



Digital as a Key Enabler for Climate Action

The Latin America Perspective

Introduction

As addition to our global study “The Road to Sustainability: Digital Technologies as a Key Enabler for Climate Action,” this **regional chapter** further explores how digital technologies can be leveraged to meet the challenges across the three pillars of climate action (Mitigation, Adaptation & Resilience, Setting Foundations). As one out of six regional deep dives, this chapter is intended to adapt global recommendations to the local context and distinct regional dynamics within **Latin America**.

Latin America (LATAM) is a diverse region with a wide range of countries, politics, infrastructure, and perspectives. Alongside the regional outlook, we have chosen to focus on four specific countries: **Mexico, Colombia, Argentina, and Brazil**.

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Climate Action in LATAM – the current state

As the coming years will have the greatest influence on future climate stability, there is little time left to deploy and implement climate protection actions. One key component, though not sufficient on its own, is the reduction of greenhouse gases (GHG) (mitigation) **to meet the Paris Agreement commitments to limit overall global warming to 1.5 °C.**

The LATAM region was responsible for **3.62 Gt CO₂eq in 2022 or 6.7% of the total global GHG emissions.**¹ However, the distribution of emitters within the region is very uneven, with Brazil (1.3 Gt CO₂eq), Mexico (820 Mt CO₂eq), Argentina (383 Mt CO₂eq), and Colombia (216 Mt CO₂eq) together accounting for **three quarters of the emissions at the region level.**

Argentina, Mexico, Colombia, and Brazil have each set ambitious climate targets. Argentina's target is to reach net zero by 2050.² Mexico aims for a 35% emissions reduction³ by 2030, while Colombia is aiming for a 51% reduction by the same year.⁴ Brazil has committed to a 43% reduction by 2030 and has proposed legislation for large businesses to cut and monitor emissions, while also supporting digital technology for carbon market monitoring.⁵ According to a study, 15% of the global potential for offsetting emissions through natural climate solutions is in Brazil besides forests, making it the country with the greatest potential.⁶

At the country level, LATAM countries have advanced a lot of national legislation and joined a large number of international treaties. In addition to agreeing to the Paris Agreement, **all countries (except Brazil) have signed a regional legal instrument aimed at strengthening environmental rights in Latin America and the Caribbean.** Furthermore, the Andean communities (Bolivia, Colombia, Ecuador, and Peru) have developed an agenda specifically to utilize digital transformation for sustainable development.⁷

The LATAM region is hosting many global forums and summits in the area of climate change. Examples of this active environmental diplomacy include the G20 summit in 2024 and the COP30 in 2025, both taking place in Brazil, which has also taken on the Mercosur presidency. Other regional organizations also exist to assist in supporting technology to combat climate change such as PACAL and REGATTA⁸ as well as OCTA, an intergovernmental organization formed by eight Amazonian countries that promotes sustainable development of the Amazon region. On the technology front, Argentina, Colombia, Mexico, and Brazil had all developed open data policies by 2019 with input from civil society experts and relevant organizations.⁹

At COP28 in Dubai, the Brazilian Ministry of Science, Technology, and Innovation (MCTI) launched the SIRENE Organizational platform.¹⁰ This innovative, publicly accessible tool is designed to collect voluntary GHG emission inventory reports from a wide range of organizations, spanning public, private, and third sectors across various economic segments. As a pioneering federal initiative, it aims to foster participation among organizations nationwide in support of Brazil's climate objectives.

There is widespread consensus on the significance of climate change and sustainability among the public, including a demand from 88% of Latin Americans for stricter government climate measures.¹¹ In fact, climate change and environmental degradation are now considered among the top challenges in most Latin American and Caribbean countries, with the exception of Argentina, Chile, and Paraguay where they do not make the top five concerns. Current strategies typically lean towards a "bottom-up" approach, emphasizing industry transformation over public education. For instance, while there is public interest in Brazil to limit deforestation, a lot of this pressure comes from local organizations whose purpose is to preserve Indigenous and native communities.

The burning issues

Drawing on comprehensive discussions with a diverse range of stakeholders, three paramount issues have been pinpointed which, when addressed collectively, hold the key to propelling sustainable progress and equitability in the LATAM region.



Deforestation

Between 2010 and 2020, South America lost an average of 2.6 million hectares of forest per year. In other words, the continent lost an area of forest the size of Ecuador in the span of a decade.¹² With all eyes on the Amazon and many other forests, protecting this major carbon sink is important to the region, as reflected by almost all NDCs. This includes not only protecting against further damage and accelerating reforestation efforts but also adapting economies to be less reliant on timber industries.



Loss of Ecosystems, Habitats and Biodiversity

The loss of ecosystems, habitats, and biodiversity in Latin America has profound consequences for the region's environmental health and socio-economic stability. The vast and diverse ecosystems, from the Amazon rainforest to the Andean highlands, are home to unique flora and fauna, many of which are endemic and hold immense ecological value. Indigenous livelihoods tied to these ecosystems are therefore at risk. Fostering biodiversity and bioeconomy activities creates ways in which the Latin American population can generate income, have their basic needs met, and helps them to break free from illegal activities and organizations.



Increased Weather Changes

Latin America is particularly vulnerable to climate change. In 2022 alone, extreme weather events affected 10 million people and caused \$US 9 billion in damage.¹³ Much like the rest of the world, climate change mitigation is not enough to stave off the damage that has already occurred, resulting in increasing natural disasters such as droughts, floods, and wildfires. In addition to infrastructure for areas without absolutely any, even areas with sufficient infrastructure must continuously consider upgrades to ensure adaptation and resilience. Currently 60% of the regional NDCs mention the development of early warning systems for droughts, floods, storms, heat waves, and cold waves.¹⁴

Climate KPIs LATAM

| Measure | Unit |
|--|---|
| Climate Indicators – Changes in temperature by 2080¹⁵ | |
| Central America (dry season/wet season) | 1.0 – 5.0 °C / 1.3 - 6.6 °C |
| Amazonia (dry season/wet season) | 1.8 - 7.5 °C / 1.6 - 6.0 °C |
| Southern South America (winter/summer) | 1.8 - 4.5 °C / 1.8 - 4.5 °C |
| Activity Indicators¹⁶ (in leading LATAM countries) | |
| Absolute emissions per year (CO ₂ e) | BRA: 489M t / MEX: 407M t / ARG: 186M t / COL: 92M t |
| GHG per capita (CO ₂ e) | BRA: 2.3 t / MEX: 3.2 t / ARG: 4.1 t / COL: 1.8t |
| Projected emissions in 2050 if all NDCs are achieved (CO ₂ e) ¹⁷ | BRA: 733M t / MEX: 279M t / ARG: 151M t / COL: 121M t |

Across South America, the combined percentage of renewable energy in the energy mix reaches 37%. In the realm of renewable energy, hydropower significantly surpasses other sources, generating seven times the amount of energy compared to wind power, the next-largest component.¹⁸ Brazil and Colombia both have comparable energy mixes relative to other countries in the region with 42% and 29%, respectively, coming from renewable sources in 2022.¹⁹ In Brazil, this percentage increased by 15% between 2015 and 2020 and includes remote villages without access to the electric grid, which runs on 77% clean energy.²⁰ By contrast, Argentina and Mexico barely generate any of their energy power from renewable energy sources, with 11% and 9%, respectively.²¹ Overall, the pace of increase in renewable energy capacity needs to accelerate, as electricity demand in LATAM is expected to surge by 48% between 2020 and 2030.²²



Case Study

A group of telecom and network providers has achieved a successful deployment of their first customer project using NarrowBand IoT (NB-IoT) technology in Chile. In collaboration with Kamstrup, a leading water supply services provider, the project focused on testing the connectivity management of a residential water meter telemetry solution. The NB-IoT technology enables low energy consumption, wide network coverage, and scalability, making it ideal for Internet of Things (IoT) applications. The telemetry solution allows customers to monitor daily water consumption, facilitates accurate billing, detects leaks, and provides crucial information to the water company's operation teams about the status of customer supply. With this collaboration, the group of telecom and network providers has launched the first real NB-IoT experience in Latin America.



Case Study

Rainforest Connection, a group of engineers and developers, is utilizing technology to combat deforestation in tropical rainforests and to address climate change. Recognizing that nearly one-fifth of GHG emissions result from forest destruction, the team, in collaboration with the Temb  tribe from the central Amazon, has created the world's first scalable, real-time detection and alert system using recycled cell phones and machine learning. They've placed modified smartphones, called "Guardian" devices, in trees in threatened areas, powered by solar panels. These devices continuously monitor the sounds of the forest and use TensorFlow, Google's machine learning framework, to analyze audio data in real time, detecting illegal activities such as chainsaws and logging trucks. The initiative, known as "Planet Guardians," involves students from Los Angeles STEM science programs who build their own Guardian devices to protect the rainforest. Through technology and programs like "Planet Guardians," Rainforest Connection aims to engage the next generation in the fight against climate change.

Digital Transformation and Innovation

In general, the LATAM region is struggling with a 'digital gap,' with regions suffering from limited access to technology due to inadequate internet coverage or devices.

This mainly stems from physical limitations around geographic landscape, as well as economic sources such as poverty and underdeveloped or deficient infrastructure. In 2020 it was estimated that 38% of the population in the region did not have access to the internet.²³ By contrast, Colombia is highlighted as a country with a particularly accelerated digital transformation and Mexico and Argentina as having “moderate to high” levels of infrastructure.²⁴ **The percentage of urban households with broadband internet in Colombia is 60%, reaching 70% in Mexico, but these figures drop to 20% and 25%, respectively, in rural areas.**²⁵ In terms of 5G, the LATAM region also lags behind in international comparison, with an estimated 12% penetration rate of this technology by 2025 according to GSMA projections.²⁶

Despite this, 55% of the private sector in 2022 relied on Cloud solutions with a 45% increase in investments in 2023.²⁷

Additionally, during the pandemic, in Argentina, Brazil, Chile, Colombia, and Mexico, 19% of companies in traditional sectors used technologies such as big data and digital platforms, 18% used IoT, and 16% used artificial intelligence.²⁸ Similarly, governments in Latin America have started to invest in the digital transformation of public entities such as with Colombia's 2019 National Policy for Digital Transformation and Artificial Intelligence.²⁹ Likewise, in Argentina, the Governmental National Office of Information Technologies has begun implementing a “Cloud first policy.”³⁰

Recognizing the potential of digital technologies to enable climate action, it is estimated that today's digital technologies,

if well optimized and applied widely, could reduce up to 20% of total global emissions.³¹ This positive impact results from the ability to better **connect and communicate**, enabling better **monitoring and tracking**, providing software that can **analyze, optimize, and predict**, and offering support through augmentation and automation. To fully harness the benefits of digital transformation for climate resilience in LATAM, there is a pressing need to not only elevate digital skills, talent, and maturity, but also to implement strategic digital initiatives in climate monitoring, infrastructure, and innovation.

From our comprehensive interviews and the synthesis of diverse opinions, three clear priorities have emerged that are instrumental to harnessing the power of digital transformation for climate resilience:

Invest in the development of artificial intelligence (AI). AI significantly contributes to combating climate change by enhancing data analysis and decision-making processes. AI algorithms can analyze vast amounts of environmental data from various sources, enabling more accurate predictions and models of climate patterns and changes. This improved understanding aids in developing more effective strategies for reducing GHG emissions and implementing sustainable practices. AI also optimizes energy usage in various sectors, from smart grids to transportation, and supports the development of more efficient renewable energy systems, thereby playing a vital role in reducing the overall carbon footprint.

Deploy IoT and remote monitoring systems. IoT and remote monitoring systems play a crucial role in gathering real-time data about energy consumption, resource use, and environmental impacts. This data can be used to identify inefficiencies, monitor compliance with environmental standards, and optimize resource allocation. By enabling smarter management of energy and utilities, these systems can significantly reduce waste and greenhouse gas emissions, contributing to more sustainable urban and industrial environments.

Invest in AI and satellite imaging for environmental monitoring. AI and satellite imaging technologies provide powerful tools for monitoring environmental changes such as deforestation, land cover changes, and the health of natural ecosystems. By analyzing large amounts of data from satellite images, AI can help design effective green solutions, monitoring urban development for sustainability and assessing the impact of human activities on natural habitats. These insights are vital for informing policies and actions to protect the environment and mitigate the effects of climate change.



Case Study

Equipe de Conservação da Amazônia (Ecam), a Brazilian NGO, is committed to empowering traditional communities and advocating for environmental conservation. Indigenous and other traditional communities often serve as vital defenders of the forests they inhabit, protecting these areas from encroachment and deforestation. Scientific evidence has demonstrated that Indigenous peoples and local communities are exceptionally effective stewards of conservation, often surpassing the efficacy of government-funded protected area agencies. However, their efforts are frequently undermined by poorly-documented land tenure, a legacy of colonial practices, leaving them in vulnerable positions. Ecam's mission includes assisting these communities in establishing clear land tenure and sustainable management plans for the forested lands they have inhabited for generations.

Following the Rio+20 Conference in 2012, Ecam formed a partnership with Google to create the Surui Cultural Map. This collaboration expanded in 2016/17 when Google facilitated a partnership with USAID, securing \$3.8 million in operational funding for the Amazon Project. This project extended the successful Surui pilot to 30 additional Indigenous and forest communities across the Brazilian Amazon. Through the program, Ecam has trained hundreds of Quilombola and Indigenous groups to use Google tools for land management. This initiative has not only increased the involvement of these communities in land-related discussions but also strengthened their land rights and provided economic incentives for forest conservation.

Today, Indigenous peoples, Quilombolas, and small-scale family producers are leveraging advanced technologies as tools for defending their territories and preserving their cultures. This includes the use of Google Earth and the Ground smartphone app, which democratize offline mapping and data collection, enabling these communities to map and manage their lands effectively.

Climate Forward Government

Governments can effectively handle risks and challenges in environmental action by **setting goals** and **creating a flexible framework to achieve them**. As a first step, comprehending regional barriers and complexities is key so that policymakers can tailor their strategies to effectively address them, enabling the acceleration of digital tech-driven climate action.

Barriers to Digital Climate Solutions

Globally, two main overarching barriers to harnessing the potential of digital technologies for climate action have been identified: insufficient innovation and insufficient engagement. LATAM presents 3 key barriers and challenges that need to be overcome:

1. Inappropriate Regulations Enforcement and Budgeting

While most LATAM countries understand the cost of inaction when it comes to climate change and are setting ambitious goals that are often supported by a growing set of regulations at the intersection of environment and digital, this legislation is not always enforced. One reason for this is the complexity of these issues and the difficulty of getting individual municipalities on board. This is exacerbated by the fact that digital solutions may be as inherently complex as the climate issues they intend to solve. Beyond this limitation, there are concerns among lobbyists that digital solutions targeting climate issues may have less immediate and observable impacts, leading to a greater allocation of funding and attention to short-term, physically tangible issues. As a result, budgeting for climate projects is often insufficient or turns out to be one-off instead of being considered a recurring investment.

2. Poverty and Economic Inequality

Poverty rates in the LATAM region are among the highest in the world. It is estimated that in 2020, 33.7% of the population in LATAM was living in poverty and an additional 12.5% in extreme poverty. Inequality is also on the rise, with 1% of the richest having 22-fold more income than the bottom decile. While climate change can further exacerbate poverty, one could think of reductions in rainfall

for farmers, climate policies themselves, if poorly designed, may also aggravate social inequalities and disproportionately affect those already vulnerable. For instance, government measures limiting deforestation can further endanger the well-being and economic situation of Indigenous populations active in the cattle ranching or timber industry. Poverty also leads to a significant digital gap and limited access to technology starting with a lack of internet coverage.

3. Resource Constraints for Climate Tech Companies

The ecosystem of climate tech companies is a complex one to understand for financial institutions, which rarely possess the know-how to perform comprehensive risk and business model assessments. Banks also have a limited track record in climate tech financing for private projects. As a result, most banks end up financing projects based on the sponsors' credit history, due to lower perceived risk, and rejecting or significantly delaying financing for new sponsors. Economically, this translates into banks perceiving higher risks and therefore providing shorter tenures, higher interest rates, and asking for asset-backed guarantees. Many new companies or small startups in the field of climate tech fail to secure funding under reasonable terms, if at all.



The Guacamaya Project

In September 2023, the unveiling of Guacamaya marked a significant jump forward in conservation efforts for the Amazon. Led by a joint venture that includes many universities around the world, this AI-powered initiative promises to revolutionize biodiversity monitoring. Integrating AI models with bioacoustics data, camera trap monitoring, and satellite imagery, Guacamaya streamlines research processes, offering comprehensive insights and solutions for conservation in a fraction of the time. This technological innovation not only enhances data processing but also fosters global collaboration, setting a precedent for safeguarding critical ecosystems beyond the Amazon.³⁴

Policy Goals

Policy goals in LATAM should address the aforementioned challenges by implementing three core strategies:

First, enforcing regulation measures and standardizing the market. It would be beneficial for governments to encourage the enforcement of regulations by easing the adoption of digital tools and climate solutions through standardization and supportive privacy regulations. The aim is to facilitate adopting innovative climate technologies and ensure consistent, high-quality environmental practices across all sectors.

Second, policymakers should consider improving education and support populations affected by climate measures. As mentioned above, the population in LATAM is relatively aware of climate change patterns and their consequences on living standards. Governments, however, can provide local populations with the necessary educational and technical tools to act accordingly and support Indigenous communities that are disproportionately affected by climate change.

Finally, policymakers might explore options to increase the number of climate tech companies. This involves not only providing direct funding but also facilitating an environment where climate tech companies can thrive, innovate, and contribute significantly to climate change mitigation and adaptation efforts.



Case Study

Sipremo, a Brazilian start-up, has created an innovative cloud platform utilizing artificial intelligence.³⁵ This platform efficiently predicts natural disasters, specifying their potential locations, timings, and types. It not only facilitates informed decision-making by alerting relevant parties but also generates strategic reports. Impressively, the technology boasts a 75% accuracy rate in forecasting such events. It has been instrumental in reducing disaster-related costs by 32% through advanced warnings and enhancing preparedness, demonstrating a significant impact on building resilience against natural disasters.

Digital Tech Policy

In presenting the potential policy measures for achieving these goals, the Digital Sprinters Framework by Google offers a structured approach. This framework defines four primary categories: Infrastructure, People, Market Environment and Tech Innovation. Each category addresses specific policy aspects that can facilitate sustainable and inclusive economic growth while harnessing the power of digital transformation.



Infrastructure

- **Connect remote areas**, including expanding internet access to enable adoption of digital technologies that lower emissions. This is best done by incentivizing internet companies through grants and tax cuts to invest in regions that would otherwise be unprofitable to invest in.
- **Invest in reforestation & deforestation monitoring technologies** using drones and satellites within the confines of Indigenous populations' sovereignty and autonomy. Such technologies can identify where illegal deforestation is taking place.
- **Expand sanitation & sewer treatment using digital solutions** both in terms of tracking and monitoring usage, as well as water quality. More advanced methods of treating water can have a large impact on both health and emissions in these areas.
- **Ensure improved resilience:** The World Meteorological Organization suggested in 2022 that South America needs to strengthen and supplement their existing early warning systems. These systems³⁶ can assist with planning as well as crisis response and can help authorities and the public access climate data to make informed decisions.



People

- **Improve environmental and digital literacy:** Increased investment in environmental and digital education not only raises awareness of people's environmental footprints but also helps future generations shift from low-paid and heavy-environment footprint industries such as lodging to high-paid, low-environmental footprint careers in the service industry.
- **Empower local leadership for capacity building** and initiating localized campaigns. This fosters a deeper understanding of climate change issues within respective communities and increases regulation enforcement, thereby bridging the gap between abstract global issues and tangible local impacts.
- **Provide financial institutions with tailor-made training** to adjust their risk assessments and develop relevant financial products to unlock the provision of capital.



Market environment

- **Ensure effective and equitable carbon markets:** As Brazil is poised to create a regulated carbon market which could become one of the largest in the world, governments might explore ways to strike the right balance between effectiveness and equity. This implies taking into account specific Indigenous populations and sectors such as agriculture to avoid a “green gold rush.”
- **Improve regulation enforcement** by standardizing environmental and digital legal frameworks as well as making laws clearer and more accessible. In addition, governments would benefit from continuously reviewing regulations to include monitoring digital tools for better and cheaper enforcement.
- **Provide populations affected by climate measures with adequate financial assistance** to compensate for their revenue loss. Additionally, or alternatively, offer reskilling programs to help those communities find other revenue sources.
- **Avoid one-time budgeting of climate tech projects** and develop a long-term view to make those investments recurring and to ensure sufficient funding.



Tech Innovation

- **Encourage biotech and bioeconomy companies to drive non-timber demand through grants and subsidies:** As the logging industry is expected to shrink as a result of anti-deforestation efforts, it is important to drive forward innovation to secure the livelihood of workers operating in the industry. Digital solutions can potentially enhance the value of non-timber forest products in various ways. This includes optimizing the collection of nuts and leaves to make it economically competitive with tree logging or employing AI to advance scientific research and development for discovering additional medicinal applications.
- **Support funding of the climate tech ecosystem by increasing incentives for financial institutions to fund climate tech projects** through government loan guarantees or by providing government loans directly to entrepreneurs.



Case Study

Governments can leverage technologies that Monitor & Track (such as sensors and warning systems) in order to build more resilient infrastructures, thus allowing us to be better equipped for damage caused by climate change. Furthermore, the data created can help provide insight through the “Analyze, Optimize and Predict” function of technology. One application of this is the Tapestry project, which aims to create a single, virtualized view of the electricity system. By developing computational tools that can predict and simulate future scenarios on the electric grid, ranging from the immediate future to decades ahead, Tapestry is facilitating the transition to a carbon-free, reliable electric grid.



Case Study

EcoRegistry is a platform that uses blockchain to streamline and facilitate the carbon market. This company had the first-ever registration of carbon credits based on blockchain and is known for its reliability, traceability, and security. This platform currently has 166 registered projects and has issued over 67,900,000 credits. Furthermore, it aligns closely with Colombian governmental initiatives such as RENARE, as it serves as a source of information that can enrich the institution’s data.

Industry perspectives

Having identified what to do, and how to do it, the next question is where to start. Based on current emission levels and the expertise of interview partners, a special focus on implementing digital technologies leveraging climate action should be placed on the following four key industries: **Energy, Industry, Transportation, and Agriculture.**

| Industry | Recommendation ³⁷ | Specific action | Priority |
|----------------|---|--|----------|
| Energy | Smart grid and energy storage | Invest resources to develop the digital infrastructure needed to expand the energy grid in remote villages | High |
| | Generation of renewable energy/ minerals | Offer incentives for the adoption of solar panels, which can improve energy use sustainability, especially when coupled with feed-in systems and proper monitoring | Medium |
| Industry | Subsidization of digital tools | Incentivize small and medium businesses in the industry sector to adopt climate-friendly digital solutions that may have high up-front costs | Medium |
| Transportation | Legal framework for digital tools in transportation | Reduce red tape around the use of new digital technology such as drones to transport products to and from remote areas or intelligent traffic light and real-time traffic systems | Medium |
| | Transition to EV | Incentivize households financially and fiscally, to acquire electrical vehicles, especially in areas facing heavy traffic congestions | Medium |
| Agriculture | Sustainable farming techniques | Invest in AI-powered solutions to implement and monitor crop rotation and product diversification policies. Such digital tools can also address soil carbon monitoring and fight deforestation | Medium |

Conclusion

This regional chapter delves into the intricate interplay of digital technologies and climate action in the diverse and dynamic landscape of Latin America and underscores the imperative to adapt overarching recommendations to the distinctive local contexts and challenges faced by countries in this region.

Deforestation, loss of ecosystems and biodiversity, and increased weather changes mandate a call for urgent comprehensive and innovative solutions. The vast and unique ecosystems in Latin America, home to diverse flora and fauna, face unprecedented threats. Despite grappling with a digital gap, the region has made strides in leveraging digital technologies to combat climate challenges. From fighting illegal deforestation through artificial intelligence to preserving biodiversity and enhancing early warning systems for extreme weather events, digital technologies showcase their potential impact.

Governments in the region play a pivotal role in shaping climate policies and removing barriers to climate action such as poor regulation enforcement and poverty. As Latin America navigates the complex intersection of digital technologies and climate action, the strategies outlined here, if effectively implemented, can propel the region towards a sustainable and inclusive future.

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