



Advancing Climate-Compatible Infrastructure Through the G-20

Opportunities for Progress Under the German Presidency

By Gwynne Taraska, Pete Ogden, Nancy Alexander, and Howard Marano December 2016

Center for American Progress



 HEINRICH BÖLL STIFTUNG
NORTH AMERICA

Advancing Climate-Compatible Infrastructure Through the G-20

Opportunities for Progress Under the German Presidency

By Gwynne Taraska, Pete Ogden, Nancy Alexander, and Howard Marano
December 2016

Contents

- 1 Introduction**

- 5 The infrastructure investment gap and the global response**

- 8 Climate-compatible infrastructure: A necessary condition for economic stability**

- 12 Options and opportunities for the G-20 and the German presidency**

- 22 Conclusion**

- 23 Appendix: Supplemental figures**

- 25 About the authors**

- 26 Endnotes**

Introduction

To date, 17 G-20 countries—which account for 67 percent of global greenhouse gas pollution—have officially joined the Paris Agreement, bringing the pact into effect sooner than anyone expected.¹ If they follow through with their commitments to reduce emissions, it will represent unprecedented progress in the global effort to curb climate change.

U.S. President-elect Donald Trump, meanwhile, has suggested a number of actions, including dismantling the Clean Power Plan and pledging to “cancel” the Paris Agreement, that would drive the United States—and potentially other countries—in the opposite direction.² In light of this, the G-20 summit in July 2017 provides an important opportunity for committed major powers to resist backsliding by any and all G-20 countries—and even to make some progress in meeting the climate challenge.

To its credit, the German government, which officially assumed the G-20 presidency in December 2016, has taken steps that position the summit well for just such an effort. When German Chancellor Angela Merkel announced her three “pillar” objectives for the summit, she explicitly identified climate change as a priority. These pillars include fostering global economic stability; making the global economy viable for the future, including through the Paris Agreement and the 2030 Agenda for Sustainable Development; and establishing the G-20 as a “community of responsibility,” including by promoting a compact with Africa that would address infrastructure investment, among other topics.⁴

TABLE 1
G-20 priorities in 2017

Building resilience	Improving sustainability	Assuming responsibility
World economy	Climate and energy	Tackling the causes of displacement
Trade and investment	2030 Agenda	Partnership with Africa
Employment	Digitalization	Fighting terrorism
Financial markets/international financial architecture	Global health	Anti-corruption
International tax cooperation	Empowering women	Agriculture/food security

Source: Die Bundesregierung, "Priorities of the 2017 G20 Summit" (2016), available at https://www.g20.org/Content/DE/_Anlagen/G7_G20/2016-g20-praesidentschaftspapier-en.pdf.

Making progress on climate—and economic stability—through climate-compatible infrastructure

The G-20 has expanded its infrastructure initiatives in recent years. These initiatives, however, have insufficiently considered the reality of climate change.⁵ Despite the fact that three of the four infrastructure sectors in which the G-20 is promoting investment—energy, transport, and water—are inextricably linked with climate issues, climate change has remained a topic that the forum has addressed only in parallel and, for the most part, has avoided.⁶

Developing a focus on making infrastructure low-carbon and climate-resilient, however, would allow the G-20 and the German presidency to make progress across the objectives of the summit, including economic stability. Infrastructure projects that are vulnerable to the physical effects of climate change can cause profound economic damage, while infrastructure projects that are high-carbon can face early obsolescence as global markets pivot to clean energy. High-carbon projects also drive further climate change—infrastructure already accounts for some 60 percent of global greenhouse gas pollution—and further economic risk.⁷

The G-20 is uniquely positioned to become a leader on climate-compatible infrastructure. First, the founding purpose of the forum is to promote global economic resilience: Divorcing its climate and infrastructure conversations runs counter to this core objective. Second, G-20 countries account for more than 75 percent of greenhouse gas pollution and more than 85 percent of global gross

domestic product. They therefore have both the responsibility and the capacity to drive the necessary investments. (see Figures 1 and 2 in text and Figures A1 and A2 in appendix) Third, G-20 leadership on this issue would have effects beyond its member nations, given that they play a dominant role in development and climate finance through their leadership and support of multilateral development banks, national development banks, project preparation facilities, and other channels of investment in less developed countries.⁸

This report proposes that the German presidency and the G-20 adopt an integrated climate and infrastructure agenda. It first analyzes the G-20's traditional approach to infrastructure, which undermines sustainable development and economic stability. It then presents a menu of options—on topics including climate risk disclosure, fossil fuel subsidy reform, national growth plans, climate-related risk insurance, and proxy carbon pricing—that would allow the German presidency and the G-20 to promote climate-compatible infrastructure in order to help fulfill the goals of the forum and the 2017 summit.

Key dates

1 December 2016: Start of German presidency

12-13 December 2016: Sherpa meeting

22 January 2017: Meeting of agriculture ministers

16-17 February 2017: Meeting of foreign ministers

17-18 March 2017: Meeting of finance ministers and central bank governors

22 March 2017: S20 Dialogue with the Science and Research Community

23-24 March 2017: Sherpa meeting

26 April 2017: W20 Dialogue with Women in Business, Science and Society

3 May 2017: B20 Dialogue with Business Associations

17 May 2017: L20 Dialogue with Trade Union Representatives

18-19 May 2017: Sherpa meeting

18-19 May 2017: Meeting of labor ministers

19-20 May 2017: Meeting of health ministers

30 May 2017: T20 Dialogue with Think Tanks

7 June 2017: Y20 Youth Summit

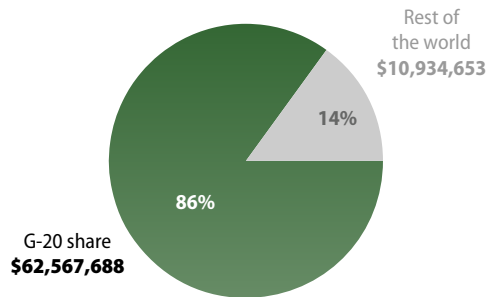
19 June 2017: C20 Dialogue with Civil Society

5-6 July 2017: Sherpa meeting

7-8 July 2017: 2017 G-20 summit in Hamburg

1 December 2017: Start of Argentinian presidency⁹

FIGURE 1
Share of global GDP of the G-20
 GDP, in millions of U.S. dollars, 2015

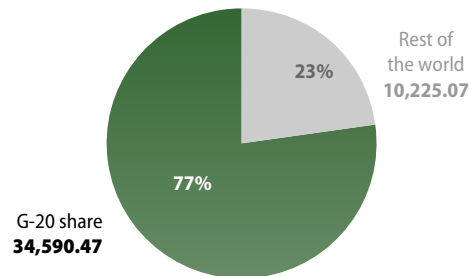


Economy	GDP, in millions of dollars
United States	\$17,946,996
China	\$10,866,444
Other European Union	\$5,789,433
Japan	\$4,123,258
Germany	\$3,355,772
United Kingdom	\$2,848,755
France	\$2,421,682
India	\$2,073,543
Italy	\$1,814,763
Brazil	\$1,774,725
Canada	\$1,550,537
Korea	\$1,377,873
Australia	\$1,339,539
Russia	\$1,326,015
Mexico	\$1,144,331
Indonesia	\$861,934
Turkey	\$718,221
Saudi Arabia	\$646,002
Argentina	\$583,169
South Africa	\$312,798
Total world	\$73,502,341

Source: World Bank Group, "GDP ranking," available at <http://data.worldbank.org/data-catalog/GDP-ranking-table> (last accessed November 2016).

FIGURE 2
Share of global greenhouse gas emissions of the G-20

GHG emissions, in MtCO₂e, excluding land-use change and forestry in 2012



Economy	Total GHG emissions, in MtCO ₂ e
China	10,975.50
United States	6,235.10
India	3,013.77
Russia	2,322.22
Other European Union	2,035.96
Japan	1,344.58
Brazil	1,012.55
Germany	887.22
Indonesia	760.81
Mexico	723.85
Canada	714.12
Korea	693.33
Australia	648.23
United Kingdom	553.43
Saudi Arabia	526.97
Italy	465.20
South Africa	462.60
France	457.34
Turkey	419.70
Argentina	338.00
Total world	44,815.54

Source: World Resources Institute, "CAIT Climate Data Explorer," available at <http://cait.wri.org/historical> (last accessed November 2016).

The infrastructure investment gap and the global response

There is a global shortfall in infrastructure investment. In developed countries, chronic underinvestment is resulting in a growing amount of decaying and outdated infrastructure.¹⁰ In developing countries, infrastructure investment often fails to keep up with increased industrialization and urbanization.¹¹ At the same time, billions of people still lack access to basic infrastructure: Globally, 1.3 billion people lack access to electricity, 768 million people lack access to clean water, and 2.5 billion people lack access to adequate sanitation.¹²

Unmet demand for infrastructure development is currently estimated to be \$1 trillion per year: Global demand is approximately \$3.7 trillion, while \$2.7 trillion is invested.¹³ Looking to the future, an estimated \$90 trillion in infrastructure investments will be required by 2030 to accommodate global growth.¹⁴ Indeed, it is hoped that the trillions in investment will provide a major stimulus to the global economy.¹⁵

Impediments in both the public and private sectors contribute to the infrastructure investment gap. In the aftermath of the global financial crisis, fiscal constraints and banking rules have cut the capacity for investment in general and the capacity of European banks to prepare infrastructure projects in particular.¹⁶ In addition, advanced and developing countries with weak institutions can lack the policy and regulatory capacity to support beneficial projects.¹⁷ In the private sector, investors can be reluctant to commit capital to long-term and potentially risky projects.¹⁸

The expansion of infrastructure initiatives

In recognition of the infrastructure investment gap, there has been an expansion of infrastructure initiatives in the G-20. At the 2016 summit in Hangzhou, for example, the G-20 launched a Global Infrastructure Connectivity Alliance to strengthen and link the infrastructure master plans in the regions and continents of the world, particularly in four sectors: energy, transport, water, and information and communications technology.¹⁹ Each regional master plan has its own funds,

such as the European Fund for Strategic Investments or the Silk Road Fund. To achieve its goals, the Alliance promotes billion- or trillion-dollar projects that are financed, built, and operated especially through public-private partnerships. At the Summit, multilateral development banks issued a declaration to support infrastructure investment with a minimum of \$350 billion in 2016-2018.²⁰

There has been an expansion of infrastructure initiatives by individual G-20 member countries over the past few years as well. Recent ventures include the China-led Asian Infrastructure Investment Bank, which became operational in 2015, and the New Development Bank, which was established by the so-called BRICS countries in 2014 and has authorized \$100 billion to mobilize resources for infrastructure and development projects.²¹

More established institutions are also placing increased emphasis on infrastructure. The World Bank, for example, launched the Global Infrastructure Facility in order to provide a platform to coordinate the development of public-private partnerships on infrastructure.²² Private-sector partners and financial institutions involved in the Facility represent approximately \$10 trillion in assets. Meanwhile, the African Development Bank has established the Africa50 Infrastructure Fund—which has a target capitalization of \$3 billion—in order to support infrastructure development across the continent.²³ Some national development banks—including those in China, Brazil, South Africa, Algeria, and Germany—are also focusing on infrastructure by adopting investment targets.²⁴

The new model of infrastructure financing

Governments are increasingly turning to private finance—including from long-term institutional investors, such as pension funds and insurance companies—in order to narrow the infrastructure investment gap. This trend, sometimes referred to as the financialization of infrastructure, is partly due to the fiscal constraints facing governments and partly due to the appetite of institutional investors to pursue profitable investment opportunities, among other factors.²⁵ These investors are experiencing a crisis in their income model, since they cannot rely on healthy returns from products such as government bonds.²⁶

In order to attract long-term institutional investors, governments are presenting infrastructure as an asset class with the potential to yield moderately high returns. In such arrangements, investors do not own infrastructure assets, but rather the claim to a revenue stream from users of infrastructure services—for example, tolls or water fees—and the government.

To reduce the financial risks borne by investors, governments are pursuing measures such as the use of guarantees and the creation of infrastructure bonds, which provide the higher investment ratings sought by institutional investors.²⁷

To further promote private infrastructure investment, an effort is underway to standardize the procedures and contract clauses of public-private partnerships. The World Bank and the Public-Private Infrastructure Advisory Facility, for example, presented recommended standard contract clauses to the G-20 Meeting of Finance Ministers and Central Bank Governors in 2015.²⁸ The World Bank also supports a number of knowledge-sharing tools: These include the PPP Knowledge Lab; Private Participation in Infrastructure Project Database; Public-Private Partnership in Infrastructure Resource Center for Contracts, Laws and Regulations; and the Body of Knowledge on Infrastructure Regulation.²⁹

Climate-compatible infrastructure: A necessary condition for economic stability

The G-20 has developed a focus on infrastructure since 2010, but it has yet to effectively incorporate the reality of climate change in its plans. For example, the Global Infrastructure Hub, launched by the G-20 in 2014, does not consider the infrastructure investment gap in the context of climate change—or explicitly grapple with climate implications at all. In addition, the G20 Investment and Infrastructure Working Group, which operated from 2014 to 2016, launched several major infrastructure initiatives that did not tackle the climate dimension of their work.³⁰

Failure to integrate the topics of infrastructure and climate change, however, invites economic instability. It is fiscally unwise to attempt to narrow the infrastructure investment gap by funding projects that are vulnerable to the physical effects of climate change. Likewise, it is fiscally unwise to narrow the infrastructure investment gap by funding projects that are high-carbon, incompatible with the global pivot toward clean energy, and at risk of early obsolescence.

Of course, high-carbon projects not only face the prospect of devaluation but also drive climate change and the associated economic damage. There were more than 1,000 natural disasters inflicting some \$100 billion worth of economic damage in 2015 alone.³¹ These natural disasters were spread across the globe, affecting both developed and developing countries. A growing body of research has shown that the recurrence of these events is increasing, even when controlling for changes in exposed values caused by population growth and development.³² Going forward, climate change has the capacity to put trillions of dollars in global financial assets at risk—it also has the capacity to push more than 100 million additional people into extreme poverty.³³ Experts in the World Economic Forum now identify climate change as the greatest global threat due to its ability to cause a cascade of risks, including migration and conflict.³⁴

To date, the G-20 has largely avoided climate issues at the leaders' level, leaving them to the U.N. Framework Convention on Climate Change. At the 2016 summit, for example, the forum avoided key climate priorities, such as a deadline for phasing out fossil fuel subsidies and the integration of long-term emissions reduction plans into each G-20 country's Growth Strategy. The forum has also been agnostic on energy sources, as demonstrated by the 2016 Energy Ministers' Statement and the Leaders' Communique.³⁵ Indeed, the Communique promotes diversification of energy sources, especially natural gas. G-20 countries themselves exhibit a wide range of renewable energy adoption. (see Figures 3 and 4)

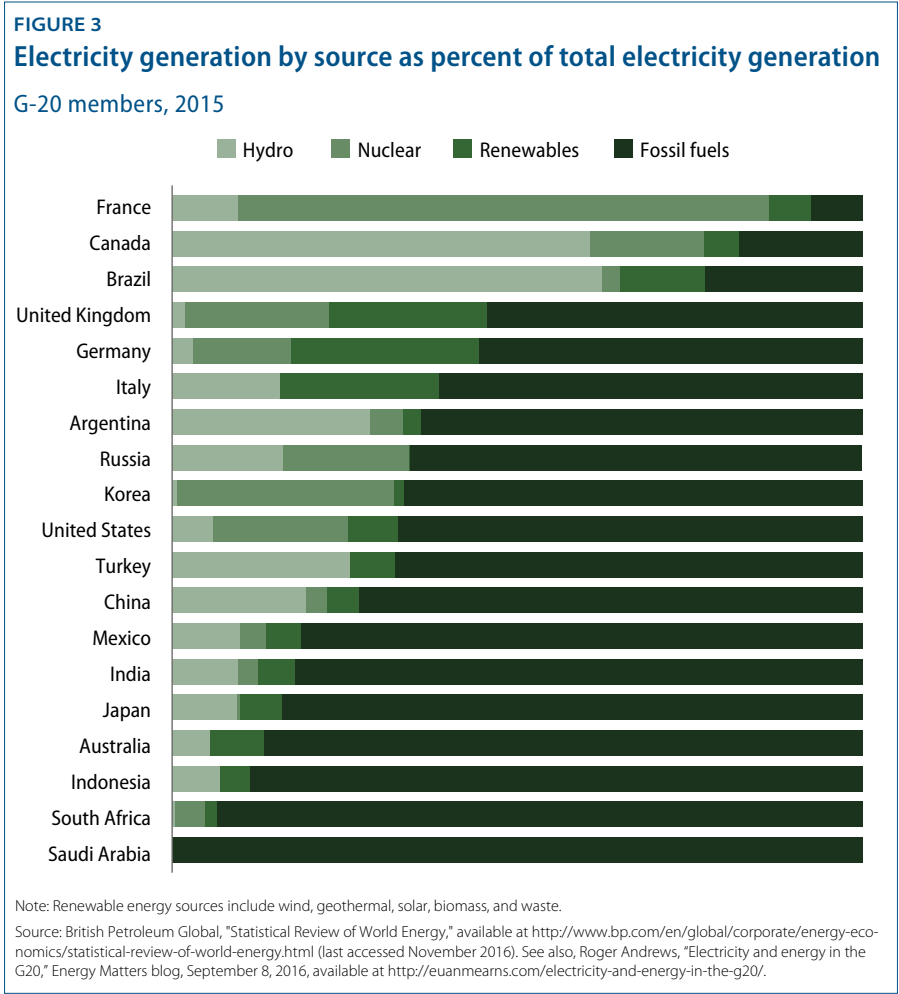
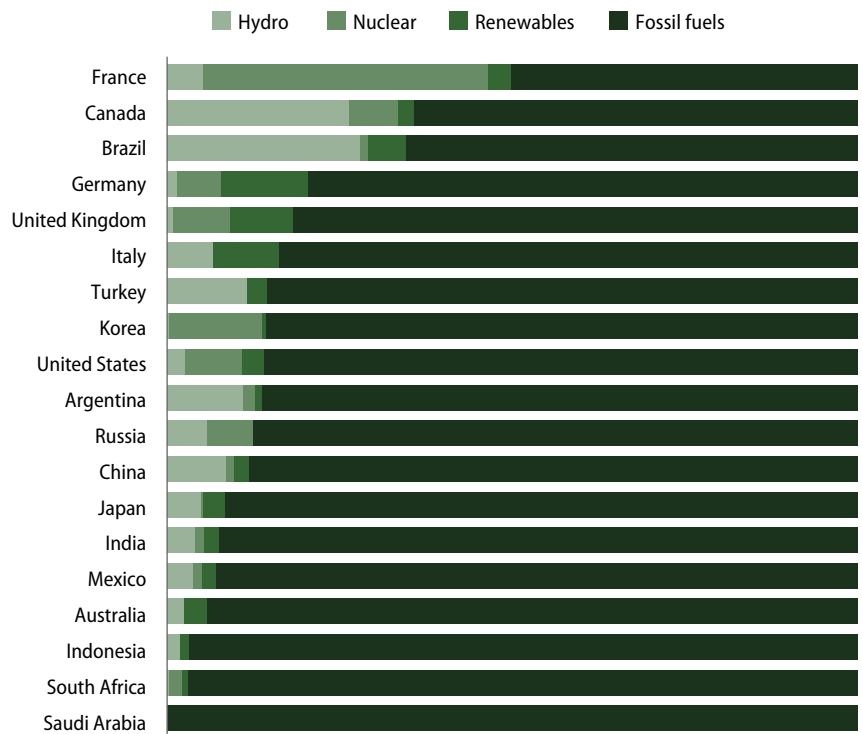


FIGURE 4
Electricity generation by source as percent of total energy consumption
 G-20 members, 2015



Note: Renewable energy sources include wind, geothermal, solar, biomass, and waste.
 Source: British Petroleum Global, "Statistical Review of World Energy," available at <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> (last accessed November 2016). See also, Roger Andrews, "Electricity and energy in the G20," Energy Matters blog, September 8, 2016, available at <http://euanmearns.com/electricity-and-energy-in-the-g20/>.

But while climate change has not been a primary focus of the forum, it certainly has proven itself willing and capable of taking up the issue both directly and indirectly, providing a foundation for more substantive work. In 2009, for instance, G-20 countries committed to eliminate fossil fuel subsidies—and this remains an item on its agenda. Over the years, the G-20 has also launched several climate and energy initiatives, including the G20 Energy Access Plan, the Voluntary Action Plan on Renewable Energy, and the Energy Efficiency Leading Programme.³⁶ It has an established Climate Finance Study Group and, in 2016, also created a new Green Finance Study Group.³⁷ In 2015, the Turkish presidency launched the GreenInvest Platform to facilitate green growth investments, a commitment first made during the 2012 Mexican presidency.³⁸

TABLE 2
Change in renewable electricity generation as a percentage
of total energy consumption

G-20 members, 2005—2015

Economy	
Turkey	3867%
China	2144%
Korea	1389%
South Africa	1204%
Brazil	810%
France	686%
United Kingdom	667%
Italy	473%
Germany	327%
India	283%
United States	258%
Australia	252%
Canada	198%
Japan	161%
Argentina	141%
Mexico	73%
Russia	19%
Indonesia	-1%

Note: Renewable energy sources include wind, geothermal, solar, biomass, and waste. Saudi Arabia did not have any renewable energy generation in 2005 therefore it is excluded from this figure.

Source: British Petroleum Global, "Statistical Review of World Energy," available at <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> (last accessed November 2016).

Options and opportunities for the G-20 and the German presidency

Developing a focus on climate-compatible infrastructure that spans the forum would be a natural—and constructive—step for the G-20 to take in 2017. It would allow the forum to protect global progress on climate change and to pursue the “pillar” objective of supporting sustainability, including sustainable energy. It would also allow the forum to pursue its overarching goal of promoting global economic stability and would build on several of its existing strands of work.

1. Identify and disclose transition risk

Discussion of climate risk typically focuses on the disruptive and costly physical effects of climate change, but there is another category of risk that threatens the global economy: transition risk.

Transition risk arises from the global pivot toward nonpolluting energy. The recent surge of international support for climate action—even in the face of the 2016 U.S. presidential outcome—is just one indication that this pivot is well underway.³⁹ More than 100 countries representing more than 75 percent of global greenhouse gas pollution have now officially joined the Paris Agreement within just a year of its finalization.⁴⁰ Moreover, the entry into force of the Agreement in November 2016 follows on the heels of other multilateral climate successes, including the amendment to the Montreal Protocol to phase down hydrofluorocarbons, or HCFs, and the agreement in the International Civil Aviation Organization, or ICAO, to limit greenhouse gas pollution from air travel.

It is not only governments that are turning toward nonpolluting energy—the marketplace is as well. In 2015, global investment in renewables reached a record \$286 billion, with developing countries accounting for more than half of this amount.⁴¹ Renewables also made up the majority of global installed capacity for the first time in 2015, with investment in renewable energy capacity equal to more than

twice the amount allocated to new coal and gas generation.⁴² In the same year, global employment in the renewable energy sector was more than 8 million.⁴³ This growth is being driven by the continued reduction in renewable energy costs, a trend that is expected to continue as wind and solar become the cheapest way to produce electricity in most of the world in the 2030s.⁴⁴

As investors and civil society increasingly turn away from greenhouse gas pollution—and as many governments pursue policies to implement their national and collective climate goals—the value of assets will shift. High-carbon assets will decline in value or even become stranded: The fossil fuel industry, for example, could lose more than \$30 trillion over 25 years.⁴⁵ The flipside of transition risk, of course, is transition opportunity: low-carbon alternatives will increase in value. An abrupt reassessment of asset values, however, could have a destabilizing effect on the global economy.⁴⁶

The first step in mitigating transition risk is identifying it. This is not only a green issue. It is in the economic self-interest of companies, investors, and nations to have a clear view of the financial risks and opportunities presented by climate change. This is particularly important in the context of infrastructure projects, which can lock in greenhouse gas pollution through lifespans that measure in the decades.

Currently, too few companies accurately and thoroughly report their exposure to the physical and transition risks posed by climate change. In the United States, for example, the Sustainability Accounting Standards Board analyzed the disclosures of more than 600 companies and found that more than 60 percent of the entries contained either no acknowledgment of climate risk or only boilerplate statements.⁴⁷ In addition, there is a vast diversity of reporting regimes.⁴⁸

To counter this irregularity, the Financial Stability Board—an international body that aims to promote global financial resilience—created the Task Force on Climate-related Financial Disclosures at the request of the G-20. This has been among the foremost positive developments in the G-20 on climate change. The current objective of the task force is to develop guidelines for companies to publicly disclose climate risks to investors. The task force delivered its initial recommendations and launched a 60-day public consultation in December 2016.⁴⁹ The final report will be released in June 2017, in advance of the G-20 summit.⁵⁰

With the disclosure guidelines in hand, the G-20 and the German presidency should turn to the task of promoting implementation. To this end, it would be helpful for G-20 members to adopt a leadership role in climate risk disclosure. There are a number of steps that they could take. For example, G-20 countries could commit to considering and publicly disclosing physical risks and transition risks in major federal projects and actions in order to protect their national economies over the long term.⁵¹ Given the influence they have in international development finance, they also could work to institute responsible climate-disclosure practices among the development banks of which they are members. And, in order to promote adequate climate risk disclosure practices in the private sector, they could implement policies to contract only with companies that adhere to the task force's disclosure guidelines.⁵²

2. Strengthen fossil fuel subsidy reform

In order to improve investment in climate-compatible infrastructure, countries will need to increase public expenditures and foster the market conditions necessary to attract an influx of private finance.

Fortunately, G-20 countries committed in 2009 to take a step that would drive progress on both of these fronts: eliminating inefficient fossil fuel subsidies.⁵³ Such subsidies drain national budgets—diverting public dollars away from infrastructure spending—and tilt the investment playing field against renewable energy and energy efficiency.⁵⁴ Moreover, they are generally extremely regressive: In developing countries, the richest 20 percent of the population captures on average six times more of the value of fuel subsidies than the poorest 20 percent.⁵⁵ Phasing out these subsidies alone could reduce global greenhouse gas pollution by between 6 and 13 percent by 2050. The economic and climate benefits would be even greater if the savings are put to good use.⁵⁶

There has been some progress—albeit insufficient progress—toward fulfilling the 2009 commitment. Globally, countries provided \$325 billion worth of fossil-fuel consumption subsidies in 2015 alone.⁵⁷ To help build momentum for the elimination of fossil fuel subsidies, the G-20 finance ministers announced in 2013 a new peer review program in which countries could voluntarily engage in an information-sharing and consultation exercise designed to clarify the level of their subsidies and how to reduce them.⁵⁸ The first peer reviews—completed by the United States and China—were publicly released during the 2016 summit.⁵⁹

The G-20 under the German presidency could build on this successful first peer review by improving and expanding participation in the process.⁶⁰ For example, the United States and China could establish a precedent whereby countries that undergo peer review participate as advisors in subsequent rounds. This would allow countries to share the lessons learned from their own experiences and to guide the process for new participants. G-20 countries could also provide support for the peer review process by contributing additional funds to The World Bank's Energy Sector Management Assistance Program.⁶¹ These funds could be used to provide further technical assistance to countries with limited experience assessing their own subsidy programs.

In addition, Germany could establish a channel for non-G-20 countries, civil society, and academic institutions to provide input into the peer review process and the phase-out of fossil fuel subsidies generally. This could take the form of a public comment period in which the G-20 formally solicits technical expertise and insights. Such a comment period would expand and diversify the pool of expertise and resources available to countries pursuing reform.

Germany could also create a public platform for G-20 countries to track and share their progress in meeting a timeline for fossil fuel phase-out. This would improve public understanding of the benefits that accrue from reform, which is critical to getting such reforms enacted and making them durable.⁶² Indonesia, for example, has linked subsidy reforms to economic and social development goals. It has used part of the savings from reduced subsidies to fund public transportation infrastructure investments in Jakarta, a city suffering from chronic congestion.⁶³ It has also invested in poverty reduction, education, and health care for low income populations.⁶⁴ In 2015, savings from reduced subsidies contributed to an increase of an estimated \$12.6 billion in expenditures on programs to reduce poverty and transfer funds for regions and villages.⁶⁵

Importantly, the G-20 should also build on its 2009 commitment and establish 2025 as the deadline for phasing out all inefficient fossil fuel subsidies. This would be consistent with the G-7 commitment made in 2016 and would create a focal point for efforts in the G-20 to promote low-carbon, climate-resilient development.⁶⁶

3. Include Paris goals in growth strategies

Within the G-20, the growth strategy of each country, which includes infrastructure plans, has been a crucial contribution to the collective effort to foster economic recovery and prosperity.⁶⁷ Countries should include their goals to reduce greenhouse gas pollution and build resilience to the effects of climate change—including any Paris goals—in their growth strategies. This would promote accountability and would allow countries to plan, in an integrated way, how to achieve a stable and low-carbon economy.

The Paris Agreement calls on countries not only to submit near-term climate goals but also to formulate national mid-century strategies to decarbonize their economies.⁶⁸ Four G-20 countries—Germany, the United States, Canada, and Mexico—have already created their mid-term strategies.⁶⁹ All G-20 countries should create them by 2020 and include them in their plans for growth.

The G-20 could also implement peer reviews of national progress in adopting renewable energy technologies, which could be done in the context of each country's national mid-century decarbonization objectives. This would be in keeping with the forum's practice of implementing peer reviews when national progress is essential to reaching collective goals.

4. Expand access to climate-risk insurance

The world is already locked into a period of increased climate risk and damage due to the past century and a half of pollution that has accumulated in the atmosphere. This necessitates increased emphasis on enhancing the climate resilience of existing and new infrastructure—otherwise, there will be damaged physical assets, lost investment, and misallocation of public and private resources. More intense and frequent climate-fueled natural disasters will increasingly threaten critical infrastructure networks, such as the electricity grid and water supply.⁷⁰ Compounding these challenges, infrastructure systems are frequently interconnected, creating the potential for multiple failures during extreme weather events.⁷¹

Increasing the resilience of infrastructure can produce significant benefits for both developed and developing countries. In the United States, for example, it is estimated that every \$1 spent on resilience efforts yields \$4 in economic benefits,

not including prevented injuries and lives saved.⁷² In the developing world, many countries are still building basic infrastructure, meaning that investments in resilient infrastructure now could avoid additional costs from retrofitting as the effects of climate change intensify.⁷³

Despite the benefits of more resilient infrastructure, there remains a gap in finance for climate adaptation that might support these efforts. The cost of adaptation in developing countries alone could range from \$140 billion to \$300 billion by 2030.⁷⁴ By comparison, \$25 billion in international public finance went to climate adaptation in 2014.⁷⁵

The G-20 should promote climate resilience from the outset as part of its focus on infrastructure development. To this end, the G-20 should establish closer collaborations with existing international institutions that fund climate-resilient infrastructure in order to share experience and best practices. The Green Climate Fund, for example, is developing expertise in this area.⁷⁶

In addition, the G-20 could expand access to climate-risk insurance. Insurance can help countries to better manage and adapt to the increase of climate-fueled risks facing existing and future infrastructure. Not only can climate-risk insurance help to hedge against potential losses from extreme weather events, providing more security for public and private investments, but it can also assist with post-disaster recovery and create incentives for adaptation measures.⁷⁷

Of the more than 1,000 natural disasters inflicting some \$100 billion worth of economic damage in 2015, only 30 percent of these losses were covered by insurance, and the majority of uninsured losses occurred in developing nations in Africa, Asia, and South America.⁷⁸ This lack of coverage can put a significant strain on governments, as they must invest in near-term relief and recovery efforts as well as mid- and long-term reconstruction, with infrastructure investment being critical throughout.⁷⁹

As of 2015, climate-related risk insurance was available to 100 million people in developing countries and major emerging countries.⁸⁰ However, while the share of insured economic losses in developed countries grew from 20 percent to 40 percent from 1980 to 2006, it held steady in developing countries at approximately 3 percent.⁸¹ There are several reasons for this gap, including that the required premiums for climate-risk insurance can be prohibitively expensive.⁸² In addition, there is a lack of the kind of risk modeling in many regions that is required for insurers to offer coverage.⁸³

In recognition of the insurance gap, the G-7 set an ambitious goal in 2015 of providing access to insurance against climate-related risks to 400 million additional people in the most vulnerable developing countries by 2020.⁸⁴ This would add to the 100 million people in developing countries that already have coverage.⁸⁵

Under the German presidency, the G-20 could strengthen the effort to narrow the insurance gap by adopting this same target. It could also address the obstacles to achieving it, such as lack of familiarity among stakeholders with the innovative policies—such as parametric risk insurance, regional risk pools, and micro insurance—that present opportunities to expand insurance to new populations in developing countries.

To this end, the G-20 could support a platform for sharing insurance policy designs and best practices that would be open to G-20 and non-G-20 countries, subnational governments, regional organizations, and non-governmental organizations. The platform could also focus on increasing investment in the collection of risk modeling data with a particular focus on developing countries.⁸⁶ The G-20 could design the platform in coordination with the Insurance Development Forum, a partnership launched in 2016 by The World Bank, the United Nations, and the insurance industry that is focused on expanding access to insurance in developing countries.⁸⁷

4. Steer investments toward low-carbon infrastructure

In order to help mitigate the risks of climate change—and to take advantage of the opportunities—there are a number of tools that the G-20 could promote in its infrastructure initiatives in order to steer investment toward low-carbon options. One tool is to consider the rising cost of carbon pollution in infrastructure investment decisions. Factoring in a so-called proxy price on greenhouse gas emissions when evaluating projects acts as a stress test: It helps determine whether projects will remain financially viable as carbon pollution faces increasing costs.⁸⁸ This practice—already well known in the private sector—helps prevent projects that decline precipitously in value or become obsolete before the end of their useful lives. The value of a proxy carbon price could be indexed to an estimation of the financial damage caused by each ton of carbon pollution.⁸⁹

The G-20 could also promote the practice of proxy carbon pricing by countries in their national infrastructure efforts. For instance, in the future, G-20 countries could use proxy pricing to help inform their infrastructure investment and permitting decisions. This would help protect their economies from infrastructure projects that may become stranded in the global pivot to clean energy. A proxy carbon price could also be used when evaluating the costs and benefits of potential power plant and other regulations.

Proxy carbon pricing can also help inform international investments of G-20 countries, which could encourage the multilateral development banks of which they are members—including established banks as well as more recent banks, such as the New Development Bank and the Asian Infrastructure Investment Bank—to adopt the practice of stress testing sets of potential infrastructure investments.⁹⁰ This would help steer investment away from high-carbon infrastructure. To date, proxy pricing has been adopted by a handful of banks, including the European Investment Bank and the European Bank for Reconstruction and Development.⁹¹ But given that a number of banks—including the Asian Development Bank, the African Development Bank, and the Inter-American Development Bank, among others—are dedicated to increasing climate investment, the practice could be explored by the wider international development finance community.

Toward a wider lens on socially responsible infrastructure

While this paper focuses on climate-compatible infrastructure, it is also important that steps are taken throughout the project cycle to ensure that infrastructure can deliver the anticipated social benefits in line with the “responsibility” pillar of the German presidency.

When done right, infrastructure development is necessary to attain several Sustainable Development Goals, as highlighted by the G-20’s Action Plan on the 2030 Agenda on Sustainable Development. In addition, it is a big-ticket item that also competes with funding for other key goals. Doing infrastructure right is therefore a high-stakes venture in economic, social, and environmental terms.

While drawing in private investment is critical, it also introduces a number of risks that must be managed.⁹² At a basic level, the use of private financing can result in private control of critical infrastructure services.⁹³ For instance, it is common for private investors to demand PPP contract renegotiations, which usually result

in deals that yield higher profits and fewer costly obligations.⁹⁴ PPP laws may constrain a government's regulatory scope in ways that protect firm profits. At the same time, governments, seeking to attract investors, can find themselves bearing excessive risks, with losses covered by user fees and taxpayer resources.⁹⁵

These hazards catalyze others that must also be navigated as private sector financing is drawn in. Transferring risk from the private to the public sector—which means that gains are privatized and losses socialized—can drive inequality and weaken the power of governments, undermining development.⁹⁶ Moreover, the financialization of infrastructure encourages so-called mega-projects, which are at risk of being over budget while under-delivering economic, social, and environmental benefits.⁹⁷ Mega-projects also can require a large amount of land and lead to the displacement of communities, especially in areas where land tenure is unclear.⁹⁸

Such risks are amplified in the context of Africa, which is the region of focus for the G-20 in 2017. Unmet infrastructure demand is particularly stark in Africa—only approximately 40 percent of the population has access to modern infrastructure and electricity—and countries on the continent accounts for approximately 70 percent of the least developed countries.⁹⁹ Since private finance often gravitates toward mega-projects, it may fail to reach the communities and regions that most need infrastructure investment through means such as decentralized solar schemes or railways, due to comparatively low profitability. It is important, therefore, that countries and the private sector work together to strategically deploy their public and private resources in the most effective combinations to help meet development needs in Africa.¹⁰⁰

Key dimensions for project success

Transparency. Information disclosure and transparency are critical tools to usefully involve stakeholders and affected communities, achieve a balanced risk allocation, limit corruption, make known off-budget commitments, deliver benefits, and hold service providers accountable.

Consultation. Governments should use tools such as the OECD's Public Governance of Public-Private Partnerships, or PPPs, guidelines for public works as well as PPPs, because they involve the users of infrastructure services in ways that help control risks and ensure sustainability.¹⁰¹ Environmental and social impact assessments should also engage affected communities at the project concept and identification stages.

Safeguards. Upstream, especially in project selection, design, and construction, greater weight should be given to the social and environmental impacts of projects. Downstream, during implementation, there is a trend toward more lenient environmental and social standards and their enforcement.¹⁰² This trend should be reversed through a systematic effort to identify the range of benefits that safeguards help ensure.

Fiscal risks. Where PPPs are the desired modality, the IMF's PPP Fiscal Risk Assessment Model should be tested with the engagement of many stakeholders, and implemented responsibly.¹⁰³

Scale. As it seeks to reduce the shortfall in infrastructure investment, the G-20 should avoid an uncritical preference for mega-projects over "appropriate scale"

projects.¹⁰⁴ Importantly, when countries finance multiple, mega-infrastructure projects, there is a risk of a shortfall in financing for more sustainable infrastructure or other budget priorities, such as social protection and health care.

PPP issues. According to a report by the London School of Economics, PPPs "are not regarded as an appropriate instrument for [information technology] projects, or where social concerns place a constraint on the user charges that might make a project interesting for the private sector."¹⁰⁵ Many evaluations substantiate this point, particularly where there are natural monopolies, as may be the case in the water supply and electricity distribution sectors.

Investment guidelines. The G-20 and Organisation for Economic Co-operation and Development, or OECD, should revise their guidelines and principles pertaining to infrastructure financing and investment—including long-term institutional investment—in order to incorporate the principles of the 2030 Agenda on Sustainable Development. At present, such social and environmental principles are secondary and optional, if they appear at all. The High-level Principles on Long-Term Investment Financing by Institutional Investors are a case in point.

Standardization. The standardization of infrastructure projects, including model PPP contract clauses, procurement systems, and disclosure requirements, should be opened to longer and more in-depth consultation with stakeholders.

Conclusion

It is vital to prevent the global momentum to curb climate change from slowing. Fortunately, this year's G-20 under the German presidency can provide a near-term line of international defense—and it even has the potential to drive progress by integrating its infrastructure and climate agendas. Moreover, doing so would be true to the founding purpose of the G-20, which is to support global economic stability. This cannot be achieved without climate-compatible infrastructure and, more broadly, a swift transition to a low-carbon global economy.

Appendix: Supplemental figures

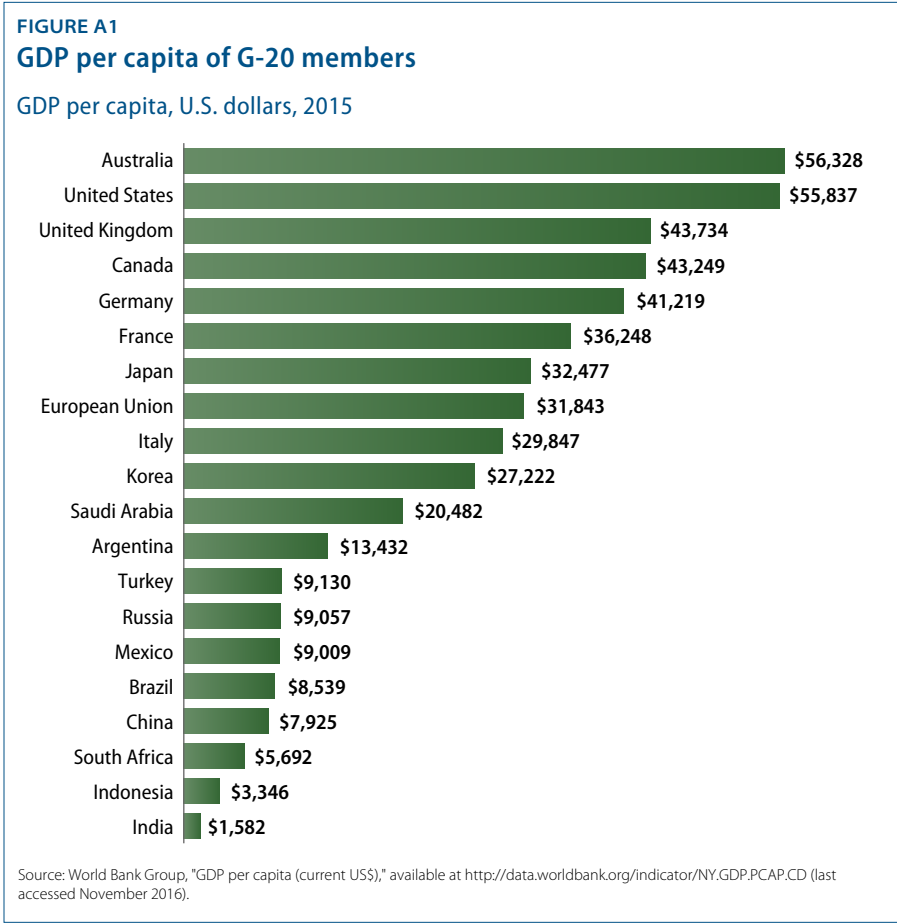
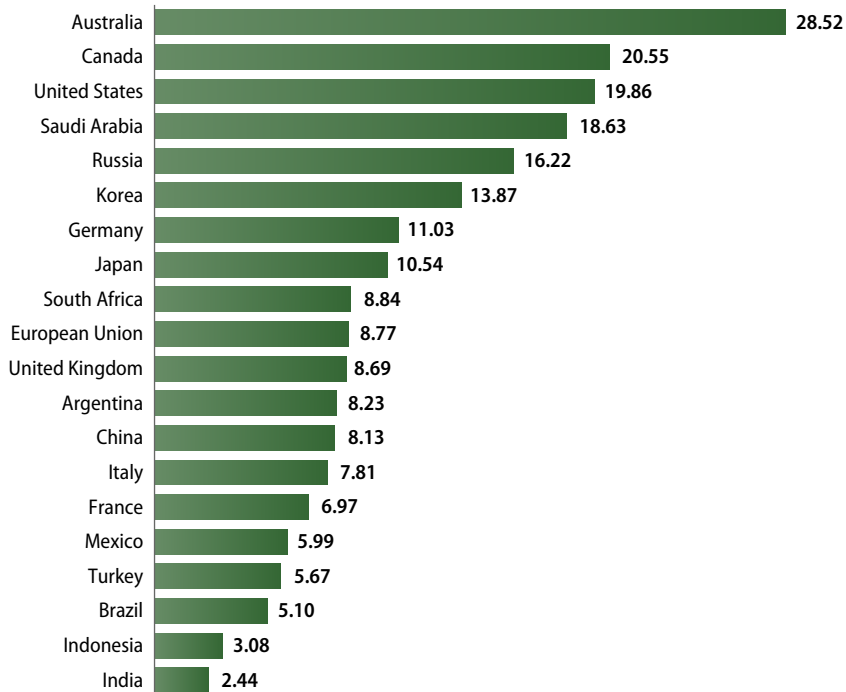


FIGURE A2

Greenhouse gas emissions per capita of G-20 members

GHG emissions per capita, in MtCO₂e, excluding land-use change and forestry in 2012



Source: World Resources Institute, "CAIT Climate Data Explorer," available at <http://cait.wri.org/historical> (last accessed November 2016).

About the authors

Gwynne Taraska is the Associate Director of Energy Policy at the Center for American Progress.

Pete Ogden is a Senior Fellow at the Center for American Progress.

Nancy Alexander is director of the Economic Governance Program at Heinrich-Böll-Stiftung North America.

Howard Marano is a Research Assistant at the Center for American Progress.

Acknowledgement

The Center for American Progress thanks the Heinrich-Böll-Stiftung North America for their support of our energy programs and of this report.

The Center for American Progress produces independent research and policy ideas driven by solutions that we believe will create a more equitable and just world.

Endnotes

- 1 United Nations Framework Convention on Climate Change, "Paris Agreement – Status of Ratification," available at http://unfccc.int/paris_agreement/items/9444.php (last accessed December 2016).
- 2 Gwynne Taraska and Howard Marano, "As the Paris Era Begins, the United States Decides Between Influence and Irrelevance," Center for American Progress, November 18, 2016, available at <https://www.americanprogress.org/issues/green/news/2016/11/18/292734/as-the-paris-era-begins-the-united-states-decides-between-global-influence-and-irrelevance>; BBC News, "Donald Trump would 'cancel' Paris climate deal," May 27, 2016, available at <http://www.bbc.com/news/election-us-2016-36401174>.
- 3 German Federal Government, "G20 Agenda, The G20 Presidency 2017 at a glance," available at https://www.g20.org/Webs/G20/EN/G20/Agenda/agenda_node.html (last accessed December 2016).
- 4 German Federal Government, "Merkel: The G-20 is Particularly Important Now," available at <https://www.G-20.org/Content/DE/Podcast/2016/2016-11-25-Video-Podcast-EN/2016-11-25-Video-Podcast-EN.html> (last accessed December 2016); German Federal Government, "Germany's G20 Presidency begins," available at https://www.G-20.org/Content/EN/Artikel/2016/11_en/2016-11-30-G-20-kernbotschaften-im-kabinett_en.html (last accessed December 2016).
- 5 Gwynne Taraska and Henry Kellison, "Could the G-20 Become Coherent on Climate? Reconciling the Priorities on Climate and Infrastructure from Hangzhou to Hamburg" (Washington: Center for American Progress, 2016), available at <https://www.americanprogress.org/issues/green/reports/2016/08/25/143032/could-the-g-20-become-coherent-on-climate/>.
- 6 The fourth sector is information and communications technology, or ICT.
- 7 Zia Qureshi, "Meeting the Challenge of Sustainable Infrastructure: The Role of Public Policy" (Washington: Brookings Institution, 2016), available at <https://www.brookings.edu/wp-content/uploads/2016/07/Sustainable-Infrastructure-Policy-Paperwebfinal.pdf>.
- 8 It is notable that the forum has brought together nine multilateral development banks to discuss how to expand coordination to increase the number of viable infrastructure projects and the level of private-sector support. African Development Bank, Asian Development Bank, European Bank, European Investment Bank, International Fund for Agricultural Development, Islamic Development Bank, Inter-American Development Bank, and The World Bank Group, and German Federal Government, "Partnering to Build a Better World: MDB's Common Approaches to Supporting Investments in Infrastructure" (2015), available at <http://g20.org.tr/wp-content/uploads/2015/11/Paper-on-MDB-Common-Approaches-to-Supporting-Infrastructure-Development.pdf>.
- 9 German Federal Government, "G20 specialised ministers meetings," available at https://www.g20.org/Webs/G20/EN/G20/meeting_ministers/meetings_ministers_node.html (last accessed December 2016); German Federal Government, "Dialogue with civil society," available at https://www.g20.org/Webs/G20/EN/G20/Civil_society/civil_society_node.html (last accessed December 2016); German Federal Government, "The G20 Presidency 2017 at a glance," available at https://www.g20.org/Webs/G20/EN/G20/Agenda/agenda_node.html (last accessed December 2016).
- 10 James Rydger, Michael Jacobs, and Ilmi Granoff, "Ensuring new infrastructure is climate-smart" (Washington: The Global Commission on the Economy and Climate, 2015), available at <http://newclimateeconomy.report/2015/wp-content/uploads/sites/3/2015/10/Ensuring-infrastructure-is-climate-smart.pdf>.
- 11 Christoph Rothballer, Marie Lam-Frendo, and Hanseul Kim, "Strategic Infrastructure: Steps to Operate and Maintain Infrastructure Efficiently and Effectively" (Cologne: World Economic Forum, 2014), available at http://www3.weforum.org/docs/WEF_IU_StrategicInfrastructureSteps_Report_2014.pdf.
- 12 The World Bank Group, "Global Infrastructure Facility," available at <http://www.worldbank.org/en/programs/global-Infrastructure-facility> (last accessed December 2016).
- 13 Christoph Rothballer and Hanseul Kim, "Strategic Infrastructure: Steps to Prepare and Accelerate Public-Private Partnerships" (Cologne: World Economic Forum, 2013), available at http://www3.weforum.org/docs/AF13/WEF_AF13_Strategic_Infrastructure_Initiative.pdf.
- 14 Amar Bhattacharya, Jeremy Oppenheim, and Nicholas Stern, "Driving Sustainable Development through Better Infrastructure: Key Elements of a Transformation Program" (Washington: Brookings Institution, 2016), available at <https://www.brookings.edu/wp-content/uploads/2016/07/07-sustainable-development-infrastructure-v2.pdf>.
- 15 Higher growth is one motivation for the infrastructure push; others include the promotion of geostrategic advantages—access to natural resources and markets—and development.
- 16 Bhattacharya, Oppenheim, and Stern, "Driving Sustainable Development through Better Infrastructure"; Rothballer and Kim, "Strategic Infrastructure: Steps to Prepare and Accelerate Public-Private Partnerships." In the European Union, for example, public investment has been less than 2 percent of gross domestic product.
- 17 Rydger, Jacobs, and Granoff, "Ensuring New Infrastructure is Climate-smart"; The Global Commission on the Economy and Climate, "The Sustainable Infrastructure Imperative: Financing for Better Growth and Development" (2016), available at http://newclimateeconomy.report/2016/wp-content/uploads/sites/4/2014/08/NCE_2016Report.pdf. The Economist Intelligence Unit's "Infrascopes Reports" also show that few countries have the capacity to manage public-private partnerships, or PPPs, which are the G-20's preferred model of delivering services.
- 18 Rothballer, Lam-Frendo, and Kim, "Strategic Infrastructure: Steps to Operate and Maintain Infrastructure Efficiently and Effectively"; Rothballer and Kim, "Strategic Infrastructure: Steps to Prepare and Accelerate Public-Private Partnerships"; The Global Commission on the Economy and Climate, "The Sustainable Infrastructure Imperative."
- 19 Heinrich Böll Foundation, "G20 Global Infrastructure Connectivity Alliance," available at <https://us.boell.org/2016/09/09/G-20-global-infrastructure-connectivity-alliance> (last accessed December 2016).

- 20 Heinrich Böll Foundation, “MDBs Joint Declaration of Aspirations on Actions to Support Infrastructure Investment,” available at <https://us.boell.org/2016/09/09/mdb-joint-declaration-aspirations-actions-support-infrastructure-investment> (last accessed December 2016).
- 21 Asian Infrastructure Investment Bank, “The Asian Infrastructure Bank,” available at <http://euweb.aib.org/html/aboutus/introduction/aib/?show=0> (last accessed December 2016); Government of the Federative Republic of Brazil, the Russian Federation, the Republic of India, the People’s Republic of China and the Republic of South Africa, “Agreement on the New Development Bank - Fortaleza, July 15” (2014), available <http://ndb.int/download/Agreement%20on%20the%20New%20Development%20Bank.pdf>; New Development Bank, “Formation of the New Development Bank,” available at <http://ndb.int/genesis.php> (last accessed December 2016).
- 22 The World Bank Group, “Global Infrastructure Facility,” available at <http://www.worldbank.org/en/programs/global-infrastructure-facility> (last accessed December 2016); Global Infrastructure Facility, “GIF Briefings: Reflecting on the 3rd GIF Advisory Council Meeting Changsha, China: June 2016” (2016), available at <http://pubdocs.worldbank.org/en/514161468432446319/AC-Issue-Brief.pdf>.
- 23 Africa50, “About Us,” available at <http://www.africa50.com/about-us/> (last accessed December 2016).
- 24 The Global Commission on the Economy and Climate, “The Sustainable Infrastructure Imperative.”
- 25 Julian Müller, “Harnessing private finance to attain public policy goals: How governments try to involve the private sector in times of austerity and what risks this entails” (Amsterdam: Centre for Research on Multinational Corporations, 2016), available at <https://www.somo.nl/wp-content/uploads/sites/2/2016/07/Harnessing-private-finance.pdf>.
- 26 Ibid.
- 27 Another tactic is regulatory reform that creates a new asset class of qualifying infrastructure with limited risk. Müller, “Harnessing Private Finance to Attain Public Policy Goals.”; European Union, “Commission Delegated Regulation (EU) 2016/467” (2015), available at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0467&from=en>.
- 28 Steven Shrybrman and Scott Sinclair, “A Standard Contract for PPPs the World Over: Recommended PPP Contractual Provisions Submitted to the G20” (Washington: Heinrich Böll Foundation, 2015), available at https://us.boell.org/sites/default/files/ppp-web_1.pdf.
- 29 The World Bank, “World Bank Group’s Role in PPPs,” available at <https://ppp.worldbank.org/public-private-partnership/overview/world-bank-group> (last accessed December 2016). In addition, the OECD has provided recommendations on the governance of PPPs and has partnered with The World Bank to provide a project checklist. Organisation for Economic Co-operation and Development, “Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships” (2012), available at <https://www.oecd.org/governance/budgeting/PPP-Recommendation.pdf>.
- 30 There is no reference to climate change, for example, in the Working Group’s 2015 joint action plan with the Global Partnership for Financial Inclusions on small and medium-sized enterprise financing. The Working Group also conducted a voluntary survey on investment strategies of G-20 countries, which does not focus on climate change as a thematic section. G-20 and the Global Partnership for Financial Inclusion, “G20 Action Plan on SME Financing” (2015), available at <http://www.gpfi.org/sites/default/files/documents/01-G-20%20Joint%20Action%20Plan%20on%20SME%20Financing.pdf>; G-20 and Organisation for Economic Co-operation and Development, “G-20/OECD Report on G-20 Investment Strategies Volume I” (2015), available at http://G-20.org.tr/wp-content/uploads/2015/12/G-20-Investment-Strategies-and-G-20-OECD-Report-on-G-20-Investment-Strategies_Volume-I.pdf; G-20 and Organisation for Economic Co-operation and Development, “G-20/OECD Report on G-20 Investment Strategies Volume II” (2015), available at http://G-20.org.tr/wp-content/uploads/2015/12/G-20-Investment-Strategies-and-G-20-OECD-Report-on-G-20-Investment-Strategies_Volume-II.pdf; G-20 and Organisation for Economic Co-operation and Development, “G-20/OECD Report on G-20 Investment Strategies Highlights” (2015), available at <http://www.mofa.go.jp/files/000111454.pdf>.
- 31 Munich RE, “The earth’s ‘hotting up’” (2016), available at https://www.munichre.com/site/touch-publications/get/documents_E1273659874/mr/assetpool.shared/Documents/5_Touch/_Publications/302-08875_en.pdf.
- 32 Peter Hoeppe, “Trend in weather related disasters – Consequences for insurers and society,” *Weather and Climate Extremes* 11 (2016): 70-79, available at <http://www.sciencedirect.com/science/article/pii/S22121094715300347>.
- 33 Stephane Hallegatte and others, “Shock Waves: Managing the Impacts of Climate Change on Poverty” (Washington: The World Bank Group, 2016), available at <https://openknowledge.worldbank.org/bitstream/handle/10986/22787/9781464806735.pdf>; Simon Dietz and others, “Climate value at risk’ of global financial assets,” *Nature Climate Change* 6 (2016): 676-679, available at <http://www.nature.com/nclimate/journal/v6/n7/full/nclimate2972.html>.
- 34 World Economic Forum, “The Global Risks Report” (2016), available at http://www3.weforum.org/docs/GRR/WEF_GRR16.pdf.
- 35 G-20 Energy Ministerial Meeting Beijing Communiqué (2016), available at <http://www.G-20.utoronto.ca/2016/160629-energy.html> (last accessed December 2016).
- 36 G-20, “G-20 Energy Access Action Plan: Voluntary Collaboration on Energy Access” (2015), available at http://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/guidelines_policy_and_hub_docs/23.09.2015-G-20_Energy_Access_Action_Plan_Final.pdf; G-20, “G-20 Voluntary Action Plan on Renewable Energy” (2016), available at <https://ec.europa.eu/energy/sites/ener/files/documents/G-20%20voluntary%20Action%20Plan%20on%20Renewable%20Energy.pdf>; G-20, “G-20 Energy Efficiency Leading Programme” (2016), available at <https://ec.europa.eu/energy/sites/ener/files/documents/G-20%20Energy%20Efficiency%20Leading%20Programme.pdf>.

- 37 United Nations Environment Programme, "G-20 Green Finance Study Group Meets for the First Time in Beijing," Press release, January 26, 2016, available at <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=27058&ArticleID=35902&l=en>.
- 38 Global Green Growth Institute, "G-20 launch of Green-Invest to mobilize private capital for inclusive green investments," Press release, June 4, 2015, available at <http://gggi.org/G-20-launch-of-greeninvest-to-mobilize-private-capital-for-inclusive-green-investments/>; G20 Development Working Group, "2015 Annual Progress Report" (2015), available at <https://www.oecd.org/G-20/topics/development/G-20-Development-Working-Group-Annual-Progress-Report-2015.pdf>.
- 39 Taraska and Marano, "As the Paris era begins, the United States Decides between Influence and Irrelevance."
- 40 United Nations Framework Convention on Climate Change, "The Paris Agreement."
- 41 Frankfurt School-United Nations Environment Programme and Bloomberg New Energy Finance, "Global Trends in Renewable Energy Investment 2016" (2016), available at http://fs-unesp-centre.org/sites/default/files/publications/globaltrendsrenewableenergyinvestment2016lowres_0.pdf.
- 42 Ibid.
- 43 This does not include large scale hydropower which employed an additional 1.3 million people in 2015. International Renewable Energy Agency, "Renewable Energy and Jobs Annual Review 2016" (2016), available at http://www.se4all.org/sites/default/files/IRENA_RE_Jobs_Annual_Review_2016.pdf.
- 44 Bloomberg New Energy Finance, "Coal and Gas to Stay Cheap, but Renewables Still Win Race on Costs," Press release, June 12, 2016, available at <https://about.bnef.com/press-releases/coal-and-gas-to-stay-cheap-but-renewables-still-win-race-on-costs/>.
- 45 Joe Ryan, "Fossil Fuel Industry Risks Losing \$33 Trillion to Climate Change," Bloomberg, July 11, 2016, available at <http://www.bloomberg.com/news/articles/2016-07-11/fossil-fuel-industry-risks-losing-33-trillion-to-climate-change>.
- 46 For a lucid discussion of transition risk, see Mark Carney, "Resolving the climate paradox – speech by Mark Carney," Bank of England, September 22, 2016, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2016/speech923.pdf>.
- 47 Sustainability Accounting Standards Board, "Climate Risk – Technical Bulletin" (2016), available at <http://using.sasb.org/sasb-climate-risk-framework/>.
- 48 Organisation for Economic Co-operation and Development and Climate Standards Disclosure Board, "Climate Change Disclosure in G20 Countries: Stocktaking of Corporate Reporting Schemes" (2015), available at <http://www.oecd.org/daf/inv/mne/Report-on-Climate-change-disclosure-in-G20-countries.pdf> and Task Force on Climate-Related Financial Disclosures, "Phase I Report of the Task Force on Climate-Related Financial Disclosures" (2016), available at https://www.fsb-tcfd.org/wp-content/uploads/2016/03/Phase_I_Report_v15.pdf.
- 49 Task Force on Climate-Related Financial Disclosures, "About the Task Force," available at <https://www.fsb-tcfd.org/about/> (last accessed December 2016).
- 50 Task Force on Climate-Related Financial Disclosures, "Financial Stability Board Agrees 2017 Workplan," Press release, November 17, 2016, available at <https://www.fsb-tcfd.org/wp-content/uploads/2016/11/Press-Release-Financial-Stability-Board-agrees-2017-workplan-17-Nov-2016.pdf>.
- 51 See, for example, CEQ's final guidance on the consideration of greenhouse gas pollution and climate change: The White House Council on Environmental Quality, "CEQ Releases Final Guidance on Greenhouse Gases and Climate Change," available at <https://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance> (last accessed December 2016).
- 52 The United States, for example, has proposed a rule that would spur disclosure of climate risk among contractors and vendors that work with the federal government. U.S. Department of Defense, U.S. General Services Administration, and U.S. National Aeronautics and Space Administration, "Federal Acquisition Regulation: Public Disclosure of Greenhouse Gas Emissions and Reduction Goals-Representation," *Federal Register* 81 (2016): 33192-33196, available at <https://www.federalregister.gov/documents/2016/05/25/2016-12226/federal-acquisition-regulation-public-disclosure-of-greenhouse-gas-emissions-and-reduction>. See also Brian Deese and Jeff Zients, "Enlist the Market in the Climate-Change Fight," *The Wall Street Journal*, August 18, 2016, available at <http://www.wsj.com/articles/enlist-the-market-in-the-climate-change-fight-1471561052>.
- 53 University of Toronto G20 Information Centre, "G20 Leaders Statement: The Pittsburgh Summit," September 25, 2009, available at <http://www.g20.utoronto.ca/2009/2009communique0925.html>.
- 54 Richard Bridle and Lucy Kitson, "The Impact of Fossil-Fuel Subsidies on Renewable Electricity Generation" (Geneva: International Institute for Sustainable Development and Global Subsidies Initiative, 2014), available at <http://www.iisd.org/sites/default/files/publications/impact-fossil-fuel-subsidies-renewable-electricity-generation.pdf>.
- 55 Javier Arze del Granado, David Coady, and Robert Gillingham, "The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries" (Washington: International Monetary Fund, 2010), available at <http://www.imf.org/external/pubs/ft/wp/2010/wp10202.pdf>.
- 56 Laura Merrill and others, "Fossil-Fuel Subsidies and Climate Change: Options for Policy-makers within their Intended Nationally Determined Contributions" (Copenhagen: Nordic Council of Ministers), available at <http://norden.diva-portal.org/smash/get/diva2:786861/FULLTEXT02.pdf>.
- 57 International Energy Agency, "World Energy Outlook 2016" (2016), available at <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlook2016ExecutiveSummaryEnglish.pdf>.
- 58 University of Toronto G20 Information Centre, "G20 Meeting of Finance Ministers and Central Bank Governors," July 20, 2013, available at <http://www.g20.utoronto.ca/2013/2013-0720-finance.html>.

- 59 For further information on the results of this peer-review and recommendation to strengthen the program, see Pete Ogden and Howard Marano, "The First G-20 Fossil Fuel Subsidy Peer Review: Insights and Lessons from the United States and China" (Washington: Center for American Progress 2016), available at <https://www.americanprogress.org/issues/green/reports/2016/10/26/290986/the-first-g-20-fossil-fuel-subsidy-peer-review/>.
- 60 Pete Ogden and Ben Bovarnick, "Making Subsidy Reform Stick," Center for American Progress, March 12, 2015, available at <https://www.americanprogress.org/issues/green/news/2015/03/12/108382/making-subsidy-reform-stick/>; Ogden and Marano, "The First G-20 Fossil Fuel Subsidy Peer Review."
- 61 The Energy Sector Management Assistance Program is a program that "provides analytical and advisory services to countries to achieve environmentally sustainable energy solutions to achieve environmentally sustainable energy solutions for poverty reduction and economic growth." For further information on the program see: The Energy Sector Management Assistance Program, "Overview," available at <https://www.esmap.org/overview> (last accessed December 2016).
- 62 Ogden and Bovarnick, "Making Subsidy Reform Stick."
- 63 International Energy Agency, "Fossil Fuel Subsidy Reform in Mexico and Indonesia" (2016), available at https://www.iea.org/publications/freepublications/publication/PartnerCountrySeriesFossil_Fuel_Subsidy_Reform_Mexico_Indonesia_2016_WEB.pdf.
- 64 Shelagh Whitley and Laurie van der Burg, "Fossil Fuel Subsidy Reform: From Rhetoric to Reality" (Washington: The Global Commission on the Economy and Climate, 2015), available at <http://newclimateeconomy.report/2015/wp-content/uploads/sites/3/2015/11/Fossil-fuel-subsidy-reform-from-rhetoric-to-reality.pdf>.
- 65 Rimawan Pradiptyo and others, "Financing Development with Fossil Fuel Subsidies: The Reallocation of Indonesia's Gasoline and Diesel Subsidies in 2015," (Winnipeg: International Institute for Sustainable Development, 2016), available at <https://www.iisd.org/sites/default/files/publications/financing-development-with-fossil-fuel-subsidies-indonesia.pdf>.
- 66 G-7, "G-7 Ise-Shima Leaders' Declaration," May 27, 2016, available at <http://www.mofa.go.jp/files/000160266.pdf> (last accessed December 2016).
- 67 G20 Information Centre, "G20 Growth Strategy, 2016 Hangzhou Summit, Published on September 26, 2016," available at <http://www.g20.utoronto.ca/2016/growth-strategies.html> (last accessed December 2016).
- 68 United Nations, "Adoption of the Paris Agreement" (2015), available at <https://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>.
- 69 United Nations Framework Convention on Climate Change, "Communication of long-term strategies," available at http://unfccc.int/focus/long-term_strategies/items/9971.php (last accessed December 2016).
- 70 Intergovernmental Panel on Climate Change, "Climate Change 2014: Impacts, Adaptation, and Vulnerability: Summary for Policymakers" (2014), available at http://ipcc-wg2.gov/AR5/images/uploads/WG2AR5_SPM_FINAL.pdf.
- 71 Organisation for Economic Co-operation and Development, "The Role of Government in Making Infrastructure Investment Climate Resilient: Draft Survey of Current Practices" (2016), available at [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/EPOC/WPCID\(2016\)2&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/EPOC/WPCID(2016)2&docLanguage=En).
- 72 Multihazard Mitigation Council, "Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities, Volume 1 – Findings, Conclusions and Recommendations," (2005), available at http://www.floods.org/PDF/MMC_Volume1_Finding-ConclusionRecommendations.pdf.
- 73 Rothballer, Lam-Frendo, and Kim, "Strategic Infrastructure"; The Global Commission on the Economy and Climate, "The Sustainable Infrastructure Imperative."
- 74 United Nations Environment Programme, "The Adaptation Gap Finance Report" (2016), available at <http://web.unep.org/adaptationgapreport/sites/unep.org/adaptationgapreport/files/documents/agr2016.pdf>.
- 75 Ibid.
- 76 Pete Ogden and Gwynne Taraska, "Opportunities for the Next Executive Director of the Green Climate Fund," Center for American Progress, October 3, 2016, available at <https://www.americanprogress.org/issues/green/reports/2016/10/03/145132/opportunities-for-the-next-executive-director-of-the-green-climate-fund/>.
- 77 For previous Center for American Progress work on climate-risk insurance, see Pete Ogden, Jerusalem Demas, and Ben Bovarnick, "Bridging the Risk Modeling Gap: Expanding Climate-Related Risk Insurance Through Global Risk Assessment" (Washington: Center for American Progress, 2016), available at <https://www.americanprogress.org/issues/green/reports/2016/08/10/142547/bridging-the-risk-modeling-gap/>; Pete Ogden, Ben Bovarnick, and Yume Hoshijima, "Key Principles for Climate-Related Risk Insurance" (Washington: Center for American Progress, 2016), available at <https://www.americanprogress.org/issues/green/reports/2015/08/28/120162/key-principles-for-climate-related-risk-insurance/>; Pete Ogden and Ben Bovarnick, "Harnessing Insurance Markets to Enhance Climate Resilience," Center for American Progress, June 10, 2015, available at <https://www.americanprogress.org/issues/green/news/2015/06/10/114820/harnessing-insurance-markets-to-enhance-climate-resilience/>.
- 78 Munich RE, "The earth's 'hotting up'."
- 79 Swiss RE, "Disaster risk financing: Smart solutions for the public sector" (2015), available at http://media.swissre.com/documents/Closing_the_Gap_2015_FINAL.pdf.
- 80 Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH and KfW Development Bank, "Climate Risk Insurance for Strengthening Climate Resilience of Poor People in Vulnerable Countries" (2015), available at http://www.climate-insurance.org/fileadmin/mcii/pdf/G7_Climate-Risk-Insurance_Background-Paper.pdf.
- 81 Guillermo Perry, *Beyond Lending: How Multilateral Banks Can Help Developing Countries Manage Volatility* (Baltimore: Brookings Institution Press, 2009), available at <http://www.cgdev.org/publication/9781933286327-beyond-lending-how-multilateral-banks-can-help-developing-countries-manage-volatility>.
- 82 Ogden, Bovarnick, and Hoshijima, "Key Principles for Climate-Related Risk Insurance."
- 83 Ogden, Demas, and Bovarnick, "Bridging the Risk Modeling Gap."
- 84 The White House, "G-7 Leaders' Declaration," Press release, June 8, 2015, available at <https://www.whitehouse.gov/the-press-office/2015/06/08/g-7-leaders-declaration>.

- 85 Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH and KfW Development Bank, "Climate Risk Insurance for Strengthening Climate Resilience of Poor People in Vulnerable Countries."
- 86 Ogden, Demas, and Bovarnick, "Bridging the Risk Modeling Gap."
- 87 Insurance Journal, "Re/Insurance CEOs Join Insurance Development Forum, UN & World Bank Initiative," May 17, 2016, available at <http://www.insurancejournal.com/news/international/2016/05/17/408771.htm>.
- 88 Alison Cassady and Gwynne Taraska, "Proxy Carbon Pricing: A Tool for Fiscally Rational and Climate-Compatible Governance" (Washington: Center for American Progress, 2016), available at <https://cdn.americanprogress.org/wp-content/uploads/2016/04/13143140/CarbonPricing.pdf>.
- 89 In the United States, for example, see U.S. Environmental Protection Agency, "The Social Cost of Carbon," available at <http://www3.epa.gov/climatechange/EPAactivities/economics/scr.html> (last accessed December 2016). See also Interagency Working Group on Social Cost of Carbon, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (2010), available at <https://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf>.
- 90 Gwynne Taraska and Ori Gutin, "The Potential of Proxy Carbon Pricing in International Development Finance" (Washington: Center for American Progress, 2016), available at <https://www.americanprogress.org/issues/green/reports/2016/05/25/138123/the-potential-of-proxy-carbon-pricing-in-international-development-finance/>.
- 91 Ibid.
- 92 The World Bank Group, "World Bank Group's Role in PPPs."
- 93 Heinrich Böll Foundation and Latindadd, "Infrastructure: for people or for profit? The crucial role of responsible democratic governance" (2014), available at <https://us.boell.org/sites/default/files/infrastructure-final.pdf>; International Monetary Fund, "World Economic Outlook October 2014: Legacies, Clouds, Uncertainties" (2014), available at <http://www.imf.org/external/pubs/ft/weo/2014/02/pdf/text.pdf>.
- 94 For example, according to the IMF, 55 percent of PPPs end up being renegotiated—every other year, on average. Maximilien Queyranne, "Managing Fiscal Risks from Public-Private Partnerships (PPPs)" (Washington: International Monetary Fund, 2014), available at http://www.imf.org/external/np/seminars/eng/2014/cmr/pdf/Queyranne_ENG.pdf.
- 95 Müller, "Harnessing Private Finance to Attain Public Policy Goals." Demonstrating the risk to public finances posed by poorly managed PPPs, as of 2014, a health care public-private partnership project was using over half of Lesotho's health budget due to unplanned escalating costs. Oxfam International, "A Dangerous Diversion: Will the IFC's flagship health PPP bankrupt Lesotho's Ministry of Health" (2014), available at <https://www.oxfam.org/sites/www.oxfam.org/files/bn-dangerous-diversion-lesotho-health-ppp-070414-en.pdf>.
- 96 Nancy Alexander, "Is the boom in megaprojects sustainable," World Economic Forum, July 13, 2015, available at <https://www.weforum.org/agenda/2015/07/is-the-boom-in-megaprojects-sustainable/>.
- 97 See Bent Flyvbjerg, "What You Should Know About Megaprojects and Why: An Overview," *Project Management Journal* 45 (2) (2014): 6-19, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2424835.
- 98 Duncan Green, "Not So Mega? The Risky Business of Large Scale Public-private Partnerships in African Agriculture," Oxfam International, September 16 2014, available at <https://oxfamblogs.org/fp2p/not-so-mega-the-risky-business-of-large-scale-public-private-partnerships-in-african-agriculture/>. For example, an agricultural project in the Bagamoyo district of Tanzania is being opposed by rural communities because over 1,000 people will lose some or all of their land and their homes as a result of the project. Oxfam International "Delivering sustainable development: A principled approach to public-private finance" (2015), available at https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/dp-delivering-sustainable-development-public-private-100415-en.pdf.
- 99 United Nations Office of the Special Adviser on Africa, "Financing Africa's Infrastructure Development" (2015), available at http://www.un.org/en/africa/osaa/pdf/policybriefs/2015_financing_infrastructure.pdf; United Nations Development Policy and Analysis Division, "Least Developed Country Category: 2015 Snapshots," available at http://www.un.org/en/development/desa/policy/cdp/cdp_ldcs_countryfacts.shtml (last accessed December 2016).
- 100 Heinrich Böll Foundation and Latindadd, "Infrastructure: for people or for profit?"
- 101 Organisation for Economic Co-operation and Development, "Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships" (2012), available at <https://www.oecd.org/governance/budgeting/PPP-Recommendation.pdf>.
- 102 Bretton Woods Project, "World Bank approves new 'diluted' safeguards," September 23, 2016, available at <http://www.brettonwoodsproject.org/2016/09/world-bank-approves-new-diluted-safeguards/> (last accessed December 2016).
- 103 International Monetary Fund, "PPP Fiscal Risk Assessment Model (PFRAM)," available at <https://www.imf.org/external/np/fad/publicinvestment/pdf/PFRAM.pdf> (last accessed December 2016).
- 104 Nancy Alexander and Aldo Caliarì, "Some Highlights of the 2016 China-led G-20 Summit," Heinrich Böll Foundation, September 13, 2016, available at https://us.boell.org/sites/default/files/uploads/2016/09/na-ca_g20-final.pdf.
- 105 Ehtishma Ahmad and others, "Involving the Private Sector and PPPs in Financing Public Investments: Some opportunities and challenges" (2014), available at http://www.lse.ac.uk/asiaResearchCentre/_files/ARCWP67-AhmadBhattacharyaVinellaXiao.pdf.

Our Mission

The Center for American Progress is an independent, nonpartisan policy institute that is dedicated to improving the lives of all Americans, through bold, progressive ideas, as well as strong leadership and concerted action. Our aim is not just to change the conversation, but to change the country.

Our Values

As progressives, we believe America should be a land of boundless opportunity, where people can climb the ladder of economic mobility. We believe we owe it to future generations to protect the planet and promote peace and shared global prosperity.

And we believe an effective government can earn the trust of the American people, champion the common good over narrow self-interest, and harness the strength of our diversity.

Our Approach

We develop new policy ideas, challenge the media to cover the issues that truly matter, and shape the national debate. With policy teams in major issue areas, American Progress can think creatively at the cross-section of traditional boundaries to develop ideas for policymakers that lead to real change. By employing an extensive communications and outreach effort that we adapt to a rapidly changing media landscape, we move our ideas aggressively in the national policy debate.

