.3 in 2014, placing income inequality on a rising rather than falling trajectory even as the economy has grown (World Bank, 2024). Over the same period, the accounts show the real contribution of forests to GDP running more than three times higher than conventional statistics recorded (INE, Banguat, & IARNA-URL, 2013). An updated valuation estimates the annual flow of ecosystem services at 3.3% of GDP, most of it from hydropower provisioning and the non-use value of intact natural areas that markets do not price (Ortiz, Herrera, & Monterroso, 2024). A GDP-centered lens misses both the asset base an unequal economy depends on and the fact that many of the services drawn from that base do not reach the households recorded as poorest in conventional statistics. Turning this diagnostic potential into an operational tool, one that combines environmental intensity indicators with a natural capital dependency matrix and a policy alignment index, is the subject of companion methodological work now in preparation, which this paper does not attempt to substitute for.

5.2. Monitoring the Global Biodiversity Framework

Guatemala's ecosystem accounts already produce two of the physical building blocks that Global Biodiversity Framework monitoring requires, extent and condition, at a level of spatial detail few developing countries can match. Using Holdridge life zones as the unit of analysis, natural ecosystems cover approximately 60% of national territory, but nine of the country's 14

ecoregions show critically compromised ecological integrity. The condition accounts identify land-use change, concentrated in accessible lowlands and the volcanic-cordillera fringe, as the dominant driver of that compromise (World Bank et al., 2021). The connectivity analysis embedded in the condition accounts adds a finding directly relevant to GBF indicators on ecosystem connectivity. Deforestation in the four biological corridors linking the Maya Biosphere Reserve absorbed 84% of all national forest loss between 2001 and 2014 (World Bank et al., 2021). This shows that the reserve's long-term viability depends as much on what happens outside its formal boundary as inside it. These are exactly the extent and condition indicators, and exactly the connectivity logic, that the Kunming-Montreal Global Biodiversity Framework's headline indicators call for (CBD, 2022). Guatemala's experience shows that a country does not need a purpose-built biodiversity monitoring system to generate this evidence if its SEEA ecosystem accounts are already in place. It needs the accounts read with a biodiversity lens.

5.3. Ecosystem accounts in national disaster risk assessments

Latin America's hydrometeorological hazard exposure gives ecosystem service accounts a disaster risk reduction application that goes beyond conservation, and Guatemala's own metropolitan region illustrates the point concretely. A recent multi-scale accounting study of metropolitan Guatemala, covering 28 municipalities and 3.5 million residents, found that 92.6% of regional water supply derives from unregulated private wells rather than monitored utility sources, and that only 3.2% of wastewater receives treatment. Under current trends, approximately 500,000 residents will inhabit flood- and landslide-prone areas by 2032 (Tercero Villagrán & Castañeda, 2026). These are exactly the hidden flows that utility-based hazard assessments miss, because they are invisible to any agency that only monitors the formal, regulated share of water and waste systems. At the national scale, the SEEA land and ecosystem accounts reinforce the same picture, with roughly 63% of national territory classified as at high risk of degradation. The water accounts place the annual cost of water-related disease from contaminated sources at 0.97% of GDP (INE, Banguat, & IARNA-URL, 2013). Read together, the national Central Framework accounts and the municipal-scale ecosystem accounting method developed for Guatemala City show how SEEA-consistent data, compiled at more than one spatial scale, can feed disaster risk assessments that utility records alone cannot produce.

5.4. Spatially explicit accounts for climate change adaptation

Climate adaptation planning requires knowing not just how much natural capital a country has but where its condition is most fragile relative to the populations and economic activities that depend on it. Guatemala's ecosystem accounts are built around exactly that spatial logic. The accounts use Holdridge life zones, defined by biotemperature, precipitation, and evapotranspiration, as georeferenced units that can be updated as new climate data become available, making them a natural vehicle for adaptation planning rather than a static one-off inventory (World Bank et al., 2021). Guatemala's own climate projections show why this

matters. National water availability is projected to decline by 26% by 2050 relative to 2015 levels (MARN, 2021, as cited in Tercero Villagrán & Castañeda, 2026). The accounts can already localize this stress to the life zones and watersheds where hydrological regulation services are most concentrated.

Extending this logic below the national scale, a post-WAVES study connected ecosystem service flows to specific hydrological units across Guatemala's watersheds (Pinillos et al., 2025). It shows that the same accounting architecture used for national aggregates can be downscaled to the sub-national units where adaptation investment decisions are actually made. The energy and forest accounts add a further, GHG-side link to this domain, since biomass combustion and forest carbon stock depletion both entered the national record documented in Section 3.2. That record feeds directly into the evidence base for Guatemala's nationally determined contributions and its access to climate finance instruments (INE, Banguat, & IARNA-URL, 2013).

6. Conclusions

This paper argues that natural capital accounts generate governance value in Latin America only when institutional design keeps pace with statistical production. Guatemala's two-decade record is the clearest available evidence that this design problem is solvable in a resource-constrained developing country. The accounts make legible what GDP cannot, that Guatemala's economy depends on ecosystems it is measurably degrading, and that this dependency and degradation can be tracked at both national and sub-national scale. The resulting evidence can be connected to disaster risk, biodiversity, and climate policy questions that matter across the wider region. Guatemala's status as a WAVES core-implementing country, and the fact that Banguat has since institutionalized the accounting function as a permanently funded strategic objective, is best read alongside three other regional cases. Mexico's 1990 accounts predate the SEEA standard itself, Costa Rica made a parallel choice to anchor its own accounts in a central bank, and Colombia built a technically sophisticated, IDB-supported bridge to policy. Together these cases are evidence that the region's environmental-governance capacity has generally been built through domestic institutional initiative rather than imported wholesale from an external template, with funding continuity and inter-institutional coordination, not a shortage of technical capacity, determining how far that initiative has been able to scale.

Two lines of work now in preparation would extend the argument made here. A companion paper develops an integrated diagnostic framework, combining environmental intensity indicators, a natural capital dependency matrix, and a policy alignment index, to convert Guatemala's accumulated accounts into a systematic policy-screening tool rather than a set of separate statistical products. A second companion paper examines whether Latin American central banks more broadly, not only Banguat, hold the mandate, statistical capacity, and modeling infrastructure to host SEEA accounting as a matter of financial stability and monetary policy relevance. It uses Guatemala's Environmental Accounting Unit as an institutional template

and proposes options for CEMLA-coordinated regional adoption. Neither paper's results are drawn on here beyond this forward pointer, since both currently report illustrative rather than official figures.

This paper's limitations follow directly from its design. It relies on Guatemala as a single deep case rather than a matched multi-country comparison, so the institutional conditions identified in Section 4 are documented patterns rather than causally tested requirements. Readers should treat them as hypotheses the wider SEEA community can test against other long-running programs, not as established causal findings. The Colombia, Costa Rica, and Mexico material in Section 3.3 draws on secondary regional surveys rather than the primary institutional access available for Guatemala, so the comparison across the four countries is necessarily asymmetric in depth. Finally, the authors' direct involvement in coordinating parts of Guatemala's program over two decades is a source of institutional access that makes this synthesis possible. It is also, however, a source of interpretive bias that an external evaluation of the same record might weigh differently. Extending the marine and coastal dimension of Guatemala's accounts, the only significant gap in an otherwise broad portfolio, is a tractable next step that would close one of the clearest remaining data gaps identified by the region's own ocean accounting assessment (GOAP, 2024).

7. Recommendations

The findings above translate into five concrete recommendations for the agencies that fund, monitor, and coordinate SEEA implementation across the region, offered here as discussion points for the Group's consideration rather than as a closed list.

Domestic institutional initiative, not donor design, is the lesson this paper draws most directly, and it exposes a measurement gap. Regional and international monitoring instruments should add an institutional-trajectory dimension to their existing coverage metrics. UNSD's Global Assessment and CEPAL's regional survey both classify countries by current compilation stage. Neither records when a program's environmental accounting function began relative to any donor engagement, or which institution has hosted it over time (UNSD, 2026; Alcantar López et al., 2025). A simple addition, two fields recording a program's start date and its hosting-institution history, would let future assessments distinguish autonomous, long-running programs from donor-initiated ones, a distinction this paper had to reconstruct from country-level grey literature because no existing regional dataset carries it. That gap is not a minor omission. It means the region's own most established programs, Mexico's and Colombia's, are currently indistinguishable in international reporting from programs that began only once a donor program arrived, understating exactly the kind of institutional depth this paper argues the region should be recognized for.

Funding continuity, the condition Guatemala's own record identifies as decisive, translates into a specific design change. Funding agencies designing natural capital accounting programs should treat a permanently budgeted staff position, not a training-completion target, as the operational milestone that indicates durability. Guatemala's own record makes the case directly. Its program slowed for several years once WAVES funding ended in 2019 (World Bank, 2021). It only recovered once Banguat's 2022 decision created a permanently funded unit, restoring continuity rather than retraining anyone already in place (Banguat, 2022). Technical assistance can produce well-trained staff and still leave a program vulnerable if none of those staff hold a position their government has committed to funding beyond the project's own timeline. A concrete design change follows from this record. World Bank, IDB, and comparable funding vehicles could require, as a project completion indicator, evidence that a specified number of positions have been absorbed into a government's permanent budget line, rather than counting staff trained or accounts compiled alone.

Institutional anchoring in a stable host takes a specific form in Costa Rica and Guatemala that international guidance has yet to catch up with. UNCEEAA's compilation guidance should address central-bank hosting explicitly as a recognized institutional variant, alongside the statistics-office model the guidance currently assumes by default. Costa Rica and Guatemala both host their SEEA accounts inside a central bank rather than a national statistics office or environment ministry, a choice each government made independently (BCCR, 2024; Banguat, 2022). That choice gives the resulting statistics a direct line to macroeconomic and financial credibility a purely statistical agency does not carry on its own. This is not a hypothetical scenario the guidance needs to anticipate. It is a documented, replicable model already operating in two countries, with a companion paper to this one arguing the model extends further across the region's central banks. Guidance covering data-access arrangements, governance safeguards, and coordination with a country's national statistics office when a central bank hosts the accounts would let other countries adopt the model deliberately, rather than reconstructing it independently as Costa Rica and Guatemala each had to.

The same lesson on domestic initiative has a peer-learning implication. CEPAL and UNSD should convene the region's own most established programs as peer-learning anchors for other Latin American and Caribbean countries, rather than channeling capacity-building primarily through networks built around a single past donor program. Mexico's SCEEM, launched in 1990, and Colombia's account series both predate the WAVES Global Partnership by roughly a decade (Martínez Guzmán, 2000; DANE, 2017). Yet regional capacity-building has generally organized around WAVES alumni rather than around these older, more established programs. Country-to-country exchange organized around Mexico's, Colombia's, and Guatemala's own institutional histories would let other countries learn directly from the region's longest-running programs, drawing out lessons a donor-centered account of the region's progress does not surface. This recommendation costs little to implement, since it asks a convening agency to change whom it invites and platforms rather than to fund new infrastructure.

Epistemic autonomy, the shift from expert-led validation to a government's own analytical judgment, is the final lesson with a design implication. Donor-funded technical assistance programs should build an explicit handover milestone into their design, one that verifies a government's own staff, not its consultants, are producing and defending the analysis to policy audiences without external validation. Advisory relationships can produce competent technical execution while a recipient government remains structurally dependent on external expertise for the underlying analytical judgment, a pattern documented in other developing-country contexts and not unique to environmental accounting (Koch & Weingart, 2016). Guatemala's own trajectory shows what that handover looks like in practice. Consultant support helped build its accounts through 2019. The program became something the country ran on its own judgment only once Banguat's 2022 decision made the unit permanent and staffed it with its own hires (Banguat, 2022). Writing a comparable criterion into project completion indicators, evidence of local staff presenting and defending account results independently, would give this transition a monitorable marker rather than leaving it as an informal judgment made well after a program's funding has already ended.

The authors welcome the Group's views on which of these recommendations merit further elaboration, and on what other regional or international mechanisms could make institutional ownership, rather than compliance with an external template, the explicit basis for future capacity-building design.

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