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China's leadership in fostering and financing infrastructure investment for a sustainable and dynamic future

Nicholas Stern, Isabella Neuweg and Patrick Curran

Policy insight

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About the authors and acknowledgements

Nicholas Stern is IG Patel Professor of Economics and Government at the London School of Economics and Political Science, and President of the British Academy. **Isabella Neuweg** and **Patrick Curran** are both policy analysts and research advisers to Professor Stern at the Grantham Research Institute.

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Executive summary

Severe stresses following seven decades of achievement are being addressed by a new global agenda

Since the mid-1940s the world has seen unprecedented advances on key dimensions of income, life expectancy and education. But severe structural and environmental issues are seriously threatening these achievements. For further progress on economic growth, development, poverty reduction and inequality to happen, global and local environmental challenges must be tackled at the same time. The recognition that these objectives are interwoven and complementary has been a driving force behind the new global agenda agreed in the last three years, including the Addis Ababa Action Agenda, the Sustainable Development Goals (SDGs), and the Paris Climate Change Agreement – in which China is taking an active leadership role. Sustainable infrastructure lies at the heart of this agenda. It will drive both growth and the low-carbon transition, while being essential for achieving almost all of the SDGs.

To delay action would be deeply dangerous

Change has to occur rapidly and across all sectors, including the design and organisation of cities, the structure of energy systems, increasing energy productivity and the management of land and oceans. There is an uncomfortably narrow window of opportunity for making the choices that will bring strong and sustainable growth and a cleaner, more socially cohesive living environment, because investment, particularly in infrastructure, can lock in capital, technology and patterns of pollution and emissions for decades. China is showing recognition of and action on these issues.

China is entering a new phase of slower but more sustainable growth

Economic advances in China over the last four decades have been truly remarkable but at the expense of its own environment and the global climate, with dangerous levels of air pollution, for example, at home, and the country becoming the world's largest emitter of greenhouse gases. Now, China is moving to a different phase of growth and change as wages rise, its productivity moves closer to that of rich countries, and the service sector grows as manufacturing declines. As this occurs, China's ambition is to steer its pattern of development in a much more sustainable direction, while maintaining a robust, albeit slower, rate of GDP growth – demonstrating global leadership in the process.

Managing this transition will require clear direction and intervention to scale back investments in polluting industrial sectors, along with the ramp-up of China's low-carbon industry, including decarbonisation of its power network through investment in sustainable infrastructure and support for private sector investment. A strong commitment to climate and environmental actions form fundamental principles of China's 13th Five-Year Plan. It is dedicating substantial resources to the transition out of coal and towards domestic renewable energy, and is becoming a leader in the manufacture of renewable energy components. New technologies and better design, including of cities, will enable China in the future to reduce congestion, waste, pollution, greenhouse gas emissions, and other negative environmental impacts from production and consumption.

China's experience provides lessons for both developed and developing countries

China's experience from its rapid growth, and in showing how sustainable infrastructure can lead future growth and investment, is of outstanding importance for the rest of the world. The lessons learned can be communicated and shared through China's growing influence in existing

multilateral institutions, and its actions to foster new development banks, with the aim of helping fellow developing countries to avoid the same path of severe environmental stresses. The lessons reach to developed countries, too, which face the urgent tasks of having to replace old, polluting and inefficient capital with new, clean and efficient capital, ensuring new investment is smart and at the frontiers of technology, and pushing out that frontier – problems that China is tackling.

China is fostering growth through sustainable infrastructure across the world

Over the last few years, China's investment in infrastructure has been at the rate of about 12% of GDP, more than all developed countries put together and more than all other developing countries put together. China also builds and finances more infrastructure in other developing countries than all multilateral development banks and countries of the Organisation for Economic Co-Operation and Development (OECD) combined. Its actions provide the opportunity to foster sustainable infrastructure and low-carbon development across the world.

The delivery of sustainable infrastructure requires a clear, stable and credible policy direction for its investors, and the harnessing of development finance and private capital. China has extensive experience in these fields. The country saves and invests more than the European Union and United States combined. It has the entrepreneurial capacity and financial strength to become the largest capital exporter in the world and has been building and financing infrastructure across the world at a scale that is unmatched. And it has created new multilateral development banks (MDBs) with great potential to lead the transformation of the world's infrastructure.

MDBs can and should play a central role on the finance side through risk reduction and risk management. Providing help to long-term institutional investors in getting through the early stages effectively can produce assets that are very attractive. Good development banking is profitable – and such banks help with policy. China's participation is strong in new banks including the Asian Infrastructure Investment Bank, New Development Bank and other vehicles such as the Silk Road Fund, which can offer real leadership and increasing scale. China can also play a crucial role in guiding existing MDBs to deliver on and scale up investment in sustainable infrastructure – an urgent requirement for achieving the necessary pace and scale of the economic transformation.

China shows leadership beyond financial investment

China has the potential to mobilise large sums of capital for a new global growth model, within China and around the world. And it showed its leadership in 2016 in the G20, especially around green finance. This story is about more than capital, investment and finance, however. China has joined, adhered to, benefited from and become an advocate for the World Trade Organization and is a champion of international trade and openness. And China has begun to lead the world on climate not only through its actions at home but also in playing a key role in creating, bringing into force and carrying forward the Paris Agreement. Its announcements in November 2014 in Beijing of its Paris targets alongside the US, and the ratification of the agreement at its G20 summit in 2016, again alongside the US, were vital in creating and maintaining momentum and commitment across the world.

President Xi Jinping's speech in Davos on 17 January 2017 set out a vision of an integrated, open and collaborative world, finally making China's global leadership role explicit and recognised.

1. Introduction: global achievements, fragilities and the emergence of a new agenda

The past 70 years have brought extraordinary global achievement but the world faces severe stresses in the form of deep poverty and inequality, and environmental degradation. The global community has a new ambitious and shared agenda and real opportunity to rise to the challenges but the window of opportunity is narrow: there is great urgency to act now.

In this paper, we consider China's role in these challenges, outlining how China's own action and its leadership in fostering sustainable development globally can create great advances and opportunities for China and the wider world in an era in which the country has emerged as a global leader. First, in this introduction, we set out the global context, before reviewing the lessons that can be learned from China's past paths and patterns of development.

Seventy years of extraordinary global achievement

Seventy years ago, after two world wars and a great depression, the world was working together to create a global agenda to replace confrontation, 'closedness', fragility and conflict with collaboration, openness, security and peace. This process saw the establishment of the United Nations, the Universal Declaration of Human Rights and the Bretton Woods institutions – the International Monetary Fund, World Bank and World Trade Organization. Notwithstanding the cold war, much of that agenda was delivered, through those institutions and others.

Economic and social progress since the mid-1940s has been remarkable: the global economy has grown by a factor of six, with income per capita trebling, and the world population has doubled (Kose and Ozturk, 2014). Globally, average life expectancy rose from 45 years in 1950 to 71 years in 2013 (World Health Organization, 2015; Riley, 2005) and the adult literacy rate increased from 36 to 84 per cent over the same period. Many of the UN's Millennium Development Goals have been achieved. Indeed, the headline target of reducing extreme poverty by half between 1990 and 2015 was reached five years ahead of schedule (United Nations Development Programme, 2016), largely because of developments in China.

Severe stresses remain – including major pressure on the natural environment

While these achievements are to be celebrated, they should not obscure the many underlying problems and stresses in the structure of the global economy and society. Within-country inequality increased over much of the last 70 year period, peaking between 1990 and 2010 (Kose and Ozturk, 2014). In the last few decades, the share of income and wealth concentrated among the very highest earners has climbed in many advanced and emerging market economies (Keeley, 2015). Deep poverty has declined in many middle- and low-income countries but remains a severe, persistent and widespread problem. The global financial crises in and following 2008 further served to illustrate fundamental fragilities.

The development and growth of the global economy over these seven decades has been built on the back of the extraction and exploitation of natural resources and has inflicted severe damage on the natural environment. The consumption of energy, a key aspect of rising living standards in this period, has increased more than threefold since the 1950s, driven primarily by the use of fossil fuels

for electricity, industrial activities and transportation (Kose and Ozturk, 2014). Annual greenhouse gas emissions have risen correspondingly (Committee on Climate Change, 2016), putting the world at severe risk from climate change – a risk that has the potential to reverse many of the advances in economic and social development.

The degradation of natural systems, including local air quality, forests, oceans, rivers and soil, threatens the resilience of countries and communities to cope with the impacts of climate change. Within China itself, coastal areas face rising sea levels and the potential of severe damage, particularly to infrastructure, from storms and typhoons (Hilton, quoted in Buckley, 2015), and the country's water resources, already under stress, are likely to come under further pressure still (Chinese Ministry of Science and Technology, quoted in Buckley, 2015).

A new global agenda is taking shape

Global and local environmental challenges are intertwined with the agenda for fostering economic growth, development and poverty reduction (Fankhauser and Stern, 2016), and managing climate change and overcoming poverty will be the twin challenges that define the 21st century. The determination to tackle these issues has become the driving force behind this new global agenda, and 2015 and 2016 will be remembered for historic landmark international agreements, targeting the diverse but related areas of:

- Development finance (Addis Ababa Action Agenda on Financing for Development)
- Development goals (2030 Agenda for Sustainable Development)
- Climate change (Paris Agreement, Kigali Amendment to the Montreal Protocol, Marrakech Action Proclamation for Our Climate and Sustainable Development)
- Urbanisation (New Urban Agenda)

Together, these agreements provide the world with the first truly shared global agenda that has sustainable infrastructure at its heart. They involved almost 200 countries, without any one country dominating. In contrast, only 44 countries participated in the Bretton Woods Conference in 1944, at which point much of the world was colonised and the United States was clearly dominant. The creation of the new global agenda is remarkable not only because it was agreed by all and applies to all: it is also founded on the ability to look ahead at the potential for damage or risk, rather than simply responding to devastating past experience of the consequences of the inability to collaborate.

Urgent change is needed for the Paris targets to be met

The window of opportunity for making the right choices is uncomfortably narrow because investment in 'bad' infrastructure can lock in capital and technology – and therefore emissions – for decades. If the current pledges under the Paris Agreement, known as 'nationally determined contributions' (NDCs), are implemented, annual emissions of greenhouse gases will be between 55 and 60 gigatonnes of carbon-dioxide-equivalent ($GtCO_2e$) in 2030 (United Nations Environment Programme [UNEP], 2016). While this range represents a substantial cut compared with plausible business-as-usual scenarios, a path that follows these plans would imply that annual emissions would not decline, and may even rise by 10 per cent or more, over the next 15 years or so. The Paris Agreement set a goal of 'holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels' (United Nations Framework Convention on Climate Change [UNFCCC], 2015a).

Analyses show that annual emissions would need to be about 20 per cent lower in 2030 compared with current levels to have a greater than 66 per cent chance of limiting the rise in global mean surface temperature to less than 2°C compared with pre-industrial levels (taken as the average temperature during the second half of the 19th century); these calculations rely on the assumption that global net negative emissions in the second half of the century can be achieved (UNEP, 2016).

Delay is dangerous. Limiting the rise in temperature to the goal set in the Paris Agreement will require immediate action across the whole global economy as the remaining carbon budget is shrinking rapidly. It is cumulative emissions that matter, so if the world is slow to cut emissions in the short term, it will have to reduce them more quickly later. Any further delays in decisive action will increase the reliance on unproven future technologies to generate so-called 'negative' emissions in order to stay within the carbon budget. It is already clear that limiting the temperature increase will require net annual emissions to reach zero in the second half of the century. This in turn would require complete decarbonisation of the power generation sector and extending electrification as far as possible in other sectors, including heating and transport (Energy Transitions Commission, 2017). Sectors that are not easily electrified would require the use of carbon capture and storage (CCS) technologies. Negative emissions may be possible by combining bioenergy and CCS (ibid), but the potential cost and scale are unclear.

Today's investment decisions will determine the nature of the low-carbon transition

If the world's economy continues to grow by between 3 and 4 per cent per annum (International Monetary Fund, 2017), global gross domestic product (GDP) will roughly double over the next 20 years or so. This will be accompanied by a greater than twofold increase in infrastructure. If this doubling in the next two decades looks anything like the replication of the current economic structures, then any chance of holding the temperature increase to a maximum 2°C will be remote. It would lock in high-carbon structures precisely at the time when emissions must fall, all the while perpetuating pollution and congestion and creating severe barriers to poverty reduction.

The alternative is that the world uses the opportunity of the large investments necessary for growth and urbanisation to choose a path that reduces emissions, increases resilience, creates clean and productive cities, and fosters robust and supportive ecosystems, while driving growth, development and poverty reduction – critical for almost all the Sustainable Development Goals (SDGs), too. That alternative is surely very attractive.

Sustainable infrastructure must be at the heart of the new agenda

Meeting the world's development needs will require an average investment in infrastructure of US$4–6 trillion every year for the next 20 years, with 70 per cent of that in low- and middle-income countries (Bhattacharya et al., 2015 and 2016). Wise investment in infrastructure will create opportunities to both boost growth and meet development priorities. Emerging economies, particularly China and India, will be the most important drivers of the trends in economic growth and emissions in the coming decades (ibid). Evidence from the United States and Europe has shown that it is possible to decouple economic growth from emissions. The UK economy, for example, has grown by around 60 per cent since 1990 while emissions have fallen by around 40 per cent. With purposive and effective action elsewhere, particularly in China, the global growth rate of emissions is falling. Indeed, global carbon dioxide emissions related to energy were virtually unchanged between 2013 and 2015, while the annual growth rate for global GDP was more than 3 per cent in

both 2014 and 2015 (International Energy Agency [IEA], 2016a). But, and here we must be clear, to meet the Paris targets, the world must go far beyond a gradual reduction: emissions must fall greatly.

Sustainable infrastructure is at the core of meeting the global challenges. It is essential for an effective acceleration of the transition to low-carbon growth and for meeting the SDGs. Further, there is now a great opportunity to scale up action because there are three mutually reinforcing factors working in the world's favour. First, interest rates are at an historical low and there are excess savings relative to planned investment, as well as investors who are seeking assets that offer stable, low-risk returns. Second, technology is changing rapidly, driven by digital innovation, new materials and advances in biotechnology. And third, the agreements of 2015 and 2016 point to clear political direction and evidence that global collaboration is possible.

If the world responds effectively to these challenges, the prize is strong and sustainable growth, cities in which we can move and breathe, ecosystems that are robust and supportive, and societies that are more inclusive and cohesive (see New Climate Economy, 2014 and 2016; Bhattacharya et al., 2016).

2. Looking forward and looking back: lessons from China

Over the last four decades China has undergone rapid economic expansion, as well as industrial and urban transformation. Between 2000 and 2013, China's economic strategy was characterised by an acceleration in capital investment in real estate, infrastructure, energy-intensive manufacturing (for example, steel, cement, glass and aluminium), and coal-fired electricity generation (Averchenkova et al., 2016). By 2013, roughly half of the world's coal, steel and cement production took place in China (Green and Stern, 2016), largely in state-owned enterprises (SOEs).

However, China's strategy has been changing radically over the last few years, the country moving into a different phase of growth and change. China is reaching a Lewis turning point (Green and Stern, 2016) – at which cheap labour supplied from the agricultural to the manufacturing sector dwindles and wages begin to rise; its productivity continues to move closer to that seen in rich countries; and the service sector is growing while manufacturing is declining proportionally. For these reasons, China's overall economic growth rate, conventionally measured through GDP, will also slow. However, its pattern of development can be steered in a much more productive, clean and sustainable direction than has been seen previously, while maintaining a growth rate that remains robust – which is China's ambition.

Past socioeconomic advances and environmental stresses present key lessons for China and beyond

Investment in infrastructure has been a core driver of China's past growth, and a key feature of the stimuli used after the Asian financial crisis of 1997 and the global slowdown following the financial crisis of 2008. Financing for infrastructure has been provided predominantly by the state at all levels, accounting for 85 per cent of total investment in 2012 (Wilkins and Zurawski, 2014). These investments have contributed significantly to China's economic and social development. For example, nearly 76 per cent of the population now has access to sanitation facilities, compared

with just 47 per cent in 1990 (World Bank, 2017a); virtually all of the population now has access to electricity (World Bank, 2017b); and the road network has expanded by over four times since 1990 (Wilkins and Zurawski, 2014).

While there have been many remarkable achievements, stresses on the environment have been extensive. At the local level one of the most widely impacting and malign consequences continues to be exposure to dangerous levels of air pollution. This arises from growing vehicle use in urban areas, coal usage at industrial facilities without appropriate abatement technologies, domestic burning of low-grade coal, and dust from construction activities. Rohde and Muller (2015) estimate that breathing in very fine particulate matter measuring less than 2.5 micrometres in diameter (PM 2.5) alone contributes to 1.6 million premature deaths a year in China. Other environmental pollutants that have serious local health consequences include sulphur dioxide and nitrous oxide emissions from vehicle and industry (Hao and Wang, 2005; Smith et al., 2011), nitrates leaching into groundwater from inefficient or careless application of fertilizers (Gu et al., 2013), and solid waste in cities (Wang & Nie, 2001). On a global scale, China now emits more greenhouse gases than any other country in the world (World Resources Institute, 2015).

In some cases the scale and pace of investment, combined with weaknesses in management, have led to unproductive, low-quality assets (Ansar et al., 2016). Debt burdens at the city level have grown, making some of these investments financially precarious (ibid). In some sectors or activities there is significant overcapacity: for example, some coal-fired electricity plants operate at less than 50 per cent of their potential capacity (Gray, 2016). All of this serves to underline the importance of careful strategic planning and delivery, and effective financial systems.

A new path of sustainable growth and global leadership is setting the bar

Supporting investment in sustainable infrastructure in its domestic economy is at the core of both China's own transition and development, and its contribution as a leader on the world stage. At home, the strong commitment to integrate climate and environmental concerns within development plans can be seen through their inclusion as fundamental principles in the 13th Five-Year Plan. The plan outlines a range of policy options to tackle these challenges. China is also taking an active leadership role in global climate change negotiations with the commitment in its nationally determined contribution[1] to the Paris Agreement helping to foster the collaboration and participation of other countries. The big task now on the world stage, including for China, is to implement the pledges.

The strong commitment to climate and environmental action is also evident in the Chinese government's ongoing policy statements, including those made at the 22nd UN Framework Convention on Climate Change conference of the parties (COP 22) in Marrakech in November 2016, and in President Xi Jinping's landmark speech at Davos in January 2017.

Chinese progress towards the low-carbon transition at home and beyond

The transition to low-carbon growth will require twin strategies: first, clear directions and interventions that result in the scaling back of investments in polluting industrial sectors (so-called 'brown' industry). Allocations of capital and labour to these sectors should be drastically reduced or

[1] China's nationally determined contribution aims to 'peak its carbon dioxide emissions by around 2030 and to make best efforts to peak earlier; to reduce the carbon intensity of GDP 60–65% below 2005 levels by 2030; and to meet 20% of total primary energy consumption from sources other than fossil fuels by 2030' (UNFCCC, 2015b).

avoided altogether, while also managing the economic and social dislocation that will occur during the transition. Second, low-carbon ('green') industry and decarbonisation of the power network need to be ramped up through targeted investment in sustainable infrastructure and support for private sector investment. These two processes are intertwined but will require different policy interventions: the former means a strong and direct role for the state; the latter requires policy to create both the enabling framework for investment decisions and a strong financial framework, including development banks, to generate the right scale and form of finance.

China is already embracing many of the opportunities associated with this promising new approach to growth. The country is making the largest investments in domestic renewable energy in the world (IEA, 2016c), and is leading in the manufacture of renewable energy components for wind, solar and lithium-ion battery technologies (Buckley, 2017). It is also raising and attracting finance for the transition, with the largest issuance of green bonds in 2016, of US$36.2 billion, and the potential to access a further US$230 billion over the next five years (Climate Bonds, 2016). This progress will be complemented by the launch of China's national emissions trading system in 2017, which will become the world's largest such scheme. If carbon price levels are high enough, strong further impetus will be added to the low-carbon transition.

China is increasingly influencing developments across Southeast Asia and beyond in relation to climate action and sustainability. The rapid growth in domestic installation has, through economies of scale, lowered renewable energy costs for other countries. China is also increasing its spending abroad: in 2016 it invested a record US$32 billion in renewable projects in other countries, including 11 new deals worth more than US$1 billion each (Buckley, 2017).

With all these actions, China has undoubtedly become a leader in the nascent green transition and is well positioned to capitalise on and drive the needed expansion both at home and abroad. At the same time, there will continue to be local and global challenges. These include how China should make the transition away from its old growth model at home, towards a low-carbon economy, while managing the potential social and economic consequences that could result. The shift will have social and distributional impacts for the large labour force currently employed in Chinese coalmines and steel factories, estimated to be about 12 million workers in total, according to the National Bureau of Statistics (Reuters, 2016). The wellbeing of these workers – even though they represent but a small fraction of the overall workforce – must be regarded as important, especially as the affected jobs and industries are disproportionately concentrated in areas of China where incomes tend to be lower (The Economist, 2016).

The affected companies are also more likely to be state-owned enterprises, including fossil-fuel producers, fossil-fuel-based utilities and energy-intensive manufacturers. By contrast, private companies predominate in the renewable energy sector, particularly in the wind and solar industries (Green and Stern, 2016). Consequently, polluting industries enjoy not only greater operational privileges (such as subsidised capital and land, and preferential supply arrangements), which affect climate policy implementation, but also they may have greater access to the political process than those shaping low-carbon industries. Officials and SOEs from coal-producing regions that will be significantly affected by government reforms to cut excess coal capacity are understandably lobbying to mitigate the impacts on them (Hornby, 2016).

Managing the challenges

The difficulties of implementing a shift towards a clean growth model, in the face of vested interests and the social implications of the transition, can be managed in part by strengthening institutions and social security measures, particularly in those parts of the country that will be disproportionately impacted. While China has already committed up to RMB 100 billion (US$15 billion) to cover the significant job losses expected in the steel and coal industries, such resources can be complemented through increased investment in social security, healthcare and education, as well as by offering opportunities outside these sectors.

China has identified key opportunities to integrate sustainability into its infrastructure needs and planned investments into clean energy, cleaner industrial processes, low-carbon agricultural practices and so on, including in urban transport, energy transmission systems and communication. New technologies and better design, including of cities, can be used to leverage these investments to limit congestion, waste and resource impacts while also reducing pollution, greenhouse gas emissions and other environmental damages from production and consumption. Clean infrastructure investments will provide many local economic, social and environmental benefits and attractions, from energy security to reduced traffic congestion to protection of the natural environment (e.g. Stern, 2015; New Climate Economy, 2014, 2016; Dowling and Russ, 2012). The challenge now is to implement and ramp up these measures.

Sharing lessons learned with both developing and developed countries

Most developing countries are facing challenges and choices similar to those in China about how to integrate economic growth and sustainability. Importantly, it is now increasingly recognised that rather than being mutually exclusive options, they are fundamentally intertwined. China's story is already demonstrating this and the insight is embodied in the global agenda.

China's example and its sharing of experience will be crucial. If India, for example, were to follow the same growth path that China pursued in the past, it could, in two decades' time, reach similar levels of per capita income and greenhouse gas emissions to China now – reducing the chance for the world community to meet the Paris targets to remote. The lessons that China has learned through its rapid transition are thus extremely valuable and they must be communicated and shared with other developing countries to support sustainable development in those countries and help them avoid the severe environmental stresses that China has experienced. China's growing influence in existing multilateral institutions, and its actions to foster new development banks, provide a key opportunity both to share experience and to show what is possible (see Chapter 3 below).

The lessons are not just for developing countries. Developed countries also face urgent tasks: replacing the old, polluting and inefficient capital with capital that is new, clean and efficient; ensuring new investment is smart and at the frontier of technology, and pushing out that frontier. With almost four decades of rapid growth and investment behind it, China is facing and tackling these problems.

For all countries, low-carbon growth is the growth story of the future – via sustainable infrastructure demand in the short run, and innovation and creativity in the medium run – because high-carbon growth in the longer run is simply not feasible due to the brutally hostile environment it would create.

3. China's role in fostering growth through sustainable infrastructure across the world

Over the last few years, China's investment in infrastructure has been at the rate of about 12 per cent of GDP, for developed countries around 3 per cent and for other developing countries, 5 to 6 per cent; China has been investing more in infrastructure than all developed countries put together and more than all other developing countries put together (see Bhattacharya et al., 2016). China also builds and finances more infrastructure in other developing countries than all multilateral development banks and member countries of the Organisation for Economic Co-operation and Development (OECD) combined (ibid). China's own example and active financing role, creation of new development banks, its One Belt, One Road (OBOR) economic and diplomatic programme, and its role within the G20 provide the opportunity to foster sustainable infrastructure and low-carbon development across the world.

The delivery of sustainable infrastructure requires two key elements. First, a clear, stable and credible policy direction for its investors. Second, harnessing development finance and private capital to finance the transition at city, provincial, national and global levels. Such finance must help investors get through the difficult early stages and will require a range of instruments.

China can lead by encouraging its own ramp-up of low-carbon activities and ambition, while ensuring they are well integrated with sustainable development investments and objectives. In particular, it can offer clear, stable and credible policy direction to invest in sustainable infrastructure and can harness development finance and private capital to deliver the transition at city, provincial, national and global levels. China can build on its extensive experience of using public–private sector partnerships effectively and of providing a sound enabling framework for investments through clear policy directions. In so doing, it can encourage other countries to do the same.

Public policy plays an essential role in enabling investment and overcoming challenges

Infrastructure investments are typically complex, including many parties, financers and risks. They are also particularly vulnerable to policy and political risks. They often require appropriate regulations to govern construction, operation and returns as they can involve natural monopolies in areas such as transport, water and power distribution. Investments usually depend on specific circumstances and the risks are difficult to insure. And while the indirect externalities and social benefits may be large, they are difficult to measure. Consequently, markets alone cannot provide effective infrastructure services and private investments often cannot be realised without some form of public involvement or support.

Public policy is an important enabler for infrastructure – both through direct investments in the public sector and by establishing the necessary investment framework that can encourage private sector involvement as well as support from development banks, national and multilateral. Public policy, in the form of a stable and predictable policy and regulatory environment, can provide the framework needed for private investors in light of the inherent barriers to infrastructure investments arising from their size and long-term nature. Government, in particular, can alleviate some of the risk during the early stages of infrastructure projects. Nevertheless, alongside private

capital, direct public investments will continue to play an important role for rural roads and water management.

Public policy is also central to ensuring investments are directed to *sustainable* infrastructure. Public policies can create the incentives that orient investors towards sustainable projects instead of ones that are high-carbon and less climate-resilient. They can include carbon pricing, standards or regulations, procurement, and the creation of effective markets in low-carbon goods and services. But public policy inevitably entails some real and perceived risk. The credibility of policies, and the commitment by the state to meeting its long-term obligations, are both crucial if a project is to be taken to construction and operation, and possibly scaled up.

Challenges to infrastructure investments

Lack of clarity in public policy and insufficient availability of the right kind of finance can affect investment decisions and outcomes in all countries – but emerging markets and developing countries can be particularly vulnerable to failures on these dimensions. In some places weaknesses in the legal and institutional frameworks can lead to political and regulatory risks, thereby undermining confidence. Capacities for project development may also be weak. Consequently, many countries lack a pipeline of well-structured projects, while proposals that do come forward are often subject to higher costs. Further, implementation of projects can be subject to disruption, delays and higher costs. Many emerging markets and developing countries can also face great difficulties in mobilising the long-term finance needed for infrastructure projects. Taken together, for many countries, all these difficulties can cause construction costs and financing costs to be very high.

Importantly, many infrastructure investments in both developed and developing countries currently fail to take sustainability sufficiently into account. Investment decisions are affected by major price distortions, particularly pervasive fossil-fuel subsidies and the absence of carbon pricing. These greatly affect the incentives to invest in low-carbon technologies when compared with the artificially low market prices for fossil fuels in the absence of pricing for the damage they do. While the broader impediments to infrastructure investment are now better recognised, insufficient attention has been paid, even within the G20, to incorporating sustainability criteria into investment planning and project selection. Consequently, infrastructure investments are not as sustainable as they could or should be, and result in the imposition of negative externalities and costs for others. Higher costs for investment, financing and sustainability combine to impede both the quantity and quality of infrastructure investment (New Climate Economy, 2016).

Making projects happen

Given the challenges, public policy plays a key role in transforming sustainable infrastructure opportunities into actual projects. First, it can tackle fundamental price distortions to improve incentives for investment and innovation, and to generate revenue. Such revenue can be redirected, for instance, to support those with weaker standards of living, to provide new job opportunities in affected areas, to promote technical progress, to reduce other taxes, to be returned in grants, and in many other ways.

Second, stronger policy frameworks and institutional capacities that both deliver the right policies and create and sustain conditions for investment can help build pipelines of viable and sustainable projects, reduce high development and transaction costs, and attract private investment.

Third, public policy can help transform the financial system to deliver the scale and quality of investment needed to augment support from all sources (especially private sources such as long-term debt finance and the large pools of institutional investor capital), reduce the cost of capital, enable catalytic finance from development finance institutions and accelerate the greening of the financial system. Lastly, it can channel more investments into clean technology research, development and deployment, to reduce costs and enhance accessibility.

China has shown the world the value of trying out policies in a few places before rolling out nationwide. Recently, for example, the economy of the megacity Chongqing has grown faster than the rest of China through strong investment in infrastructure combined with the effective management of dislocation in its move away from old technologies, and strong investment in new sectors and modern technologies (Rithmire, 2013). Managing local distortions resulting from the reform agenda while investing in new opportunities will be central to social and political sustainability in China and elsewhere over the low-carbon transition.

Multilateral development banks can play a key role in financing and supporting the transition

The older of the existing multilateral development banks (MDBs) can and must play a part in financing and overcoming many of the impediments to the low-carbon transition, but there are particular opportunities for innovation and leadership from the new banks that are led or strongly influenced by China. These include the Asian Infrastructure Investment Bank (AIIB), New Development Bank (NDB) and other vehicles such as the Silk Road Fund. A central aim of these new institutions is to support infrastructure investment in developing countries, while at the same time connecting regions. China's influence means the new MDBs can offer leadership and provide confidence and support to sustainable infrastructure projects around the world.

MDBs can and should play a central role on the finance side through risk reduction and risk management. An MDB brings its presence as a respected and long-term partner and that in itself reduces risk, particularly from uncertainty about policies or excessive interference. The combination of instruments it can bring can help in getting through the early stages effectively. Once this is done, there can be assets that are very attractive to long-term institutional investors. Good development banking can be profitable. Such banks help with policy, too. The new banks, in which China's participation is strong, can offer real leadership and increasing scale. And China can play a crucial role in guiding *existing* MDBs to deliver on and scale up investment in sustainable infrastructure. These existing banks must rapidly ramp up their role in financing sustainable infrastructure if the necessary pace and scale of the economic transformation are to be achieved.

With authorised capital of US$100 billion as of the end of 2015, of which US$30 billion came from China, the size of the AIIB already exceeds that of many other development banks (Hansakul, 2016). On current plans it may not be long before the capital base of the AIIB and the NDB taken together is comparable to that of the Asian Development Bank, and well over half of that of the World Bank Group's (ibid). Further, there are planned capital injections into existing banks, such as the China Development Bank and the Agricultural Bank of China, which are increasingly active in cross-border funding (ibid). Both the AIIB and NDB have strong mandates to support the low-carbon transition and to invest in sustainable infrastructure. The AIIB is considering an end to investments in fossil-fuel power generation (AIIB, 2017) and the NDB is targeting sustainable infrastructure investments with its first funding round (NDB, 2017).

If these development banks are successful in reducing risk, transmitting clear directions and getting good projects to the operational stage, opportunities for other Chinese investors and capital could open up. These could include the national social securities fund under the Ministry of Finance and territorial pension funds. The accumulated reserves of the funded component have grown rapidly from around RMB 7 billion in 1990 to over RMB 3 trillion in 2013, and these could be put to use to earn low-risk, long-term returns while supporting sustainable infrastructure in China and around the world, provided such projects can be fostered and encouraged to emerge.

In alignment with China's global expansion and economic trajectory, its foreign direct investment is set to increase rapidly over the coming decade and China has the entrepreneurial capacity and financial strength to become the largest capital exporter in the world (Humphrey et al., 2015). If this is directed towards sustainable infrastructure with the help of strong policy and institutions, there is the potential to mobilise large sums of capital for a new growth model, both within China and around the world.

4. Conclusions: China's global leadership

China is showing how infrastructure can lead growth and investment. In so doing, it is setting an outstanding example from which lessons can be learned – in terms of both its enormous achievements and its deep stresses. These lessons apply to developing *and* developed countries.

China saves and invests more than the European Union and United States combined; it has the entrepreneurial capacity and financial strength to become the largest capital exporter in the world and to mobilise large sums of capital for a new global growth model. It has been building and financing infrastructure across the world on a scale that is unmatched, creating new multilateral development banks with great potential to lead the transformation towards sustainability. And it showed its leadership in 2016 within the G20, especially in the area of green finance.

This growing influence means that China will be central to delivering on the new global agenda not only in its home territory but everywhere. The prize is a form of growth and development that is much more attractive, robust, lasting and inclusive than that which current models offer. It is a story that involves much more than capital, investment and finance, however. China has joined, adhered to, benefited from and become an advocate for the World Trade Organization and is a champion of international trade and openness. And China is playing a key role in the international diplomacy involved in creating, bringing into force and carrying forward the Paris Agreement. Its actions in Beijing in November 2014 in announcing its Paris targets alongside the US, and the ratification of the agreement ahead of the G20 summit in 2016, again alongside the US, were vital in creating and maintaining momentum and commitment across the world.

President Xi Jinping's speech in Davos on 17 January 2017, in which he set out a vision of an integrated, open and collaborative world, marked the beginning of a new era. On that Tuesday, China's by then longstanding leadership role on the world's stage finally became explicit and recognised.

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