
What Large-Scale Infrastructure Initiatives, Cement, and Steel Mean to the Global Decarbonization Initiative

ALVIN CAMBA & TIANYUE STEVEN GU

States in the Global South have long pursued large-scale infrastructure initiatives to assuage the economic demands of their populations. Alternative financiers such as Chinese policy banks have emerged to finance the infrastructure deficit of Global South countries. However, constructing large-scale infrastructure inevitably requires cement and steel, two major sources of carbon emissions, and sectors least susceptible to carbon capture storage technologies. This piece illustrates how large-scale infrastructure initiatives are linked to the imperatives of government leaders to consolidate power and the effects infrastructure initiatives have on legitimacy. It also discusses the limits of the current thinking on decarbonization and the need to ignite a conversation on cement, steel, and infrastructure through the lens of climate.

In 2017, the Asian Development Bank released an analysis of infrastructure needs for its forty-five developing member countries, finding that

Alvin Camba is assistant professor at the Josef Korbel School of International Studies at the University of Denver and a faculty affiliate of the Climate Policy Lab and the Center for International Environment & Resource Policy at the Fletcher School at Tufts University.

Tianyue Steven Gu is an undergraduate student studying global economic affairs at the University of Denver. He has written about the relationship between immiserizing growth and Madagascar's export-oriented economy, and has worked on property restitution in post-revolution Zanzibar.

these countries needed to invest USD 26 trillion (or USD 1.7 trillion per year) in infrastructure from 2016 to 2030 to attain their respective needs and economic goals.¹ Infrastructure initiatives have long had a tradition in development economics. In the 1960s, the Rosenstein-Rodan thesis argued that bolstering physical infrastructure—transportation, communications, and power—improves a country’s manufacturing, extractive, and real estate sectors, thereby generating long-term self-sustaining growth for a country.² Dozens of academic papers in political economy, development economics, and infrastructure studies attest to the importance of infrastructure construction to economic development.³

In the last ten years, large-scale infrastructure initiatives have become popular among leaders in the Global South. To name a few, presidents Rodrigo Duterte of the Philippines, Joko “Jokowi” Widodo of Indonesia, and Nursultan Nazarbayev of Kazakhstan have all launched large-scale initiatives to improve their country’s physical infrastructure. These programs entail expanding bridges and roads, constructing railways, and improving transport corridors. While infrastructure initiatives produce net economic benefits for host countries, they also unfortunately expand cement and steel consumption across the world. The world produces 4 billion metric tons of cement annually, which generates 3 billion tons of carbon dioxide (CO₂).⁴ Global steel production has also been massive, totaling 1.9 million tons in 2021 and resulting in 1.5 billion tons of CO₂ emissions.⁵ Cement and steel demand have also been projected to increase since the onset of the Ukraine-Russia War and the recovery from the COVID-19 pandemic. Every road or highway needs cement and concrete to be built; every bridge, railroad track, and flyover depends on a variety of steel to be finished; and every social, physical, or economic infrastructure requires both commodities.

Large-scale infrastructure initiatives are not solely policy initiatives, and cement and steel are not solely economic commodities. Rather, they are political choices and socially embedded actions that host country leaders take to increase their domestic political power. Host country leaders—presidents, junta leaders, prime ministers, etc.—have the incentive to expand infrastructure for two reasons. First, large-scale infrastructure construction incorporates rival political elites and business elites throughout the entire process. Construction activities such as laying the groundwork, paving the road, or installing railroad tracks require labor, goods, and services to start. Political elites, who either have their own businesses or are connected to local business groups, benefit not only from participating in the construction process, but also from the impact of the projects on their localities. Projects require local permits and the payment

of site-specific taxes to governing local leaders. The construction of certain infrastructure in localities can also strengthen the power of the local elites and allow their families to maintain power for generations. Business elites own the largest construction firms and provide the most important supply chains. Expanding infrastructure construction creates an artificial demand that only a small number of business groups can fulfill. In this sense, host country business elites who finance political parties during elections are “paid back” through such infrastructure initiatives. Construction activities generate a win-win situation for those who are involved.

Second, due to economic growth in the last twenty years, countries in the Global South suffer from unemployment and inter-linked developmental problems such as overcrowded cities, urban-to-rural migration, and informal settlement, that cannot be solved by the infrastructure drive alone. This strategy creates a veneer of legitimacy that allows infrastructure projects, and the leader behind them, to go largely unchecked. These large-scale infrastructure initiatives were inspired by the development successes of the East Asian states, including Taiwan, South Korea, Japan, and China. Leaders can generate self-sustaining and long-term political capital by pursuing infrastructure construction. Since the neoliberal turn in the 1980s, governments across the world have cut back their spending on infrastructure projects.⁶ Most multilateral development banks (MDBs) have also been wary of direct financing for infrastructure projects, opting to instead endorse what has been popularly called public-private partnerships.⁷ In other words, Western and international sources for infrastructure financing have been harder to come by since the 1990s.

Due to both reasons, governments in the Global South in the last ten years have pursued infrastructure initiatives. The former President of the Philippines, Rodrigo Duterte (2016-2022), enacted the Build! Build! Build! (BBB) program, which allocated 4 to 6 percent of the country’s annual GDP to building large-scale infrastructure projects. Duterte attenuated his predecessor’s conflictual relations with China in the South China Sea, resulting in the restoration of inter-state economic initiatives.⁸ Apart from Chinese funding sources, Duterte also intensified his borrowing and financing of foreign-funded infrastructure, increasing both the Japanese and MDB portfolios, and starting approximately twenty-one large-scale projects. The Duterte government claimed that they initiated thousands of infrastructure projects, which were broadly defined as any form of improvement or change in public infrastructure.⁹ The BBB program was a major political win for the Duterte coalition; despite the opposition’s concern about the economic, political, and environmental ramifications of

Duterte's BBB, most Filipinos surveyed thought that Duterte's BBB was a positive initiative.¹⁰

In addition to Duterte, President Joko Widodo (popularly known as Jokowi) of Indonesia, initiated the global maritime initiative (GMI), which was the program that inspired BBB.¹¹ GMI intensified Chinese, Japanese, and MDB development finance for infrastructure projects. Apart from relying on development finance (concessionary or commercial loans), the Jokowi administration also capitalized on a mechanism called the special purpose vehicle (SPV), a financing scheme that allowed Indonesia to artificially deflate its loan borrowings from foreign financiers. SPVs, comprising host country and foreign firms, are special entities in the form of joint ventures or semi-government enterprises. SPVs borrow finance from policy banks, thus shielding the host country government from attaining more debt. Jokowi's SPV, the Jakarta-Bandung High-Speed Railway (JBHSR), was created to fund a major railroad project.¹² Apart from the JBHSR, Jokowi has initiated dozens of coal-fired power plants, tollways, bridges, and roads.¹³ The Chinese, the Japanese, MDBs, and private financiers have all financed these Indonesian infrastructure projects.

Apart from the BBB and Indonesia's GMI, other leaders in the Global South have launched similar initiatives. Some examples include Thai President Prayut Chan-o-cha's Southern Economic Corridor, Vietnam General Secretary Nguyen Xuan Phuc's Infrastructure Master Plan, and Kazakhstani President Nazarbayev's Nurly Zhol.¹⁴ Regional organizations have started similar initiatives due to the recognition of infrastructure's centrality to development, such as the African Union's Sub-Saharan Africa Transport Policy Program and Latin America's Latam Projects Hub.¹⁵

All these country-and-region-specific initiatives help Global South states pursue economic development. However, these policies can also counteract the world's decarbonization efforts, because infrastructure construction requires importing and using large quantities of cement and steel. Both commodities are produced through carbon-intensive means that have been particularly difficult to decarbonize. While energy's contribution to carbon emission has decreased, contributions from cement and steel productions have roughly remained the same. In 2021 alone, cement contributed to approximately 2.9 billion tons of CO₂ globally, which is eight percent of the total amount of emissions worldwide and surpasses all countries except for the United States and China.¹⁶ Over half of cement's carbon emissions come from making the clinker, which is an intermediate product in the cement production process that is produced through sintering. Similarly, steel's contribution to carbon emissions has ranged between 4 to 5 percent

annually since 2015.¹⁷ CO₂ emissions from steel come from the production process, particularly blast furnaces, basic oxygen furnaces, and electric arc furnaces. Steel is used in a variety of sectors, such as construction, the power sector, weapons, and physical infrastructure. The steel industry is worth USD 2.5 trillion annually while the stainless-steel industry garners an annual value of USD 112 million.¹⁸

Current global decarbonization efforts have focused on energy systems. Cement and steel have been given less attention. Existing efforts to decarbonize cement and steel have been less salient among MDBs, and technological solutions have been less promising. In other words, the focus on energy transition and increasing the share of renewables across the world has overshadowed a much-needed conversation on cement and steel. Given the contribution of both commodities to global CO₂ emissions, it is imperative for MDBs and states in the Global South to begin these discussions.

There are existing technological and policy solutions that can decrease carbon emissions from both commodities. Fennell et al (2022) highlighted eight solutions that countries can implement.¹⁹ First, production plants should use the best available technology, which means improving industrial plants, boilers, and heat exchanges. Second, countries should take a conservative approach to using cement and steel, opting to use smaller amounts to prevent over-usage. Third, there is a need for firms to reinvent steel production. For instance, firms can move away from using coke²⁰ and rely instead on direct-reduced iron, as well as using hydrogen instead of coal in the production process. Fourth, a similar rethinking of cement technology is necessary, such as moving away from the use of limestone in calcification to magnesium oxychloride cement. Fifth, firms should use charcoal or biomass in the production of cement and steel. Sixth, there is a need to increase carbon capture technology capabilities alongside the expansion of both commodities. Seventh, it is possible to add CO₂ in concrete to make cement stronger, limiting the amount of cement needed in structures. This optimization of carbon capture in concrete is an active research area that needs more support. Eighth, the usage of cement and steel can be reduced by increasing water usage in cement and recycling steel. And, finally, governments should subsidize the transition process.

Despite all these possible solutions, real hurdles remain. MDBs have yet to include cement and steel decarbonization in any major financial or policy initiative. There are far smaller initiatives, such as the International Financial Corporation's support for sustainable cement in Kenya and the Republic of Congo.²¹ However, these initiatives are far too small to make

a global impact given the expansive use of cement across different parts of the world. There are also bilateral initiatives by donor countries, such as the Japanese government's transition finance.²² However, this initiative is reserved only for Japanese cement firms and factories. Existing efforts are thus too little and too lackluster to address larger global concerns.

In sum, there are domestic drivers among Global South countries to expand cement and steel industries. The economic benefits and aspirations brought by large-scale infrastructure are driving the expansion of cement and steel production and usage. For Global South leaders, the political and legitimization benefits are the main drivers of large-scale infrastructure initiatives, inevitably resulting in increased emissions from cement and steel. The political nature of infrastructure decisions creates perverse incentives for host country leaders to import massive amounts of cement and steel to strengthen their power over domestic elites and legitimize their domestic political rule. There is therefore a need to meaningfully include cement and steel in future decarbonization and climate change discussions.*f*

ENDNOTES

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