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## The New Silk Road in Science: China's Science Diplomacy in the Americas

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JACK D. GORDON INSTITUTE  
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# THE NEW SILK ROAD IN SCIENCE

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CHINA'S SCIENCE DIPLOMACY  
IN THE AMERICAS

**AUTHOR**  
ADAM RATZLAFF

## SEPTEMBER 2024

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## EXECUTIVE SUMMARY

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As U.S. policymakers' concerns over Chinese influence in the Americas continue to grow, one area that deserves particular attention is Chinese engagement in science and technology. While it is sometimes considered outside the scope of traditional diplomacy, science and technology are increasingly important for economic development and encompass a large range of sectors that are critical to U.S., Chinese, and regional capabilities. These include defense, the green energy transition, and healthcare. Given the importance of these issues, it is unsurprising that China has sought to gain a foothold in this area.

Chinese science diplomacy in the Americas targets key sectors, including space exploration, health diplomacy, digitization, next-generation telecommunications, and the energy transition. Each provides China with a unique opportunity to engage in areas where Latin America and the Caribbean need investment and actively seek support. The United States has been involved in science diplomacy with the region in various ways for over a century. In fact, the predecessor to the Pan American Health Organization, the International Sanitary Bureau, was formed in 1902 as part of a collective effort to address yellow fever.<sup>1</sup> However, regional leaders increasingly laud China's great strides in science and technology. While some of this is due to the differences between U.S. and Chinese economic systems, it also reflects China's holistic strategy of Latin American and Caribbean (LAC) engagement.

To boost science diplomacy in the Americas, U.S. policymakers should:

- Accelerate nearshoring, friend-shoring, and technology transfer programs.
- Deepen military science and technology engagement.
- Empower the private sector.
- Increase fellowship and scholarship opportunities and support science study abroad.
- Develop joint regulatory systems.
- Support regional healthcare initiatives and disaster response.
- Create a unified messaging campaign.

The rise of Chinese science diplomacy in the region and the growing U.S.-Chinese rivalry offer opportunities and challenges for LAC policymakers as well. To maximize their gains while avoiding potential pitfalls, LAC leaders should:

- Capitalize on U.S.-Chinese competition while avoiding dependency.
- Ensure technological transfers.
- Close the digitization gap.



## INTRODUCTION

Right outside the hotel where Ecuadorean and Chinese officials signed the May 2023 Free Trade Agreement was a sign reading “Welcome to Ecuador, China” alongside a Chinese CS55 Plus, a new electric vehicle (see Figure 1). While China has rapidly become a critical trade partner for many countries in the Americas, the prominent display of China’s electric automobiles at a signing ceremony highlights an important shift in China’s approach to Latin America and the Caribbean (LAC). Although China still relies on the region for raw materials, it increasingly engages with LAC in “new infrastructure,” a loosely defined term that focuses on key industries in telecommunications, fintech, energy, and other innovation-related sectors.<sup>2</sup> This shift in China’s approach to the region—as well as globally—can be seen not only through trade but also in its approach to investment, exchange programs, and diplomacy.

**Figure 1. Entrance to Marriott Hotel for Signing Ceremony in Ecuador, May 2023**



Source: Author's photograph.

Chinese engagement in 5G and space cooperation has grown exponentially, and Chinese mask and vaccine diplomacy throughout the COVID-19 pandemic highlighted an important realignment of Chinese foreign policy—in the Americas and globally. These areas exemplify China's increased science diplomacy in the region. The role of science and technology in a country's foreign policy is not new; states have regularly leveraged technology and innovation as components of their foreign policies.<sup>3</sup> However, in an increasingly globalized and interconnected world, the role of science diplomacy and technological development is increasingly viewed as a critical component of national security. As such, Chinese activity in technological development is increasingly

considered a threat within U.S. policy circles and the U.S. military.<sup>4</sup>

While China provides critical and necessary financial and technological support to LAC countries, there are growing concerns about cybersecurity, privacy, and dual-use technologies. Understanding Chinese science diplomacy with LAC as part of its broader diplomatic and economic strategy is critical for U.S. and regional policymakers. While Chinese science diplomacy provides important opportunities for countries to help prepare their citizens for the technologies of the future, it may also include risks, such as intelligence gathering and infringement of sovereignty. For the United States, China's growing presence in science and technology in LAC not only signals greater competition but also poses security risks, most notably in areas where these technology partnerships could potentially serve dual-use purposes and expand Chinese military capabilities in the region.

## CHANNELS OF CHINESE SCIENCE AND TECHNOLOGY ENGAGEMENT WITH LATIN AMERICA

While much of the focus of traditional diplomacy focuses exclusively on the role of foreign ministries and the state more broadly, science diplomacy is composed of a broad array of actors. These include governments, companies, universities, and multilateral institutions. While the role of the U.S. private sector has been viewed as increasingly critical in foreign policy broadly,<sup>5</sup> its role within science diplomacy is more pronounced given the large disparity between investment in science and technology relative to the public sector. However, in China, the overlap between the state and the private sector makes the mapping of these engagements somewhat more straightforward, given the tight linkages between the public and private sectors—particularly with China’s large state-owned enterprises (SOEs). In fact, reporting on Chinese space partnerships in the region has noted the tight connections between the Chinese SOEs engaged in supporting civilian space programs abroad and the People’s Liberation Army.<sup>6</sup> The connections between China’s public and private sectors make understanding the role of the state in promoting science diplomacy all the more critical as it allows China to pursue national security ends more readily.

The main strategic vehicle of China’s global science diplomacy efforts is the Digital Silk Road (DSR) Initiative.<sup>7</sup> The DSR serves as the digital component of China’s Belt and Road Initiative (BRI). At present, 22 LAC countries are members of the BRI.<sup>8</sup> Brazil also recently announced its intent to join.<sup>9</sup> According to a 2020 study by the Council on Foreign Relations,<sup>10</sup> the precise number of countries worldwide that are signatories to the Digital Silk Road Initiative is unknown. However, there are at least four within the Western Hemisphere—Cuba, Ecuador, Peru, and Venezuela.<sup>11</sup> The DSR has a loose mandate but is a central component of China’s broader BRI initiative and provides support to member countries with digital infrastructure including telecommunications networks, e-commerce systems, AI capabilities, and surveillance technology.<sup>12</sup> When China announced the expansion of the DSR globally, U.S. officials expressed concern that China would use it to expand its espionage capabilities.<sup>13</sup>

**Table 1. Belt and Road Initiative Members in Latin America and the Caribbean**

	Year Joined
Antigua and Barbuda	2018
Argentina	2022
Barbados	2019
Bolivia	2018
Chile	2018
Costa Rica	2018
Cuba*	2018
Dominica	n/a
Dominican Republic	2018
Ecuador*	2018
El Salvador	2018
Grenada	2018
Guyana	2018
Honduras	2023
Jamaica	2019
Nicaragua	2022
Panama	2017
Peru*	2019
Suriname	2018
Trinidad and Tobago	2018
Uruguay	2018
Venezuela*	2018

Sources: Created using data from James McBride, Noah Berman, and Andrew Chatzky, “China’s Massive Belt and Road Initiative,” *Council on Foreign Relations*, February 02, 2023; “Assessing China’s Digital Silk Road Initiative,” *Council on Foreign Relations*; and Didi Tang, “Honduras signs up to China’s Belt and Road programme,” *The Times (UK)*, June 12, 2023,.

Note: \*Also a member of the Digital Silk Road.

In addition to the DSR, the China-CELAC Forum is a vehicle for Chinese regional engagement in the Americas. Established in 2014 and meeting since 2015, the China-CELAC Forum serves as the primary mechanism through which China engages in multilateral diplomacy with Latin America and the Caribbean.<sup>14</sup> While the Forum itself is primarily a gathering of the executives of all 33 LAC countries with their Chinese counterparts, one of the most important functions of the Forum is the centralization of various subforums that gather government officials or civil society representatives from LAC

with their Chinese counterparts. In the 2022-2024 China-CELAC Joint Action Plan, there were 22 existing or proposed subforums.<sup>15</sup>

While the various subforums on private sector engagement and investment will touch on issues of science diplomacy and knowledge transfer, there are four subforums from the 2022-2024 Joint Action Plan that are of particular importance for science and technology partnerships in the region: the Science, Tech, and Innovation Forum, the Digital Technology Anti-Epidemic Cooperation Forum, the Digital Technology Cooperation Forum, and the Space Cooperation Forum.

In September 2022, Chinese and LAC representatives met at the fourth China-CELAC Science, Tech, and Innovation Forum to discuss deepening cooperation and the development of additional subforums to further scientific collaboration.<sup>16</sup> The China-CELAC Space and Cooperation Forum met for the first time earlier this year.<sup>17</sup> The agenda for the Forum included conversations on “space infrastructure for sustainable socio-economic development,” deep space exploration, “innovative development of the space supply chain,” and “global governance of outer space.”<sup>18</sup>

While the outcomes of these meetings can have important investment and governance implications, the China-CELAC high-level gatherings on science cooperation also generate attention and media coverage to improve regional perceptions of China. Although many countries participate in science diplomacy initiatives, these efforts rarely receive much visibility. China, through its media partners, uses these gatherings as an opportunity to showcase Chinese engagement with LAC nations in science and technology. Given that these areas are largely win-win and benefit nations in the region, the media blitz serves as an important tool for boosting perceptions of China and framing it as an important and interested partner.

Latin American leaders often see Chinese investment in these areas as critical. In fact, at a recent gathering to mark the 10th anniversary of the China-CELAC Forum, Uruguayan Ambassador Fernando Lugris called for deeper Chinese engagement in science, technology,

and communications in LAC.<sup>19</sup> Investment in science and technology also aligns with China's recent plans to invest more heavily in “new infrastructure.” Recent reports on Chinese foreign direct investment to the region highlight a notable shift toward sectors related to science and technology—despite a decline in total Chinese foreign direct investment in the region.<sup>20</sup> This is occurring in most LAC countries and not just in those linked to the Digital Silk Road. Chinese officials have recently noted plans to deepen engagement in science and technology as part of their “new infrastructure” initiatives.<sup>21</sup>

China's science diplomacy efforts in LAC pose three central challenges to U.S. interests: (1) an increase in Chinese economic and political influence in the region, including through increased perceptions of Chinese altruism, (2) security concerns surrounding potential dual-use technologies that China could leverage for use as weapons systems or intelligence systems, and (3) the ability for China to shape regulatory environments and global governance in the science and technology sectors.



## CRITICAL AREAS OF CHINESE SCIENCE AND TECHNOLOGY ENGAGEMENT

Chinese engagement in specific sectors highlights different trends as well as opportunities and challenges for the region and the United States. Chinese science diplomacy takes place across a variety of key areas: space, health, energy, and technology.

### **Space Diplomacy**

Space cooperation is Chinese science engagement in the Americas that has garnered attention and concern. Space technology is dual use, with civilian and military applications. U.S. officials have expressed concerns about China's ability to leverage these locations and resources as potential missile launch sites as well as for espionage.<sup>22</sup> Adding to these concerns is the fact that national militaries largely run many of the space programs in the region, which allows for deeper Chinese engagement with LAC militaries as part of scientific diplomatic efforts.<sup>23</sup> Given these concerns, understanding how China uses science diplomacy to engage in space partnerships relative to U.S. efforts is crucial.

In 1988, China and Brazil developed the China-Brazil Earth Research Satellite (CBERS) program.<sup>24</sup> Since launching its first satellite in 1999, CBERS has launched five additional satellites and plans to launch another in 2025.<sup>25</sup> In 1989, China and Argentina started a space partnership. China also engages with some LAC nations through the Asia-Pacific Space Cooperation Organization, founded in 2008. Peru is a founding member and Mexico became an observer in 2015.<sup>26</sup>

China has invested in space facilities across South America. According to the Washington Post and the Center for Strategic and International Studies, China has several ground space facilities across the continent.<sup>27</sup> The oldest of these facilities is in Venezuela and was built in 2008.<sup>28</sup> In addition to these facilities, China has access to additional facilities in Brazil and Chile as part of research partnerships developed in the 1980s that continue to expand.<sup>29</sup> The companies operating these facilities and the technology used in them are largely run by Chinese state-owned enterprises with close ties to the People's Liberation Army.<sup>30</sup> Given the dual-use potential of these programs and the connections to the Chinese military, national security experts have expressed concerns

these could pose potential cybersecurity risks, be used for surveillance, and serve as necessary inputs for missile command and tracking.<sup>31</sup>

In addition to joint research programs, Chinese space engagement has also taken advantage of a traditional area of Chinese influence in the region—loans. For example, the China Development Bank provided a US\$250 million loan to Bolivia to fund the Tupac Katari satellite.<sup>32</sup> While concerns that China is leveraging loans as a form of “debt diplomacy” have largely proven unfounded,<sup>33</sup> Chinese policy banks have supported projects that have commercial and strategic use, such as the Bolivian satellite.

For its part, the United States has also sought to develop mechanisms to better engage the region in space partnerships. In 2023, at the first gathering of Americas Partnership for Economic Prosperity (APEP), a Chilean-led initiative on space, known as APEP-S, was announced.<sup>34</sup> As Laura Delgado López and Victoria Valdivia Cerda have noted, given that APEP is primarily focused on economic partnerships and opportunities, it remains unclear whether APEP-S will incorporate a security dimension.<sup>35</sup> Delgado López and Valdivia Cerda have also expressed concerns that the narrow aperture of the APEP membership—which is limited to 10 countries in Latin America and the Caribbean as well as Canada and the United States—may limit APEP-S, particularly given that the Latin American nations with the most advanced space programs (Argentina and Brazil) are not APEP members.<sup>36</sup> While APEP-S may become the primary mechanism through which the United States engages LAC nations' space programs, U.S. engagement through other mechanisms continues. For example, in July 2023, NASA Administrator Bill Nelson visited Argentina, Brazil, and Colombia to discuss space cooperation.<sup>37</sup> Similarly, the United States has also leveraged its military as a tool for engaging the region in science diplomacy in the arena of space. In fact, in January 2024, U.S. Southern Command hosted representatives from 11 LAC countries to discuss opportunities for space collaboration.<sup>38</sup>

As the United States and China seek to develop space program partnerships, Latin American leaders have also sought to foster a regional mechanism to discuss space programs. In September 2021, 18 LAC governments<sup>39</sup> created the Latin American and Caribbean

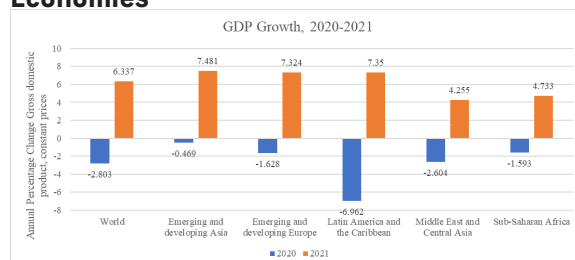
Space Agency (ALCE).<sup>40</sup> According to a press release from the Mexican Foreign Ministry, ALCE's mission is to "coordinate cooperation in space technology, research, exploration, and related applications that contribute to and strengthen the comprehensive and sustainable development of a regional space program that will benefit the Latin American and Caribbean peoples."<sup>41</sup>

Regional efforts to strengthen space cooperation are important given concerns about overdependence on third parties for satellite communications, including for disaster management.<sup>42</sup> ALCE's mandate specifically calls for cooperation to strengthen earth monitoring and communications mechanisms,<sup>43</sup> which may help assuage some of these concerns. While ALCE specifically seeks to engage LAC actors, China has expressed interest in partnering with the organization.<sup>44</sup> Given U.S. concerns about Chinese activity in other regional bodies,<sup>45</sup> the United States should also seek to engage with ALCE as a forum for conversations on space partnership.

**Health Diplomacy: From Masks and Vaccines to the Health Silk Road**

While the DSR is the clearest extension of the BRI in science diplomacy, China has also rhetorically expanded the BRI to include the Health Silk Road.<sup>46</sup> This expansion provides a clear platform for China to use healthcare diplomacy as part of its broader foreign policy and science diplomacy strategy. Although the Chinese government and the World Health Organization initially discussed the Health Silk Road in a 2017 Memorandum of Understanding, it has been used as an umbrella policy to capture various elements of Chinese engagement in the healthcare field, which was particularly important during the COVID-19 pandemic. Shortly after its launch in 2017, WHO Director-General Tedros Adhanom Ghebreyesus noted the importance of leveraging the BRI to strengthen health cooperation at a forum on the newly established initiative.

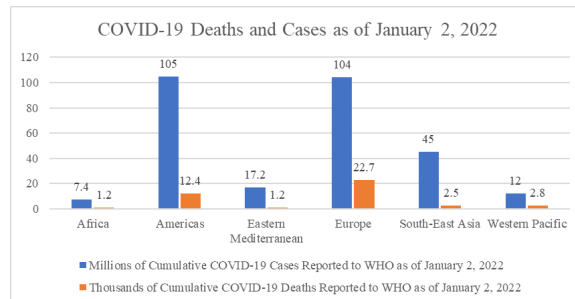
**Figure 2. COVID-19 Impacts on Regional Economies**



Source: Created using data from the World Economic Outlook Database (Washington, DC: International Monetary Fund, 2023).

The COVID-19 pandemic highlighted the critical role of health diplomacy in international affairs. In fact, the Americas as a whole (including the United States and Canada) was among the areas most impacted by COVID-19 over the first two years—in terms of cases, deaths, and the economy (see Figures 2 and 3). Despite concerns about the origins of the pandemic, China was able to leverage health diplomacy to its benefit during the pandemic and improve perceptions of the country across much of LAC.

**Figure 3. COVID-19 Health Impacts by Region**



Source: Created using data from WHO COVID-19 Dashboard (Geneva: World Health Organization, 2024).

As the region struggled to address the pandemic, China leveraged its mask and vaccine diplomacy to support LAC and boost perceptions of China. China stepped in with personal protective equipment (PPE) and vaccines early—despite global shortages.<sup>47</sup> While there were notable cases of Chinese overreach in this approach—such as attempting to tie Paraguayan aid to its recognition of Taiwan,<sup>48</sup> the pandemic and Chinese aid helped bolster China's image in LAC. The Chinese messaging campaign and rapid provision of aid meant that despite the fact that the United States ultimately provided greater support—and more effective vaccines—the public viewed Chinese aid as superior.<sup>49</sup> Coupled with the reports of a strong and effective response to COVID-19 in China,<sup>50</sup> this case highlights just how effective Chinese science diplomacy can be, relative to the United States.

While China’s health diplomacy came under scrutiny during the COVID-19 pandemic, the CCP was involved in health diplomacy in the region before the pandemic and continues to engage. As noted above, the Health Silk Road’s origins were in 2017.<sup>51</sup> China has also sent medical missions to countries in the Caribbean using its “Peace Ark” naval hospital ship. The Peace Ark’s first LAC tour was in 2011 and consisted of visits to Costa Rica, Cuba, Jamaica, and Trinidad and Tobago.<sup>52</sup> China has also financed hospitals, including multiple hospitals in Guyana.<sup>53</sup>

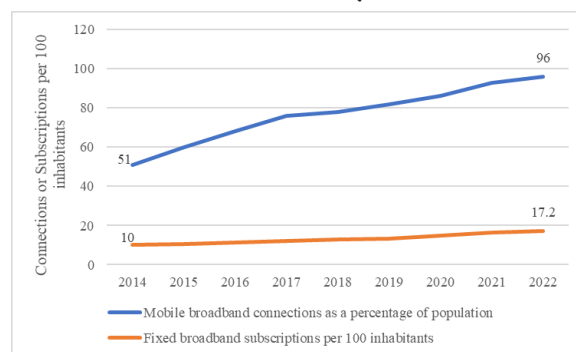
China’s health diplomacy has been critical for the region, but it creates important concerns that U.S. and LAC policymakers must consider. China’s provision of PPE and vaccines was crucial, and increasing access to healthcare resources is an important tool that China will likely continue to leverage. However, Chinese health diplomacy is not fully altruistic. Indeed, there are multiple reported instances of China leveraging access to health materials with other interests. These have included reports of linking access to aid to recognition of Beijing over Taipei under the One-China Policy,<sup>54</sup> as well as leveraging access to key medical resources to the adoption of Chinese technology contracts—most notably of Huawei’s 5G infrastructure.<sup>55</sup> These cases highlight the need to apply caution in accepting Chinese aid and suggest that China may rely on health diplomacy through the denial or offer of key medical resources as a tool for pushing other issues critical to China in the future.

### 5G and Digitization

The LAC region faces a critical gap in access to technology and digitization. While rates of both high-speed fixed and mobile internet have nearly doubled since 2014 (see Figure 4), rates remain lower than those in other territories. The increase in cellphone penetration has been particularly rapid, with over 50 subscriptions per 100 inhabitants in every country for which data is available. Additionally, there are large differences in internet penetration across LAC (see Figure 5). Given the centrality of technology for development and labor markets in the twenty-first century, closing these gaps is essential. The COVID-19 pandemic made these gaps and their implications even starker. Some studies have suggested that the lack of digital infrastructure in the region resulted not only in negative economic outcomes but will also have long-term implications in terms of educational attainment rates.<sup>56</sup> However, challenges remain in deepening access and large investments will be necessary.

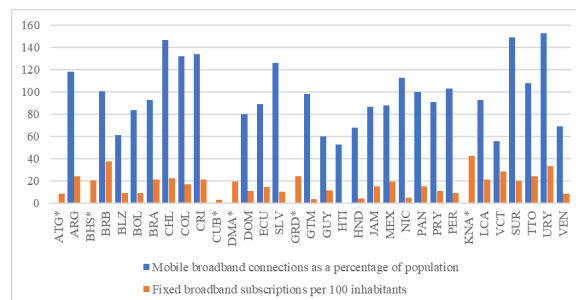
China and Chinese companies have been influential in increasing digitization across the Americas. The rapid expansion of Chinese telecommunications giant Huawei is a case in point. Founded in the 1980s, Huawei’s entry into LAC is a relatively new phenomenon.<sup>57</sup> However, today, the Chinese company is among the strongest information and communication technology (ICT) providers in the region. In 2023, Huawei sales in LAC were reported at US\$4.89 billion, marking a 10.9% increase from 2022.<sup>58</sup> Huawei was also the cloud-based ICT provider with the most nodes in Latin America and the Caribbean in 2023.<sup>59</sup>

**Figure 4. Growth in Digitization Rates in Latin America and the Caribbean, 2014-2022**



Source: Created using data from the Digital Development Observatory (Santiago, Chile: Economic Commission for Latin America and the Caribbean, 2024).

**Figure 5. Digitization Rates Across Latin America and the Caribbean, circa 2022**



Source: Created using data from the Digital Development Observatory (Santiago, Chile: Economic Commission for Latin America and the Caribbean, 2024).

Notes: (1) Data for the most recent year between 2020 and 2022 is presented for each country, and (2) countries with an asterisk (\*) do not have available data on cellphone users.

U.S. policymakers have expressed security concerns surrounding the expansion of Huawei and its 5G technology. Since its early days, Huawei has seen its role as closely connected to Chinese geopolitical ambitions

and actively engaged in countries where U.S. relations were weakest.<sup>60</sup> At the first Western Hemisphere Cyber Conference in September 2023, U.S. Department of Homeland Security Secretary Alejandro Mayorkas warned against low-cost Chinese technology and noted Chinese investment in LAC as a potential risk for cyberattacks and sovereignty.<sup>61</sup> SOUTHCOM raised similar concerns in its posture statements. Additional concerns about how the role of Chinese companies in facial recognition and artificial intelligence infrastructure will affect privacy should also be considered as China expands its technology services in the region.<sup>62</sup> The Biden administration is not the first U.S. administration to warn against the expansion of Huawei in LAC, and a bipartisan consensus surrounding these concerns has emerged.

In addition to security concerns, Huawei's critics and competitors have pointed to numerous areas that have allowed Huawei to expand and raised concerns about its business practices. These include government support for Huawei, which permits the company to provide services and technology at a fraction of the cost of its competitors,<sup>63</sup> letting them underprice competition and make inroads into new markets. The linkage between Huawei and the CCP has also allowed the company—and the CCP—to link business and geopolitical interests and pressure governments to adopt Huawei technology as part of broader diplomatic initiatives.<sup>64</sup>

Furthermore, Huawei's existing 3G and 4G infrastructure in LAC countries gives Huawei a further comparative advantage in the expansion of 5G, as upgrading the infrastructure using the same provider is significantly cheaper and easier. To make itself even more competitive, Huawei's flagship corporate responsibility program, "Seeds for the Future," provides training and exchange programs for IT professionals. This has deepened regional expertise in Chinese technology infrastructure and encourages further adoption of these technologies.<sup>65</sup> Similarly, Huawei has expressed interest in developing a research hub in Guyana—a move that Guyanese President Irfaan Ali has endorsed; Ali has also urged Huawei to include artificial intelligence training.<sup>66</sup> In December 2023, Huawei and UNESCO's Latin America office signed a memorandum of understanding to further develop Latin American digital talent.<sup>67</sup>

Despite U.S. and regional concerns over Huawei's expansion, Huawei is an important technology purveyor to LAC. Huawei's leadership has also pointed to U.S. efforts to counter its sales in the region as its own threat to regional sovereignty and historic U.S.

interference.<sup>68</sup> Even countries whose leaders have sought to look for alternatives to Huawei have faced challenges. Indeed, the need to improve digital infrastructure coupled with the fiscal constraints faced by many countries has led leaders to opt for Huawei as a 5G provider despite their security concerns. A recent study by Julie Zeng highlights how Brazil's Jair Bolsonaro administration used Huawei to increase 5G access in the country despite the president's stated concerns and overall anti-Chinese positions.<sup>69</sup> The only country in the region that has placed formal restrictions on the adoption of Huawei is Costa Rica.<sup>70</sup>

### **Energy Transmission and the Green Energy Transition**

A key component of China's emphasis on "new infrastructure" is the nation's expansion into the region as a purveyor of energy and its competition to develop the necessary technology and components to accelerate the green energy transition. With scholars suggesting that control of essential green technology will help dictate power in the twenty-first century,<sup>71</sup> Chinese engagement in the energy transition is critical to understanding Chinese influence in the Americas. This is particularly true given Chinese efforts to invest in "three new industries"—electric vehicles, lithium-ion batteries, and solar cells—as a major component of its exports.<sup>72</sup>

Central to efforts to accelerate the energy transition will be control over the critical rare earth and minerals necessary to develop batteries, alternative energy infrastructure, and other technology resources. These include such minerals as copper, cobalt, and lithium. The LAC region is resource-rich and has large deposits of many critical minerals.<sup>73</sup> There are clear signs of Chinese interest in mining lithium<sup>74</sup> and copper.<sup>75</sup> Lithium is among the most important elements in battery production. Despite the scarcity of lithium reserves, South America is home to the largest ones in the world. The "Lithium Triangle"—Argentina, Bolivia, and Chile—accounts for nearly 60 percent of global lithium reserves,<sup>76</sup> which has made the continent a critical battleground to access these materials.<sup>77</sup>

China has been extremely active in accessing and developing lithium projects across the Lithium Triangle. In Bolivia, China won bids worth over a billion dollars to produce lithium carbonate plants.<sup>78</sup> It also made China the first foreign company to take part in Bolivia's lithium industry.<sup>79</sup> In Chile, a Chinese company, Tianqi, purchased a 23 percent share in the country's largest lithium producer, SQM.

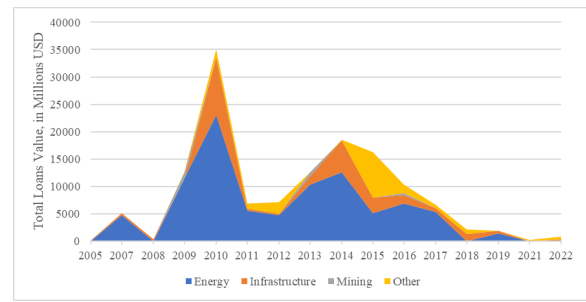


Another company invested US\$290 million in a lithium battery production factory in Chile.<sup>80</sup> Similarly, in Argentina, China has acquired shares in numerous lithium mines and is supporting the building of electric vehicle battery plants.<sup>81</sup> Globally, Chinese companies have purchased more than half of the largest lithium mines that have gone on the market since 2018.<sup>82</sup> As Chinese companies win large contracts in the lithium industry, analysts fear that China's ambitions are not purely economic. The country may be leveraging its geopolitical weight to win these concessions through "geostrategic corruption."<sup>83</sup>

While it is possible to view investment in lithium mining as a positive, Chinese investment in lithium mining as part of its "three new industries" investment plan may have negative consequences for the region. China exports large quantities of low-cost electric cars, solar panels, and batteries to Latin America and the Caribbean.<sup>84</sup> Although access to these goods could allow LAC to adopt green energy solutions more readily, the expansion of low-cost imports that use regional commodities risks establishing a new form of economic dependency. Governments should consider developing mechanisms to ensure they can move up the value-added chain and take advantage of their natural resource endowments. Chile has implemented some measures to ensure they do so.<sup>85</sup> Other countries should consider similar steps.

Chinese interest in the Americas as part of the energy transition is not, however, limited to mining concerns. China has also invested heavily in energy infrastructure across the region. According to the Inter-American Dialogue's China-Latin American Finance Database, approximately two-thirds of total lending to LAC from Chinese policy banks went toward energy projects (see Figure 6). While much of this went into traditional fossil fuel investments, China provided several loans to expand the region's alternative energy sector—including loans for new hydroelectric dams. While the majority of Chinese policy bank loans in the energy sector went to Venezuela—predominantly to support the country's oil and gas sector—other key beneficiaries included Argentina, Bolivia, Brazil, Ecuador, and Mexico. Providing financial support for science and technology projects is a key component of science and technology diplomacy. It serves as a tool to deepen ties between China and the region while showcasing China's approach to supporting South-South cooperation and providing the region with critical investment.

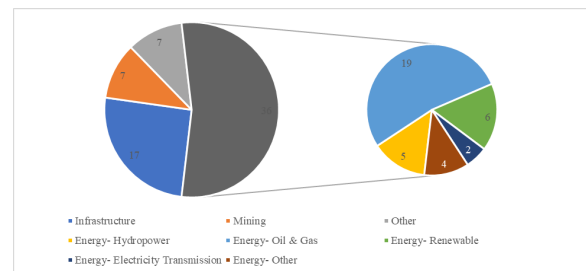
**Figure 6. Chinese Policy Bank Loans in the Energy Sector**



Source: Created using data from the China-Latin America Finance Database (Washington, DC: Inter-American Dialogue, 2023).

Similarly, Chinese commercial banks have invested heavily in the energy sector. According to the Inter-American Dialogue, more than half—36 of 67—of Chinese commercial bank loans to the region between 2007 and 2021 were in the energy sector (see Figure 7). While the bulk of these were in oil and gas, 11 loans were for renewable energy and hydropower. While these loans are not directly from Chinese government entities, Chinese commercial banks align their lending with government priorities, showcasing cohesion within China's science diplomacy efforts. The degree to which China now controls the electric grids of several countries has become a point of contention and concern among LAC leaders.<sup>86</sup>

**Figure 7. Number of Chinese Commercial Bank Loans by Sector, 2007-2021**



Source: Created using data from the China-Latin America Finance Database (Washington, DC: Inter-American Dialogue, 2023).

In addition to its work in mining and investment, China has leveraged trade as an important element in promoting the green energy transition. As the Ecuador-China Free Trade Agreement signing highlights, the production and sale of Chinese electric vehicles is an important component of the trade agenda. The production and trade of Chinese electric vehicles has been rapid, with 65 percent of total electric vehicle production globally and 59 percent of total sales in 2023.<sup>87</sup> Chinese government



support for electric vehicle sales and its use of trade deals to open new markets,<sup>88</sup> have led to deep concerns among U.S. automakers. In a June 2023 interview, the Executive Chairman of Ford Motors, Bill Ford, said U.S. automakers were unable to compete with China's electric vehicle sales.<sup>89</sup>

Countries across LAC urgently want financing and the opportunity to maximize the potential gains of the green energy transition. China has happily stepped in to fill this void. By providing funding, investing heavily in key resources, and increasing trade with the region, China has become a key partner as it relates to the energy transition. While this represents an important opportunity, there are reasons for regional leaders and the United States to be concerned. These include concerns over future competitiveness in the green economy, new dependencies on commodity exports, and Chinese control of key energy infrastructure in the Americas.

## TOWARD A U.S. STRATEGY OF SCIENCE DIPLOMACY IN THE AMERICAS

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While China has made inroads into the region through its science diplomacy and technology partnerships, the United States has taken important steps to deepen its own scientific and technological ties. U.S. policymakers must understand the interests of the countries, emphasize the risks of data breaches and losing technological autonomy, and leverage science diplomacy to the fullest. This can be done by:

- Accelerating nearshoring, friend-shoring, and technology transfer programs.
- Deepening military science and technology engagement.
- Empowering the private sector.
- Increasing fellowship and scholarship opportunities and supporting science study abroad.
- Developing joint regulatory systems.
- Supporting regional healthcare initiatives and disaster response.
- Creating a unified messaging campaign.

Each of these actions will require U.S. policymakers to engage with LAC politically and economically and seek to address its needs and interests rather than purely pursuing U.S. national interests. Many of these recommendations build upon existing or proposed U.S. programs but require deepening the degree to which science diplomacy and technological partnerships are incorporated into these activities.

### ***Accelerating Nearshoring, Friend-Shoring, and Technology Transfer Programs***

A large portion of technological imports to the United States and the rest of the Western Hemisphere presently come from Asia. It is in the United States's interest to strengthen supply chain resiliency, ensure access to critical technology, and guarantee inputs are available for import from friendly states. Science diplomacy and bolstering regional trade are useful tools for promoting these objectives. Some key efforts on this front are already underway, including the development of the Americas Partnership for Economic Prosperity (APEP) and the recently introduced Americas Trade and Investment Act (Americas Act). These

two mechanisms could play an important role in broadly promoting nearshoring. The Act also explicitly incorporates elements related to digitization and the green energy transition. While there are some challenges the Act will likely face in terms of its adoption and implementation,<sup>90</sup> implementing the legislation will supercharge efforts to promote nearshoring.

However, the APEP and Americas Act are both overly narrow in their criteria; only 12 countries (including the United States and Canada) are currently APEP members and the Americas Act places explicit limitations on expansion.<sup>91</sup> The inadequate number of countries participating in these initiatives will affect the ability of APEP and the Americas Act to engage with the region more deeply.<sup>92</sup> For Inter-American science diplomacy to be effective at countering Chinese advances, it cannot simply cede two-thirds of LAC countries to China by not engaging with them.

In addition to the Americas Act, at the first presidential-level APEP meeting, a specific program aimed at promoting space cooperation among member states (APEP-S) was announced by the White House. While there were few details released about program specifics, using this initiative to promote space cooperation—between civilian and military partners—could further showcase U.S. interest in using science diplomacy to cooperate with LAC countries. This is particularly important given that, at present, many countries rely heavily on China for space programs.

To complement these formal programs, the United States should develop mechanisms and trusted partner programs that allow for knowledge transfer for critical technology. While the United States may have concerns about accessing technology from China, cultivating trusted partners among regional companies and states can allow Latin America and the Caribbean to develop a more robust tech sector while supporting lower prices on technology products.

### ***Deepening Military Science and Technology Engagement***

When it comes to government-to-government engagement on issues of science diplomacy, the United States can and should leverage its investment in military technology. While U.S. science diplomacy is more reliant on the role of the private sector to ensure research and development opportunities abroad than China's, the U.S. government directly invests in military research and development that could benefit broader U.S. science diplomacy initiatives. This includes the Department of Defense's Defense Advanced Research Projects Agency. As noted

by General Laura Richardson at a Florida International University event, SOUTHCOM leverages its position and partnerships to test new technology used by the military.<sup>93</sup> While these initiatives have long been part of U.S. science diplomacy in the Americas,<sup>94</sup> it is important for the United States to deepen engagement and highlight the partnerships between the U.S. Department of Defense and partner militaries in the region.

For example, collaborating with partners and sharing this technology and any information gathered could help deepen engagement. When technology is first tested and used in the Americas, it also highlights the relative importance that the United States places on relationships with LAC militaries. Given the role of Latin American militaries as the body primarily responsible for many LAC space programs, one area in which this may be particularly fruitful is space technology. However, the United States should target dual-use areas to engage with civilian agencies in the region more effectively. This could include investment and partnerships in dual-use sectors.

### ***Empowering the Private Sector***

The United States is at a distinct disadvantage vis-a-vis China when it comes to science diplomacy due to the nature of the U.S. economy relative to China. While China leverages its large SOEs to invest in areas deemed geopolitically strategic, the United States relies on its private sector in this area—which is not controlled by the government. However, in the case of the United States, the private sector must play an important role in science diplomacy, given its dominance as a domestic and international player in science and technology development. As such, U.S. policymakers should take steps to ensure the private sector is in lockstep with U.S. priorities and interests. These interests include promoting nearshoring and friendshoring, supporting a robust private sector in the region, accelerating Latin American and Caribbean development prospects, and ensuring China does not control critical or dual-use infrastructure that could threaten U.S. or partner national security.

Relying on the private sector for science diplomacy, however, includes risks. While deepening private sector science engagement allows the United States to more readily compete with Chinese efforts, this engagement is not always clearly identified by those in LAC as a U.S. effort. Furthermore, the private sector does not always engage in ways that are beneficial to regional governments or U.S. national

interests. While there are numerous examples of the U.S. private sector alienating potential partners, a clear example of recent missteps in the technology domain space has come from Elon Musk's engagement in Brazil. Not only has Musk's X (formerly known as Twitter) run afoul of Brazilian regulators surrounding free speech concerns,<sup>95</sup> but the Lula administration is also concerned about the expansion of Musk's Starlink as a political tool in Brazil's rural areas.<sup>96</sup> Given these concerns, the U.S. government should look for opportunities to engage and partner with its private sector to ensure that private sector engagement in the region aligns with, or at least does not run counter to, U.S. national interests and objectives.

Adopting the Americas Act could be an important first step in encouraging U.S. businesses to invest more readily in the LAC tech sector. By providing government incentives to promote U.S. business investment through the Development Finance Corporation and the U.S. Export-Import Bank, the Americas Act has the potential to increase private sector interest in the region. However, concerns over intellectual property protections and political risk may still deter some companies from investing. To further encourage U.S. private sector engagement, U.S. policymakers should actively engage with the private sector to promote investment, as was done with the Biden administration's Partnership for Central America program. Additionally, the U.S. government could consider guaranteeing investments in some critical areas by ensuring a minimum—a practice used to limit corporate risk during the Good Neighbor Policy for certain cultural diplomatic efforts.<sup>97</sup>

In addition to promoting investment, the U.S. government could support the private sector by developing mechanisms to encourage more effective labor exchanges. While immigration—particularly from Latin America—has become a hot-button political issue, steps to promote immigration and labor exchanges are critical to supporting a thriving private sector across the Americas. On the immigration side, the United States should encourage skilled science and technology immigration into the country by offering visas for such labor. However, given regional concerns of “brain drain,”<sup>98</sup> these should be coupled with incentives that encourage laborers to come to the United States and develop skills they can then integrate into the economy of their home nation and strengthen value-added chains across the Americas. Additionally, U.S. policymakers should facilitate U.S. science and technology researchers' ability to work in LAC. This could be accomplished by limiting double tax liabilities for U.S. citizens working in Latin America and the Caribbean.

### **Supporting Science Study Abroad and Increasing Fellowship and Scholarship Opportunities**

One tool China has leveraged as part of its broader cultural and science diplomacy efforts is student and faculty exchange programs. While this is an area where the United States has historically held an advantage,<sup>99</sup> China has embraced the use of educational exchanges and highlights it regularly at China-CELAC Forum meetings. The Americas Act empowers the U.S. Department of State to expand education and other people-to-people exchanges with the region.

Efforts to encourage Latin American and Caribbean attendance and participation in U.S. exchange programs have a long history with programs like the Fulbright Program, the International Visitor Leadership Program, the Young Leaders of the Americas Initiative, and the 100,000 Strong in the Americas Innovation Fund. According to pre-pandemic surveys, the United States remained the most popular destination for Latin American students to attend for study abroad.<sup>100</sup> However, as the cost of education in the United States continues to climb, U.S. policymakers should take steps to ensure that costs do not become prohibitive for LAC students interested in coming to the United States—particularly as China is providing financial support for its exchanges. By providing additional financing for these initiatives and creating scholarship and fellowship programs for promising Latin American students and faculty to attend universities in the United States—particularly in the sciences—can ensure that the United States maintains its advantage in this domain.

However, U.S. students and faculty in the sciences often experience different barriers to participation than their liberal arts colleagues. These include questions about resource availability at foreign universities, whether universities accept credits from foreign institutions, and opportunity costs associated with participating in these programs. The United States should seek to limit these barriers by investing in LAC universities. One important step on this front is the development of an American University of the Americas, proposed in the Americas Act. However, one university is not enough to challenge Chinese exchange efforts. Instead, U.S. policymakers should seek to develop partnerships between U.S.-based and LAC-based laboratories that can allow faculty and students to participate in exchange programs more easily. These can also develop collaborative partnerships and technology exchanges to create deeper people-to-people ties that may support U.S. policy interests in other domains as well.

### **Developing Joint Regulatory Systems**

One of the challenges facing scientific exchanges is the differing regulatory systems impacting different countries. This can create challenges for technology and educational exchanges to occur, given the differing expectations and norms of other countries. To address this, the United States should consider developing joint regulatory and trade frameworks to allow for the transfer of technology and the exchange of goods to occur more readily and cost-effectively. The U.S. government has already made efforts to develop joint regulatory systems and norms for space governance through the Artemis Accords, which include Argentina, Brazil, Colombia, Ecuador, Mexico, Peru, and Uruguay among its signatories.

As noted above, this should also occur in the educational area, with universities sharing accreditation of classes to facilitate U.S. students in the sciences to take advantage of study-abroad opportunities more readily. Investing in foreign academic institutions' science capacity and equipment and leveraging existing study abroad programs to deepen connections between science students and faculty across the Americas by creating shared standards for key course and lab work provides an opportunity to deepen ties across the hemispheric scientific community that will yield gains in the future.

### **Supporting Regional Healthcare Initiatives and Disaster Response**

As part of U.S. science diplomatic efforts to challenge China, the United States must also directly confront the Health Silk Road. While the United States already engages in a number of health diplomacy initiatives, these efforts are less visible than Chinese efforts. These include operations such as the usage of the U.S.S. Comfort, among others. While these operations are important, the United States should seek to leverage its health diplomacy efforts to engage more deeply with the region. In addition, the United States should do more to publicize its programs with local media to help bolster the perception of its activities relative to Chinese efforts.

In addition to specific missions and operations, the United States could consider expanding academic opportunities for medical students from regional countries to come and train in the United States. However, to ensure these efforts compete with Chinese activities in this area, the United States must fund this endeavor. Additionally, to ensure this does not contribute to brain drain, funding should be contingent on students returning to practice medicine in their home countries, similar to funding conditions applied to Fulbright students.

### **Creating a Unified Messaging Campaign**

As with many other areas, the United States faces a critical deficit relative to China when it comes to its messaging campaigns on science diplomacy. While all the policies suggested above would improve U.S. science diplomacy efforts and promote U.S. interests in the region, countering Chinese science diplomacy efforts will require more than just implementing effective policies. As the provision of COVID-19 vaccines highlights, ineffective or insufficient messaging on science diplomacy efforts as well as the timeliness of delivery opens the door for China to appear more effective and altruistic.

The United States must seek to close the messaging gap relative to China. First, U.S. policymakers should continue and deepen training initiatives with LAC journalists so they are better equipped to provide independent reporting on Chinese activities. While organizations like the Andrés Bello Foundation, *Expediente Público*, and the Caribbean Investigative Journalism Network already offer this type of training, additional funding and support could increase their impact.

The United States should also invest more in its own news organizations, such as Voice of America. The United States should also consider revamping the former U.S. Information Agency, which was consolidated into the State Department in 1999. While the U.S. Information Agency was marginalized in the past,<sup>101</sup> having an agency solely focused on combatting misinformation and providing information about U.S. activities abroad—through their own and local channels—can help harmonize the message of different government agencies and ensure that they meet effectively target different populations. Finally, the United States must do more to ensure that citizens throughout the Americas are aware of the science and health diplomacy the United States engages with. While efforts to increase awareness using traditional and social media already exist, greater efforts to develop a unified message and engage citizens where they are—through local media, social media, and in-person engagements—can all help create a more unified and identifiable U.S. messaging strategy.

## RECOMMENDATIONS FOR LATIN AMERICAN AND CARIBBEAN LEADERS

Given the region's long history as commodity exporters and past challenges with moving up the value-added chain, Latin American and Caribbean leaders must maximize the gains they receive from U.S.-Chinese competition. However, this must be done carefully. There are significant gaps that policymakers should seek to close. Some key areas that LAC policymakers should explore are:

- Capitalizing on U.S.-Chinese competition while avoiding dependency;
- Ensuring technological transfers; and
- Closing the digitization gap.

### ***Capitalizing on U.S.-Chinese Competition while Avoiding Dependency***

The growing U.S.-Chinese rivalry can provide opportunities for LAC leaders if they can successfully navigate this rivalry and leverage their positions.<sup>102</sup> In science diplomacy, there are various opportunities for LAC policymakers to take advantage of this rivalry. Encouraging investment from China and the United States—financially as well as in infrastructure and people—could provide the necessary resources.

As LAC policymakers seek to navigate U.S.-Chinese competition, they must not simply trade one form of economic dependency for another. While some in the region have long sought to end economic dependence on the United States, there are concerns that the financial assistance and trade provided by China may lead to new forms of dependency. Indeed, studies have shown that trade with China has largely been through commodity exports rather than allowing LAC countries to move up the value-added chain.<sup>103</sup> Likewise, there are concerns about Chinese control over key energy infrastructure in various nations.<sup>104</sup> Science and technology partnership may provide a unique opportunity for LAC policymakers to develop new policies and practices that benefit their countries and allow for future development prospects that will make the region more competitive in the twenty-first century.

### ***Ensuring Technological Transfers***

Central to avoiding dependency is ensuring that national companies can move up the value-added chain and produce new goods. This is particularly true in science and technology, where the value added to products continues to expand. While the region has access to critical minerals and resources that are scarce in other parts of the world, LAC continues to rely on the import of many of the end products produced using these resources—whether from electric vehicles, computers, or other technologies. For Latin America and the Caribbean to ensure they can better compete in the twenty-first century and bolster their economies, they must develop mechanisms to ensure they do not remain trapped as low-value-added commodity-producing countries. While these resources provide an important economic boost and opportunity, LAC policymakers must establish mechanisms to help their economies climb the value-added chain.

Ensuring technology transfers occur and placing export restrictions on raw rare-earth minerals would help. This could include ensuring that the processing of rare-earth minerals and the development of key products and inputs occur in-country before exporting abroad. To guarantee that this happens, leaders should seek to develop upstream industries and encourage foreign direct investment in these sectors with technology transfer required to go to local producers. However, leadership must find ways to operate collectively so mining interests do not simply migrate production to a neighboring state.

### ***Closing the Digitization Gap***

One of the most critical challenges for Latin American and Caribbean countries to compete in the twenty-first-century economy is the persistence of gaps in access to digital infrastructure and education. Countries in the region must strive to ensure access to digital infrastructure for all citizens if they are to close economic development gaps and reduce persistent inequalities. While countries across the region have taken important steps on this front, science diplomacy and the U.S.-China rivalry may provide opportunities for governments to accelerate digitization efforts. By seeking to partner with foreign governments, regional scientists and firms can accelerate technology transfers, and leaders can seek additional financing for digitization efforts.



While closing the digitization gap is critical, LAC policymakers should contemplate the potential tradeoffs of different technology providers. While these must include the cost implications of adopting different technologies, policymakers should also study the possible risks of various digital infrastructures. Given the high levels of cybercrime in LAC, security concerns must also be taken into account. In addition, growing apprehension over privacy and the national security of vital infrastructure should be studied when choosing partners for digitization efforts. In cases when cost and security considerations conflict, regional leaders should highlight that in negotiations with U.S. policymakers and seek resources to overcome cost concerns in favor of ensuring that digital infrastructures are as secure as possible.

## **CONCLUSION**

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Science and technology will be critical components in determining power dynamics and global affairs in the twenty-first century and beyond. While China's science diplomacy efforts in Latin America and the Caribbean remain relatively new, they represent threats and opportunities for regional dynamics. Although additional financing and infrastructure—particularly for digitization—are critical, there are reasons for policymakers from LAC and the United States to be concerned with growing Chinese interests and investment in science and technology. Ensuring that Chinese investments benefit the region and do not run the risk of being leveraged for espionage or military purposes will present a challenge, but one that governments across the Americas can and must tackle collaboratively.

The recently introduced Americas Act, as well as actions the Department of Defense and SOUTHCOM are already taking, are important U.S. steps for supporting the region and addressing Chinese activities. However, while the Americas Act will provide financial support for LAC and the U.S. private sector to engage more deeply on these issues, more can be done to strengthen private sector engagement—particularly in the transfer of technology and the development of deeper partnerships. Ensuring that the public and private sectors work collaboratively and engage more meaningfully—and strategically—is necessary if the United States wishes to compete with Chinese science diplomacy efforts.

For Latin American and Caribbean policymakers, Chinese science diplomacy may appear to be an opportunity to close critical infrastructure and investment gaps that have long plagued the region. However, leaders must be cautious as there are security and development concerns associated with accessing these funds. In addition to privacy concerns, providing ownership of a nation's digital infrastructure to a foreign entity could prove to be a threat in the future. Additionally, LAC leaders must ensure they do not become trapped in a new form of dependency by becoming overly reliant on Chinese technology imports or exporting rare earth minerals in the process. Developing strategies in coordination with the United States and other regional governments may serve an important role in ensuring the benefits of technology transfers and development are shared throughout the hemisphere.

Just as technology continues to change, Chinese science diplomacy is multifaceted and rapidly evolving. The opportunities and challenges that this presents will also continue to shift and both U.S. and regional policymakers should collaborate and share ideas on how to best engage on these issues. This will be critical to maintaining national security and sovereignty of technological resources moving forward.

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