GEOECONOMICS AND INDO-PACIFIC ENTERPRISE INITIATIVE

Building Up Competitiveness and the G7's Infrastructure Ambitions

Wilson Center

Essays by: Michele Acciaro, Bart W. Édes, Stephen Ezell, John W. Fowler, Shihoko Goto, Kelsey Harpham, Kent Hughes, Shelby Lauter, John H. Matthews, Ingrid Timboe

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Preface

In April 2022, the Wilson Center founded the Geoeconomics and Indo-Pacific Enterprise Initiative in recognition of the need to focus on economic interests that are increasingly driving foreign policy priorities in the world's most populous region. While Asia's economies continue to face traditional challenges including inflationary pressure and fluctuations in financial markets, they are also finding themselves facing new challenges including the need to reassess supply chain resilience, embrace technology shifts, address energy security risks, and of course, deal with the impact of ever-growing tensions between the world's two largest economies.

The G7's decision to mobilize $600 billion for infrastructure projects worldwide in June 2022 was a clear indication by the world's richest countries that they needed to work together to counterbalance the threat posed by China's Belt and Road Initiative to the regional order of the Indo-Pacific and beyond. Beijing's steady efforts for the past decade to develop infrastructure in emerging markets may have been welcomed in many parts of the world at least initially, but growing frustration and indeed fears about the risks of depending on Chinese capital have also become clearer in recent years. By focusing on four areas of investment, namely communication technology, sustainable energy, healthcare, and equality, the G7 is seeking to play a greater role not only in meeting the needs of the global South, but also their own priorities in partnering with developing countries moving forward.

The essays in this booklet not only highlight the need for greater infrastructure investment, but the changing nature of infrastructure itself. Although the world's richest nations are not expected to match the financial commitments made by China in building roads and bridges across borders, they will be redefine the nature of quality infrastructure that lead to longer-term growth together as well as greater opportunities for private capital investments.

The purpose of this publication is to identify some of the areas for cooperation and ways of financing infrastructure projects that will garner the sustained support of the G7 countries. We hope that the essays will further the debate in coordinated policies regarding effective and sustainable infrastructure investments that meet both the needs of emerging markets as well as the strategic goals of the world's leading democratic economies.

Shihoko Goto
Director, Geoeconomics and Indo-Pacific Enterprise
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Washington, D.C.

CHAPTER ONE

Aligning the G7's Strategic Interests and the Indo-Pacific's Infrastructure Needs

Shihoko Goto is Director of the Wilson Center's Geoeconomics and Indo-Pacific Enterprise Initiative.

Kent Hughes is a Public Policy Fellow at the Wilson Center and a former President of the Council on Competitiveness and Associate Deputy Secretary of Commerce.

At their meeting in June 2022, the G7 countries announced the Partnership for Global Infrastructure and Investment focused on the infrastructure needs of the Indo-Pacific region. The decision was driven by the opportunity to invest in countries with great economic promise, the recognition of the fragility of existing supply chains, and to meet the competition posed by China's Belt and Road Initiative.

Countries need extensive investments in traditional infrastructure include roads and rail, power plants, and water supply sectors. At the same time, country after country is seeking to build a modern infrastructure that will foster growth and innovation. In addition to traditional infrastructure, the Indo-Pacific wants investments that will bring high-speed internet, global communications, and research driven universities. The G7 countries are well situated to provide investments in 21st century infrastructure, and the purpose of this select collection of essays is to draw attention to how to invest effectively in infrastructure projects that will have lasting results.

With an educated population, investment friendly policies, and a commitment to innovations, the Indo-Pacific offers the G7 an opportunity to help drive their own economies and innovations. At the same time, heightened interest among the world's wealthiest nations to invest in much-needed infrastructure provides on opportunity to reimagine infrastructure beyond the traditional structural projects of roads and bridges.

Of course, G7 interest in the Indo-Pacific is in part a response to China's Belt and Road Initiative (BRI). Through BRI, China has clearly been ahead of the curve when it comes to outlining and financing infrastructure project in the region. But Beijing's approach using loans rather than grants have led to charges of unsustainable loans. Because China is not a member of either the Paris Club (of nation's who have made loans) or the London Club (private companies that have made loans to developing countries) China does not have an international approach to dealing with non-performing loans. As a result, there is a decrease in the Chinese appetite to finance infrastructure projects across the Indo-Pacific region. At the same time, China's investments have focused on traditional infrastructure such as rail networks, roads, and ports.

In addition to responding to China, the G7 countries are taking a new look at supply chains. The Pandemic has focused attention on the way inventories, domestic production, or reliance on more than one source supply can

aid economic resilience. The concern is heightened when countries are dependent on a potential adversary. The Indo-Pacific is already attracting international investments by G7 countries as they seek a more diverse supply chain. Investments in traditional and modern infrastructure will contribute to the effectiveness of diversified supply chains.

The United States is committed to providing one-third of the total GDP to the tune of $200 billion, which will be spent over the next five years through grants and federal financing.[1]

Part of Washington's strategy is to encourage more private investments into projects as the G7 countries step up their commitment to infrastructure. Certainly, public financing alone cannot meet the needs of the region, especially at a time when all industrialized countries are themselves focused on investing in their down domestic infrastructure needs. The U.S. Infrastructure Investment and Jobs Act which was signed in November 2021 will provide $550 billion in new investments by the government over the next five years to provide much-needed funding for public transit, communications, water, and energy systems across the country.

Yet if infrastructure were to be defined more broadly as a common good, then the need to invest in the production of technology components is vital for the future of the global economy. In their essay entitled *The G7's Way Forward For Semiconductor Infrastructure Development in the Indo-Pacific*, Shelby Lauter and Stephen Ezell of the Information Technology and Innovation Foundation note that the complexities and prohibitive costs of manufacturing semiconductors requires a concerted approach. They call for a coordinated approach in technology development, ecosystem support, and technology protections together with countries across the Indo-Pacific. At the same time, Lauter and Ezell call for the recognition of the centrality of semiconductors in the national and economic security goals of the G7, and develop a semiconductor-specific infrastructure strategy.

Meanwhile, John Fowler of Arizona State University focuses on the need to develop a technology focused workforce in his essay *The Challenge to Cultivate Global Semiconductor Talent.* He points out that one of the biggest risks facing the chip sector is access to highly skilled talent, and that talent shortages

1 https://www.whitehouse.gove/briefing-room/statements-release/2022/06/26/fact-sheet-chips-and-science-act-will=lower-costs-jobs-strengthen-supply-chains-and-country-china/

in turn will hurt innovation and competitiveness. At the same time, the talent dearth is seen across the board in all countries, and calls for more funding not only for research, but also to grow talent focused on the semiconductor industry from the ground up at universities in addition to providing financial incentives to attract the best and brightest.

Yet semiconductors are hardly alone in requiring more funding and coordinated support from the G7. Investing in water resources too is highlighted by John Matthews, Ingrid Timboe, and Kelsey Harpham of the Alliance for Global Water Adaptation. In *Water as a Resilience Multiplier and an Inclusive Indo-Pacific*, they note that access to water, containing water, and risks posed by water as a destructive force due to climate change continue to rise rapidly. The authors call for greater awareness of the need for water resilience in the Indo-Pacific that can ultimately lead to greater social as well as economic security.

Even the best of strategies, however, cannot be put into action without adequate financing. In *International Financial Institutions and the Infrastructure Financing Gap*, Bart Édes of Canada's Asia Pacific Foundation points out that the G7's ambitious plan to boosting infrastructure financing in developing countries cannot be done without the support of multilateral development banks, not only for their ability to finance projects, but also to provide the expertise as well as capacity to ensure that projects are actually implemented. In turn, the development banks will need the continued financial support of the G7 to ensure that they are able to deliver upon expectations.

As for Michele Acciaro of the Copenhagen Business School, he provides insight into the history of infrastructure development that had initially been dominated by western powers in his essay *The G7 Challenge in Facing China's Infrastructure Ambitions*. In outlining China's motivations for promoting its own infrastructure vision, Acciaro also points out the challenges facing European nations as they too look to Chinese capital to fund some of their own critical infrastructure needs. He also cautions the lack of clarity of the G7 infrastructure proposal beyond financing measures, and points out the need for specific collaborative projects to ensure that the plan does not simply end without action.

To be sure, the G7 each have their own ambitious infrastructure development plans either in the making or being signed into law. In the United

States, commitments have been made not only to fund infrastructure, but Washington has also shown a renewed commitment to investments in research and innovation. There is no doubt that fear of China has been a driving force for new capital on that front too. The $52.7 billion Chips and Science Act garnered bipartisan support in September of buildup the U.S. semiconductor industry and enhance U.S. technology and research and innovation more broadly, including in information technology. While responding to China is an important motivation for the G7, the emphasis on the information technology sector. That focus on information technology nicely parallels the Indo-Pacific's interest on modern as well as traditional infrastructure. That focus is echoed in PGII and its goal to further 5G and 6G networks and enhance cybersecurity.

As President Biden stated in unveiling the G7 initiative, the infrastructure is not aid or charity. Rather, plan can be an opportunity for the establishment of a true partnership between the richest countries and the Indo-Pacific, where the interests of both sides are aligned. Only then can investments come to full term, given the need for bipartisan support to ensure continued commitments.

CHAPTER TWO

The G7's Way Forward For Semiconductor Infrastructure Development in the Indo-Pacific

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Stephen Ezell is Vice President for Global Innovation Policy at the Information Technology and Innovation Foundation.

The June announcement of the Group of Seven's (G7) Partnership for Global Infrastructure and Investment (PGII) reflects the shared urgency to secure global supply chains and compete with China's ambitious Belt and Road Initiative; importantly, it provides the financial momentum to actually do so. Intended for low- and middle-income countries, the investment funds establish global supply chain resiliency as a top priority, alongside the expansion of open trade and enhancement of national and regional security. How this investment will impact critical infrastructure and the semiconductor industry remains to be seen, but as a key arena for manufacturing, assembly, and testing, the Indo-Pacific region should be central to the G7's strategy.

While the PGII pledged over $600 billion in sustainable infrastructure development, the announcement provided few details on where and how the money will be spent.[1] This briefing recommends more than 20 ways to invest in the semiconductor supply chain and offers approaches for greater G7 coordination that extends beyond financial support. Through coordinated semiconductor innovation, ecosystem development, technology protections, talent expansion, and trade liberalization, the G7 can aid the region's industries, improve supply chain resiliency, and build strategic influence in the Indo-Pacific.

An Integrated and Costly Semiconductor Industry

The semiconductor industry is one of the world's most highly complex and integrated industries, enabling rapid leaps in technological development on one hand, while creating several points of vulnerability on the other. The global semiconductor network's reliance on free trade to transfer products, intellectual property (IP), and other goods reflects one such dependency. The Semiconductor Industry Association identified the following additional vulnerabilities threatening semiconductor supply: geographic concentration of manufacturing, design, and other production; geopolitical tensions leading to security threats and material shortages; protectionist trade policies; talent shortages; and a lack of

1 The White House, "FACT SHEET: President Biden and G7 Leaders Formally Launch the Partnership for Global Infrastructure and Investment," June 26, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/26/fact-sheet-president-biden-and-g7-leaders-formally-launch-the-partnership-for-global-infrastructure-and-investment/.

new research funding.[2] Shoring up the supply chain will entail an equally integrated strategy that takes into account these multifaceted risks.

Semiconductors are also an extremely costly industry, thanks to the complexity of designing and manufacturing chips, as well as the level of specialty of material inputs, the scale of production, and the technical knowledge required for production. Strong global demand for semiconductors drives these costs further. As a basis of multiple end products that touch nearly all aspects of modern life, demand for semiconductors has only continued to swell, driving sales up 13.3 percent in Q2 of 2022, compared to the same period last year.[3] Demand for cutting-edge semiconductor technology is also increasing, with AI-related semiconductors expected to grow 50 percent annually from 2019 to 2022.[4] Semiconductors are expected to grow from a $570 billion global industry today to a $1 trillion one by the end of this decade. Achieving that growth will require enormous capital investment (cap ex), with the industry investing a total of $339 billion in cap ex across 2021 and 2022 alone. To meet global demand, industry experts estimate that an additional $3 trillion in capital and R&D investment is needed.[5]

Given the high level of global integration and enormous financial costs of operation, plurilateral investments in semiconductors are a necessity. The G7's PGII provides an opportunity to fund such investments where they will have the greatest impact: the Indo Pacific. G7 nations can look to the Quad's example for guidance. In September 2021, the Quad—Australia, India, Japan, and the United States—announced a Semiconductor Supply Chain Initiative focused on resiliency.[6] As members of both the G7 and the Quad, Japan and the United States should be leaders in the Indo-Pacific in order to achieve semiconductor resiliency and competitiveness.

2 Antonio Varas, Raj Varadarajan, Jimmy Goodrich, Falan Yinug, "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era," Boston Consulting Group & Semiconductor Industry Association, April 2021. https://www.semiconductors.org/strengthening-the-global-semiconductor-supply-chain-in-an-uncertain-era/

3 Semiconductor Industry Association, "Global Semiconductor Sales Increase 13.3% in Q2 2022 Compared to Q2 2021," August 1, 2022, https://www.semiconductors.org/global-semiconductor-sales-increase-13-3-in-q2-2022-compared-to-q2-2021/.

4 Trisha Ray, Sangeet Jain, Arjun Jayakumar, and Anurag Reddy, "The Digital Indo-Pacific: Regional Connectivity and Resilience," Observer Research Foundation, February 15, 2021, https://www.orfonline.org/research/the-digital-indo-pacific-regional-connectivity-and-resilience/.

5 Varas et al, 2021.

6 The White House, "FACT SHEET: Quad Leaders' Summit," September 24, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/24/fact-sheet-quad-leaders-summit/.

A Coordinated G7 Strategy

The complexities and prohibitive costs of manufacturing necessitate an allied approach to strengthening the supply chain.[7] Beyond the financial support of the PGII, G7 nations should engage Indo-Pacific nations, of which there is some overlap, in a dialogue that seeks cooperative agreements and a shared understanding of extant threats in the supply chain. Through coordinated technology development, ecosystem support, and technology protections, G7 leaders can comprehensively bolster the semiconductor industry in the Indo-Pacific.

Technology Development

To augment future technological innovations, G7 leaders must invest in advanced manufacturing cooperation and collaborative, pre-competitive R&D. Funding should be targeted to encourage reciprocal R&D agreements and integrated research partnerships among universities, private institutions, government agencies, and public-private associations. A key vulnerability at certain points of the supply chain is the high degree of geographic specialization, which can lead to bottlenecks and other disruptions. In fact, the Boston Consulting Group has identified more than 50 points of high geographical concentration across the supply chain where one single region accounts for over 65 percent of the market share at a certain point in the semiconductor supply chain.[8] Investment incentives for production diversification can reduce the risk that a disruption in any one nation has an outsize effect on the rest of the supply chain. To start, channel investments where infrastructure already exists. For instance, G7 funds could go toward existing design firms in India or manufacturing hubs in Singapore where there are not already high levels of geographic concentration in these fields, compared to other nations.[9]

Another way to boost R&D collaboration in the Indo-Pacific would be by creating a G7 jointly operated R&D fab for semiconductor prototyping and testing and G7 centers of excellence to develop leadership, best practices,

7 Stephen Ezell, "An Allied Approach to Semiconductor Leadership" (ITIF, September 2020), https://d1bcsfjk95uj19.cloudfront.net/sites/default/files/2020-allied-approach-semiconductor-leadership.pdf

8 Antonio Varas et al., "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era" (BCG and SIA, April 2021), https://www.semiconductors.org/strengthening-the-global-semiconductor-supply-chain-in-an-uncertain-era/.

9 Ray et al, 2021.

research, and training in specialized areas.[10] Coordinated R&D and design should be met with strong pre-standardization policies for emerging technologies, such as common technical standards, terminology, methodology, and concepts.[11] Crucially, joint standards establish foundations for better data gathering and, thereby, better assessment of supply chains. Pre-standardization policies also ensure information sharing among allied countries, even if the national legal policies differ.

The G7 technology development strategy should also foster innovation-focused dialogue among allied nations in the Indo-Pacific. For example, an innovation policy experts' group could exchange knowledge on innovation methods, increase development and application of digital technologies enabled by semiconductors (e.g., IoT/AI/robotics, etc.), address how to use such technologies to bolster faltering productivity levels, and communicate findings to enable responsive policymaking.[12]

Semiconductor Ecosystem Support

Reinforcing the supply chain also entails strengthening the ecosystem that supports semiconductor design and manufacturing. Thus, a G7 allied approach should include investment for ecosystem supports like joint mapping and predictive analysis, secure computing infrastructure, and rules in the competitive market. Joint mapping can be used to identify current gaps in the supply chain, while predictive analysis using AI/ML technology can forecast future shortages for early action. Together, these technologies form a critical knowledge advantage, but their success ultimately relies on good data collection and sharing practices, in addition to greater development of AI capabilities.

The ecosystem surrounding semiconductors extends to the digital integration and security of networks. In the Indo-Pacific, the funding and adoption of Open Radio Access Network ("ORAN") equipment is critical to the security of networks and development of 5G and 6G digital connectivity. The G7 should look to the Quad's "Memorandum of Cooperation on 5G Supplier

10 Stephen Ezell, Pranay Kotasthane, and Glenn Downey, "Semiconductors—it takes a village to raise a chip," The Times of India, May 24, 2022. https://timesofindia.indiatimes.com/india/3-ideas-for-4-countries-hunting-for-chips/articleshow/91748347.cms.

11 Nigel Cory, "Comments to the U.S. Commerce Department on the Indo-Pacific Economic Framework," Information Technology and Innovation Foundation, March 21, 2022, https://www2.itif.org/2022-indo-pacific-economic-framework.pdf.

12 Ibid.

Diversification and Open RAN" and "International Standards Cooperation Network" to guide its own cooperative digital agreements in the region.[13]

Further, the G7 should work with Indo-Pacific leaders to form cooperative rules and norms governing ecosystem development. At the competitive-market level, this partnership could include cooperative development financing; export credits that incentivize partnerships with allied vendors and companies; and shared standards of globalized development.[14]

Strategic development financing—when successful—spurs additional investment from other actors, such as in the private sector. Take, for instance, the swell of private-sector investment that followed a U.S. government-led initiative in 2018; the effort—involving the U.S. Department of State, U.S. Agency for International Development (USAID), and other agencies—contributed $2.9 billion in Indo-Pacific infrastructure aid and prompted millions more from private contributions.[15] To build on these investments, the G7's PGII initiative should involve experienced operators in the region, like the U.S. International Development Finance Corporation (DFC), among others.

G7 leaders can generate an even greater impact by working collaboratively with like-minded nations to target financing opportunities and encourage funding from Indo-Pacific governments. Importantly, such collaboration can foster greater adoption of semiconductors and supporting technologies, including AI, high-performance computing, and 5G. In this sense, cooperative development financing increases the supply of semiconductors, as well as the demand. When paired with other incentives, like export credits, and shared development standards, such coordination will better position the G7's PGII to offer an alternative to China's Belt and Road Initiative.

Technology Protections: IP Protections, Export Controls, and Foreign Investment Screening

The semiconductor supply chain also hinges on strong technology protections, including management of IP, export controls, and foreign investment

13 The White House, "FACT SHEET: Quad Leaders' Tokyo Summit 2022," May 23, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/23/fact-sheet-quad-leaders-tokyo-summit-2022/.

14 Ezell, Kotasthane, and Downey, 2022.

15 Ezell, 2020.

screening. For each of these protections, the G7 and Indo-Pacific leaders should strive for reciprocal agreements among like-minded nations.

Foremost, IP and related trade secrets must be protected against theft. IP is the backbone of semiconductor design, and it provides important market protections like combating the sale of counterfeit semiconductors and related products. Broader IP information sharing, as well as more robust protections for trade secrets and penalties against their theft, are a start. Allied nations can go further by maintaining a comprehensive index of IP theft in order to better track and prevent threats. In particular, G7 nations need to build a consolidated list of foreign enterprises that engage in unrelenting unfair trade practices such as IP theft and cyberespionage and collaborate to collectively block such firms from enjoying access to G7 markets. And this should go beyond blocking the import of specific products that have benefited from pilfered IP or technology—as the United States' 337 rules at the U.S. International Trade Commission has done—but to wholesale blocking of the infringing firm's access to G7 markets entirely.

The G7 and Indo-Pacific nations can further protect technology by collaborating on export controls and agreeing upon the use of narrow and targeted controls as deemed strictly necessary by the level of sensitivity or threat. Multilateral controls can effectively protect sensitive technologies, while avoiding the dangers that unilateral controls may pose for global partnerships. Additionally, G7 leaders can align investment screening practices as an extra safeguard against malfeasance.[16]

Talent Supply Chain Resiliency

Underlying the resiliency of semiconductor supply chains is that of talent supply chains. The present talent shortage most acutely threatens the pace of innovation and chip design.[17] But the shortage's effects spill over into other stages of semiconductor production, including predictive software and systems development, validation and testing, and end-market expertise.[18] The need for highly skilled workers must be met with greater investment in science

16 Ibid.

17 Varas et al, 2021.

18 Selena Loh LaCroix, "Talent solutions for today's semiconductor shortage," Korn Ferry, October 12, 2021, https://www.kornferry.com/insights/featured-topics/talent-recruitment/talent-solutions-for-todays-semiconductor-shortage.

and engineering programs, particularly at the graduate level. Further, immigration laws must facilitate the flow of global talent and ensure that education programs are able to attract international students.

Yet, if G7 leaders truly want to evade the worst threats of the talent shortage, they must think outside of the typical boxes of education investments and changes to immigration law. Further, the talent pipeline must be addressed comprehensively, not just at the levels of training and recruitment. Some ideas for an unconventional G7 talent strategy could involve the following:

- **Targeted education for impact.** Investment in education and training centers could be targeted to match national competencies and strengths—for example, education investment in Japan could emphasize silicon and semiconductor manufacturing equipment.[19] This approach would ensure simultaneously diverse yet complementary training that strategically prepares workers throughout the industry. Another opportunity for targeted programs could be to accelerate training in specific technical areas where the need is greatest. In such cases, governments should work with the private sector and universities to identify and fill training gaps.

- **A competitive recruitment and engagement plan.** The abundance of software and consumer technology jobs creates significant talent pool competition. In order to compete for high-skilled workers, G7 nations need an engaging recruitment plan that attracts applicants through effective marketing and branding and matches recent graduates with relevant work based on skills and interests. The marketing strategy, in particular, is key to recruiting diverse candidates. By communicating the tremendous impact of semiconductors in everyday life, as well as the scope of specialties and room for growth in the semiconductor industry, the marketing plan could engage new applicants who would otherwise enter adjacent fields.[20]

19 Semi village
20 Loh LaCroix, 2021.

- **Train for crisis management.** The climate and health crises of the last two years are not isolated events; rather, crises will inevitably grow worse and become more disruptive. Supply chain resiliency requires a flexible workforce that can adapt to unforeseen challenges and crises, whether they be climate-related, political, or global health-related. Training for crisis management should involve predictive analysis instruction and cross-functional training, as duties are likely to shift in a time of crisis. In order to navigate crises, the semiconductor workforce must be agile, flexible, and alert to new challenges.

- **Upskill current talent.** Investment must be made throughout the talent pipeline, including current talent. Upskilling workers is important for adapting to new technologies and, even more so, is crucial for talent retention. Nurturing current talent ensures comprehensive reinforcement of the talent supply chain at all stages.

- **More flexible industry.** Employees in the semiconductor industry report lower worker satisfaction levels than those of other tech companies.[21] This finding clearly poses retention challenges, but when taken together with other trends in the employment market, it signals the need for the industry to change its workstyle, particularly with regard to worker flexibility. Elsewhere in the tech market, employees are still able to work from home, a pandemic practice that appeals to many who do not wish to return to the office or to relocate, if needed. Some parts of the industry are also seen as more attractive than others due to real and perceived differences in compensation, benefits, and career opportunities. Improving talent pipelines will ultimately require more flexible offices and attractive benefits in order to compete.

21 Ondrej Burkacky, Ulrike Kingsbury, Andrea Pedroni, Guilietta Poltronieri, Matt Schrimper, and Brooke Weddle, "How semiconductor makers can turn a talent challenge into a competitive advantage," McKinsey & Company, September 7, 2022, https://www.mckinsey.com/our-insights/how-semiconductor-makers-can-turn-a-talent-challenge-into-a-competitive-advantage.

Supportive Trade Rules and Regulations

Semiconductors represent the fourth-largest globally traded good, behind crude and refined oil and motor vehicles.[22] Fortifying the supply chain means promoting greater trade liberalization in the Indo-Pacific region. Strong trade regimes that promote openness and free trade are crucial for the transfer of knowledge and technology, especially as components of greater innovation and learning. They are also important for fostering regional connectivity and resilience to supply chain shocks.

The Indo-Pacific region already has a rich environment of formalized trade agreements: the ASEAN Free Trade Area, the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the Asia-Pacific Trade Agreement, and the Regional Comprehensive Economic Partnership (RCEP) to name a few, as well as independent ASEAN agreements with individual nations.[23] The region also has a diverse range of trade regimes, from the very liberal to the more protectionist. Yet, the trade environment still faces high regional transaction costs, barriers to technology flows, and missed opportunities for economic growth through trade. The G7 can support the Indo-Pacific in realizing these opportunities through development of a coherent agreement and updates to existing trade partnerships. The ultimate goal of these negotiations should be a free and open Indo-Pacific.

As part of a comprehensive Indo-Pacific trade strategy, G7 nations should advocate for an ITA expansion. Following the establishment of the WTO's Information Technology Agreement (ITA) in 1997 and its expansion in 2015, the semiconductor industry experienced a 20 percent increase in trade, and participating nations experienced a boost in economic growth thanks to lower price of ICT goods.[24] A further expansion of the ITA would eliminate tariffs on another 250 ICT product categories, including at least 60 next-generation semiconductors and semiconductor products or inputs. The reduction in prices via tariff elimination an ITA-3 could deliver carries the potential for an additional $784

22 Varas et al, 2021.
23 Ray et al, 2021.
24 Ibid.

billion in global economic growth over 10 years.[25] With the adoption of a so-called ITA-3, signatory countries could also spur deeper participation in global value chains and faster adoption of new ICT technologies, the impact of which could have tremendous ripple effects throughout the semiconductor industry.

Multiple and Multi-layered Alignments

Lastly, G7 nations could raise the efficiency of the Indo-Pacific's multiple and multi-layered national alignments. As a very large and diverse region, varying geopolitical, national, and economic interests compel the formation of many alliances. However, the presence of distinct yet sometimes overlapping alliances—the Quad and the Supply Chain Resilience Initiative (SCRI) share Australia, India, and Japan as core members, for instance—creates redundancies and inefficiencies in reaching their common goal of supply chain resiliency. Without adequate information sharing between these groups, their efforts to improve resiliency may be less effective. By communicating more often, combining talents where possible, and balancing priorities when necessary, major groups focused on the Indo-Pacific can maximize impact. The G7 nations should become leaders in this space by setting an example.

Conclusion

The G7 nations need to turn their words into action in enacting new policies to support a free, open, and inclusive Indo-Pacific by recognizing the centrality of semiconductors to their national and economic security goals, and by acting to develop a coordinated semiconductor-specific infrastructure strategy in the Indo-Pacific. The PGII's investment funds could be used to build infrastructure for R&D and advanced manufacturing capacity, improve identification and prediction of supply chain shortages, support digital infrastructure for semiconductor development, incentivize allied vendor partnerships, and draw new talent. Beyond funding infrastructure, the G7 should also take leadership roles in plurilateral agreements and in creative solutions for resilient supply chains.

25 Stephen Ezell and Luke Dascoli, "How an Information Technology Agreement 3.0 Would Bolster Global Economic Growth and Opportunity," Information Technology and Innovation, September 2021, https://d1bcsfjk95uj19.cloudfront.net/sites/default/files/2021-ITA-3.pdf.

CHAPTER THREE

The Challenge to Cultivate Global Semiconductor Talent

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As the main component in all modern electronics, semiconductors are critical to the global economy. Countries around the world serve as key nodes in a dispersed network of suppliers for the core building blocks of the technology that modern society has come to rely upon. Over the past three decades, the chip industry has been a driving force for global growth as well. The semiconductor market worldwide grew at a 7.5 percent compound annual growth rate from 1990 to 2020, outpacing the 5 percent growth of global GDP during that time.

The risks for disruption in the semiconductor supply chain are therefore significant, and G7 leaders have clearly recognized the need to address supply chain resiliency challenges. There are no shortage of risks, from disruptions due to a natural disaster such as an earthquake or typhoon, global shocks to the trading system like the COVID-19 pandemic, or upheaval caused by political considerations such as an armed conflict. Clearly, all these risks can cause significant disruptions in the semiconductor supply chain. But the world's wealthiest nations must also recognize the urgent need to invest in the infrastructure of a technology-focused workforce. After all, a shortage of talent to design the next generation of computer is becoming acute at even as innovation remains key for competitiveness.

Semiconductor devices are highly complex products to design and manufacture. In 2021,the Semiconductor Industry Association (SIA) reported that that the semiconductor supply chain "consists of four broad steps, supported by a specialized ecosystem of materials, equipment and software design tools and core IP suppliers."[1] The four broad steps are: 1) Pre-competitive research; 2) Design; 3) Frontend manufacturing (wafer fabrication); and 4) Backend manufacturing (assembly, packaging, and testing). All of these require a sophisticated workforce, but the specific needs are different .[2]

Pre-competitive research focuses on identifying fundamental materials and chemical processes and to make innovations in design architectures

1 Varas, Antonio, Varadarajan, Raj, Goodrich, Jimmy, and Falan Yinug, "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era," Semiconductor Industry Association, April, 2021, https://www.semiconductors.org/strengthening-the-global-semiconductor-supply-chain-in-an-uncertain-era/

2 "United States, Taiwan, and Semiconductors: A Critical Supply Chain Partnership", *Project 2049 and US-Taiwan Business Council*, June 8, 2022. https://www.us-taiwan.org/events/report-release-event-initial-report-us-taiwan-and-semiconductors-a-critical-supply-chain-partnership/.

that will enable the next commercial leaps in computing power and efficiency. Much of this basic research is done at universities, and is supported by government funding. Pre-competitive research is then followed by industrial research, which helps translate the new innovative ideas into practice — although direct benefits are often not realized for over a decade. This step requires a mix of highly educated scientists and engineers.

Design involves developing the architecture for integrated circuits. While computer chips were originally designed manually, that is not possible for the complex chips produced today. Instead, current chip design work relies on sophisticated Electronic Design Automation (EDA) software and reusable architectural building blocks. Even with these tools, developing leading-edge chips can take several years and requires the work of hundreds of highly specialized design engineers. U.S. IDMs and fabless companies are still the leaders in chip design, with 10 of the top 20 semiconductor design companies, including both fabless and IDMs, headquartered in the United States.

Frontend manufacturing starts with a wafer made of raw silicon or other semiconductor material. The electronic circuitry is fabricated onto the wafer layer by layer in a wafer fabrication facility (wafer fab). Frontend processing is very capital-intensive, comprising approximately 64 percent of industry-wide capital expenditures. These plants also require a wide variety of top notch engineering support including chemical, electrical, and industrial/manufacturing engineers. Wafer fabs are therefore usually built where there is a strong supply of engineering talent at the BS, MS, and PhD levels. When it comes to wafer fabrication, four regions in Asia make up the bulk of the manufacturing capacity. The United States is down to a 12 percent share, while Taiwan is at 20 percent, South Korea at 19 percent, Japan at 17 percent, China at 16 percent, Europe at 9 percent, and the rest of the world with 6 percent.[3] The growth of wafer fabrication capabilities in East Asia was primarily due to decades-long government investment strategies and incentives.

3 "World Fab Forecast (WFF)," op.cit.

Backend manufacturing begins by slicing the wafers produced in the frontend processes into individual chips and then assembled and packaged into protective plastic or ceramic frames and encased in a resin shell to become usable in electronic devices. Finally, the chips are thoroughly tested to determine their operating characteristics, such as the speed for a microprocessor. While backend processing requires sophisticated equipment, it is not as capital-intensive as the frontend. Backend processing does not require the same level of highly trained engineering support as the frontend, but is more labor intensive. Therefore these facilities have traditionally been in countries with relatively inexpensive labor. Currently, only about 2 percent of backend operations are done in the United States, and China and Taiwan account for more than 60 percent of the world's assembly, packaging, and test capacity.

The six regions mentioned above have strengths in different parts of the semiconductor supply chain. While the United States was once the leader in all aspects of the industry, that has evolved over time. Today, the United States is still the leader in intensive R&D activities, but the bulk of manufacturing is now conducted in East Asia.[4]

Talent shortages will hurt innovation

The largest risk on the design side of the global semiconductor industry is access to highly skilled talent. Talent shortages may not pose an immediate threat of large-scale disruption for the industry, but it could significantly reduce the industry's long-term ability to maintain its rapid pace of innovation. The industry workforce is aging, with a significant number of current employees in technical positions likely to retire over the next ten to 15 years, Furthermore, the industry needs to attract talent with different skill sets, particularly in software development and artificial intelligence.

In the near term, talent has also become a major concern for the industry. In a 2021 survey of semiconductor industry leaders by KPMG, 30 percent named talent as one of the top 3 risks threatening their ability to grow over the next three years.[5] This was the third-highest risk factor behind territori-

4 See Exhibit 14 in "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era" report, op.cit., for a detailed breakdown.

5 "Global Semiconductor Industry Outlook," *KPMG*, February 2021, https://advisory.kpmg.us/content/dam/advisory/en/pdfs/2021/semiconductor-industry-outlook-2021.pdf

alism—including cross-border regulation, tariffs, new trade agreements, and national security policies- and supply chain disruptions. In the 2020 version of this survey, talent was tied for the number one risk. The report went on to speculate that the decrease in the 2021 ranking was likely due to the new work-from-anywhere paradigm.

Most of the needed new talent for the semiconductor industry will come from university undergraduate and graduate programs. More sophisticated roles will likely be filled by graduate students, who are conducting research with funding grants from the government, research consortia, and directly from industry. While U.S.-based academic institutions have traditionally provided much of the talent for industry, this is changing. First, many of the Chinese students now choose to go back to China upon graduation. Second, academic institutions in Taiwan, China, Korea, Japan, and Europe now have strong graduate programs that help support the industry.

The U.S. talent dilemma

Even before COVID and the announcement of new fabs being built in the US by Intel, Micron, Samsung, and TSMC there were thousands of semiconductor jobs were going unfilled.[6] The new fabs are expected to create at least 70,000 new semiconductor manufacturing jobs.[7] This does not include the additional jobs that are needed in the chip design arena.

The U.S. semiconductor talent shortage is being addressed by both the government and the semiconductor industry with the government helping more on the mid-term and long-term problem, while the companies are more focused on the short-term problem. In the recently enacted CHIPS and Science Act, $13.2 billion is allocated for R&D and workforce development.[8] R&D funding is important in addressing the talent shortage because many of the

6 Silverberg, Elliot and Hughes, Eleanor, "Semiconductors: the skills shortage", *theinterpretor*, September 15, 2021, https://www.lowyinstitute.org/the-interpreter/semiconductors-skills-shortage.

7 VB Staff, "Report: Critical talent shortage for over 70,000 semiconductor manufacturing jobs", *VentureBeat*, December 9, 2021, https://venturebeat.com/social/report-critical-talent-shortage-for-over-70000-semiconductor-manufacturing-jobs/.

8 "FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China", *The White House*, August 9, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/.

students working on R&D projects at universities ultimately go to work in the industry. The experience gained in working in the R&D environment makes the transition to industry easier than it is for students who don't have this experience. Without much governmental R&D funding for semiconductor manufacturing over the last two decades, a number of research labs at US universities were shut down. In looking even further into the future, the legislation authorizes new and expanded investments in STEM education and training from K-12 to community college, undergraduate and graduate education, particularly for marginalized, under-served, and under-resourced communities.

In the private sector, semiconductor firms are looking for ways to attract and retain the talent needed to run their business. An important aspect of this to increase diversity of the workforce. Many of the companies have goals and strategies regarding seeking out more women, unrepresented minorities, and veterans. There also significant efforts underway to reskill their workers to address changes in the nature of the work. Salaries in the industry have also been increasing in response to competition from other industries.

Beefing up Europe's tech talent pool

Europe's microelectronics sector currently has 200,000 direct jobs (and 1,000,000 indirect) high-skilled jobs. As worldwide demand for chips continues to increase, the need for semiconductor workers in Europe will increase. Intel plans to invest up to €80 billion over the next decade to build up Europe's supply chain for semiconductor chips including every part of the chip supply chain with investments also going to France, Ireland, Italy, Poland and Spain.[9] Their initial investment of 33 billion euros will create about 5,500 jobs at the company, plus thousands more in construction and at suppliers and partners.

In 2019, SEMI and 19 partners from 14 European countries launched the METIS—Microelectronics Training, Industry and Skills—initiative to fill the skills gap and boost workforce diversity by strengthening collabora-

9 Cooban, Anna, "Intel will invest nearly $90 billion in Europe's chipmaking industry", *CNN Business*, March 15, 2022, https://www.cnn.com/2022/03/15/tech/intel-chips-europe/index.html.

tion between the microelectronics industry and education providers.[10] The four-year project focuses on the skills and related training needed to support emerging verticals such as artificial intelligence, autonomous driving and Industry 4.0 in Europe.

Taiwan's China challenge in the chip space

The recently released Taiwan 104 Manpower Bank *2021 Taiwan Semiconductor Talent White Paper*, indicates that the second quarter average monthly talent gap in the semiconductor industry was almost 28,000 which was the highest total over the last 6-and-a-half-years[11]. The white paper also broke down the gap by discipline and indicated that 55 percent of the gap was for engineers, mostly for Frontend and Backend manufacturing. The average monthly salary of the industry is 52,288 yuan which ranked second to the computer and consumer electronics industry. The higher salaries are one of the main ways that Taiwanese firms are attempting to attract and retain top talent.

The Taiwanese government has done a couple of things to address the semiconductor gaps. First, the Taiwanese government devoted significant resources to establish "chip schools" within top universities on the island.[12] The leading chip companies are partnering with the government to establish these talent pipelines. According to the Taiwan Ministry of Education, four chip schools were established in 2021 and one additional school has been approved. Each school was given a quota of about 100 master's and PhD students. The schools will operate year round with no winter and summer breaks in order to produce graduates more quickly.

10 Pelé, Anne-Françoise, " Semiconductor Industry Needs to Close Talent Gap, *EE Times Europe*, July 8, 2021, https://www.eetimes.eu/semiconductor-industry-needs-to-close-talent-gap/.

11 iNews, "Taiwan's semiconductor talent gap hits a 6-and-a-half-year high, the most shortage of engineers", *iNews*, September 26, 2022, https://inf.news/en/taiwan/348b5ee33b530474fb4f8e95007457b4.html.

12 Wu, Sarah, "Taiwan invests in next generation of talent with slew of chip schools", Reuters, March 10, 2022, https://www.reuters.com/markets/funds/taiwan-invests-next-generation-talent-with-slew-chip-schools-2022-03-10/.

Part of the problem for Taiwan is the fact that the over 3,000 engineers and corporate leaders from Taiwan have accepted employment in China.[13] In response, the second thing that the Taiwanese government has done is to tell recruiting firms to remove listings for high-tech positions based in China.[14]

Those firms that violate this rule will be subject to fines and those fines will be greatest for those job openings in the semiconductor industry. It should be noted that this is also a signal to the US that Taiwan views China as a major threat.

Growing South Korea's tech talent

The South Korean semiconductor industry is faced with a significant talent shortage. In addition to the challenges faced by other countries in the industry, South Korea has long had an extremely low birth rate. Both the South Korean government and South Koreans companies have taken actions to reduce the current and future talent shortages in the semiconductor industry. The South Korean Ministry of Education recently set a goal of training 150,000 people with semiconductor expertise over the next ten years.[15] The plan includes the establishment of new departments of semiconductor studies at four advanced research institutions across the country. It also will raise current student quotas at universities in and around Seoul for departments with semiconductor-related and semiconductor-supporting programs. It plans to bolster academic-industrial cooperation programs in advanced degree programs to promote chip engineers and hope to expand exchange programs with overseas schools, institutes, and tech companies. [16] In a somewhat controversial move, the government also will redirect $2.8 billion from its childhood education budget to higher and lifelong education including educational

13 Ihara, Kensaku, "Taiwan loses 3,000 chip engineers to 'Made in China 2025'," *Nikkei Asia*, https://asia.nikkei.com/Business/China-tech/Taiwan-loses-3-000-chip-engineers-to-Made-in-China-2025

14 Mott, Nathaniel, "China's Efforts to Recruit Semiconductor Talent Hit by Taiwan Ban", *Tom's Hardware*, April 30, 2021, https://www.tomshardware.com/news/taiwanese-ban-hits-chinas-efforts-to-recruit-semiconductor-talent

15 Lem, Pola, "Korea's semiconductor talent boost 'too little, too late'", Time Higher Education, August 31, 2022, https://www.timeshighereducation.com/news/koreas-semiconductor-talent-boost-too-little-too-late.

16 "3,000 semiconductor professionals to be trained", *Korea Joong Ang Daily*, May 30, 2022, https://koreajoongangdaily.joins.com/2022/05/30/business/tech/Korea-semiconductor-talent/20220530183757599.html.

efforts to develop and grow semiconductor talent. [17]

South Korean semiconductor companies have also been making efforts to attract and retain semiconductor talent. The industry faces stiff competition for talent from gaming and internet companies as well as Chinese companies who are offering ever-increasing salaries. This has led Samsung and other semiconductor companies to offer significant bonuses to all employees and to increase entry level salaries.[18] In order to retain some of their top talent that is aging, several South Korean semiconductor companies are offering employees the chance to put off retirement past the standard retirement age of 60. Some of these companies are also moving some of their younger employees into "honored engineer" positions in order to retain their top performing younger employees.

Japan's private and public investments to meet demand

The Japan Electronics and Information Technology Industries Association (JEITA) estimated that the eight large Japanese semiconductor companies will need to hire 35,000 engineers in the next 10 years to support expansion of the industry. [19] These companies are targeting local universities for entry-level talent and are expending large amounts of money in their recruitment efforts.

In response to the current and future talent challenges, the Japanese government is looking into establishing talent development programs that involve industry, academia, and government collaboration. The programs are based on a framework established in a joint chip-making venture By TSMC and Sony Group Corp. that involved Kyushu University and nine local governments.

17 "South Korea will redirect 3.6 trillion won (US$2.8 billion/100.8 billion baht) from its budget for childhood education to higher and lifelong education, such as nurturing semiconductor talent, the government said on Thursday", *The Nation Thailand*, July 8, 2022, https://www.nationthailand.com/international/40017515.

18 "The semiconductor talent war heats up Samsung employees purse bulging", *RMC Team*, February 10, 2022, https://www.realmicentral.com/2022/02/10/the-semiconductor-talent-war-heats-up-samsung-employees-purse-bulging/

19 Valero, Beatriz, "Skills shortage threatens Japan's semiconductor industry", *Engineering and Technology*, June 28, 2022, https://eandt.theiet.org/content/articles/2022/06/skill-shortage-threatens-japans-semiconductor-industry/.

China's goal for self-sufficiency

China has set a target of 2035 to be fully self-sufficient in tech by 2035[20] and some believe that they will lead the global semiconductor industry by 2030 due to its growing market size and domestic production capacity.[21] Even though China plans to invest about US$150 billion by 2030 to ramp up its semiconductor manufacturing capacity, the biggest obstacle to achieving self-sufficiency is not funding, but is a chronic shortage of talent.[22] China reportedly needs 400,000 more semiconductor employees to meet its goals.[23] China's biggest talent challenge is the need for chip manufacturing talent. Even though China has numerous excellent universities that turn out a significant number of graduates with advanced degrees in microelectronics and communications, they suffer the same issue faced by their competitors—many of the top graduates prefer to go to work for internet firms.[24] In addition, they need engineers with practical work and leadership experience as they try to close the gap on their competition.

China has reacted to the current and future talent shortage by doing what most of their competitors have done. They have established integrated circuit schools at two of the top Chinese universities: Tsinghua University and Peking University. These new schools will provide the students with classroom knowledge and hands-on experience. The Chinese government has given tax breaks, incentives, and subsidies to Chinese semiconductor companies to scale up production. Chinese companies have been increasing wages for their key semiconductor talent which has resulted in a somewhat larger number of Chinese students who studied abroad (mainly the US) returning to their

20 Gaikwad, Sumeet, "Opportunities with China's semiconductor push", Asia Fund Managers, July 18, 2022, https://www.asiafundmanagers.com/us/opportunities-with-chinas-semiconductor-push/.

21 Williams, Lara, "China will lead the global semiconductor industry by 2030 due to its growing market size and domestic production capacity", Investment Monitor, July 25, 2022, https://www.investmentmonitor.ai/analysis/china-lead-global-semiconductor-growth-2030.

22 Qu, Tracy, "China's semiconductor talent shortage poses biggest obstacle to Beijing's chip self-sufficiency ambitions, SMIC founder says", *South China Morning Post*, November 18, 2021, https://www.scmp.com/tech/tech-war/article/3156576/chinas-semiconductor-talent-shortage-poses-biggest-obstacle-beijings.

23 Silverberg, Elliot and Hughes, Eleanor, "Semiconductors: the skills shortage", *theinterpretor*, September 15, 2021, https://www.lowyinstitute.org/the-interpreter/semiconductors-skills-shortage.

24 "China's semiconductor industry faces a growing talent shortage as Beijing aims for global dominance in chip manufacture", *Colombo Gazette*, October 26, 2021, https://colombogazette.com/2021/10/26/chinas-semiconductor-industry-faces-a-growing-talent-shortage-as-beijing-aims-for-global-dominance-in-chip-manufacture/#:~:text=China%20faces%20a%20chronic%20shortage%20of%20scientific%20and,a%20dearth%20of%20qualified%20senior%20professionals%2C%20they%20said.

homeland. Chinese companies also use promotions as a way to retain key personnel.[25] Finally, Chinese companies have actively been recruiting engineers and semiconductor leaders away from their Asian competition (particularly Taiwan) to join them.

No silver bullet to cultivate much-needed tech talent

It is clear that the current and future semiconductor talent shortages are not restricted to a single country. While there are some differences in the problems faced by each country, all are challenged by the fact that many of the students that in the past would have gone into the semiconductor industry, now prefer to go to work for gaming and internet companies. Governments and consortia are investing in workforce development programs. In the United States and Europe, there are special efforts to get more participation from underrepresented groups. In Asia, there is considerable focus on creating new semiconductor degree programs and/or on allocating more MS and PhD slots in existing programs. Governments are also putting more funds into R&D at key universities. The R&D funds are allowing the universities to produce highly educated students with an increased understanding of the challenges faced by the industry. Semiconductor companies are offering higher salaries and promotions to recruit and retain the talent that they need.

25 Hsu, Edward, "Spotlight on pay and talent trends in Asia's lively Semiconductor industry", *WTW*, January 2022, https://www.wtwco.com/en-US/Insights/2022/01/spotlight-on-pay-and-talent-trends-in-asias-lively-semiconductor-industry.

CHAPTER FOUR

Water as a Resilience Multiplier for an Inclusive Indo-Pacific

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In concluding the September 2021 Quad meeting with the heads of India, Australia, and Japan, President Biden **proclaimed** that "the future of each of our nations—and indeed the free world—depends on a free and open Indo-Pacific enduring and flourishing in the coming decades." As the world's most dynamic and populous region, the Indo-Pacific is full of potential, but it is not without its challenges. Almost all of the Indo-Pacific nations have "**difficult hydrologies**," which present persistent and long-term structural challenges for development. Climate change is exacerbating these challenges still further as novel, previously unexperienced climate conditions emerge across the region more quickly than predicted by groups such as the IPCC. Continued economic fallout from the COVID-19 pandemic, coupled with global supply chain disruptions, geopolitical instability, and record high food prices threatening to undermine worldwide development gains of the past 30 years, and aggravating the situation still further. Clearly, new approaches to building and sustaining water security for growth and development are needed urgently.

Additional water-sector investment has been identified as a clear gap. The **benefit-cost ratio** of investments in water and sanitation infrastructure in least-developed countries such as Lao PDR or the Solomon Islands can be as high as 7 to 1, allowing for greater economic opportunities, income generation, and poverty reduction. While the Indo-Pacific has made historic gains in access to water, sanitation and hygiene over the past 25 years, as of 2019, over a **billion people** in the region still do not have reliable access to water, sanitation, and hygiene (WASH) services, while existing water service providers struggle to keep up with ever-increasing demand.

Rapid urbanization continues to strain the limits of water infrastructure in cities like Manila, Dhaka, and Karachi, where over 40 **percent** of the urban populations already live in slums without access to safe, clean, and reliable drinking water and sanitation supplies. According to the **AIIB**, over 770 million cities and urban settlements in Asia are now annually exposed to flood risks. At the same time, traditional water sector investments are not enough to cope with emerging climate and development challenges.

There are unintendend water consequences of longstanding development policies too. Subsidized fuel sources have accelerated the use of groundwater pumping in Pakistan and India, causing rapid aquifer depletion. Groundwater consumption are, ironically, creating significant flooding issues in Hanoi and

Jakarta through subsidence. In rural areas, expanded groundwater pumping has increased the feasibility of irrigated agriculture, which has an overall positive effect on food security in the short term. Such pumping is almost universally unregulated and has led to widespread **overextraction**, sometimes exacerbated with "clean" solar-fueled pumps. As groundwater often provides a back-up source of water during periods of surface water scarcity, the loss of these aquifers is particularly alarming and may produce the perverse result of undermining food security over the medium to long term.

Increased water-related climate risks for Indo-Pacific nations

Most of the region is already **highly exposed** to water related climate risks including melting glaciers, more frequent and intense typhoons or cyclones, sea level rise, and more powerful droughts. Such risks affect the ability of water service providers to maintain reliable and profitable operations; these challenges for water services are only increasing. According to a recent OECD **report**, in order to meet their sustainable development targets under SDG 6, most Indo-Pacific countries will need to allocate between 1 and 2 percent of their GDP on water supply and sanitation infrastructure over the next decade. Given that most water infrastructure is designed to last for fifty years or more, uncertainty about future climate is a serious threat to planning and designing resilient infrastructure. Many countries may in effect be investing in designs and systems that are outdated at the time that they launch operations because they depend on a traditional and widespread past-predicts-the-future planning methodologies.

Low-lying Pacific nations such as Timor-Leste and the Marshall Islands, meanwhile, face the threat of losing their entire land base. As the finance minister of Tuvalu **warned** at the 2021 UN Climate Conference in Glasgow: "It is not fiction, it is not projected to happen in the future—our land is fast disappearing. Tuvalu is literally sinking." At the same time, Pacific Island countries are at the **forefront** of taking action against climate change themselves. They are developing and mainstreaming climate adaptation and resilience solutions, including resilient water infrastructure. Given the implications of mass displacement on regional stability and security, efforts to ensure their survival

should be viewed as a strategic national priority for the United States and its G7 partners.

Rethinking investments in water resilience

Most investment processes mobilizing intra- and international resources and both public and private investors are often using business-as-usual frameworks for nontraditional and often complex problems. Building up infrastructure alone may also be insufficient for ensuring that issues around equity and the promotion of a strong civil society grow in tandem with infrastructure services. Strengthening societal resilience to confront unpredictable shocks and stressors requires a transformation in how to invest in the future. Planning for resilience requires reducing the emphasis on achieving highly optimized, predictable outcomes and increasing the adaptive capacity of our economies, policies, financial institutions, ecosystems, and physical infrastructure in order to help them to withstand and adjust as conditions change. If investments are to deliver inclusive, equitable, and environmentally sound growth for low and middle income countries in the Indo-Pacific region, they must embrace a resilience perspective.

Water has been recently emerging as a kind of organizing principle for climate adaptation and resilience projects, perhaps notably in the call for "water-based adaptation" for all sectors by the Intergovernmental Panel on Climate Change (IPCC) **sixth assessment report**. Water resilience, in particular, has been identified by the **Global Commission on Adaptation** as a key enabler of broader societal resilience. Both the **Asian Development Bank** (ADB) and **World Bank** have begun to mainstream water resilience within their broader investment portfolios. The PRC-backed Asian Infrastructure Investment Bank (AIIB) has also developed a new water infrastructure investment **strategy**; however, it remains to be seen how this new strategy will guide the AIIB's investment since only four water infrastructure projects have been approved since its adoption in late 2020. Likewise, major water reforms at the Green Climate Fund (GCF) have only just been **realized**; implementation through water projects to date around water resilience has been limited but could change dramatically.

Moving Beyond Crisis: Developing Systemic Solutions for Systemic Threats

Water resilience must be a key part of ensuring the future growth of the Indo-Pacific, and water resilience must also be integral to the strategy to promote sustainable growth. Most water interventions by donor countries have focused on traditional WASH (water sanitation, hygiene, and health) projects, such as expanding urban water utilities or provisioning rural household clean water programs. These programs will remain regionally important and indeed have expanded through internal investment processes, such as India's aggressive engagement with SDG 6. Water resilience, however, is an approach that seeks to transform sector- and ministry-specific programs designed to expand specific areas of growth, such as energy generation capacity, to defining the **water linkages** between sectors and ensuring that these programs are invested with attention to the potential synergies and conflicts. Recognizing the transformative, disruptive role of climate change is central to water resilience.

Water resilience assumes three factors, namely:

1. Climate change is a new and unfamiliar disruptive force that will influence the region in profound ways for at least decades to come. While the existing political and economic systems are designed for a "stationary" (i.e., fixed) climate, climate change is rapidly stranding infrastructure, governance, and policy agreements as often unspoken assumptions about "normal" climate conditions are profoundly violated. Climate change is, in effect, a profound threat multiplier.

2. Water is arguably the medium **of most negative climate impacts**, and many of these impacts are challenging to predict with the accuracy necessary for traditional planning, design, and operational functions.

3. Infrastructure for energy production, data processing, storage, transportation, manufacturing, clean water, and the food system last over **climate-relevant lifespans,** ranging from a few decades to a century or longer, but they are not designed for the range of climate conditions they will face over these periods. While existing infrastructure and policy

> systems are declining in functionality as a result of essentially unforeseen climate impacts, new investments and approaches remain unlikely to go beyond **de-risking a narrow set of climate impacts**. Thus, new clean energy or sustainable forestry programs may be rapidly left behind with accelerating climate change, losing efficiency or even experiencing damage as a result of novel events. In some cases, trade agreements and transboundary resource sharing frameworks may be undermined by the same kinds of climate risks as infrastructure.

There are no quick fixes to issues related to water risks. Indonesia is essentially abandoning its national capital as a result of flood issues, while the scope of 2022 flooding in Pakistan—most often viewed as a water-scarce country—shows many climate impacts are nonlinear and very challenging to anticipate. Island nations in both the Indian and Pacific oceans face potentially existential challenges from the pinch of scale of severe freshwater scarcity for all sectoral use, intense tropical cyclones, and rising sea levels, which so far have largely seen solutions that are either small relative to the scope of the problems or so expensive as to present significant economic challenges simply to maintain current conditions.

Water resilience is a comprehensive approach to these issues, and one in which donor aid and a community of regional learning and capacity building can be catalytic. Moreover, water resilience relies on actively engaging with civil society and a vision of infrastructure and policy investments embedded in a social-ecological context. Water resilience at its core recognizes that not all economic development problems can be engineered and that long-term solutions almost always require a mixture of built, hybrid and green, and governance options. One group has also referred to these approaches as **"deep resilience."**

Some policymakers have highlighted the transition to a water resilience approach. In March 2022, the IPCC stated that **"water-based adaptation"** should be the core focus of most adaptation and resilience interventions globally. California Governor Gavin Newsom identified water issues as an **existential threat** to the basis of much of his state's economy, including the gradual loss of summer water storage in snowpack (extending and intensifying the dry season), the emergence of a 1200-year scale "drought," water governance systems designed to fit a long-past economy and a much lower population size,

and the threat of increasingly extreme pluvial flood events, in addition to unprecedented wildfires and exceptional heat that stresses the state's energy system. Many of these issues have resonance throughout the Indo-Pacific.

Newsom's essential focus, beginning with a 2019 **executive order,** has been to reorient state agencies to water resilience. Beginning in August 2022, Newsom announced a new **state water plan** that transitions state policies and programs **"away from a scarcity mind-set to one more of abundance."** That is, how can the state radically adapt to emerging climate conditions, especially around water scarcity, in ways that can actually fuel prosperity and attract additional social and capital investment? If climate change is a threat multiplier, California has clearly identified water as a "resilience multiplier."

In the Indo-Pacific, Singapore has developed an arguably longer track record along very similar lines. According to a recent **national report,** Singapore clearly demonstrates that a lack of abundant local water resources need not be an obstacle to successful economic development:

> Water has always been an existential issue for Singapore. Singapore is classified as being water scarce and as the most water-stressed country in the world, according to the World Resources Institute's 2015 report. We also rank 170th out of 190 countries in terms of freshwater availability, according to the first UN World Water Development Report in 2002.

Yet because of Singapore's strategic prioritization of water for economic development priorities, water has not been a significant limiting factor for the country for many decades.

Operationalizing Water Resilience for the Indo-Pacific

There are five ways that can enhance water resilience in the Indo-Pacific while also leading to greater social and economic security, namely:

1. Promoting water resilience leadership: the 2015 UNFCCC Paris Agreement created a new framework for economic development in the form of five-year periodic national climate planning and reporting systems called NDCs or Nationally Determined Contributions. The

NDCs defined a new class of national level climate planners (NDC focal points) who report national climate ambitions to the global community. Perhaps more importantly, the NDC focal points also look across sectors and ministries to identify potential gaps and synergies from a climate perspective. A number of countries and both UN, donor, and NGO actors have called on the NDCs to be drivers of **water resilience** that can align the **water and climate agendas** and enhance the ambitions around climate action. Indeed, at least one collaborative **global donor-funded program** has started to build this capacity within national parties, while the UNFCCC itself is conducting a **certification program** for NDC focal points on water-based adaptation and resilience. Existing capacity-building and education efforts such as the **Quad Fellowship** or the **ADB-Japan Scholarship Programme** could be expanded to include funding for the recruitment and development of individuals from a variety of technical and policy backgrounds. Arguably, these approaches should also be extended to other policy frameworks, such as transboundary water sharing agreements (e.g., India-Pakistan, the Lower Mekong River, following patterns already apparent in the Zambezi, Danube, and Colorado Rivers), which all appear quite sensitive to violations of assumptions as the water cycle continues to evolve rapidly in unplanned directions. PGII could very tangibly support the process of preemptively ensuring that these agreements will remain durable under a wider range of conditions in ways that lead to guidance for new institutions and processes to avoid conflict and insecurity.

2. Addressing the cost of water resilience: Water-centric economic planning and management is an important perspective for how to approach resilience between and within sectors. Traditional macroeconomic approaches by finance and economic ministries (including Integrated Water Resources Management [IWRM] and water-food-energy nexus [WEF] methodologies), have focused on efficiency and optimization for critical resources and outputs, but "efficient" solutions may also be "brittle" and prone to failure if basic climate assumptions are violated. Efforts to develop capacity and promote macroeconomic planning, monitoring, and evaluation that addresses water resilience as a key

additional quality in addition to efficiency and optimization could be transformative across the region. The reverse is also true: when countries over optimize without considering potential climate impacts, especially around high-uncertainty resources such as water, disruptions can trigger a downward economic spiral or even disinvestment. These risks may be heightened as developing economies transition from water-intensive agricultural commodities to preparing for manufacturing economies by increasing energy generation capacity via water-intensive sources. Such hidden water insecurity may be most prominent in energy systems. Much of South and southeast Asia falls into these categories, certainly for hydropower development (Bhutan, Nepal, Vietnam, Thailand, Laos), but also with the construction of new coal-fired, natural gas, and hydropower plants (e.g., India, Pakistan, China).

3. Enhancing stakeholder engagement for defining problems and coordinating solutions: Engaging technical agencies and line ministries in the process of stakeholder engagement early in strategic planning is critical for long-term efficacy and coherence in resilience efforts. Globally, infrastructure investment has taken a traditionally technocratic and top-down approach to identifying needs, defining project scope and siting, and identifying beneficiaries from investment. Often, these methods have also developed quite simplified and limited solutions to complex problems, such as generating energy while hampering or eliminating traditional livelihoods, irreparably damaging critical ecosystems, or adding significant burdens to other sectors such as agriculture or downstream countries. Climate proofing may be limited to risk assessment frameworks (e.g., an SEA or EIA), but realistically these often occur late in project development and remain quite narrow in scope. More recently, water resilience practitioners such as **UNESCO** have recommended the use of more inclusive approaches that partner technical decision makers with a **diverse array of stakeholders** early in the project cycle. In one **Thai city,** for instance, recent emerging sectoral conflicts and climate risks for hydropower, flood control, irrigation water scarcity, and urban resilience were diffused by creating an integrated and conjoined set of urban lakes to solve multiple problems.

The processes of stakeholder engagement expand the set of criteria used to determine project success (e.g., quality of life, ecological resilience) and also reinforce inclusive, equitable growth through such methods as **"shared vision planning."** The US made this transition with groups such as the US Army Corps of Engineers decades ago and is well placed to facilitate capacity building. Such bottom-up approaches strengthen civil society, transparency, and democratic processes but often require some transition support from more experienced external actors for technical and senior decision makers. Expanding support for initiatives such as the **The Coalition for Disaster Resilient Infrastructure** (CDRI) and its **Infrastructure for Resilient Island States** (IRIS) project or the **USAID and Australia Mekong Safeguards Program** (Mekong Safeguards) is one way to support transparent, locally developed infrastructure investments. Adopting existing tools and frameworks for bottom-up infrastructure development such as the World Bank's **Decision Tree** Framework, the Asian Development Bank's recent **water resilience guidance**, or UNESCO's **Climate Risk Informed Decision Analysis** (CRIDA) may also be beneficial.

4. Finding nature-based solutions: Nature-based solutions, or NBS, should become a new target for investment across the Indo-Pacific, especially for groundwater resources. Groups such as the ADB have recently published a practitioner's guidance that aligns **NbS with climate resilience,** and in 2022 the ADB has launched a new NbS project preparation and financing facility. Of course, developing regulatory, monitoring, governance, and enforcement systems for groundwater is essential. Some investments should also end, such as donor efforts that have reinforced poor behavior (e.g., **solar-powered groundwater pumps**, which have lowered the costs of groundwater and led to even less sustainable use). In mountainous and snowpack-fed low-elevation areas, dry seasons are generally becoming longer and drier while yet seasons are becoming flashier. A major part of California's program to move to an "abundance" orientation has been to develop **groundwater recharge systems as regional snowpack storage disappears**; these systems capture rainy-season floodwaters in recharge zones, essentially shifting storage from one

nature-based solution (snowpack) to another (aquifers). These approaches could be transformative in much of southern Asia and, potentially, in island regions as well.

5. Supporting transnational cooperation along rivers: Given the fact that nearly all of Asia's major rivers cross international borders, efforts to strengthen riparian cooperation between countries should be supported. Infrastructure investments upstream, such as hydropower dams, may have significant impact on downstream communities and ecosystems, as is currently being seen in the **Mekong River Delta** and in the lower reaches of the **Kabul River**, a major tributary of the Indus shared by Afghanistan and Pakistan. Similarly, unregulated pumping of transboundary aquifers is becoming a **serious problem** in many Indo-Pacific countries including Pakistan, India, and Vietnam. According to one recent analysis, countries sharing the Ganges-Brahmaputra-Meghna (GBM) basin lose over $14 billion per year due to poor cooperation amongst the partners. Programs that support the creation and maintenance of transboundary water sharing agreements and technical working groups, such as IUCN's **Building River Dialogue and Governance** (BRIDGE) or the **Mekong-U.S. partnership**, are one way to advance transboundary cooperation.

6. Establish agencies focused on resilience: Following the model of the 100 Resilient Cities (100RC) initiative, consider appointing "chief resilience offices" within the PGII implementation team to ensure that climate risk is mainstreamed into all PGII investments from the start of the project lifecycle. Funding a CRO could enable officials to "own" resilience and direct capacity as well as develop tailored decision making guidelines.

The 2022 U.S.-Indo-Pacific Strategy notes that the United States "has long recognized the Indo-Pacific as vital to our security and prosperity." Investing in climate-resilient water infrastructure is an investment in the long-term economic resilience and stability for the Indo-Pacific region, especially for resilience that reflects broader civil society engagement through shared vision planning. In particular, by investing in water resilience, the U.S. offers a compelling alternative to PRC infrastructure investments under the Belt and

Road Initiative, which continues to promote '**technocratic, incremental, and industry-oriented**' approaches to development. The events of the past two years have clearly demonstrated that the challenges facing the region cannot be effectively addressed with incremental change.

CHAPTER FIVE

The G7 Challenge in Facing China's Infrastructure Ambitions

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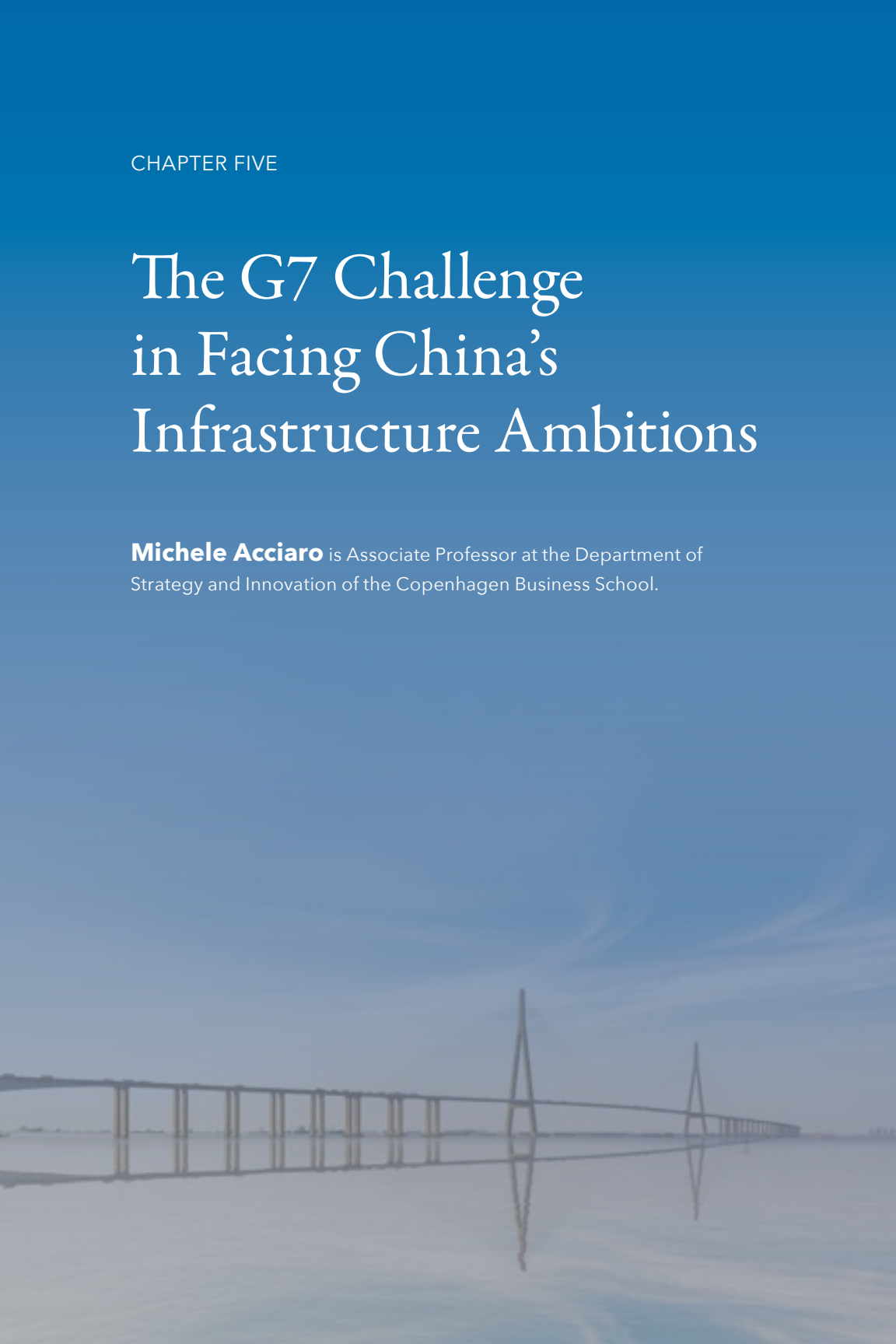

In June 2022, the Biden administration made clear its commitment to meet the world's infrastructure needs. The Partnership for Global Infrastructure and Investment has been promoted as a way for the United States together with the world's richest nations to contribute to building infrastructure in select emerging economies, with the objective of advancing their development and strengthening global security. The declaration follows years of negotiations which resulted in a commitment in Summer 2021 from G7 countries for a global infrastructure plan and can be seen as a response of the efforts from the BRIC economies of Brazil, Russia, India, and China to expand on the Chinese infrastructure and aid plan generally referred to as the Belt and Road Initiative (BRI), or the New Silk Road.

The partnership has a variety of objectives but it is clear that its main role is rebalancing a loss of economic, and indirectly political, influence in the countries where China has been most active in the last decade. It is of particular relevance for countries in Central and West Asia, Africa and South East Asia, although it should be acknowledged that both the BRI as well as the Partnership for Global Infrastructure and Investment, are global in their scope. t the June 2022 meeting, the G7 announced that the Partnership will provide $600 billion for development efforts, of which one-third would be provided by the United States and as such the largest contributor to the initiative, while half would be provided by the European members of the G7, namely Britain, France, Germany, and Italy.

The plan is to invest the commitment over the next five years, and its success ultimately depends on significant private finance being raised as well. There are four principle areas of investment focus, namely: climate change and energy security; communication and connectivity; equity and gender equality; and global health security. These four areas echo the political agenda of both the Biden administration and the European Commission, and are a response to the ongoing energy crisis and the COVID-19 pandemic. The infrastructure partnership frames a variety of existing and planned projects of a development and humanitarian nature, with the implicit objective of tying developmental objective with the priorities of the G7 economies.

International development projects have been for decades an instrument for advanced economies to exert influence in the developing world. This

approach has often improved living conditions and economic growth, but in recent decades, development assistance projects have also been seen to favor Western businesses in general. Assistance has often followed patterns reminiscent of old colonial areas of influence, and has increasingly attached conditions to funding aimed at advancing the regional political agendas of European countries, such as reducing migration, and in North America, trying to counteract global terrorism.

From the COVID-19 pandemic to international terrorism and cross-border migration, many of the truly destabilizing phenomena of modern times are global in nature. These challenges have highlighted the limitations of global institutions and have come under scrutiny from some quarters as being sources of instability themselves. The traditional approach towards managing risk and instability has been that of prevention, cooperation and strengthening democratic institutions. However, this approach has not been able to prevent crises that have unfolded rapidly or that involved territories that were peripheral to global reach, either because they are situated in failed states, or in marginalised economies, or under the control of countries that are placed outside of the main multilateral collaboration.

The climate crisis is a clear example where developing an approach to a global challenge that most likely will affect developing economies disproportionately has been met with resistance often specifically by those economies that are to benefit the most from such approach. The reasons for the limited success of multilateral approaches to fight the climate crisis are multifaceted. A common denominator is the decreasing willingness of the political elites in developing economies to accept policies driven by a western political agenda, which can be seen as the result of the weakening hold of the global North on the global South. The role of multinationals has come under greater scrutiny too between the wealthiest and less prosperous nations.

At the same time, the strategic importance of Africa, Central, and South East Asian countries is increasing in view of the rebalancing of the geopolitical power towards the Indo-Pacific. As a bipolar world order crumbled with the collapse of the Soviet Union, a more fragmented, and arguably more balanced, world order is emerging, as the interests of countries that are not great powers are increasingly reflected. While a new form of multilateralism, where countries' negotiating power is proportional to their population and not only their

military and economic power, has yet to emerge, many smaller economies find themselves on an imaginary Maginot Line, tempted to pledge their allegiance, together with their strategic geopolitical position or natural resources, to the power that best meets their needs.

Infrastructure's role in shaping the emerging world order

Infrastructure is critical in establishing and consolidating power relationships. Infrastructural power is a key precondition for countries' legitimacy and their ability to stir and control their people. The world has been reminded in the ongoing war in Ukraine of the strategic role played by transport infrastructure, telecommunications and energy infrastructure in aiding military and political power.

Maritime transport and ports are a clear example of how infrastructural developments can be an example of geopolitical muscle flexing beyond the apparent objectives of fostering connectivity and economic development. The increasing dominance of China as a global power and the influence of Chinese entities through the Belt and Road Initiative has become all too apparent not just politically, but also economically. Certainly, BRI has only furthered China's central position in global supply chains. While supply chains over the last three decades have become synonyms with globalization, the interconnectedness of markets worldwide have also made countries far more vulnerable to Chinese economic coercion than ever before.

Neither the BRI nor the Partnership for Global Infrastructure and Investment are not simply infrastructure investment programs. but rather they also look to reshape global value chains. The BRI is instrumental for the internal Chinese economy, for China's political system's legitimacy, and for the actualization of the "Made in China 2025" strategy and its latest Dual Circulation strategy for greater Chinese economic leadership. The interconnected nature of economics, geopolitics and country specific development strategy is particularly evident in the case of the BRI. Although the BRI is not only about infrastructure, it is the initiative's focus on transport infrastructure in particular that has been exemplified as reflecting China's economic

ambitions as well as values globally[1].

German geographer Ferdinand von Richthofen used the word Seidenstraßen to describe the web of exchange networks that linked the Han dynasty China with the rest of the world. The Silk Roads was never a specific route, but rather a concept of bridging China and its ideas to Europe. The modern version of the Silk Roads is the BRI, and the initiative too has expanded as a concept to include the entire world. Given the sheer size of China, it is hardly surprising that they place Beijing at the center of global action, and not simply define itself by its connection to Europe.

The Belt and Road initiative comprises of a vaguely defined set of projects, roughly divided between land-based projects, originally conceived to take place on Eurasia (the 'belt') and a set of projects aimed at developing the maritime connections between Asia and Europe (the 'road'). The MERCATOR Institute for China Studies has a database of over 2000 projects including ports, railways and energy infrastructure, from the port of Piraeus in Greece, the dry port of Khorgos, at the border between China and Kazakhstan, through the Arctic route and ports in Portugal and Spain. A large share of the projects focus on energy infrastructure including oil and gas pipelines that are necessary to maintain the supply of energy for Chinese internal consumption. A considerable part is dedicated to rail projects and the construction, expansion and upgrade of port infrastructure.

China's articulation of long-standing ambitions

China's ambitious development plan has been compared to the Marshall Plan for the 21 century. While the idea of strengthening connectivity among central Asian countries is not new , what has been novel is that the Chinese leadership under Xi Jinping has been willing to support the vision outlined during his trip to Astana (now Nur-Sultan) during his trip in September 2013 with sizeable investments.

1 Some of these considerations are based on notes prepared by the author for a speech held at the European Parliament in the occasion of the presentation of the "*Maritime Economy Report 2018—Italy, China, energy corridors, ports and new routes: geomaps of a changing Mediterranean*", held in Brussels on the 8th November, 2018 and the introduction to the round table: "*The New Silk Road: Risks and Opportunities for the Economy*", held as part of the *third International Forum Confrasporto*, on October 9, 2017 at the "Villa d'Este" in Cernobbio (Como), as well as notes taken during the Opening of the Hapag-Lloyd Center for Shipping and Global Logistics (CSGL) and the International Symposium: "*The Belt & Road Initiative's Impact on Global Logistics*", held at the Kühne Logistics University, in Hamburg, on the 22 and 23 of November 2018.

The overall project expanded over time, first with the inclusion in 2013 of the *Maritime Silk Road* during a visit in Indonesia, then adding a wide array of projects to include the Northern Sea Route, and more recently, projects in Africa and South America. Initiatives are underway too to include cyberspace and outer space. The strategy did not, however, emerge in a vacuum, but is actually an extension of previous strategies, including the *Great Western Development Strategy*, also known as *Open Up the West Program*, and the *Going Out Strategy* (*zou chuqu zhanlue*—走出去战略) aimed at incentivizing Chinse businesses to invest abroad. The project is complementary to the *Made in China 2025* strategy, which aims to develop China's manufacturing sector towards high value-added activities including the pharmaceutical industry, advanced computing, new materials, components for marine, aviation, aerospace and rail transport and electric cars. Clearly, in order to allow China's manufacturing sectors to evolve, lower value-added products such as textile and construction, which today form the basis of China's industry, need to find other outlets. The maritime sector also plays a critical role in the Chinese economy not only because of its dependence on maritime trade, but of the importance of the blue economy. In 2017, the annual Ocean Development Report indicated that China's "marine GDP" represented a total of 9.5% of its total GDP in 2016.

In 2015, the China Development Bank declared it had reserved $890 billion for the project, and further amounts of money have been earmarked by other financial institutions. Today projects have been financed with $500bn[2], mainly in Asia, and is expected to be completed in 2049, a century after Mao Zedong's statement in Beijing on 1 October that he founded the People's Republic of China, and according to estimates the total investment would amount to $4 trillion[3].

The BRI project is an integral part of China's strategy to support national growth, consolidate the prestige of Xi Jinping, take advantage of long term investment opportunities for Chinese capital, provide additional sources of revenue abroad for Chinse contractors, increase the political influence of

2 World Bank. 2019. Belt and Road Economics: Opportunities and Risks of Transport Corridors. Washington, DC: World Bank. License: Creative Commons Attribution CC BY 3.0 IGO.

3 Dezan Shira and Associates, "China Belt And Road Projects Value Now Exceeds US$4 Trillion", 16 September 2021 in https://www.silkroadbriefing.com/news/2020/11/25/china-belt-and-road-projects-value-now-exceeds-us4-trillion/

China globally, and increase control on peripheral provinces and neighboring countries. The diversity of the projects makes it difficult to see a coherent pattern behind the investment, but it could be argued that the BRI is a long-term strategy to take advantage and create growth opportunities. In the minutes of the meeting of the Central Committee of the Communist Party of China from November 2013, officials noted that "*We will set up development oriented financial institutions, accelerate the construction of infrastructure connecting China with neighboring countries and regions, and work hard to build a Silk Road Economic Belt and a Maritime Silk Road to form a new pattern of all-around opportunities*.[4]"

Xi is the driving force of the BRI. At a Beijing forum in 2017, he referred to it as the project of the century and added that "*exchange will replace estrangement, mutual learning will replace clashes and coexistence will replace a sense of superiority*". Beyond the humanistic objectives of the project, it is clear that the BRI is first and foremost a project to the benefit of China. This is summarized in the words of China's vice-minister for foreign affairs, Le Yucheng in a 2018 interview to the Financial Times: '*If you want to get rich, build roads first*.'[5]

The main impact of the BRI has been felt in the Indo-Pacific, particularly in countries bordering China, such as Vietnam, Myanmar, Pakistan, and Kazakhstan. At first glance, the model adopted so far does not seem to be characterized by a coherent vision, but more by an opportunistic investment policy. Rather than completing a predefined puzzle, the Chinese investment plan makes one think more of a mosaic image, whose final design, made up of the various infrastructure 'tiles', only makes sense in a long-term vision. On closer examination, however, one realizes that to understand the BRI it is necessary to abstract from a cost-benefit analysis of a single project, from the perspective of global industrial policy, with important geopolitical and economic results, motivated both by internal pressures within the system and by the need to consolidate China's international position[6].

4 China.org.cn: "decision of the Central Committee of the Communist Party of China on some major issues concerning comprehensively deepening the reform, Article 26, Section VII, 12 November 2013, as reported by Peter Frankopan, *The New Silk Roads*, (pg. 98).

5 J. Anderlini, 'Interview: 'We say, if you want to get rich, build roads first', *Financial Times*, 28 September 2018.

6 Michele Acciaro, 2019. "The Belt & Road Initiative and its Implications for European Ports, speech delivered at the *Botschaftertag Osteuropa* in Hamburg, on June 6th, 2019.

The challenge in coordinating G7 infrastructure development efforts

In light of these developments, it is not surprising that the G7 is working together to develop the Partnership for Global Infrastructure and Investment in order to address the increasing influence, or some might say encroachment, of China globally. The urgency for G7 cooperation is acute in areas that had been traditionally been under European, and by proxy of U.S., sphere of influence. An example of this is the EU-Africa partnership, which was formally established in 2000, but that has been acquiring increasing importance with the new European Commission as a way to reassert the role of European institutions in the continent that was gradually been eroded by Chinese interest.

Chinese institutions have been able in the last decades to consolidate their position in Africa by offering investment packages that combined telecommunications, infrastructure and economic aid, often with no conditions for the receiving countries. Meanwhile, the European and North American approach has been much more fragmented, often led by a variety of actors with diverging priorities and political agendas. In particular, European aid was driven by advancing strategic agendas for Europe, such as migration and climate change, that imposed conditions on investment that were less attractive for African, and other developing, economies. These considerations are reflected in the pillars behind the Partnership for Global Infrastructure and Investment outlined before.

Europe's needs for Chinese infrastructure investments

At the same time, the importance of China for Europe's own future growth is evident, most notably in the Chinese maritime investment program of which the Maritime Silk Road strategy is part of. In addition to the obvious dependence on Chinese manufacturing and growing export markets, Europe has observed with concern the government sponsored merger of the industry giants China Shipping Company and COSCO, and the debt acquisition of OOCL. This control over the global container fleet is compounded to the already growing role that China plays in shipbuilding, and its growing position in emerging blue economy niches. These aspects, together with increasing presence of Chinese navy globally and the political

influence that Beijing seems to be eager to command, have been sources of concern for EU policy makers.

Investment in maritime infrastructure in Europe, that included ports such as Piraeus, in Greece, Zeebrugge in Belgium, and Vado Ligure in Italy have been seen as particularly controversial part of the BRI strategy. The decision by the Italian government in early 2022, to openly support the BRI has increased tension among EU members. Italy is also the first G7 country to do so as well. For China, Italian support for BRI was a great win on the international stage, and from the perspective of the Italian government it was an opportunity hard to miss. As Bruno Maçães argued in a recent opinion piece: "*The game gets even more interesting once you realize that EU states can use the China lever to reopen controversial European issues, going far beyond bilateral economic ties*"[7]. But beyond the political dimension of the maritime component of the BRI in Europe, there is a need to understand the role Chinese investments play in developing European ports is only part of a broader strategy that has its focus on Southeast Asia.

The Maritime Silk Road resulted in several controversial port projects in the Indo-Pacific that made European countries disdainful if not even suspicious of Chinese investment in Europe. In particular some project appeared of little economic potential such as the port of Kyaukpyu in Myanmar, or even debt traps, as in the case of Sri Lanka's port of Hambantota.

The lack of commercial activity made it impossible for the port's operators to repay debts to China, and the port was handed over to China in 2017 on a 99-year lease. Meanwhile, ballooning costs associated with the China Pakistan Economic Corridor that includes expansions in the port of Gwadar, is now under Chinese operation for 40 years through a build-operate-transfer agreement. There are others deals and investments that appear more promising, such as the lease of the port of Darwin in Australia for 99 years, or some of the investments in Africa. What is interesting is that China has adopted different models depending on the regions and the port of interest.

The response of the European Union to the maritime strategy of China has been slow, first with the inclusion of some TEN-T land-based related projects in

7 Maçães, B. "China's Italian advance threatens EU unity: Trieste port plans could change north-south economic balance", The Nikkei Asian Review, 23 March 2019, available at: https://asia.nikkei.com/Opinion/China-s-Italian-advance-threatens-EU-unity

2017 in the framework of the Expert Group on Investment and Financing of the EU-China Connectivity Platform primarily on a Member-State voluntary base in the attempt to resolve a financial gap. The list was refined in July 2018[8] during an event held on the sidelines of the EU-China Summit held in Beijing. The Cabinet of the former European Commissioner for Transport, Violeta Bulc, created the *ad hoc* EU-China Connectivity Platform with the aim of coordinating the European responses to the BRI. None of these platforms, however, are aimed at challenging the investment plan of China in the Indo-Pacific.

The G7 infrastructure plan therefore seems to be the first coordinated attempt to address increasing Chinese influence across the Indo-Pacific. Yet the G7 plans to address the region's financial needs and developing a strategy to counterbalance Beijing's influence seem for now to be more complementary than providing a substitute to the BRI. The Partnership for Global Infrastructure and Investment could certainly offer a good alternative for Southeast Asian economies that might be growing weary of Chinese influence in the region. There is certainly more contestable space when it comes to telecommunications, including competition in 5G technologies as Malaysia and Singapore partnered with Ericsson, while Vietnam too chose to cooperate with non-Chinese 5G developers to develop their own standard.

The Biden administration is clearly now more focused on Southeast Asia, and the region's potential given its technological transition, population size, and economic potential is apparent. From a European perspective, the Indo-Pacific is also of strategic importance. The September 2021 EU strategy for cooperation in the Indo Pacific[9] outlined the opportunities for a closer cooperation between Europe and the Indo-Pacific, as it noted that cooperation with the Indo-Pacific will be critical for the advancement of the EU objectives in relation to sustainable and inclusive prosperity; green transition; ocean governance; digital governance and partnerships; connectivity; security and defense, and human security.

Yet for all the words calling for commitment and cooperation, it remains unclear beyond the amount of money already committed just how

8 https://ec.europa.eu/transport/sites/transport/files/2018-07-13-european-transport-infrastructure-projects.pdf

9 JOIN(2021) 24 final Join Communication of the European Parliament and the Council, The EU strategy for cooperation in the Indo-Pacific. https://www.eeas.europa.eu/sites/default/files/jointcommunication_2021_24_1_en.pdf

such activities will materialise in concrete projects. How private interests will be negotiated with the priorities set up in the Partnership for Global Infrastructure and Investment and the EU strategy for cooperation in the Indo-Pacific are only some of the issues which will need to be addressed moving forward. Uncertainty is a major concern to the success of such ambitious initiatives, and with elections going on in various countries in Europe and the mid-term elections planned in the USA for November 2023, priorities in relation to the Indo-Pacific might need to be revisited. China might be awaiting the most propitious moment to provide its strategic response to the G7 initiatives in an increasingly complex geopolitical context.

CHAPTER SIX

International Financial Institutions Key to Meet the Infrastructure Financing Gap

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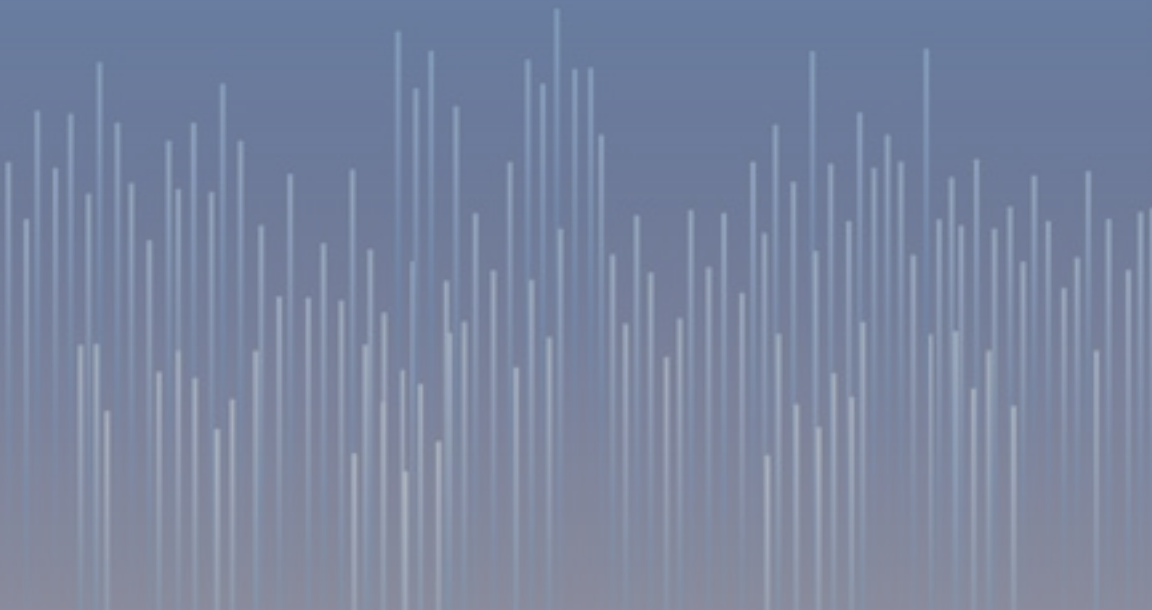

At the June 2022 G7 summit, leaders from the world's richest countries **announced**[1] the launch of the Partnership for Global Infrastructure and Investment (PGII) to mobilize up $600 billion in public and private investments by 2027. The goal was to meet the infrastructure needs of low- and middle-income countries, and the Biden administration declared it would offer one-third of the mobilized amount through grants, federal financing, and private sector investments.

The White House **memorandum** set forth the administration's approach to executing PGII, highlighting infrastructure-related priorities that "will be especially critical for robust development in the coming decades: climate and energy security, digital connectivity, health and health security, and gender equality and equity."

In their joint communiqué, G7 leaders recognized the role multilateral development banks (MDBs) play in leveraging private capital in particular. The new G7 resource mobilization effort envisions joint action with the MDBs and other financing institutions to consolidate a pipeline of bankable projects, improve project preparation capabilities, and align support for policy and regulatory frameworks for sustainable infrastructure investments.

As international financial institutions, the MDBs provide loans and grants as well as technical assistance and policy advice- to low-income and middle-income countries to promote economic and social development. These institutions allow donor nations including G7 countries to share the cost of development interventions. MDBs are able to provide aid on a larger scale than many development cooperation agencies operated by individual countries such as USAID and Germany's GIZ.

The MDBs also set high standards for projects when it comes to environmental, social, and governance issues. They can act as a force multiplier too by crowding in financing from other public and private finance institutions when preparing loans for major infrastructure projects. MDBs also seriously consider a country's debt burden before approving loans (something not done by China in its overseas lending). In short, they promote high quality and sustainable infrastructure development in ways that complement and reinforce the PGII's objectives.

1 https://pm.gc.ca/en/news/statements/2022/06/28/g7-leaders-communique

The Biden administration has directed the U.S. Secretary of the Treasury to consult with other federal officials to develop a plan for engaging the MDBs to promote investment and increase private-capital mobilization for low- and middle-income countries, and coordinate with like-minded partners in the plan's execution. In addition, White House has pushed for the chief executive of the U.S. Development Finance Corporation "to develop a plan to enhance engagement with national and international development finance institutions," including MDBs, to mobilize private capital. These plans must propose actions to facilitate commercial financing to developing countries.

All G7 countries are shareholders in the major MDBs, namely the African Development Bank (AfDB); Asian Development Bank (ADB); European Bank for Reconstruction and Development (EBRD); Inter-American Development Bank (IDB); and the World Bank. Collectively, the G7 members, together with other traditional donor countries such as Australia and several Western European countries hold a large share in the MDBs. They entrust these institutions with large sums of capital for use in tackling economic, social, and environmental challenges in the developing world. G7 countries played a key role in raising $93 billion for the most recent cycle of the International Development Association[2] to assist the world's poorest countries to boost their economies and support their populations in the midst of multiple crises.

Given their substantial shareholdings in the MDBs, G7 countries can exert considerable influence on the decisions on MDB boards of governors and directors, particularly when they work in concert on shared interests. The MDBs are very well placed to advance progress on the key infrastructure-related priorities identified by the Biden administration in the context of the PGII and its focus on key issues including energy security, climate risks, digital connectivity, health and health security, and gender equality).

Climate change is a good example of multilateral consensus and cooperation. Eight leading MDBs committed $66 billion for climate finance in 2020. This figure was complemented by $85 billion in co-financing from public and

2 The International Development Association, more commonly known as "IDA", is the part of the World Bank Group that provides development assistance to poor countries. It provides zero to low-interest loans and grants to these countries for projects and programs to increase economic growth, reduce inequalities, and raise living standards.

private sources. The MDBs have substantially boosted their funding of climate adaptation and mitigation projects in recent years, and have identified climate action as a priority in their plans for the coming years." The ADB has teamed up with the Green Climate Fund to support the ASEAN Catalytic Green Finance Facility, which aims to mobilize more than $4 billion in public and private financing for green infrastructure projects across Southeast Asia. The bank has also partnered with other international donors to provide financing for the restoration, conservation and management of coral reefs in Fiji, Indonesia, the Philippines and the Solomon Islands.

Knowledge, and Strategies to Meet This Critical Challenge

On energy security, the MDBs have long been major funders of energy projects and have increasingly promoted renewable energy in their portfolios. For example, the ADB recently approved a $600 million loan to Indonesia's state-owned power company to improve the reliability and resiliency of electricity services on the island of Java, and to promote the use of clean energy. The EBRD has put together a $74 million financing package to construct the largest renewable project in Central Asia, a greenfield wind power plant in the Navoi region of Uzbekistan.

The ADB, Japan International Cooperation Agency, and the International Finance Corporation, the private sector arm of the World Bank Group, are among those contributing funds to the Uzbek project. The EBRD has also brought in Natixis, a leading French corporate and investment bank, providing a recent example of how the MDBs generate project co-financing from the private sector.

The MDBs are also investing to promote digital connectivity, as highlighted in a joint **report** published earlier this year by five MDBs. The report observes that "MDBs have assisted developing economies to adopt new digital technologies and harmonized procedures and practices to expand trade; strengthened regional public health; increase South-South learning and technology sharing; and contributed to making tourism safe, more inclusive and greener." The IFC alone made a record $1.3 billion in investments in telecommunications, media and technology during the last fiscal year. This amount

represented a five-fold increase in digital infrastructure commitments by the institution over the past five years.

MDBs have traditionally provided much more financing for hard, physical infrastructure projects than projects in the social sectors. But these institutions have typically responded with robust lending and grant packages in the wake of health emergencies, as has been the case during the COVID-19 pandemic. For example, financing for health accounted for around 3 percent of the ADB's total **commitments** in 2019. In 2021, the share of health commitments soared to about one-quarter of the bank's business. Although the Manila-based institution is unlikely to dedicate such a large share of its overall financing to health over the remainder of the decade, it intends to give much more support than before the pandemic to helping Asian and Pacific developing countries achieve universal health coverage, and prevent and contain communicable and non-communicable diseases.

Many developing countries see the MDBs as an important source of health-related financing and technical assistance. In June 2022, the World Bank approved the establishment of a financial intermediary fund to support pandemic prevention, preparedness, and response, with a focus on low- and middle-income countries. The fund, which will complement existing resources of the World Bank, has received more than $1 billion in financial commitments from charitable foundations and governments, including Germany, the United States, and the United Kingdom.

All of the leading MDBs have policies to integrate gender action across their operations and track their gender-related impacts. Proposed loans are examined for their potential impact on girls and women, and performance is closely tracked. In May 2022, the MDBs held a Global Gender **Summit** on how to advance gender equality after the pandemic, with a focus on the care economy, climate change, and digitalization.

The World Bank houses the Women Entrepreneurs Finance Initiative (WE-FI), a financial intermediary facility that brings together several MDBs and 14 governments, including most G7 countries. Launched five years ago, WE-FI has allocated $354 million to address financial and non-financial constraints faced by women-owned and women-led enterprises in developing countries. Activities are planned in 60 countries, mostly low-income and fragile states. It is expected that 200,000 enterprises will be reached through the

facility. WE-FI has mobilized an additional $3.5 billion (achieving a remarkable leverage ratio of 1:10) to improve enabling environments and access to finance, markets, training, mentoring and networks for women entrepreneurs.

How to enhance the effectiveness of MDBs in infrastructure development

The MDBs already play a major role in financing and building essential capacity in the priority areas targeted by the PGII. They have been able to do so with the strong political and financial support of G7 countries. Yet more support will be needed for the MDBs to effectively leverage their valuable comparative advantages to help achieve the PGII's massive infrastructure financing target. In particular, there are four key areas in which MDBs can substantially boost their contributions over the coming years, namely: project preparation, attracting institutional investors, making more effective use of their current capital, and their base capital

Improve Project Preparation

One of the reasons for bottlenecks in infrastructure investment in developing countries is the lack of well-prepared projects where risk allocation meets the requirements of those providing the financing. Attention therefore needs to be paid to critical aspects of project preparation, such as financial metrics, compliance with performance standards, cash flow generation, technical engineering, risk allocation, and the quality and the capacity of the operations, maintenance and management teams.

There are numerous MDB initiatives that aim to improve project readiness on a national or regional level. One example is the NEPAD Infrastructure Project Preparation Facility Special Fund, for which AfDB was assigned the role of trustee. The fund, launched with support from several donors, including four G7 countries, provides grant resources for the preparation of regional infrastructure projects in Africa.

In the Asia and Pacific region, ADB provided a $100 million loan to the Philippines to help identify, analyze, and plan for infrastructure gaps in roads, urban transport, urban water, sanitation, and flood sectors. The facility enabled Filipino government departments responsible for public works and

transport to engage international expertise for the preparation and implementation of complex and priority infrastructure projects.

By bolstering MDB efforts to provide capacity building and technical assistance for project preparation, G7 would help to expand the range of credible infrastructure opportunities for investment. Ramped up support to reforms leading to more predictable regulatory environments and strengthened rule of law would also create conditions more conducive to business investment.

Attract Institutional Investors

The development policy world has been talking for many years about the need to tap institutional investors, such as pension funds and insurance funds, to substantially scale up financing available for infrastructure in low- and middle-income countries. Pension funds alone manage **$54 trillion** globally. Institutional investors are eager to expand their exposure to the developing world if the conditions are right. The Ontario...

MDBs have improved their leverage of institutional investment in the last decade. The IFC offers an innovative example for unlocking private capital for direct lending to borrowers in developing countries through its Managed Co-Lending Portfolio Program.

The program allows institutional investors to provide capital alongside IFC on commercial terms in globally loan portfolios that mimic the IFC's portfolio. Investors establish loan eligibility criteria and portfolio concentration limits with the IFC, and then pledge capital. When the IFC identifies eligible transactions, financing from investors is allocated together with the IFC's own loans. Through this program, the IFC has raised more than $10 billion in collaboration with a dozen partners to steer capital to assets that it has originated.

Notwithstanding the success of this initiative, MDBs have yet to mobilize very large pools of institutional investor capital. A variety of obstacles have yet to be overcome. Constraints specific to less liquid investments, regulations, actual and perceived risks in the political, regulatory, economic spheres are some of the key concerns. Investor mandates and the capacity to understand of developing country markets are also roadblocks to unleashing private capital. There is also the aforementioned issue of a lack of high-quality projects ready to receive investment.

With growing attention to environmental, social and governance considerations and limited room for growth in mature markets, institutional investors are open to increasing their exposure to large infrastructure projects in more challenging country contexts, so long as the conditions are right. One thing that MDBs could do is adopt more pooled investment approaches to diversify risk. New financial products could be introduced to cater to the varying risk appetites of different institutional investors.

The Organization for Economic Cooperation and Development has **recommended** several actions to mobilize institutional investors for sustainable development. Among them: make investment regulations more flexible in countries hosting sizable pension funds and insurance companies, encourage greater institutional asset allocation towards developing countries, increase availability and incentives for blended finance to reduce deal risk, and enhance transparency of asset distribution by institutional investors.

Given their decades of experience in preparing and financing infrastructure projects in developing countries, the MDBs are natural partners for institutional investors seeking to diversify their investments toward what they consider more frontier and emerging markets (as shown by the IFC example). G7 countries should take a more active role in promoting and facilitating cooperation between the MDBs and institutional investors.

Improve Use of Existing MDB Capital

The way that MDBs are structured and operate, and the high credit ratings of their sovereign shareholders, enable these institutions to borrow from world capital markets at comparatively low rates. MDBs use the relatively cheap funds generated through bond issues to on-lend to borrowing governments at lower rates than those governments could access on their own. Leading credit rating agencies continue to award the MDBs very high ratings because they maintain low risk profiles. (MDBs also rely on member contributions, earnings from lending operations, and repayment of loans).

MDBs are intent on keeping these high ratings (typically AAA), and thus operate in a very conservative fashion. They keep relatively high levels of capital, which sacrifices room for further lending to support critical development interventions. On average, MDBs' available statutory **headroom** is generally four times larger than their headroom based on their prudential limits.

Independent **analysis** of the benefits and costs of expanding and optimizing MDB balance sheets suggests that the institutions could increase their lending by hundreds of billions of dollars if they were to increase their lending exposure. To date, however, shareholders have been reluctant to allow MDBs to entertain slightly greater risks in their sovereign lending, and credit agencies continue to struggle with how to properly assess the true creditworthiness of public financial institutions that have certain advantages that are not enjoyed by private entities. Such MDB advantages include the ability to draw upon substantial callable capital from their shareholders, and the MDBs' preferred creditor status with sovereign borrowers.

There is growing pressure on MDB shareholders to revise their capital adequacy frameworks and engage credit agencies on changes that could be made to lending policies without sacrificing very high credit ratings. The G7 countries could play a constructive role by advancing this agenda. In the meantime, the MDBs continue to possess large and unexploited lending potential.

Inject More Capital into the Banks

Getting more out of the capital that they MDBs already have could greatly increase international funding for infrastructure finance. But changes to lending and credit review practices would be difficult to negotiate given the well-entrenched positions held by the management and shareholders of these institutions. Another means of increasing the resources that MDBs make available to developing countries is a general capital increase. Yet this path would also require delicate and complicated negotiations that require considerable political manoeuvering. That said, it has been accomplished many times over the years.

A general capital increase is an increase in contributions from all MDB shareholders. It leverages equity capital from shareholders to enable more lending. Shareholders only have to pay a fraction of their agreed contribution, with the largest part coming in the form of guarantees (callable capital). The MDBs are allowed to count callable capital as part of their resources and lend against it, even though, in practice, they never draw on it.

Although the shareholders of a few MDBs, such as the AfDB and the World Bank, have approved a general capital increase since 2018, the continuing high demand for their financing in an extended period of recurring and

related crises translates into an eventual need for more resources at these and other MDBs. The AsDB and EBRD have not seen a general capital increase in over a decade.

Earlier this year, the boards of governors at IDB and its private sector arm, IDB Invest, mandated a proposal for a capital increase for IDB Invest. This would be accompanied by changes in the way that IDB Invest operates. The envisioned new model for IDB Invest involves the origination of projects with greater impact, more de-risking of private sector investment, and the use of new financial and technical tools to mobilize capital. This planned move should provide inspiration for capital increases at other MDBs, including at ADB and EBRD, which operate in an environment of growing expectations.

Climate change presents a serious threat to sustainable development, and the effort to tackle it will be won or lost in Asia given the continent's enormous population and booming economies. It is thus critical that ADB's shareholders provide the institution with more resources to leverage in supporting low- and midlle-income countries in the adoption of climate adaptation and mitigation measures. The EBRD is likely be called upon to ramp up its investment in the Ukraine to help that war-ravaged state rebuild and modernize after its ongoing war with Russia. Discussions should begin now on capital increases for these two banks, and G7 countries should take the lead with stated intentions to provide additional contributions.

In addition to supplying MDBs with more resources, G7 members should also support greater staffing of these institutions. During the COVID-19 pandemic, MDB personnel have been stretched to the limit while working to meet the urgent needs of beneficiary countries struggling with the major human and economic costs imposed by COVID-19 and its consequences. The MDBs need more experts in a variety of subject and functional areas to delivery vital support to social and physical infrastructure in the developing world.

The G7 countries have announced a very ambitious, time-bound plan to boost infrastructure financing in developing countries. To mobilize anywhere near the PGII target of $600 billion within the next five years, these global economic leaders will have to depend heavily on the MDBs, which have unparalleled expertise and geographic presence to finance, plan, and implement major infrastructure projects. To ensure the credibility of their major commitment, they must act boldly and quickly.

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