LSE Grantham Research Institute on Climate Change and the Environment

ENERGY FOUNDATION 能源基金会

Strong, sustainable and inclusive growth in a new era for China

Paper 2: Valuing and investing in physical, human, natural and social capital in the 14th Plan

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Policy insight

April 2020

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Acknowledgements

The authors thank Giles Atkinson, Ben Combes and Zhifu Mi for their helpful review comments on this report. Georgina Kyriacou copyedited the report.

Authors' declaration

Nicholas Stern declares financial support from the Energy Foundation China and the London School of Economics and Political Science for the submitted work. Chunping Xie and Dimitri Zenghelis declare financial support from the Energy Foundation China for the submitted work. The authors declare no other relationships or activities that could appear to have influenced the submitted work.

All of the views expressed in this work are those of the authors and are independent of the funding institutions.

This report is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by internal and external referees before publication.

Suggested citation: Stern N, Xie C, Zenghelis D (2020) *Strong, sustainable and inclusive growth in a new era for China – Report 2: Valuing and investing in physical, human, natural and social capital in the 14th Plan*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

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Preface

This is the second of two 'policy insight' papers that offer an outline of strategies and policies for an innovative, sustainable and low-carbon approach to China's development. They are intended to inform decision-making for China's 14th Five-Year Plan (2021–2025). The two papers were originally prepared before the Covid-19 outbreak; the pandemic has changed the situation in many important ways, inside and outside China. The fundamentals of the medium- to long-term analyses of these papers have not changed. However, the short term is very different and it will be important to integrate, both in China and the world, the recovery from the Covid-19 crisis with the transformation of the economy embodied in the transition to a low and zero-carbon world.

The world economy is now at risk, with the prospect of a strong contraction in both demand and supply this year. Global supply chains are facing severe challenges as many countries have imposed social quarantine, lockdowns and travel bans. In response to the crisis we must ensure that lessons from the 2008 financial crash are learned: the recovery from that crash did not embody strong enough priorities for sustainability and there was a rapid relapse into austerity in a number of countries.

The Covid-19 pandemic is a crisis both for the world and for China. Unprecedented measures were taken in China to contain the virus, which reversed the escalation of cases and brought the medical emergency under control. At the time of writing China is stepping into the next phase, with lockdowns beginning to be lifted and the focus shifted to economic recovery; meanwhile, most countries around the world are still in the first two phases: managing the health crisis and preventing the collapse of the economy and deep damage to vulnerable groups.

As one of the first countries entering the recovery phase, China will lead the way. The aim should surely be to build a better and more sustainable world. As we emerge out of the Covid-19 crisis we must not deepen another, bigger and more long-lasting crisis – climate change. If a short-term stimulus were to be concentrated mainly on traditional industries and infrastructure, ramping up fossil fuel consumption and locking in decades of polluting and high-carbon development, the consequences for China and the world would be devastating.

As China leads the world out of the Covid-19 crisis, there is a great opportunity. China can show how urgent recovery measures can also accelerate the transition to the inevitable zero-carbon economy. The commitment of the world to tackling climate change will depend on what China does in the coming months and years. This influence is much more than China's size; it comes also from its technologies, its strategies and its implementation. China now has a real possibility, and arguably a responsibility, not only to make its recovery a turning point in its own path to sustainable, inclusive and resilient development but also to lead the global fight against climate change and to build a better and more sustainable world. It is a crucial moment. These ideas will be developed in the third paper of this series.

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Summary

China's new growth story

China has always looked ahead to chart its strategic development. The next set of reforms is of special significance, not only for China but also the world. China, with its size, history and prospects, is inevitably a leader on the global stage, on many dimensions.

Around the world, current models of growth are defined largely by physical and human capital. Other factors such as the technology under which they are used are determined by residual. In the context of a rapidly changing world – which faces the rise of new technologies as artificial intelligence and automation, the challenges of climate change and new threats to world trade – the 21st century growth story has to progress beyond this narrow focus. It will be based increasingly on a balanced accumulation of several types of capital; on structural change towards the service sector with a focus on the value of intangible goods, services and productive assets; on more sustainable outputs and inputs and on labour and resource efficiency and productivity.

The new growth story must take account for the depletion of natural capital, especially renewable capital, which is difficult to substitute and prone to irreversible thresholds and collapse. It must also embody increasing returns to scale in production and discovery, as well as capturing the possibilities of very rapid technological change, cost reductions and diffusion in the next two decades. These forces are subject to inertia and path-dependency. This means growth and development can be steered in directions that make a material differences in terms of future prosperity.

Physical, human, natural and social capital and their role in China's new phase

The four complementary types of capital are:

- Physical capital – long recognised as a central factor driving economic growth, this mainly refers to tangible capital goods that are used to produce a product or service, including machinery, equipment, factories, buildings, transport facilities and so on, which underpin the functioning of production processes and modern societies.
- Human capital – the personal knowledge, skills, experience, competencies and attributes (e.g. health) that an individual accumulates throughout her or his life, which can then be applied in the economy through the increase of an individual's productive capacity. It enables individuals to better harness the stock of societal knowledge which exists independently of any individual.
- Natural capital – the world's stock of natural assets, which include soil, air, water and all living things. Natural capital can be identified and valued by the range of services, often called ecosystem services, that are generated by these natural assets and that affect what is possible to do, the quality of life and indeed the possibility of human life.
- Social capital – often referred to as the glue that holds societies together but harder to pin down than the other three types of capital. No matter how it is defined, the underlying idea is that social networks and structures have value. Social capital relates to generalised trust, shared rules, and the social norms and values that shape the ways we behave in everyday relationships and transactions.

The Government has made clear that in the next phase of China's development, natural capital and social capital are likely to become central objectives of economic policy. China has already emphasised the importance of 'ecocivilisation', started to take action against air, water and land pollution, increased its forest cover, and is moving to curb greenhouse gas emissions towards net zero. China recognises the importance of social capital and a cohesive society, tackling inequality and taking action to promote good governance. China has long invested, through health and education, in the human capital of its people although there is a need for further investment, especially in rural areas. The new growth strategy needs to be not only clean but also inclusive.

Investment in human capital can improve individual health, life expectancy and build trust in communities and institutions, so boosting social capital. This improves productivity and enables investment in physical capital, training and governance, including improved environmental stewardship. By contrast, declining or depleted natural capital, including pollution, can undermine human health and wellbeing. Floods and natural catastrophes borne of environmental stress, impaired access to water and a changing climate can destroy and disable physical assets and prompt social dislocation, including conflict and migration. Degraded social capital undermines the ability of human capital to generate new ideas regardless of how well-educated or trained people are and how well equipped their workplaces.

The complementary nature of these assets means they must be valued together, and investment in them must take account of their interactions. Access to all four forms of capital form the basis of Amartya Sen's idea of "capability" or "the ability to pursue a life one has reason to value".

Investment opportunities in China's 14th Five-Year Plan (2021–25)

Investment for more sustainable infrastructure

Infrastructure delivers the basic facilities and structures needed for the operation of an economy and society. Achieving sustainable development, including in health, economic growth and the environment, requires the right infrastructure. Sustainable infrastructure is at the core of the Sustainable Development Goals. Investment in infrastructure does not always mean building new infrastructure, it also means better use of existing infrastructure.

Important investment areas for the 14th Plan include:

- Low-carbon and resilient infrastructure for more productive, more attractive and healthier cities
- Infrastructure that could increase energy efficiency in industry and that encourages clean technologies, shifting away from reliance on fossil fuels
- Investment towards making the Belt and Road Initiative environmentally sustainable

Investment in human capital

China needs a highly skilled, healthy, flexible labour force to tackle the challenges and changes of the coming decades. It will be a period of very rapid change with the move to high tech and services, increased urbanisation, AI and robotics, an ageing population and a changing world order. China must invest strongly and wisely in human capital. These investments should take account of the necessary new skills for new types of investment and also the management of change in a just way so that those who work in activities that will be restructured or decline have a chance to participate in the new economy – the agenda of the 'just transition' to a new growth era. In particular there is a need for investment in the skills necessary for cleaner infrastructure and to enable the adoption of frontier technologies, investment in education, especially in rural areas, and in institutional reform and health care.

More focus on natural capital

Particular attention needs to be paid to natural capital. Unlike physical and human capital, natural capital, which provides a crucial building block for all other forms of capital, is in decline. In China this poses one of the biggest threats to the country's continued growth and prosperity. China has implemented many reforms to improve the environment, including in relation to public health. Investment in renewable natural capital, especially through improving air quality, controlling greenhouse gas emissions, climate-smart agriculture and the right kind of future urbanisation, is required.

Institutional investment to enhance social capital

The world is changing rapidly and creating major disruptions and potential risks to employment and labour markets. The impacts of these changes together with shifting demographic trends require careful attention to social, as well as human, capital. The need to deliver a 'just transition' to a new growth era means all members of society must have the opportunity to participate, especially poorer people. This requires institutional innovation to keep up with the changing economy with enabling institutions that support and enhance social capital. Investment is needed to enhance social cohesion and trust in institutions, to reduce inequality, and to ensure a just transition.

Introduction

China is entering a new phase of growth. This paper examines the role of investment in physical, human, natural and social capital in this new phase. The second in a series,[1] it provides the beginnings of an analytical framework for key elements of this new growth story, examining how a focus on the four types of capital can help deliver prosperity through China's 14th Plan and Belt and Road Initiative.

Dematerialisation of the Chinese economy

The economic transformation that China has undergone since 1978 has been remarkable. It has taken a country of more than a billion people from low-income to upper-middle-income status.[2] However, the phase of development driven by investment in physical capital is over. It is being replaced by an era in which investment in intangible assets such as knowledge and social capital as well as the preservation of natural capital offer the strongest and most durable growth opportunities. A new strategy of promoting environmental quality, wellbeing and inclusivity is set to transform China's economy in the next 30 or 40 years as it drives towards becoming a high-income economy. This transformation will be driven by the technologies and activities of the 21st century; it cannot be shaped by 20th century concepts measured with 20th century statistics (Bennett Institute for Public Policy, 2019).

As it matures to an advanced economy, China will need to dematerialise. The World Bank estimates intangible capital (human, social and institutional capital) makes up 60 to 80 per cent of total wealth in most countries (Lange et al., 2011). Today, about four in five dollars spent in the leading economies of the Organisation for Economic Co-operation and Development are on purchasing services or intangible goods (OECD, 2020). This 'dematerialisation' complicates our understanding of growth and its drivers.

Other challenges that China has to work with include the continuing changes to the world economic and political structure; increasing greenhouse gas emissions which have put the world at severe risk from climate change; and the threat of environmental degradation to health and social stability. In many countries sharply increasing shares of wealth and income for the rich have also threatened social cohesion and many have seen falling confidence and trust in social and political institutions. For China, alongside its rapid economic growth, significant income inequality has become one of the most serious problems (Han et al., 2016). The Gini coefficient for China – which suggests the degree of inequality in income distribution – rose to 0.468 in 2018[3], beyond the warning level of 0.4 set by the United Nations.

Sustainable growth, shaped by physical, human, natural and social capital assets

New forms of growth in China, as elsewhere, can and should be sustainable. Sustainability means offering the next generation opportunities at least as good as those available to the current generation, assuming they behave similarly to generations that they follow. The emphasis on sustainability reflects the fragility of future development and growth in the face of the immense risks of climate change and environmental damage, and it reflects the pressing need to improve standards of living for China's population, especially the poorest.

The opportunities for future generations are determined by the assets they inherit from current generations, in particular physical, human, natural and social capital. The future wellbeing of China's people will in large measure be shaped by these assets. In this context, this study builds a research framework where the four types of capital are at centre stage. China's new development must increasingly recognise the deterioration in natural capital and challenges around social capital. It must also take careful account of how the world has changed, including China's very large role in the world economy and problems around international trade and investment.

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1 It follows *Strong, sustainable and inclusive growth in a new era for China – Paper 1: Challenges and ways forward* by Cameron Hepburn, Nicholas Stern, Chunping Xie and Dimitri Zenghelis.

2 World Bank classifications.

3 Data from National Bureau of Statistics of China, http://data.stats.gov.cn.

China's development strategy will have a profound effect on other countries, particularly those within the Belt and Road Initiative (BRI)[4], but also the poorest nations via the climate implications. Thus the 14th Five-Year Plan (2021–25), together with how the BRI develops, is fundamental not only to the future of China but also to the world.

Investment in the four types of capital

Strategic investment and innovation opportunities for sustainable and inclusive growth are immense and taking up these opportunities is the right response to a faltering growth rate. Strong investment in all four of the types of capital will be crucial, but they will be investment with high returns. Reverting to a narrow focus on physical capital and the technologies of the last century would exacerbate problems, threatening to further undermine growth.

Hepburn and Stern (2018) set out the new growth strategy in broad terms. Within that strategy, this paper examines the role of investment in the different types of capital. We address:

- The concept of each type of capital and its relation to growth and wellbeing
- How the different types of capital might be measured using Chinese data
- Strategies for accelerating investment to achieve high productivity and sustainable growth

The risks of economic dislocation and 'stranded assets' are intensified by rapidly declining costs of clean alternatives to fossil fuel energy sources and increasingly stringent climate and energy policies across the globe (Campiglio et al., 2018). Implementation of policies for a scenario where global temperature rise is restricted to a maximum of 2°C above pre-industrial levels could cause the fossil fuel industry to lose in the order of US $30 trillion in revenues over two decades (Lewis, 2014). Much primary fossil fuel resource as well as upstream fossil fuel-related infrastructure (including wells, mines, ports, refineries and power stations) will need to be retired early, underutilised or stranded (McGlade and Ekins, 2015; Pfeiffer et al., 2016). China can reshape its economy to be resilient to, and profit from, such changes.

Overview of the four types of capital

Physical capital – long recognised as a central factor driving economic growth, this mainly refers to tangible capital goods that are used to produce a product or service, including machinery, equipment, factories, buildings, transport facilities and so on, which underpin the functioning of production processes and modern societies.

Human capital – the personal knowledge, skills, experience, competencies and attributes (e.g. health) that an individual accumulates throughout her or his life, which can then be applied in the economy through the increase of an individual's productive capacity. It has a powerful connection with, but is separable from, the stock of societal knowledge.

Natural capital – the world's stock of natural assets, which include soil, air, water and all living things. Natural capital can be identified and valued by the range of services, often called ecosystem services, that are generated by these natural assets and that affect what is possible to do, the quality of life and indeed the possibility of human life.

Social capital – often referred to as the glue that holds societies together but harder to pin down than the other three types of capital. No matter how it is defined, the underlying idea is that social networks and structures have value. Social capital relates to generalised trust, shared rules, and the social norms and values that shape the ways we behave in everyday relationships and transactions.

See Section 2 for more details.

Further, a sustainable approach to growth can provide strong innovation, investment and growth in the short to medium term, including many productive job opportunities, and lay the foundation for very attractive, inclusive growth over the coming decades.

Plan of the paper

In Section 1 we examine the conceptual framework for a new growth story. This will involve fundamental structural change towards higher tech, higher skills, more service sector opportunities, and the role of artificial intelligence (AI) and robotics, automation and the recasting of cities. The strategy will be built on and driven by investment in the four types of capital. Section 2 sets out the issues around concept and measurement, and Section 3 presents some of the opportunities for investment in the four types of capital. In Section 4 we draw the strands together in the context of China's 14th Plan and structural and technological change within a changing world economy, including within the Belt and Road Initiative.

[4] See OECD (2018) for information about the Belt and Road countries.

1. China's new growth story

The old era or approach to development in China is coming to an end. The reasons why include pressures on the environment, social strains, changing technologies and the need for new skills as well as changing demography, rising wages, a shift in demand towards services, changing world economic geography and interactions and pressures on public finances (see our previous paper in this series for more about the end of the old era [Hepburn et al., 2020]).

China has always looked ahead to chart its strategic development. The next set of reforms, in the 14th Five-Year Plan, is of special significance, not only for China but also the world. China, with its size, history and prospects, is a leader on the global stage on many dimensions. Climate change is an important example: currently the world's largest emitter of greenhouse gases, and a country very vulnerable to climate change impacts, China must be a leading actor on this issue.

Around the world, current models of growth are defined largely by physical and human capital. Other factors such as the technology under which they are used are determined by residual. In the context of a rapidly changing world – which faces the rise of such new technologies as artificial intelligence and automation, the challenges of climate change and new threats to world trade – the 21st century growth story has to progress beyond this narrow focus. It will be based increasingly on a balanced accumulation of several types of capital; on structural change towards the service sector with a focus on the value of intangible goods, services and productive assets; on more sustainable outputs and inputs, and on labour and resource efficiency and productivity.

The new growth story must take account of the depletion of natural capital, especially renewable capital, which is difficult to substitute and prone to irreversible thresholds and collapse. It must also embody increasing returns to scale in production and discovery, and capture the possibilities of very rapid technological change, cost reductions and diffusion in the next two decades. These forces are subject to inertia and path-dependency. This means growth and development can be steered in directions that make material differences in terms of future prosperity.

The pressures on natural and social capital imply that both fostering a better environment and managing inequality and social cohesion should appear strongly in societal and economic objectives. The multiplicity of dimensions embodied in the Sustainable Development Goals offers a valuable framework for thinking about and setting these objectives. This means going beyond a fixation on output or income, which fails to capture important aspects of wellbeing and which alone monitors flows of production without accounting for the state of the underlying assets that generate them.

This does not mean that 'degrowth' is a necessary condition for sustainability: quite the opposite – economic growth is an important driver of the innovation necessary to decouple environmental impact and consumption by getting more out of the resources we have. By the same token, improving the productivity of resources is a driver of economic growth. Investing in and achieving high productivity from the four types of capital will be crucial to enabling economic growth to continue indefinitely with lower factor inputs. Unlike material wealth, which is generally depleted when used, knowledge capital can keep growing indefinitely through our intellectual development (Mill, 1848). Combining existing ideas can generate a potentially limitless supply of new ideas (Weitzman, 1996). The World Bank measures the 'true wealth' of nations and estimates that intangible capital may make up between 60 and 80 per cent of total wealth in most developed countries (Lange et al., 2018).

Intangibles also make up an increasing part of the capital base necessary for production. The valuation of the world's largest firms is now based mostly on their intangible capital and not the value of their people, buildings or capital equipment. In 1975 around 20 per cent of the value of listed companies was intangible – the ideas, processes and networks the company has nurtured. By 2015, that level had risen to around 80 per cent (Ocean Tomo, 2020). A handheld device may embody the same amount of materials as it did a decade ago, but the value of the services it delivers has increased exponentially. China's current investment in tech and the key focus areas of its principal growing tech firms – Alibaba, Tencent and Huawei – testifies to the growing commercial returns from intangible assets.

In short, the nature of growth – whether it is clean and sustainable or dirty and based on resource depletion – will depend on the policy choices undertaken today, the infrastructure, technologies and institutions the world – including China – chooses to lock in to and the productivity with which it extracts value from limited material resources.

The world's infrastructure will likely double in around 15–20 years (New Climate Economy, 2016), much of it associated with urban expansion, and a large part of that increase will be in China. This will require efficient management of existing assets and strategic planning of investment on additional capital assets. It is estimated that as much as 70 per cent of greenhouse gas emissions directly or indirectly stem from infrastructure (Saha, 2018). Sustainable infrastructure, such as uncongested public transport and clean water supply, is also closely linked to social equity, health and economic opportunities. There is a need to work in a cycle of replacement, investing in more efficient clean technologies as old dirty infrastructure comes to the end of its useful life. Additional new infrastructure cannot look anything like the old if cutting emissions in the next two decades by more than 40 per cent, necessary for holding temperature rise to 2°C, is to be possible (and the absolute cuts necessary for a 1.5°C rise would need to be much larger), thus there is an urgent need for radical change.

The belief that the world must shift to a low-carbon future is already prompting accelerating investment in clean technologies such as renewable energy and electric vehicles (EVs), lowering their costs and, as they outcompete fossil fuels, helping that shift happen (van der Meijden and Smulders, 2017). Acemoglu et al. (2012) describe how the "clean innovation machine" can be more innovative and productive than the conventional high-carbon alternative; knowledge spillovers generated along the way then benefit the whole economy (Dechezleprêtre and Martin, 2013). China is already playing a major role in this global low-carbon revolution and will continue to drive and benefit from it, provided that it continues to innovate and invest in the assets that will take the revolution forward and underlie its future prosperity. With real interest rates globally at very low and often negative levels, there is a good opportunity for China to accelerate better targeted investment via debt financing.

Opportunities from starting early and planning strategically

The evidence shows that it pays to start early when managing such a large-scale structural transition. Locking into high-carbon infrastructure, institutions and behaviours will make it costly for China to retrofit and replace these assets later when they become devalued. China will have missed the opportunity to position itself as a world leader in a changing global economy. By contrast, investing in the technologies and infrastructures of the future is likely to prove highly profitable.

Hidalgo et al. (2007) and Mealy and Teytelboym (2017) used network analysis to demonstrate that it is easier for countries to become competitive in new green products the closer they are to similar production capabilities and know-how in existing sectors. As a result, green transitions are highly path-dependent: countries that successfully invest early in sustainable capabilities have greater success in diversifying into future products and markets. This reinforces the findings of Aghion et al. (2012), who provided empirical evidence that a firm's choice over whether to innovate in clean or dirty technology is influenced by the practice of the countries where its researchers/inventors are located. They also found that firms tend to direct innovation towards what they are already good at. Innovation not only drives productivity and growth: it also helps us to get more out of the resources we have by boosting efficiency.

It is therefore clear that the assets China invests in now will shape fundamentally the direction and success of the country's development. Given that sustainable growth and wellbeing depend on the four types of capital – physical, human, natural and social (Stern, 2015; Hamilton and Hepburn, 2017; Managi and Kumar, 2018; Lange et al., 2018), investing in and achieving high productivity from these types of capital should be at the core of China's growth and development strategy for the new era.

The investment China must make in these assets will generate strong benefits, even in the short term. There is growing appreciation of the opportunities associated with a low-carbon transition (Hale, 2018). Rapid reductions in renewable energy costs have already challenged long-held notions about the cost of sustainable growth (Trancik, 2014). These include not only commercial opportunities associated with deploying (and fabricating and exporting) cheap and increasingly competitive new clean technologies, but also benefits from reductions in waste and inefficiency, improved energy security, reduced

particulate pollution, and cleaner, more compact cities that are less congested. These are all very powerful benefits, and they are over and above the fundamental benefits of the reduction of the huge risks from unmanaged climate change.

A number of authoritative studies have shown that many or most of the policies required to decarbonise the global economy will boost growth even in the short term by addressing multiple market failures. For instance, Hallegatte et al. (2012) argue that compared with business-as-usual, green growth would mean immediate positive effects on the economy, such as co-benefits (e.g. reduced local pollution), growth in new 'green' sectors, and less energy price volatility via reduced dependence on fossil fuel imports. The first report of the New Climate Economy suggested that more than half, and as much as 90 per cent, of the global emissions reductions required to meet an ambitious climate target could generate net benefits to the economy beyond those of emissions reduction (Stern and Calderon, 2014).

In the next phase of China's development, natural capital and social capital will need to become central objectives of economic policy. China has already emphasised the importance of 'ecocivilisation' (Naustdalslid, 2014), has started to take action against air, water and land pollution, is increasing forest cover, and is moving to curb greenhouse gas emissions towards net zero. China recognises the importance of social capital and a cohesive society, tackling inequality, and of taking action to promote good governance (Liu, 2017; Shigong, 2018). The country has long invested, through health and education, in the human capital of its people although there is a need for further investment, especially in rural areas. The new growth strategy needs to be not only clean but also inclusive.

In social and human capital terms, the strategy must embrace a world that is changing very rapidly. Future technological change, with AI and automation (Adams, 2018), digitisation and robotics in particular, as well as the challenges of climate change (IPCC, 2018), is likely to transform investment, work, consumption and the functioning of cities. It will stretch across all sectors, including services and manufacturing. This requires flexible and responsive institutions that are able to shift resources and investments towards activities and assets that will be fit for and resilient to change. Carbon- and resource-intensive assets are likely to play a diminishing role in the economy of the future.

Correspondingly, China is shifting the balance of its economy towards higher-technology knowledge-based services. Innovation and dematerialisation will increasingly drive productivity growth in China, extracting more value out of fewer resources. Digital technologies and innovations have the potential to radically increase real-time connectivity and efficiency of resource management. A highly skilled labour force is necessary for adopting such frontier technologies; thus there is a close connection between human capital and structural change and the new investment in physical capital.

Rapid transformative change, whether from decarbonisation or AI, automation or digitisation, needs to be managed carefully. The gains must be, and be seen to be, equitably distributed, and new opportunities available to all, if social harmony is to be preserved and the political economy is not to inhibit progress. This requires investments in people and places, as well as safety nets. It will also require:

- Enabling institutions and policies to reskill, retool, and enable affected workers to take new opportunities or activities
- Targeted 'place-based' employment transition policies in areas at high risk of disruption, drawing on lessons from across the world (see Austin et al., 2018)
- Policies designed to compensate those who lose out.

The adjustment costs associated with such a transition are real, but with the right policies they are manageable. Economic history shows that economies that embrace change, invest in a diverse range of flexible assets and that do not inhibit the flow of resources from declining, low-productivity sectors to new, more productive sectors, are better able to manage structural transformations. Over the longer term, education systems should from the beginning try to empower people to embrace change and learning should be seen as life-long, equipping people with the skills necessary to compete in a low-carbon future.

Better together – how capital assets complement each other

China's future prosperity depends on preserving and investing in the four fundamental assets that drive sustainable development and foster wellbeing. As Sections 2 and 3 will show, the value of all assets is a function of their interaction with each other. This points to the need for balanced investment, noting that these four types of capital are complementary. Investment in physical capital and technologies, including utilising and adopting AI, involves complementarities between human capital and knowledge capital (the ideas we all build on). Romer (1990) showed through the development of endogenous growth theory how increasing returns to ideas and discovery can overcome the diminishing returns to factors like labour and capital, generating resources for further investment. Investing in mobile or wired computers induces smart ideas on how to use them. This enhances the returns to developing new software and algorithms, which further increases the returns from and value of hardware.

Investment in human capital can improve individual health, life expectancy and build trust in communities and institutions, so boosting social capital. This improves productivity and enables investment in physical capital, training and governance, including improved environmental stewardship. By contrast, declining or depleted natural capital, including pollution, can undermine human health and wellbeing. Floods and natural catastrophes borne of environmental stress, impaired access to clean water and a changing climate can destroy and disable physical assets and prompt social dislocation including conflict and migration. Degraded social capital undermines the ability of human capital to generate new ideas regardless of how well educated or trained people are and how well equipped their workplaces. The complementary nature of these assets means they must be valued together, and investment in them must take account of their interactions. Access to all four forms of capital form the basis of Amartya Sen's idea of "capability" or "the ability to pursue a life one has reason to value" (Sen, 1993; 1999).

Greater quality and quantity of investment in the four types of capital can be delivered through a partnership of strong government and an innovative private sector. Wise investments in the different types of capital are mutually supportive, achieving multiple goals simultaneously. For example, extensive, clean and efficient public transport can enhance all four types of capital and thus help deliver more inclusive, cleaner and higher-quality wellbeing and growth. Some forms of renewable natural capital such as biodiverse and healthy ecosystems, forests, fish stocks and a stable climate are prone to thresholds and systemic collapse when depleted. The collapse of such critical natural capital can undermine the other three forms of capital.

It is clear that uncertainty and complexity in measurement are innate features of measuring wealth. Unlike goods and services, which are current flows, the value of capital stocks now depends on the value of future benefits they are expected to generate. This can make the valuation of wealth both uncertain and volatile. The morning after a stock market crash, the factories, land and labour that generate output have not disappeared, but the expectation of their ability to generate benefits in the future has diminished (see, for example, Zenghelis, 2019). This applies to all forms of capital, from fixed property to good ideas. Measurement challenges do not diminish the importance of valuing the assets that matter, but they do point to the importance of investing in metrics and statistics to help inform valuations.

Innovation in technologies requires innovation in institutions

In a rapidly changing world, the potential dislocation arising from new technologies, and pressures from an ageing population, point to the importance of managing change and insecurity. All of this leads us to the centrality of sustainability in objectives and a recognition that innovation and change will be fundamental to sustainability.

Romer (2010) pointed out that innovation that drives endogenous growth is not limited to technological capital and knowledge capital: it also applies to rules, governance and policies, all of which drive productivity. Romer argued that social rules often hold back the introduction and exploitation of new technology. Indeed, new technologies are potentially harmful if not accompanied by rules that make growth sustainable – for example, rules that limit pollution, soil degradation and overfishing; or rules that regulate economic rent-seeking from innovation via patents or market power, which can increase inequality and inhibit further change, if managed badly.

These pressures have also motivated increased emphasis in the run-up to the 14th Plan on the key elements of wellbeing as the economic and societal objectives, rather than the narrow goal of output or income. These objectives, embodying a broader view of development than in the past, cover the dimensions of the Sustainable Development Goals agreed in September 2015 (United Nations Development Programme, 2015). Driving innovation in institutions equipped to guide China through the challenges and opportunities of the coming decades will be as important as driving innovations in technology. Good governance also means that reforms should engage private individuals and civil society and be market-oriented in ways that encourage initiative and creativity.

We argue that this new approach to investment in multiple forms of capital can be structured in ways that are inclusive, reduce inequality and promote social cohesion. For example, public transport will benefit poorer sections of society particularly, since they are much more dependent on this type of transport, including in facilitating access to employment. Cleaning up air and water will benefit poorer people too as air and water pollution tends to do disproportionate harm to this social group.

The need to invest in assets for the future will be all the more pressing given China's population structure: as the population ages further, there will be corresponding pressures on public finances and health systems which will have to be addressed.

2. Concepts and measurement of the four types of capital

Physical capital

Physical capital has long been recognised as a central factor driving economic growth. Indeed, as we saw in the previous section many models of the first half of the last century regarded it as the central factor. For the classical economists including Smith, Ricardo and Marx, physical capital was, with labour and land, one of the three primary factors of production. Physical capital mainly refers to tangible capital goods that are used to produce a product or service, such as machinery, equipment, factories, buildings, transport facilities and so on, underpinning the functioning of production processes and modern societies. Some types of physical capital are directly involved in the process of creating a product or service that is sold, such as the power generating equipment that produces electricity. Others are less directly involved, although nonetheless crucial, such as the computers in the offices of an insurance company.

Several estimation procedures can be considered for the calculation of physical capital stocks. Some of them, such as the derivation of capital stocks from insurance values or accounting values or from direct surveys, are very resource-intensive and face problems of limited availability and adequacy of data. Other estimation procedures, such as accumulation methods and, in particular, the Perpetual Inventory Method (PIM), are (relatively) cheaper and more easily implemented because they require only investment data and information on the assets' service lives and depreciation patterns. These methods derive capital series from the accumulation of investment series and are the most popular.

Simon Kuznets was the pioneer, in the 1920s and 1930s, of the compilation of data on output and capital. He was well aware of the early work and modelling of Russian economists on investment, capital, growth and cycles. PIM builds on his work. It is the method adopted by most OECD countries that estimate capital stocks (Böhm et al., 2002; Mas et al., 2000; Ward, 1976). An important early account is Goldsmith (1951).

In China, a number of studies have estimated the stock of physical capital based on the PIM, such as Hongye and Feng (2005), who argue that the availability of data has limited research work in estimating China's capital stock using these methods. Huang et al. (2002) estimated China's capital stock in the manufacturing industry by sectors over 1980–1995; Zhang (2008) recommended a standardised procedure in constructing the level of China's provincial capital stock using PIM from 1952 to 2004.

Human capital

The concept of human capital has been widely recognised since Schultz (1961) defined it as "skills and knowledge acquired". Though a variety of further definitions have been made, in general most of them emphasise skills and personal knowledge related to the economic returns of investment in people. For decades, literature analysing the role of human capital in economic growth proxied human capital with the measurement of education or years of schooling; examples include Nelson and Phelps (1966) and Barro (1991; 2001).

As broader non-economic benefits delivered by human capital investment have become apparent, such as improved personal health and wellbeing, the OECD (1998; 2001), Hamilton (2006) and many others have extended the definition to encompass the stock of personal knowledge, skills, experience, competencies and attributes (e.g. health) that an individual accumulates throughout her or his life, which can then be applied in the economy through the increase of an individual's productive capacity.

This broader view uses the concept of human capital not only as a factor that influences economic growth but also one that contributes to wellbeing. It is an example of something that is both an objective (education, health and agency have value in themselves) and also an instrument or factor influencing other objectives, such as output or income. Human capital generates private returns (income, earnings and wellbeing) as well as public returns (stronger civic engagement, better health and lower crime).

A number of methods have been used to measure human capital, among which cost-based, income-based, indicators-based and 'residual'[5] are the most common approaches. Each method has its advantages and drawbacks (see United Nations Economic Commission for Europe [2016] for more details).

The World Bank has changed its approach to measuring human capital over the years. It adopted the residual approach in its 2006 report *Where is the Wealth of Nations?* (Hamilton, 2006) and subsequently extended its estimating framework in the 2011 report *The Changing Wealth of Nations* (Lange et al., 2011). However, the World Bank did not use this approach in its latest report (see Lange et al., 2018). In its 2019 publication the World Bank launched a Human Capital Project (HCP) and released a cross-country human capital measurement metric called the Human Capital Index (HCI) (World Bank, 2019). Similar indicator-based approaches have also appeared from the World Economic Forum (2017), which adopted the Global Human Capital Index (GHCI) to provide a holistic assessment of a country's human capital stock. However, these standard indicator-based approaches applied to all nations are mostly quite general and often simplistic as a result.

Cost-based and lifetime income-based approaches[6] are widely used in the literature. For the lifetime income-based approach, Jorgenson, Fraumeni and collaborators have proposed the 'J-F method', which has been adopted by a number of countries (see e.g. Jorgenson and Pachon, 1983; Jorgenson and Fraumeni, 1992a, 1992b). However, this approach cannot be applied fruitfully to China due to lack of available data (Li et al., 2014). In fact, there has been no comprehensive measure of human capital in China due to the technical difficulty in measuring the components of human capital (personal knowledge, skill, competencies and attributes) and the lack of data in China (Li et al., 2013). Li et al. (2014) modified the standard J-F method by incorporating the Mincer model[7] (Mincer, 1958) into the J-F framework to overcome the paucity of earnings data in China and provided a measurement of human capital at a provincial level for the period 1985 to 2010. One possibility for subsequent work is to extend that analysis to more recent years and consider breakdowns by urban and rural location or by province.

Natural capital

Natural capital refers to the stock of natural assets, which include soil, air, water and all living things. They can be identified and valued in this context by the range of services, often called ecosystem services, that they generate and that affect what is possible for humans to do, their quality of life and indeed the possibility of human life. Further, they have direct value in terms of people's enjoyment and sense of fulfilment arising from the existence of these assets.

Interest in the concept of natural capital has expanded rapidly in recent years and programmes and institutions have been established to value them, such as the Natural Capital Committee.

Helm (2015) rightly distinguishes between non-renewable and renewable assets, by focussing on capital maintenance. Non-renewable natural capital, such as oil, gas and minerals, can only be used once. Their depletion would therefore necessitate compensation through some technological innovation or capital accumulation that makes any given amount of, say, oil or coal yield more energy. By contrast, renewable natural capital refers to living resources that can replace or restock themselves, or non-living resources that regenerate because of natural processes. These including forests, fish stocks, functioning ecosystems (including oceans) and a stable climate. Once these assets are depleted below a critical threshold they are susceptible to complete systemic collapse.

Natural capital is often poorly managed around the world and is generally in decline, leading to damage to ecosystems, loss of species, excessive pollution and premature human deaths, reducing overall productivity and wellbeing. The decline of natural capital has led, over the last three to four decades, to a

[5] The residual approach takes the discounted value of future consumption flows and subtracts from this amount a 'contribution' from the monetary value of those capital goods for which monetary estimates of their current stocks are readily available. The residual is attributed to other effects, including human capital, but it is difficult to disentangle their separate effects.

[6] Both of these approaches are cost-benefit analyses and combine different aspects that contribute to human capital in a single metric (money). The cost-based approach provides a measure of the current flow of resources invested in people (e.g. education). The lifetime income-based approach values the human capital embodied in individuals as the total income that could be generated in the labour market over their lifetime.

[7] The Mincer model is an earnings function that can be used to explain wage income based on an individual's schooling and experience; it is named after Jacob Mincer.

growing recognition of its importance. The United Nations Statistical Department, for example, oversaw the production of the System of Environmental Economic Accounts (SEEA) in 1993, and subsequently revised and strengthened it, most recently in 2012 (United Nations Department of Economic and Social Affairs, 2019), in an effort to set an international standard for environmental-economic accounting. Essentially the SEEA consists of two major parts. The Central Framework (CF) looks at individual environmental assets such as energy, water, forests and timber, to explore how they are extracted from the environment, used in the economy and returned to the environment in the form of waste, water and air emissions. It gives guidance on a variety of matters, such as environmental asset accounts (often in physical terms, including environmental stocks and flows) and their use in the economy (often as monetary flows). The second part is the Experimental Ecosystem Accounting (EEA), which complements the CF by taking a different perspective on ecosystems and considers how individual environmental assets interact.

The Central Framework of the SEEA is an official statistical standard on the values of ecosystem services across countries adopted by the UN Statistical Commission. Data are, however, very limited. Several standard sources on natural capital measurement have been developed, such as by the World Bank (Lange et al., 2018) and the United Nations Environment Programme (UNEP, 2018), as well as some ongoing projects such as the Stanford Natural Capital project.[8]

In China, the 'Natural Capital Accounting and Valuation of Ecosystem Services – China'[9] project started in December 2017. It is developing accounts with monetary estimates for six ecosystem categories including forests, farmland, grassland, freshwater, marine and urban, in the two provinces of Guangxi and Guizhou. In 2014 China completed its first national ecosystem assessment, reviewing the period 2000–2010, with the main findings published in *Science* (Ouyang et al., 2016). Further work could build on these foundations.

Social capital

Social capital can be perceived and defined on the basis of "social theory, and from the broad idea that social relationships are resources that help people act effectively" (Coleman 1988; 1994). The World Bank held a workshop to discuss social capital in 1997,[10] and later released the report *Social Capital: A Multifaceted Perspective* (Serageldin and Dasgupta, 2001), presenting theoretical and empirical studies of social capital written by leading sociologists, economists and political scientists. Putnam (2000) described social capital as consisting of cognitive and structural elements, and emphasised connections within and among social networks. Bourdieu (1986) and Lin (2002) also stressed the network perspective, and described social capital as a kind of resource nested in social network (see also Arrow, 1999).

The nature of social capital and its future benefits are particularly hard to pin down. But no matter how it is defined, the underlying idea is that social networks and structures have value. Social capital is often referred to as the glue that holds societies together. It relates to generalised trust, shared rules, and the social norms and values that shape the ways we behave in everyday relationships and transactions (Bennett Institute for Public Policy, 2019). Important outcomes that flow from social capital are civic engagement, collaboration and interaction (including formal mechanisms for trading goods, services, capital and labour).

The difficulties in pinning down the concept have led to over-versatility and indiscriminate application, some have argued (Lynch et al., 2000). According to Nardone et al. (2010), most empirical studies measure social capital through indirect indicators (such as membership of organisations and voter turnout) mainly related to its outcome rather than its core components. The inevitable multi-dimensionality and complex dynamics of social capital over time make building a measurement framework very difficult (Woolcock and Narayan, 2000).

Forrest and Kearns (2001) broke down the concept into several core components, including common values and a civic culture, social order and social control, social solidarity and reductions in wealth disparities, social networks, and attachment to place, and illustrated how these components can be

[8] https://naturalcapitalproject.stanford.edu/

[9] https://seea.un.org/content/natural-capital-accounting-and-valuation-ecosystem-services-china

[10] https://archivesholdings.worldbank.org/social-capital-integrating-economists-and-sociologists-perspectives-1v

operationalised for policy action. Similar work has been done by Nahapiet and Ghoshal (1998), who systematised the domains of social capital into three dimensions: structural, which allows interaction among individuals; relational, which produces interaction among individuals as a result of long-lasting relationships (e.g. trust, governance mechanisms); and cognitive, which refers to elements of social organisation (values, beliefs, etc.) that allow individuals belonging to a group to reach a shared vision of their own community. Nardone et al. (2010) applied six indices to measure these three dimensions of social capital. Teilmann (2012) built a social capital index based on four indicators: number of ties, bridging social capital, recognition, and diversity.

Based on previous literature, one possibility for future work is to conduct statistical analyses based on social surveys in China to construct a small number of principal components that could 'explain' a latent concept of social capital. The approach of the Bennett Institute for Public Policy (2019) and the design process and data from the European Social Survey, based on a few core components such as trust, civic engagement and effective institutions, might be a useful guide for statistical analyses in China. Whether or not this is possible or helpful depends entirely on the data either already available or within scope for development.

Where next?

Bringing all this together, it is evident that much of the world's production is based on the unsustainable consumption of natural, human and social capital, which is mostly neglected in the wealth accounting of a nation. In an effort to increase stocks of these capital assets, there has been a substantial increase in attention to definitions and measurements of all kinds of capital other than physical capital. The Bennett Institute for Public Policy (2019; 2020) summarises the global momentum and future research in this field. It notes that the UN Statistics Commission is revising its accounting standards for incorporating ecosystems into national statistics and these standards will be submitted to the United Nations General Assembly in 2021 to be adopted as an official statistical standard. The World Bank also now measures the 'true wealth' of nations, taking into consideration multiple forms of capital, including natural and social (Lange et al., 2011). More work needs to be done, and it is of great importance that countries cooperate and communicate in order to form a common understanding of the importance of statistical measurements of these forms of capital.

3. Investment opportunities in the four types of capital

We have argued that plans for investment in physical, human, natural and social capital should take centre stage in China's 14th Plan. In this section we describe some key opportunities. The list is not intended to be exhaustive but to illustrate a coherent strategy for the new era, which takes into account both the importance of investing in all four types of capital and some of the complementarities and interconnections.

The dangers from low-quality physical capital to the other three types of capital have been increasingly understood: polluting physical capital damages natural capital, which undermines human health, reducing the productivity of human capital, which in turn can undermine social capital. On the other hand, poor social or human capital can also distort or deter investment and lead to low-quality physical capital. If China is to achieve strong, sustainable and inclusive growth in the new era it is clear that investment in the four types of capital must be carefully integrated.

Investment in physical capital – with a focus on infrastructure

While physical capital, as already described, includes infrastructure, buildings, machinery and more, we focus here on infrastructure. Infrastructure delivers the basic facilities and structures needed for the operation of an economy and society. It includes power, heating, transport, water, sanitation and communication and internet connectivity. Infrastructure is at the heart of the achievement of sustainable development, including health, economic growth and environmental sustainability. Sustainable infrastructure central to the Sustainable Development Goals, and investment in any one form of infrastructure will usually both enhance other forms of infrastructure and help delivery on a number of the SDGs (Bhattacharya et al., 2016).

Investment in infrastructure does not always mean building new infrastructure, it also means making better use of existing infrastructure. Besides, as local governments play an important role in the development of infrastructure in China, their sources of finance are of great importance. A key requirement for China's sustainable growth path is having instruments available for local government financing, including municipal bonds and public–private partnerships (Ahmad et al., 2019).

Investment in low-carbon and resilient infrastructure for more productive, more attractive and healthier cities

Infrastructure investments that are low-carbon and resilient have many benefits beyond the fundamental contributions of mitigation and adaptation in relation to climate change.

Reliable, clean power networks reduce pollution and improve competitiveness. Cleaner ways of heating and cooling can benefit all; Chen et al. (2013) estimated that coal-based winter heating in China cut life expectancy in northern China by more than five years in the period 1981–2000 due to the impact of associated particulate pollution on health. Better urban public transport reduces congestion and air pollution, with large economic and health impacts, particularly for poor people.

Investment in improved strategies for future urbanisation towards compact, connected and coordinated cities can deliver great benefits both in terms of sustainability and resilience and in terms of much more attractive cities with functionally and socially mixed neighbourhoods, a high level of public service and efficient public transport networks (Stern and Zenghelis, 2018). Overall, they would offer China a much more attractive future than the urban sprawl that is developing in many cities (see also Coalition for Urban Transitions, 2019).

The World Resources Institute estimates that globally compact, connected and coordinated cities could provide up to US$17 trillion in economic savings by 2050, stimulate economic growth by improving access to jobs and housing, while also strengthening resilience to physical climate risks and delivering up to 3.7 gigatonnes per year of CO_2 savings over the next 15 years (World Resources Institute, 2017).

Unlocking the power of cities to deliver clean economic development is not merely about pricing reforms and fostering new markets: it requires planning of compact, connected and coordinated use of urban

land. China alone could reduce infrastructure spending by up to US$1.4 trillion by pursuing more compact, connected urban growth (World Bank, 2014). Functionally and socially mixed neighbourhoods with access to green spaces, comfortable, affordable, and climate-smart housing for all, and efficient public transport networks could both protect natural capital and provide a basis for higher quality, stronger and more sustainable economic growth.

Investment in infrastructure to increase energy efficiency in industry

Upgrading industrial processes can significantly increase efficiency, reduce waste and lower production costs, especially in transitioning and developing countries. The International Energy Agency has estimated that implementing best industrial technologies could reduce energy intensity worldwide by as much as 26 per cent in the next 25 years, triggering a 32 per cent reduction in global CO_2 emissions from the energy system as a whole (International Energy Agency cited in UNIDO, n.d.). China's experience demonstrates that improving energy efficiency in industries can deliver substantial savings: during the first four years of the 12th Five-Year Plan (2011–14) energy productivity increased significantly across a number of key sectors, delivering an estimated US$18 billion in economy-wide annual energy cost savings (International Energy Agency, 2016).

Investment in infrastructure to encourage clean technologies

In its current plans China aims to raise its share of non-fossil fuels in the national energy mix to 15 per cent by 2020. China has already strongly and successfully invested in solar photovoltaic (PV) power: according to the China National Energy Administration, by the end of 2016 the total installed capacity of PV power generation in China reached 77 GW. Powerful future growth is anticipated; China has become the world's largest producer of solar cells, surpassing Europe and Japan (Shuai et al., 2018). China should continue support for developing a stronger solar PV industry and encourage more technological innovation to further enhance the international competitiveness of its products (ibid.).

Now is the time for China to accelerate investment in the infrastructure of the future and to create strong economic resilience and a healthier, cleaner and more productive and sustainable economy. This will form part of China's strategic evolution in its comparative advantage towards becoming a global knowledge and innovation hub for developing, producing and exporting new clean technologies in one of the fastest growing global markets (Song and Wang, 2018).

Actual or expected changes in policy, technology and physical risks – as well as the threat of litigation for loss and damage from climate change – could prompt a rapid reassessment of the value of a large range of assets as changing costs and opportunities become apparent (Stern and Zenghelis, 2016). It is important to signal future changes now, include them in the 14th Plan, and plan the process of transition carefully. As we argued in Section 1, the process of change to the zero-carbon economy is path dependent and early clarity will enable it to move ahead much more successfully than if there were hesitation or delay.

Investment towards a green Belt and Road Initiative

China's investment strategy for the new era will both shape and be influenced by China's relationship with the world. Its new trade and investment strategy, with higher tech and services internally and more low-cost manufacturing externally, is clearly interwoven with the BRI. China's partnerships with BRI countries will be of fundamental importance to both China and the world. Infrastructure for connectivity is vital for fostering trade; so, too, is productive capacity elsewhere. A wider and more decentralised set of strategic partnerships will lead to more resilience for the Chinese economy as well as providing the strong productivity gains that trade can offer.

BRI countries themselves will decide their own future and their own strategies for investment and connectivity; thus China's BRI strategy and investments will have to be developed as partnerships and take careful account of politics and priorities in the BRI countries.

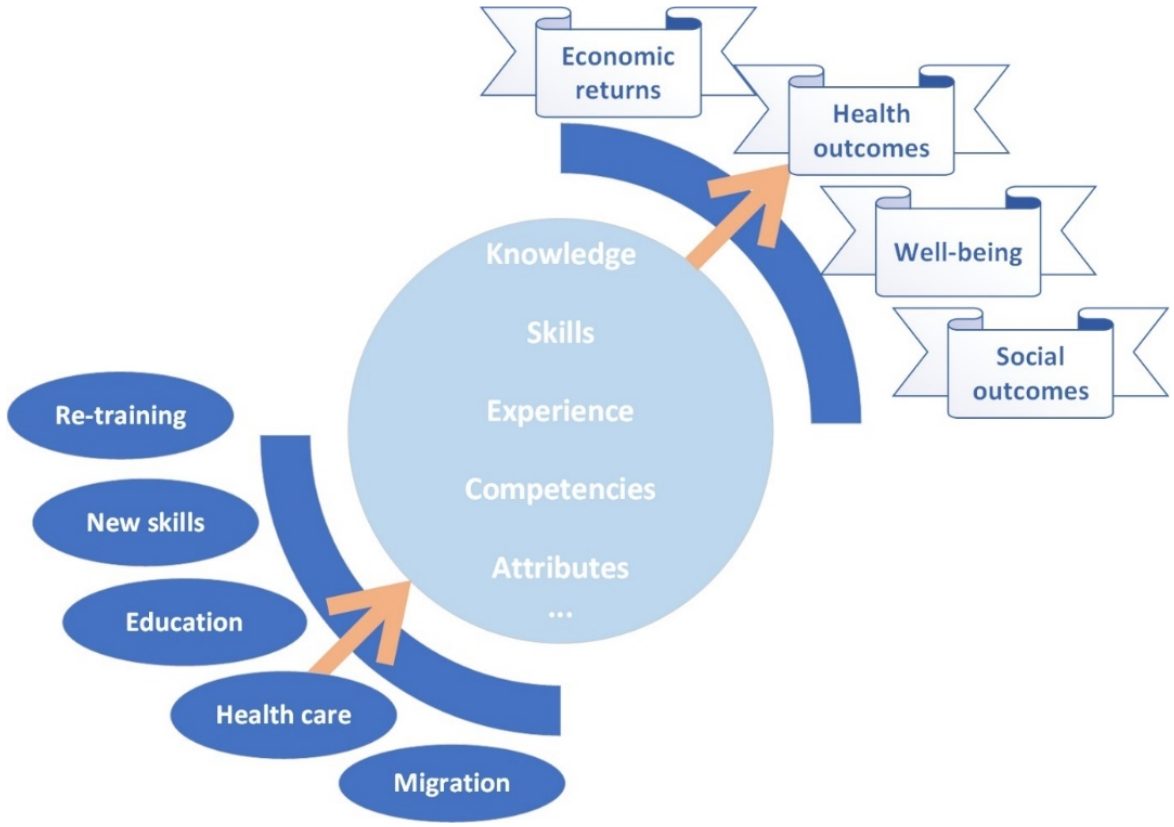
The sustainability of BRI investments is vital to the entire world, including, of course, China and the BRI countries themselves. The total population of BRI countries is around three times the population of China, and average income per capita across the BRI is around half of China's now. Two decades from now their economies may have income per capita equal to that of China now. If, at that time, their

future emissions per capita look like China's in 2020, the world would be adding tens of billions of tonnes of emissions per annum at a time when emissions must in fact fall very sharply if the world is to achieve the Paris Agreement targets. In this scenario the damage to the world's future climate would be immense and irreversible. Therefore, a green BRI is of fundamental importance to the future of the world.

Investment in human capital

China needs a highly skilled, healthy, flexible labour force to tackle the challenges and changes of the coming decades. It will be a period of very rapid change with the move to high tech and services, increased urbanisation, AI and robotics, an ageing population and changing world order. China must invest strongly and wisely in human capital. Based on the concepts described above, Figure 3.1 offers a description of the core elements of human capital, together with the investments that can enhance it and the outcomes that can flow from those investments.

Figure 3.1. Investment in human capital and the benefits of doing so



Source: Authors

These investments should take account not only of the necessary new skills that can adapt as new technology evolves but also the fact that change needs to be managed in a fair and equitable way – the agenda of the 'just transition', so that those who work in activities that will be restructured or decline have a chance to participate in the new economy. These issues are taken up under social capital below.

Skills necessary for cleaner infrastructure

As China urbanises and moves towards higher-quality and sustainable growth, it will require strong investment in new types of sustainable infrastructure. These include High-Voltage Direct Current interconnectors (HVDCs), charging points for electric vehicles (EVs), refuelling for hydrogen trucks and ships, overhead wiring on major roads for long-distance electric trucks, further investment in solar PV, and batteries. As it moves up the value chain and towards more sophisticated and cleaner technologies in this way, the skills required in China will change. China's management of the necessary rapid changes to labour markets will require investing in the retraining of current workers and the provision of continuing education or lifelong learning.

China has already been active in recognising and managing these issues. For example, when construction was delayed or halted on 151 coal-fired power plants, the Government established a US$15 billion fund for retraining, reallocating and early retirement of the estimated 5–6 million affected coal and steel sector workers (New Climate Economy, 2018). This kind of approach will be important to both fostering human capital and maintaining social capital.

On-the-job training is another effective way to develop the employee skills needed for cleaner infrastructure. However, studies carried out by Aon plc show that the employee turnover rate in China is very high, with an average of 20.8 per cent in 2016 (Aon, 2016) and high staff attrition rates mean that enterprises in China are not motivated to provide on-the-job training. Further investment is needed to help increase enterprises' training funds. In order to retain value and avoid asset stranding, new human capital must be low-carbon-compatible.

Skills to enable adoption of frontier technologies

Digital technologies and innovations, such as 'dematerialised services' and AI, have the potential to radically increase efficiency and enable new business models across most sectors of the economy (Adams, 2018). There will be real challenges in enabling humans to contribute productively alongside AI, rather than simply being directly replaced by machines. A highly skilled labour force is necessary for the adoption and application of such frontier technologies (Acemoglu and Zilibotti, 2001; Caselli et al., 2006). Those without suitable skills risk lower productivity, lower wages and lower standards of living (Che and Zhang, 2018).

These AI-based technologies are far from maturity, and as they evolve and advance China has the opportunity to invest in new skills as required by the development of digital technologies and to train its labour force to be effective, efficient and agile in an increasingly automated world. These complementary skills to AI, including coding or other computing skills, might be significant elements in future productivity growth. With the automation of whole categories of tasks, greater value will also be placed on skills and talents that are different from and complementary to AI, such as those involved in human creativity or care.

As the world's population ages, shortages of qualified labour may arise. In 2015, there were 28 people aged 65 and over for every 100 people of working age. By 2050, this dependency ratio is projected to double (OECD, 2019). AI has the potential to help older workers and boost the size of the labour force by increasing retirement ages.

Investment in education, especially in rural areas

Since the economic reform of 1978 China has increased its investment in education substantially. The proportion of China's labour force having a college education (i.e. post-18) increased from only 1.1 per cent in 1980 to 12.5 per cent in 2015 (Li et al., 2017). However, the overall education level of China's rural labour force is still extremely low. Li et al. (2017) examined China's human capital in 2015 and found that only 11.3 per cent of rural workers in the 25–64 age group had attained at least high school education compared with 44.1 per cent for urban workers. There are also sharp regional disparities, including between urban areas.

Investment in institutional reform

Unlike most countries in the world, in China the labour force has been divided into two distinct segments via the *hukou* policy, which identified the location in which individuals were allowed to live and work. In the early 1990s the *hukou* system was relaxed after the launch of economic reforms, and the labour force was no longer restricted to live and work only in the location specified on their *hukou* card. In 2014 64 per cent of individuals living in China had a rural *hukou* and 76 per cent were of working-age. Nearly one-third (31 per cent) of workers with a rural *hukou* had migrated to work in urban areas by 2014 (Li et al., 2017).

However, nearly all administrative activities, most importantly housing, land distribution, school enrolment, medical insurance and social security, are still based on an individual's *hukou* status. Children of migrants are not guaranteed places in public schools in cities; therefore, migrant children are barely found in higher-quality schools in urban areas. The denial of access to local public services, particularly

the local education system, makes it difficult for rural migrants to live permanently and raise their families in cities. By the end of 2017, only 22 per cent of rural migrant workers had a basic pension or medical insurance, 18 per cent had health insurance, 27 per cent had work-related injury insurance and 17 per cent had unemployment insurance (Ministry of Human Resources and Social Security, 2018).

Investment in health care

Health is a significant driver of the productivity of human capital, as well as a key element in wellbeing. Public investment in health systems can show powerful economic and social returns, particularly when made in areas of public health and prevention activities. Radically reducing pollution – strengthening natural capital – can be a particularly strong driver of improvement in health outcomes.

It is estimated that air pollution leads to an estimated 1.2 million premature deaths per year in China (Ritchie and Roser, 2017), and costs an estimated 3.5 per cent of national GDP annually (Umbach and Yu, 2016). One third of Chinese households rely on solid fuels for heating and cooking, and this is a major cause of indoor air pollution, which leads to an estimated 600,000-plus deaths in China each year (Roser and Ritchie, 2013). Changing cooking methods can increase social capital, raise productivity and enhance the quality of life. Women benefit significantly from improved access to more productive and cleaner energy, including through reducing the time taken to gather fuel and as a consequence creating more time for income-generating activities or childcare (both of which yield higher productivity) or leisure (increasing wellbeing). These ideas and actions will be powerful agents of change.

There are, of course, many important health-related issues to be addressed, including public health, lifestyles, access to medical services, care in the community, the needs of an ageing population and so on. These take us beyond the scope of this paper but are vital elements in both human and social capital.

Investment in natural capital

Successful investment in and protection of natural capital involves clear national and community strategies, so that impacts are understood, their wider economic and systemic effects evaluated, and appropriate choices made. China has implemented many reforms to improve the environment including in relation to public health (Huang, 2018). We focus here briefly on the quality of renewable natural capital, especially air quality, control of greenhouse gas emissions, climate-smart agriculture and the nature of future urbanisation. The subject of natural capital in relation to future development strategy, of course, extends beyond these issues, although the issues we raise here are crucial for sustainable growth in the new era.

Investment in renewable natural capital

Renewable natural capital is poorly managed in many places around the world. Underinvestment in renewable natural capital can lead to profound consequences for wellbeing via damage to ecosystems, loss of species, severe pollution and premature deaths.

Air pollution is a severe problem worldwide: according to the World Health Organization, more than 90 per cent of the world's population breathes polluted air every day (WHO, 2018). The United Nations Environment Programme suggests air pollution is responsible for 7 million deaths annually (UNEP, 2019). Ritchie and Roser (2017) estimate there were 1.2 million premature deaths due to air pollution in China in 2010, at a cost of 3.5 per cent of national GDP.[11]

The Chinese government has designed policies to address both air pollution and climate change. It has begun to tackle the deadly smog in its cities by switching to natural gas from coal and via air management systems. Longer-term measures include investment in new public transport and a drive towards electric cars: China was targeting 5 million electric cars on its roads by 2020. These efforts are beginning to yield results. For example, air quality improved in 2017, with the average density of PM2.5 pollution in 338 cities across China seeing a 6.5 per cent decrease from 2016 (New Climate Economy, 2018).

Water pollution is also a significant problem in China. Ebenstein (2012) finds that industrial activity has led to a severe deterioration in water quality in China's lakes and rivers and estimates that a

[11] Using standard processes for estimating the statistical value of a life.

deterioration of water quality by a single grade (on a six-grade scale) increases the digestive cancer death rate by 9.7 per cent.

Substantial land degradation accompanied by productivity decreases is a further issue. Deng and Li (2016) suggest that the annual cost of land degradation for the period between 2001 and 2009 was 1 per cent of China's 2007 GDP. China has successfully achieved some land restoration, restoring 7,732 km^2 from farmlands and 24,904 km^2 from barren lands (Mao et al., 2018). However, more needs to be done and investing in land restoration is an area in which China could offer much to the world by reducing emissions and enhancing global biodiversity.

Investment in natural capital that contributes to the reduction of carbon dioxide emissions

On a global scale, the atmosphere constitutes natural capital of the most fundamental importance. Greenhouse gas emissions play a vital role in its future. A major part of these emissions is associated with the functioning of the world's forests, land and oceans, vital elements of natural capital. We are already seeing the intensity of effects arising from past mismanagement. The planet is now, with a 1°C temperature increase over the pre-industrial average, at the edge of the stable Holocene period of the last 10 millennia, when our civilisation of villages and towns developed. The last 20 years have seen 19 of the warmest years on record (NASA, 2020). Disasters triggered by weather- and climate-related hazards were responsible for US$320 billion in losses in 2017 (New Climate Economy, 2018).

Reducing CO_2 emissions is imperative to safeguarding the world's natural capital. Significant achievements have already been made in China in reducing CO_2 emissions and limiting the use of fossil fuels through better management of the energy mix, more use of renewables and enhanced energy efficiency. UNEP estimates that substitution of fossil fuels with renewables, and with improvements in energy efficiency, cut carbon intensity by 45.8 per cent between 2005 and 2018 (UNEP, 2019). However, although much progress has been made domestically, China should make more effort in how it utilises natural capital from elsewhere in the world. UNEP has called for urgent action against global natural resources depletion as the global trade in materials has translated in displacement of all types of environmental and health impacts from the high-income, high consumption countries to low-income countries supplying raw materials (Oberle et al., 2019).

Achieving net-zero emissions in the next 30 to 50 years may seem implausible to some, given the current structure of the Chinese economy, but China's remarkable economic achievements over the last 40 years would have seemed implausible to an observer in 1978. The incentives and rewards to three or four further decades of rapid reform may be even larger than those of the past. And we can already recognise the possibility of a very attractive new sustainable and inclusive path, which will be to the great benefit of China and the world.

Further, there are great potential local health benefits from policies that encourage switching away from fossil fuels. For example, it is estimated that phasing in a US$70 carbon price in China could prevent nearly 4 million premature deaths from air pollution up to 2030 (Parry et al., 2016).

Investment in climate-smart agriculture

According to the Food and Land Use Coalition (FOLU, 2019), agriculture contributed 7.2 per cent of China's GDP in 2018 and China is the largest agricultural market in the world. At the same time, agriculture is responsible for a large proportion of surface-water pollution and is the leading cause of groundwater pollution in China, and contributes to greenhouse gas emissions. This has severe effects on aquatic ecosystems and human health (Mateo-Sagasta et al., 2017).

There are widespread impacts on natural capital from agricultural practices. China has the opportunity to develop climate-smart agricultural approaches as a means to increase agricultural productivity sustainably, thereby raising quality of life and public health, protecting the environment and reducing emissions. Climate-smart agriculture practices cover new production systems including landscape farming approaches, intercropping and integrated crop–livestock management, and improved water, soil and nutrient management. These practices contribute to food safety, can produce higher outputs, create better jobs and income for farmers, and climate change mitigation. They can improve resilience to adverse weather conditions. For example, crop diversification and agroforestry have been shown to

increase yields while avoiding environmental impacts (New Climate Economy, 2018; see also FOLU, 2019).

In addition, investment decisions should fully consider the trade-offs that exist between food production, biodiversity conservation and ecosystem service provision, and progress towards a more balanced food production system (Holt et al., 2016).

Investment in social capital

A series of rapid changes in the world are creating major disruptions and potential risks to employment and labour markets. While China can anticipate and prepare for these changes by investing in *human* capital, the impacts of these changes together with shifting demographic trends mean that careful attention is required to social capital too. While definitions of social capital vary (see Section 2 above), for the purposes of this paper we highlight some key elements of policy towards and investment in social cohesion, trust, sound institutions and a just transition.

Investment in social cohesion and reducing inequality

China has emphasised the importance of a cohesive society and has expressed concerns about inequality (Liu, 2017). Absolute poverty has reduced dramatically over the last four decades and evidence on consumption by poorer households in China indicates that the remaining incidence of extreme poverty is declining (Westmore, 2018). However, there remain many poor people in China and a large income gap exists between urban and rural populations (Wu and He, 2018). China's policymakers have highlighted the importance they attach to closing this gap, including through the provision of equal access to good education and health services.

A strategy of reducing inequality and eliminating poverty in China should have several elements, including:

- Education and training for life-long learning
- Re-training provision when old activities decline: government revenues from environmental tax reform could be used in part to fund education, vocational training and re-skilling programmes
- Assistance and finance for local entrepreneurship in starting or expanding small and medium enterprises
- Help for workers to migrate those who wish to, through information, finance and relaxing the *hukou*[12] system
- Provision of social safety nets designed, as far as possible, to aid reintegration into work or support or pensions for those who are unable so to do.

In all this, active dialogue between local communities, employees, unions, employers and local government will greatly facilitate design that fits local circumstances and create a sense for all of being involved.

Investment in a just transition

Moving up value chains, a shift towards the service sector, and adopting cleaner ways of producing have all started to affect China's society as well as its economy. Managing the phase-down of high-carbon industries and the millions of workers they employ, and to accelerate transitions within – or away from – the communities in which these industries are concentrated, presents an important challenge. This is a universal challenge for all countries, but in China it is particularly pronounced due to the sheer size of its high-carbon and heavy industrial sectors. However, it is just one part of a bigger story. This includes the shift of demand towards services as economies get richer and their comparative advantage changes, a process that has moved very rapidly in China. Further, there has been strong labour-saving technical progress, and much more is on the way.

The management of the low-carbon transition should be set in the context of these major and continuing transitions (Stern, 2015; Averchenkova et al., 2016; Neuweg and Averchenkova, 2017). The

[12] See p17 above.

consequences of these transitions are often concentrated in particular regions, where entire communities can be affected (Beatty et al., 2007; Sartor, 2018). Their way of life is often closely intertwined with an industry that employs a large share of the local population. This is particularly relevant for mining communities; China's 13th Five-Year Plan on energy development set the target of cutting coal production capacity by 0.8 billion tonnes per year by 2020 (Wang et al., 2018). Some 1.3 million workers at state-owned coal companies were laid off in 2016, with around 5 million more expected to be laid off in the following few years (Jeffreys and Xu, 2018).

There is urgent need to support affected coal communities and ensure a just transition in China. That should include transparent and comprehensive policies on compensation and medical support, as well as an occupational retraining programme to help these affected coal workers build a future, as they are often unskilled rural-to-urban migrants employed for their low labour costs. Besides, the effects on those communities often extend beyond concerns about economic means to support livelihoods. They include repercussions on identity, social ties, 'the look and feel of the place' and the understanding of self. Scott (2010), for example, illustrates, through an ethnography of mountain top removal mining in Appalachia, the various social and communal ways in which attachments are formed through identity, place and working-class masculinity.

The world community has not managed this fundamental change well. The result has often been anger and distrust. That undermines social capital, can have profound political consequences and can be an obstacle to future change.

Investment in trust

Prosperity and wealth depend not only on physical and human capital, but also people's ability and freedom to live in a peaceful, trusting society, with a safe and stable climate and healthy ecosystems. Simmel (1950) argued that "trust is one of the most important synthetic forces within society". A high level of trust reduces transaction and monitoring costs and enables social and economic cooperation and exchange. Knack and Keefer (1997) suggested a moderate increase in generalised trust could significantly boost economic growth. Dasgupta (2010) showed how higher levels of trust among economic agents can foster cooperation and productivity growth by encouraging trade and specialisation. Ang et al. (2015) suggested that regions which recorded high social trust scores are able to attract more foreign high-tech investments in China.

Social trust between citizens is not necessarily related to political trust between citizens and institutions. The formation of trust in people relies on cumulative experiences of trustworthy interactions with other people, while the formation of trust in institutions relies on broader social settings including shared ethical views, cultural norms and rules (see O'Neill, 2002).

De Cremer (2015) stresses the importance of trust in the development of the business processes, and argues that the "trust default", which influences how people behave in building a relationship, tilts more towards "distrust" in China – people only receive trust after they have proven to be worthy of it. Some studies (e.g. Huff and Kelley, 2003) suggest that this tendency of Chinese people generally not to trust strangers is related to the fact that their everyday social interaction occurs primarily with relatives and kin (ingroups) but not with strangers (outgroups). Yao et al. (2017) use survey data and indicate that a variety of positive experiences – getting support from, receiving help from, and being trusted by outgroup members – can increase generalised trust in China. The primary function of trust tends to be related to the feelings of safety (De Cremer, 2015). The building of a far-reaching social safety net, which consists of various welfare programmes including health, social pensions, public works, and school meals, targeted at poor and vulnerable households, can be a key element of investment in trust and social cohesion in China.

Investment in sound institutions

Society wastes resources when people are distrustful and dishonest with each other. The economic literature on repeated games and punishment shows why cooperation makes social sense when people expect to interact in the future (Kreps et al., 1982). However, people are surprisingly cooperative over and above what theory suggests is in their immediate self-interest (Paldam, 2000). This probably reflects

the fact that people gain direct utility from living in a trustworthy society; perhaps for evolutionary reasons, social connectedness brings most humans intrinsic pleasure. Moreover, trust builds on trust.

Generalised trust and the quality of governance are both a result of and a cause of productivity growth and higher reported wellbeing. This mutual causation sets up a feedback mechanism which means sustained, carefully targeted policy interventions could trigger a virtuous cycle of good governance and higher productivity. This highlights the importance of investing in the quality of economic and political institutions.

The quality of governance and institutions accounts for a large part of the variation in rates of growth and investment across countries by supporting social capital, according to Olson et al. (2000). Clague et al. (1999) find that the quality of governance and institutions is important for explaining rates of investment. Investment and innovation in institutions, behaviours and cultures can build social capital. New technologies can sometimes even be harmful if they are not accompanied by a sound institution that enables sustainable growth; for example, a lack of institutions that impose restrictions on environmental pollution, soil degradation and overfishing, or institutions that regulate employment and limit monopolistic rent seeking (Bennett Institute for Public Policy, 2019). Developing a legal, judicial and institutional framework to embed integrity and consistency into policymaking can enable the effective and acceptable functioning of other types of capital.

The outbreak of the coronavirus (Covid-19) epidemic in January 2020 has exposed the problem of incapability of government in central and western China and the regional disparities in government regulation. The levels of economic development in some eastern regions of China such as Shanghai, Zhejiang, and Guangdong are close to those of developed countries. Local governments in these areas witnessed higher governance capabilities and took the most prompt actions in response to the epidemic. However, Hubei, where the outbreak originated, is in a relatively less developed area and the poor response of its local government in the early stage accelerated the spread of the epidemic. Good governance ensures public institutions conduct public affairs and manage public resources in a reasonable way, which is of great significance to both national wellbeing and economic growth.

Investment in sound institutions in China includes providing assistance and financial support for local entrepreneurship in starting or expanding small and medium enterprises. It is related to employment opportunities and access to social services especially for rural-to-urban migrants. It also involves reconsideration of intergovernmental assignments to ensure that local governments have strong and sustainable own-revenue sources. Focusing on the intergovernmental fiscal system Ahmad et al. (2019) showed the need for sufficiently resourced local governments and sound management of intertemporal liabilities at provincial level.

Social and human capital are interwoven. Reforms of the intergovernmental fiscal system and wise and transparent spending decisions, including on infrastructure, can help manage or reduce income disparities. Sound, sustainable and inclusive local systems for funding public investment can foster social cohesion, trust and strong institutions.

4. Delivering prosperity in China through a focus on the four types of capital in the 14th Plan and Belt and Road

This paper shows how ignoring or neglecting China's capital assets or balance sheets comes with great risk. China's future development, wellbeing and quality of life will depend critically on the four types of capital examined here.

The speed of technological change, global interconnection in trade and investment, and the need for fundamental structural change to achieve sustainability, together with a slowing overall growth rate, indicate that a changing balance in the Chinese economy can no longer occur simply by some sectors growing more rapidly than others; some sectors in the coming years will decline and be replaced by different ones. The effects in some places might be severe. Social cohesion and economic justice require that such transitions are managed.

Section 1 outlined how the necessary investment will boost China's prosperity in the short and long term, by driving not only a cleaner, safer and more secure society but also an economy that is more efficient, innovative and productive. Such investment also puts China in a strong position to lead the world in the resource-efficient, low-carbon revolution that is already underway. It noted that investment in new clean infrastructure and technologies offers many near-term opportunities to tackle issues related to waste, inefficiency, insecurity, pollution and congestion.

Section 2 outlined the importance of, and methods for, valuing the four key assets, physical, human, natural and social capital, noting the interactions and complementarities across all four. The assessment points to the need for investment in the measurement and valuation of key assets to provide a coherent and comprehensive dataset capable of informing policymakers. China is not alone in failing to value asset stocks sufficiently; it is a challenge faced by all major countries. But China may have more to gain from leading the way in developing and utilising new measures, for the reasons this report outlines.

Valuing key assets, having recognised their importance, requires a programme of balanced investment, as set out in Section 3. Physical infrastructure must be upgraded to boost China's efficiency and productivity in order to generate innovation and knowledge that drive the new economy. Sizeable investment opportunities exist in clean technologies. Infrastructure will increasingly focus on compact, connected, low-carbon and resilient cities. But the phase of development shaped by extensive investment in physical capital will become increasingly supplanted by investment in a broader range of assets.

The paper highlights how the skills that are required to drive China's economy forward will change as it moves up the value chain into more sophisticated and cleaner technologies. This puts investment in adaptive and flexible human capital at the fore, including the training and re-training of current workers and the provision of continuing education. China's management of the necessary rapid changes in labour markets will also require investment in complementary new networks and high-end technologies as well as the protection and restoration of natural capital.

Within human capital, the need for knowledge capital can be expected to expand as the country invests in innovation. But China's prosperity also depends on its ability to live in a harmonious and trusting society, with functional institutions, safe from climate risks, and without degraded ecosystems. In other words, China must invest in and nurture its social and natural capital.

Particular attention needs to be paid to natural capital. Unlike physical and human capital, natural capital, which provides a crucial building block for all other forms of capital, is generally in decline. This poses one of the biggest threats to China's continued growth and prosperity. The air of cities has been severely polluted. So too have soil and water. Climate change is an immense risk. It is clear that strong global action is urgently needed, and that China, because of the size of its economy and emissions, must be a central player in climate action.

Resource productivity and efficiency will be powerful forces for growth in the new economy and there is real potential in the idea of the circular economy with its emphasis on design for re-use and recycling. Resource efficiency and productivity are also crucial elements for the protection of natural and human capital by decoupling growth from material use, environmental degradation and emissions. Unlike material resources, knowledge need not deplete if well managed. Indeed, it can be self-reinforcing as knowledge builds on knowledge. This opens exciting and creative avenues for sustainable growth and prosperity.

Successful investment in, and protection of, natural capital, alongside investment in physical, human and social capital, involves clear national and community strategies. This is required for economic and systemic effects to be fully understood, and appropriate choices to be made, all of which is clearly and strongly recognised by the leadership in China: in President Xi's 19th Party Conference Speech (2017)[13] there were more references to "environment" and "green" (89 times) than the "economy" (70 times). Of the 14 elements in "Xi Jinping Thought",[14] three relate directly to sustainability. China has actively participated in creating, observing and maintaining the Paris Agreement on climate change of 2015.

The need to deliver a 'just transition' to a new growth era means all members of society must have the opportunity to participate, especially the poorer people in the society. This requires institutional innovation to keep up with the changing economy, with enabling institutions that support and enhance social capital. Major change inevitably involves some dislocation. The policy response to climate change, the most pressing challenge of our generation, and to coping with the challenges presented by new technologies such as AI, big data and automation, requires institutions that enable the implementation of a range of policies to manage dislocation and to turn the changes into opportunities for as many as possible.

Such issues arise more strongly now that China is an established producer in many sectors. Some of these sectors will contract. These include coal mining, steel and some of low-cost manufacturing. As well as enabling workers to reskill, structural reform requires transparent and efficient institutions that promote competition and innovation and limit rent-seeking and clientelism. Any policies not built on foundations of trust and effective institutions risk failure. This paper argues that adjustment costs are real, but that they can be managed creatively to offer opportunities across society as a whole.

In summary, securing sustainable returns from the four types of capital requires investment and innovation in the new technologies that can give high-quality growth; in modern service sectors, including health, education, transport, communications and IT and logistics; in a strong financial system, necessary to support private sector innovation and investment; in better functioning efficient modern cities, including in their infrastructure, the clean-up of pollution and congestion; in local governance and the ability to secure local finances; in food and land-use systems; and in global governance, engagement and leadership.

More specifically, in order to drive the investments and transformations of the new era, reforms can be made in seven areas of policy necessary to foster the entrepreneurship and innovation (identified by Hepburn and Stern, 2018):

1. High productivity and high-quality growth can be supported by clear and strong price signals, targeted standards, and enterprise reform.
2. New blends of public and private finance can support investment in the four types of capital.
3. Stable and productive city-level public finance can be based on transparent revenue streams from local taxation and payments for services, accompanied by transparent and quality expenditure.
4. Improved governance can deliver sound policies that are 'predictably flexible', creating a positive investment climate.
5. Cities can be designed to be compact and clean.

[13] http://www.xinhuanet.com/english/download/Xi_Jinping's_report_at_19th_CPC_National_Congress.pdf

[14] This is a set of policies and ideals; see: https://en.wikipedia.org/wiki/Xi_Jinping_Thought

6. Those affected by change can be supported with re-training, finance for entrepreneurship, social safety nets and other policies.
7. China can take the lead, as the largest economy in the world, in shaping a well-functioning, rules-based, and equitable world order that enables increased trade and investment and the collective action necessary to protect the global commons.

The scale of China's influence on the world gives it new responsibilities. This will be China's century and its size and economic impact mean safeguarding the health of the world, including China's key markets, at a time of mounting environmental stresses. China will require clear and stable leadership to fulfil this remit, emphasising very strongly that the 14th Plan and the Belt and Road Initiative have to be understood together.

China can steer the future by developing and scaling the technologies the world will want to use and buy. But it can also anticipate the future, by making sure it does not lock into the technologies, behaviours and institutions of the past. Moreover, it can do so beyond its borders. The BRI is an opportunity to foster clean development in China's hinterland and its partners. The relationships between China and its trading partners, especially those in the BRI, will evolve to reflect the changing international division of labour in a rapidly changing world.

Moving up the value chain will require changing relationships between China and its trading partners. The countries of the BRI have income per capita and wages on average and approximately half those of China. If trade and infrastructure links can be established, and technologies advanced and shared, then the countries of the BRI could play a powerful and positive role in the spread of a more efficient, innovative and sustainable growth model. Just as China followed development paths different in crucial respects from those of the rich countries, the BRI countries will follow paths that are different in crucial respects from China's. Showing lessons is part of partnership and progress.

Had the technologies of today been available to China 25 years or so ago, its development path might have been much cleaner and more sustainable, to the great benefit of its citizens. If it had been able to look ahead more clearly to the problems of congested and polluted cities, it might have made policy and investments differently. BRI countries cannot make such a mistake and China has an opportunity, by exporting and investing in new technologies and institutions around the world, to showcase the shortcomings in the 'grow now, clean up later' approach to development (UNEP, 2019). China is entering a new era of development that could transform not only its own economy, as it drives towards sustainable, high-income, knowledge-based production, but also the wellbeing, sustainability and prosperity of the rest of the world.

References

Aon (2016) China posts an average salary increase rate of 6.7% and turnover rate of 20.8% in 2016. Media release, 14 November.

Acemoglu D and Zilibotti F (2001) Productivity differences. The Quarterly Journal of Economics 116(2): 563-606

Acemoglu D, Aghion P, Bursztyn L, Hemous D (2012) The environment and directed technical change. American Economic Review 102(1): 131-166

Adams A (2018) Technology and the labour market: the assessment. Oxford Review of Economic Policy 34(3): 349-361

Aghion P, Askenazy P, Berman N, Cette G and Eymard L (2012) Credit constraints and the cyclicality of R&D investment: Evidence from France. Journal of the European Economic Association 10(5): 1001-1024

Ahmad E, Neuweg I and Stern N (2019) Growth, structural transformation, and the new global agenda: what this means for China and the world. In Fouquet R (ed) Handbook on Green Growth. Edward Elgar Publishing

Ang J, Cheng Y, Wu C (2015) Trust, investment, and business contracting. *Journal of Financial and Quantitative Analysis* 50: 569–595

Arrow K J (1999) Observations on social capital. In Dasgupta P and Serageldin I (eds) Social Capital: A Multifaceted Perspective. Washington: The World Bank

Austin B A, Glaeser E L and Summers L H (2018) Jobs for the Heartland: Place-Based Policies in 21st Century America. NBER Working Paper No. 24548, April

Averchenkova A, Bassi S, Benes K J, Green F, Lagarde A, Neuweg I and Zachmann G (2016) Climate policy in the United States, China and the European Union: Main Drivers and Prospects for the Future: In-depth country analysis. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

Barro R J (1991) Economic growth in a cross section of countries. The Quarterly Journal of Economics 106(2): 407-443

Barro R J (2001) Human capital and growth. American Economic Review 91(2): 12-17

Beatty C, Fothergill S, Powell R (2007) Twenty years on: has the economy of the coalfields recovered? *Environment and Planning A* 39(7): 1654-1675

Bennett Institute for Public Policy (2019) Measuring wealth, delivering prosperity. The Wealth Economy Project on Natural and Social Capital, Interim Report for LetterOne. Cambridge, UK: Bennett Institute for Public Policy

Bennett Institute for Public Policy (2020) Valuing Wealth, Building Prosperity. The Wealth Economy Project on Natural and Social Capital, One Year Report. Cambridge, UK: Bennett Institute for Public Policy

Bhattacharya A, Meltzer J P, Oppenheim J, Qureshi Z and Stern N (2016) Delivering on Sustainable Infrastructure for Better Development and Better Climate. Washington DC: The Brookings Institution, New Climate Economy, Grantham Research Institute on Climate Change and the Environment

Böhm B, Gleiß A, Wagner M and Ziegler D (2002) Disaggregated capital stock estimation for Austria-methods, concepts and results. Applied Economics 34(1): 23-37

Bourdieu P (1986) The forms of capital. In Richardson J (ed) Handbook of Theory and Research for the Sociology of Education: 241–58. Westport, CT: Greenwood

Caselli F and Coleman W J (2006) The world technology frontier. American Economic Review 96(3): 499-522

Campiglio E, Dafermos Y, Monnin P, Ryan-Collins J, Schotten G and Tanaka M (2018) Climate change challenges for central banks and financial regulators. Nature Climate Change 8(6): 462-468

Che Y and Zhang L (2018) Human Capital, Technology Adoption and Firm Performance: Impacts of China's Higher Education Expansion in the Late 1990s. The Economic Journal 128(614): 2282-2320

Chen Y, Ebenstein A, Greenstone M and Li H (2013) Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy. Proceedings of the National Academy of Sciences 110(32): 12936-12941

Clague C, Keefer P, Knack S and Olson M (1999) Contract-Intensive Money: Contract Enforcement, Property Rights, and Economic Performance. Journal of Economic Growth 4: 185

Coalition for Urban Transitions (2019) Climate emergency, urban opportunity.

Coleman J S (1988) Social capital in the creation of human capital. American Journal of Sociology 94: S95-S120

Coleman J S (1994) Foundations of social theory. Harvard University Press.

Dasgupta P (2010) *A Matter of Trust: Social Capital and Economic Development*. Annual World Bank Conference on Development Economics-Global 2010

Dechezleprêtre A and Martin R (2013) Knowledge spillovers from clean and dirty technologies. Grantham Research Institute on Climate Change and the Environment Working Paper 135

De Cremer D (2015) Understanding trust, in China and the West. *Harvard Business Review* 11

Deng X and Li Z (2016) Economics of land degradation in China. In Nkonya E, Mirzabaev A and von Braun J (eds) Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development: 385-399. Springer

Ebenstein A (2012) The consequences of industrialization: evidence from water pollution and digestive cancers in China. The Review of Economics and Statistics 94(1): 186-201

Food and Land Use Coalition (FOLU) (2019) Growing Better: Ten Critical Transitions to. Transform Food and Land Use. FOLU

Forrest R and Kearns A (2001) Social cohesion, social capital and the neighbourhood. Urban Studies 38(12): 2125-2143

Gibson J and Oxley L (2005) Measuring the stock of human capital in New Zealand. Mathematics and Computers in Simulation 68(5-6): 484-497

Goldsmith R W (1951) A perpetual inventory of national wealth. Studies in Income and Wealth 14: 5-73. NBER

Grootaert C (1998) Social capital: the missing link? In Dekker P and Uslaner E M (eds) Social Capital and Participation in Everyday Life. London; New York: Routledge

Hale T (2018) Catalytic cooperation. BSG-Working Paper 2018/026. Oxford, UK

Hallegatte S, Shah A, Lempert R, Brown C and Gill S (2012) Investment decision making under deep uncertainty. Application to climate change. Policy Research Working Paper 6193. Washington DC: World Bank

Hamilton K (2006) Where is the wealth of nations: measuring capital for the 21st century. Washington DC: World Bank

Hamilton K and Hepburn C (2017) National Wealth: What is Missing, Why it Matters. Oxford University Press

Han J, Zhao Q, Zhang M (2016) China's income inequality in the global context. *Perspectives in Science* 7: 24-29

Helm D (2015) Natural capital: valuing the planet. Yale University Press

Hepburn C and Stern N (2018) *A new, high-quality and sustainable economic growth strategy for China: Reflections on issues for the next stages of reform*. Working paper (unpublished)

Hepburn C, Stern N, Xie C and Zenghelis D (2020) *Strong, sustainable and inclusive growth in a new era for China – Paper 1: Challenges and ways forward*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

Hidalgo C A, Klinger B, Barabási A-L, Hausmann R (2007) The product space conditions the development of nations. *Science* 317(5837): 482-487

Holt A R, Alix A, Thompson A, Maltby L (2016) Food production, ecosystem services and biodiversity: We can't have it all everywhere. *Science of the Total Environment* 573: 1422-1429

Hongye X and Feng H (2005) The Applying of Capital Perpetual Inventory Method in China. *Finance & Trade Economics* 3: 012

Huang J, Pan X, Guo X, Li G (2018) Health impact of China's Air Pollution and Control Action Plan: An Analysis of national air quality monitoring and mortality data. *Lancet Planetary Health,* 2 (7): 313- 323

Huang Y, Ren R, Liu X (2002) Capital stock estimates in Chinese manufacturing by perpetual inventory approach. *China Economic Quarterly* 1(2): 377-396

Huff L, Kelley L (2003) Levels of organizational trust in individualist versus collectivist societies: A seven-nation study. *Organization Science* 14(1): 81-90

International Energy Agency [IEA] (2016) *Energy Efficiency Market Report 2016*. Paris: IEA

Intergovernmental Panel on Climate Change (IPCC) (2018) Global Warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas

emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. [Masson-Delmotte V, Zhai P, Pörtner H-O, Roberts D, Skea J, Shukla P R, Pirani A, Moufouma-Okia W, Péan C, Pidcock R, Connors S, Matthews J B R, Chen Y, Zhou X, Gomis M I, Lonnoy E, Maycock T, Tignor M, Waterfield T (eds.)]. Geneva, Switzerland: World Meteorological Organization

Jeffreys E, Xu J (2018) Governing China's Coal Challenge: Changing Public Policy, Debate and Advocacy. *Environmental Communication* 12(5): 575-588

Jorgenson D W and Fraumeni B M (1992a) Investment in education and US economic growth. *The Scandinavian Journal of Economics* S51-S70

Jorgenson D W and Fraumeni B M (1992b) The output of the education sector. *Output Measurement in the Service Sectors*, University of Chicago Press: 303-341

Jorgenson D W and Pachon A (1983) The accumulation of human and non-human capital. *The Determinants of National Saving and Wealth*, Springer: 302-350

Knack S and Keefer P (1997) Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics* 112(4): 1251-1288

Kreps D, Milgrom P, Roberts J and Wilson R (1982) Rational cooperation in the finitely repeated prisoner's dilemma. *Journal of Economic Theory* 27: 245–52

Lang W, Chen T and Li X (2016) A new style of urbanization in China: Transformation of urban rural communities. *Habitat International* 55: 1-9

Lange G-M, Hamilton K, Ruta G, Chakraborti L, Desai D et al. (2011) *The changing wealth of nations: measuring sustainable development in the new millennium*. Washington, DC: The World Bank

Lange G-M, Wodon Q, Kevin C (2018) *The Changing Wealth of Nations 2018: Building a Sustainable Future*. Washington, DC: World Bank

Lewis M (2014) *Stranded assets, fossilised revenues. ESG Sustainability Report*. Kepler Cheuvreux

Li H, Fraumeni B M, Zhiqiang L, Wang X (2009) *Human capital in China*. NBER Working Paper No. 15500. National Bureau of Economic Research

Li H, Liang Y, Fraumeni B M, Zhiqiang L, Wang X (2013) Human capital in China, 1985–2008. *Review of Income and Wealth* 59(2): 212-234

Li H, Liu Q, Li B, Fraumeni B, Zhange X (2014) Human capital estimates in China: New panel data 1985–2010. *China Economic Review* 30: 397-418

Li H, Loyalka P, Rozelle S, Wu B (2017) Human capital and China's future growth. *Journal of Economic Perspectives* 31(1): 25-48

Lin N (2002) *Social capital: A theory of social structure and action*. Cambridge University Press

Liu G (2011) *Measuring the stock of human capital for comparative analysis*. OECD Statistics Working Papers 2011/06. Paris: OECD

Liu G and Fraumeni B M (2014) *Human capital measurement: country experiences and international initiatives*.

Liu X (2017) Speech by H.E. Ambassador Liu Xiaming at the British Parliament: New Era for China and New Chapter of the China – UK Cooperation, House of Commons, 21 November

Lynch J, Due P, Muntaner C and Smith G (2000) Social capital—is it a good investment strategy for public health? *Journal of Epidemiology & Community Health* 54(6): 404-408

Managi S and Kumar P (2018) *Inclusive wealth report 2018: measuring progress towards sustainability*. Routledge

Mao D, Wang Z, Wu B, Zeng Y, Luo L, Zhang B (2018) Land degradation and restoration in the arid and semiarid zones of China: Quantified evidence and implications from satellites. *Land Degradation & Development* 29(11): 3841-3851

Mas M, Pérez F and Uriel E (2000) Estimation of the Stock of Capital in Spain. *Review of Income and Wealth* 46(1): 103-116

Mateo-Sagasta J, Marjani Zadeh S and Turral H (eds) (2017) *More people, more food, worse water? A global review of water pollution from agriculture* Rome: Food and Agriculture Organization of the United Nations and the International Water Management Institute

McGlade C and Ekins P (2015) The geographical distribution of fossil fuels unused when limiting global warming to 2 °C. *Nature* 517: 187

Mealy P and Teytelboym A (2017) *Economic Complexity and the Green Economy*. INET Oxford Working Paper No. 2018-03

Mill J S (1848) *Principles of Political Economy with some of their Applications to Social Philosophy*. Oxford: Oxford University Press

Mincer J (1958) Investment in Human Capital and Personal Income Distribution. *Journal of Political Economy* 66 (4): 281–302

Ministry of Human Resources and Social Security of the People's Republic of China (2018) *Statistical Bulletin of Human Resources and Social Security Undertakings Development in 2017* [in Chinese]. http://www.mohrss.gov.cn/SYrlzyhshbzb/zwgk/szrs/tjgb/201805/W020180521567611022649.pdf

Nahapiet J and Ghoshal S (1998) Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review* 23(2): 242-266

Nardone G, Sisto R, Lopolito A (2010) Social Capital in the LEADER Initiative: a methodological approach. *Journal of Rural Studies* 26(1): 63-72

NASA (2020) *Global temperature*. Webpage: https://climate.nasa.gov/vital-signs/global-temperature/

Natural Capital Committee (2014) *The state of natural capital: restoring our natural assets*. Second Report to the Economic Affairs Committee. Natural Capital Committee, HM Government UK

Naustdalslid J (2014) Circular Economy in China – the environmental dimension of the harmonious society. *International Journal of Sustainable Development & World Ecology* 21(4): 303-313

Nelson R R and Phelps E S (1966) Investment in humans, technological diffusion, and economic growth. *The American Economic Review* 56(1/2): 69-75

Neuweg I and Averchenkova A (2017) Climate legislation in China, the European Union and the United States. In: Averchenkova A, Fankhauser S and Nachmany M (eds.) *The Political Economics of Climate Change Legislation*. London: Elgar Publishing

New Climate Economy [NCE] (2016) *The sustainable infrastructure imperative: financing for better growth and development. The 2016 new climate economy report*. Washington, DC/London: New Climate Economy

New Climate Economy [NCE] (2018) *Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times*. The Global Commission on the Economy and Climate

Oberle B, Bringezu S, Hatfield-Dodds S, Hellweg S, Schandl H and Clement J (2019) *Global Resources Outlook: 2019*. Nairobi: International Resource Panel, United Nations Environment Programme

Ocean Tomo (2020) Ocean Tomo 300® Patent Index. Web page. https://www.oceantomo.com/services/patent-indexes/ocean-tomo-300-patent-index/

Organisation for Economic Co-operation and Development [OECD] (1998) *Human Capital Investment: An international Comparison*. Paris: OECD Publishing

Organisation for Economic Co-operation and Development [OECD] (2001) *The well-being of nations: The role of human and social capital*. Paris: OECD Publishing

Organisation for Economic Co-operation and Development [OECD] (2018) *China's Belt and Road Initiative in the Global Trade, Investment and Finance Landscape*. Paris: OECD Publishing

Organisation for Economic Co-operation and Development [OECD] (2019) *OECD Employment Outlook 2019: The future of work*. Paris: OECD Publishing.

Organisation for Economic Co-operation and Development [OECD] (2020) Value added by activity. Web page. https://data.oecd.org/natincome/value-added-by-activity.htm

Olson M, Sarna N and Swamy A V (2000) Governance and growth: A simple hypothesis explaining cross-country differences in productivity growth. *Public Choice* 102(3-4): 341-364

O'Neill O (2002) *A question of trust: The BBC Reith Lectures 2002*. Cambridge University Press

Ouyang Z, Zheng H, Xiao Y, Polasky S, Liu J et al. (2016) Improvements in ecosystem services from investments in natural capital. *Science* 352(6292): 1455-1459

Paldam M (2000) Social Capital: One or Many? Definition and Measurement. *Journal of Economic Surveys* 14(5): 629-53

Parry I, Shang B, Wingender P, Vernon N and Narasimhan T (2016) *Climate Change Mitigation in China: Which Policies are Most Effective?* IMF Working Paper 16/148

Pfeiffer A, Millara R, Hepburn C, Beinhocker E (2016) The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy. *Applied Energy* 179: 1395-1408

Putnam R D (2000) *Bowling alone: The collapse and revival of American community*. Simon and Schuster

Ritchie H and Roser M (2017) Air Pollution (web page). Our World in Data. https://ourworldindata.org/air-pollution

Robinson J (1956) *The Accumulation of Capital*. Macmillan

Romer P M (1990) Endogenous technological change. *Journal of Political Economy* 98(5, Part 2): S71-S102

Romer P M (2010) What parts of globalization matter for catch-up growth? *American Economic Review* 100(2): 94-98

Roser M and Ritchie H (2013) Indoor Air Pollution (web page). Our World in Data. https://ourworldindata.org/indoor-air-pollution

Saha D (2018) *Low-carbon infrastructure: an essential solution to climate change?* World Bank Getting Infrastructure Finance Right blog, 5 April

Sartor O (2018) *Implementing Coal Transition - Insights from case studies of major coal-consuming economies*. IDDRI

Schultz T W (1961) Investment in human capital. *The American Economic Review*: 1-17

Scott R R (2010) *Removing Mountains: Extracting Nature and Identity in the Appalachian Coalfields*. University of Minnesota Press

Sen A (1993) Capability and well-being. In Nussbaum M, Sen A (Eds) *The Quality of Life*. Oxford: Clarendon Press

Sen A (1999) *Commodities and capabilities*. Oxford University Press

Serageldin I and Dasgupta P (2001) *Social capital: a multifaceted perspective*. Washington, DC: World Bank

Shigong J (2018) *Jiang Shigong on 'Philosophy and history: interpreting the "Xi Jinping Era" through Xi's report to the nineteenth national congress of the CCP'* [with an introduction by David Ownby and Timothy Cheek]. Australian Centre on China in the World

Shuai C, Chen X, Wu Y, Tan Y, Zhang Y, Shen L (2018) Identifying the key impact factors of carbon emission in China: Results from a largely expanded pool of potential impact factors. *Journal of Cleaner Production* 175: 612-623

Simmel G (1950) *The sociology of Georg Simmel*. Simon and Schuster

Song M and Wang S (2018) Market competition, green technology progress and comparative advantages in China. *Management Decision* 56(1): 188-203

Sraffa P (1960) *The Production of Commodities by means of Commodities*. Cambridge University Press

Stern N (2015) *Why are we waiting? The logic, urgency and promise of tackling climate change*. MIT Press

Stern N and Calderon F (2014) *Better growth, better climate: The New Climate Economy report*. New York: Global Commission on the Economy and Climate

Stern N, Xie C and Zenghelis D (2019) *Strong, sustainable and inclusive growth in a new era: valuing and investing in China's physical, human, natural and social capital in the 14th plan*. Working paper

Stern N and Zenghelis D (2016) *The importance of looking forward to manage risks: submission to the Task Force on Climate-Related Financial Disclosures*. London: Grantham Research Institute on Climate Change and the Environment

Stern N and Zenghelis D (2018) Innovative urbanisation: the next two decades are critical. In Burdett R and Rode P (Eds) *Shaping Cities in an Urban Age*. Phaidon

Teilmann K (2012) Measuring social capital accumulation in rural development. *Journal of Rural Studies* 28(4): 458-465

Trancik J E (2014) Renewable energy: Back the renewables boom. *Nature News* 507(7492): 300

Umbach F and Yu K (2016) *China's Expanding Overseas Coal Industry: New Strategic Opportunities, Commercial Risks, Climate Challenges and Geopolitical Implications*. EUCERS

United Nations Department of Economic and Social Affairs (2019) *Technical Recommendations in Support of the System of Environmental–Economic Accounting 2012: Experimental Ecosystem Accounting*. United Nations Department of Economic and Social Affairs

United Nations Development Programme [UNDP] (2015) World Leaders Adopt Sustainable Development Goals. Press release, 25 September

United Nations Economic Commission for Europe [UNECE] (2016) *Guide on Measuring Human Capital*. New York and Geneva: UNECE

United Nations Environment Programme [UNEP] (2018) *Inclusive Wealth Report 2018*. Nairobi: UNEP

United Nations Environment Programme [UNEP] (2019) *Synergizing action on the environment and climate: good practice in China and around the globe*. UNEP and Tsinghua University

United Nations Industrial Development Organisation [UNIDO] (n.d.) Industrial energy efficiency and climate change. Webpage: https://www.unido.org/our-focus/safeguarding-environment/clean-energy-access-productive-use/industrial-energy-efficiency-and-climate-change

Van der Meijden G and Smulders S (2017) Carbon Lock-In: The Role of Expectations. *International Economic Review* 58(4): 1371-1415

Wang D, Wan K, Song X (2018) Quota allocation of coal overcapacity reduction among provinces in China. *Energy Policy* 116: 170-181

Ward M (1976) *The Measurement of Capital; The methodology of capital stock estimates in OECD countries*. Paris: OECD

Weitzman M (1996) Hybridizing Growth Theory. *American Economic Review* 86(2): 207–212

Westmore B (2018) Do government transfers reduce poverty in China? Micro evidence from five regions. *China Economic Review* 51: 59-69

Woolcock M and Narayan D (2000) Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer* 15(2): 225-249

World Bank (2014) *Urban China: Toward efficient, inclusive, and sustainable urbanization*. Washington, DC: World Bank

World Bank (2019) *World Development Report 2019: The Changing Nature of Work*. Washington, DC: World Bank

World Economic Forum (2017) *The Global Human Capital Report*. World Economic Forum

World Health Organisation (2018) *More than 90% of the world's children breathe toxic air every day*. News release, 29 October

World Resources Institute (2017) CAIT emissions data (web page). Washington, DC: WRI

Wu J X, He L Y (2018) Urban–rural gap and poverty traps in China: a prefecture level analysis. *Applied Economics* 50(30): 3300-3314

Yao J, Zhang Z X, Brett J, Murnighan J K (2017) Understanding the trust deficit in China: Mapping positive experience and trust in strangers. *Organizational Behavior and Human Decision Processes* 143: 85-97

Zenghelis D (2019) *The future matters, so discount it with care*. Blog post, Lombard Odier, 22 August

Zhang J (2008) Estimation of China's provincial capital stock (1952–2004) with applications. *Journal of Chinese Economic and Business Studies* 6(2): 177-196