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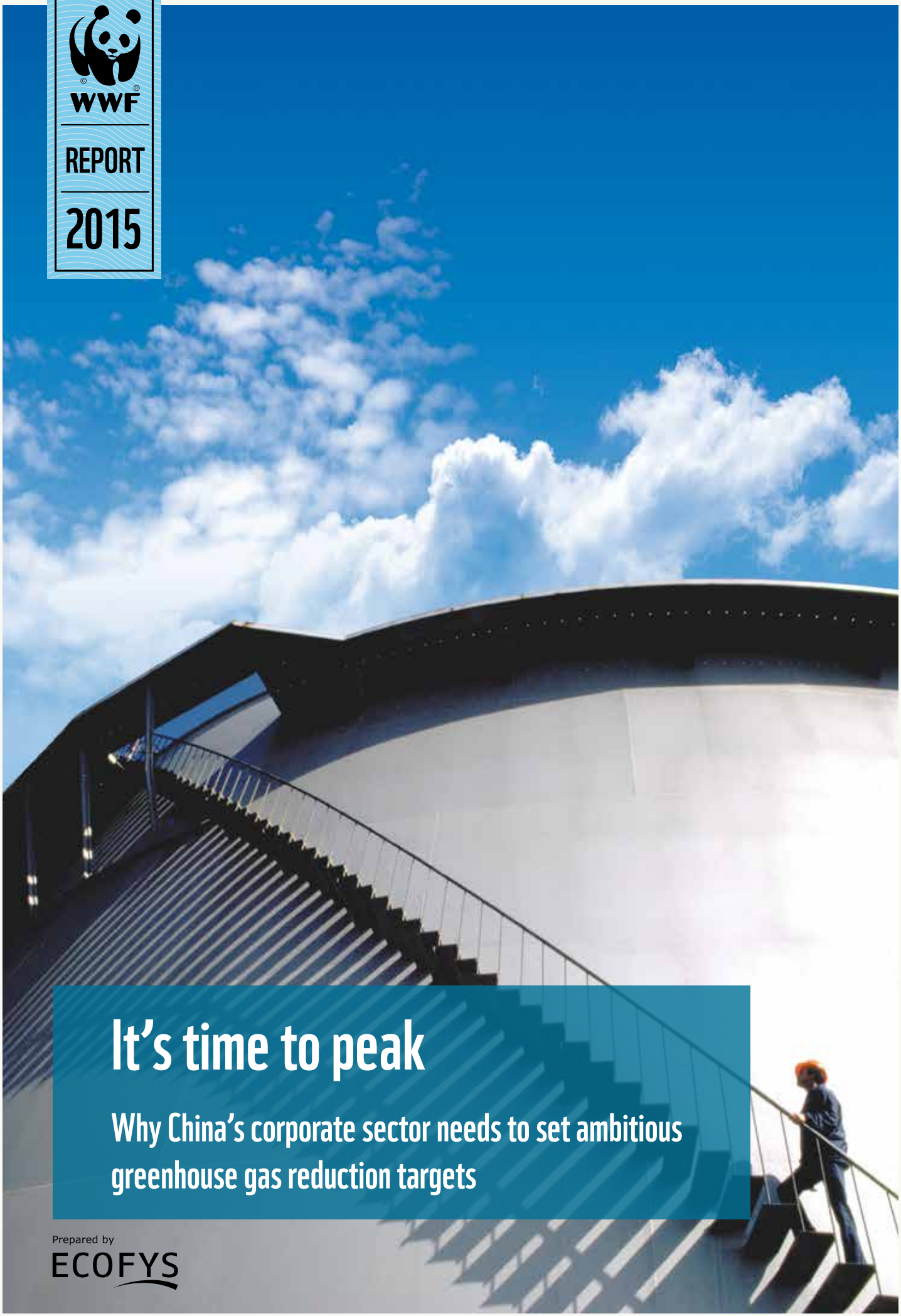

# It's time to peak

## Why China's corporate sector needs to set ambitious greenhouse gas reduction targets

Prepared by

ECOFYS

## About WWF Climate Savers Programme

WWF Climate savers is a global programme that positions companies as leaders of the low-carbon economy. Member companies take on two commitments: to become the best in class in reducing greenhouse gas emissions; and to influence market or policy developments by promoting their vision, solutions and achievements. The programme also acts as a sounding board by providing valuable guidance to companies seeking to shrink their carbon footprint while growing their business and enhancing brand equity.

## About Ecofys

Ecofys is a leading consultancy in renewable energy, energy & carbon efficiency, energy systems & markets and energy & climate policy. For us, knowledge and innovation are the key factors in turning the ideas of today into viable realities of tomorrow. We support public and corporate organisations alike to adapt to changes and identify new opportunities quickly. Together with our clients we make sure that relevant steps are taken and business projects are realised in a practical and sustainable manner. If we act now the 2050 global energy system can be sustainable, secure, affordable and fully based on renewable sources. Dedicated to our mission we all work passionately to make it happen: sustainable energy for everyone.


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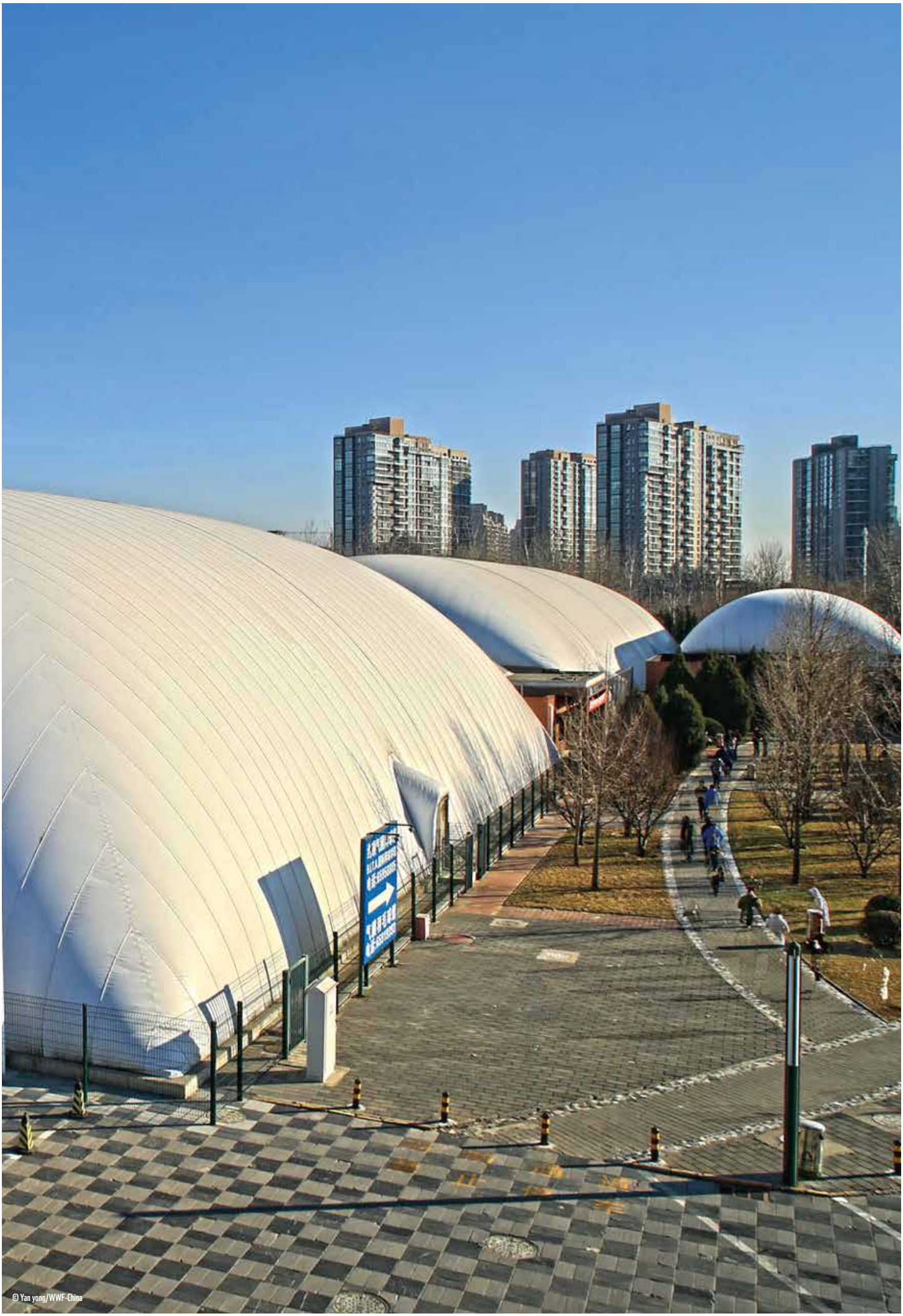

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# Executive summary

The fifth assessment report by the Intergovernmental Panel on Climate Change (IPCC) confirms what we already know. Without additional efforts, global greenhouse gas (GHG) emissions will continue to increase by 3.7 – 4.8 °C, a level well beyond the 2 °C temperature rise limit widely agreed among scientists and governments across the world as a limit above which implications of climate change become increasingly impactful and dangerous. Drastic reductions in GHG emissions, up to 40-70% globally in 2050 as compared to 2010, are needed to bring the world on track to a 2°C scenario. China's role in fighting climate change can hardly be overestimated. China is the largest emitter of GHG emissions in the world accounting for roughly a quarter of the global emissions. A low carbon GHG emissions pathway for China is thus vital in order to keep the world on track or close to a 2 °C scenario.

**A low greenhouse gas emission reduction pathway for China is vital to keep the world on track to a future with maximal 2°C temperature rise**

Industry and business will be seriously affected by rising temperature levels. More extreme weather events, issues with water supply, disruptions of supply chains can all be significant risk factors for China's corporate sector resulting from climate change. At the same time, the corporate sector is also pivotal in combatting climate change, both as a significant contributor to the emissions (corporate CO2 emissions for example make up for approximately 50% of the country's GHG emissions) and as provider of the innovative climate friendly solutions required to make the low carbon transition happen. It is necessary to explore approaches for setting Chinese corporate emissions reduction targets and options for low carbon pathways in order to achieve China's ambition to peak its emissions sooner rather than later and to achieve the emissions reductions required in the rest of the century.

**As key emitting sector and as provider of the low carbon innovations needed, China's corporate sector should act now to achieve China's ambition to peak its emissions soon**

Building on similar initiatives globally and using a number of 2°C scenario studies for China, science-based targets are developed for the scope 1 emissions (those directly emitted by companies) and scope 2 emissions (those related to the purchase of electricity or heat) of seven corporate sectors of China's economy. The emissions intensity (i.e. emissions per unit of output) of power generation needs to reduce by about 8% each year to come close to a fully decarbonised power supply system for China mid-century, which translates into a similar target for the scope 2 emissions intensity of the electricity consuming

**Companies should target to reduce the direct emissions intensity of their operations with 0.8 – 2.7% year, for the electricity sector an emissions intensity decline of about 8% each year is necessary**

sectors. The 2°C compatible scope 1 emissions intensity decline for the industry and services sector ranges between 0.8% and 2.7%. For scope 1 and 2 emissions combined, China's corporate sector needs to reduce its emissions intensity on average between 1.7% and 4.6% each year between now and 2050, depending on the sector. Combined with projections for the growth of the various sub-sectors in China over time, these reductions in emissions intensity will result in a peak in corporate emissions in China before 2030 and a steeply declining emissions pathway afterwards, in line with 2°C pathways for China.

The specific actions and technologies required to achieve a deep decarbonisation pathway for China's corporate sector vary from sector to sector and even from company to company. In this study, they are categorised in four distinguished options. First of all, it is only possible to drive down emissions if higher

**Management and behavioural change, energy efficient technology, low carbon energy and more efficient resource use will all be needed to bring down emissions**

management is highly committed to it and sets clear targets. Only then can changes in organisations be enforced which is required to work as organisation towards a lower carbon future. The second and third option are to reduce energy use via ambitious energy efficiency measures and to source the remaining energy use as much as possible from renewable power and fuel sources. Although non-utility corporates in China cannot directly influence the decarbonisation of China's electricity supply, they do have the opportunity to use on-site renewable generation as much as possible and to play a role in improving the efficiency of electricity use and the purchase of renewable fuels and electricity. Further options for corporates to reduce their GHG footprint are an increased use of secondary raw materials, improved waste management as well a reduction in GHG emissions related to e.g. corporate business travel. Via their products, the corporate sector can play an important role in driving down consumer emissions.

There is increasing evidence that companies taking up the challenge are in fact better off compared to those

**There is increasing evidence that companies taking up the challenge are better off. Many low carbon investments result in higher returns, but the window of opportunity closes rapidly**

continuing a business as usual practice. A recent WWF and CDP study in the US shows that large net savings could be achieved if US' corporate sector would devote 3% to 4% of its capital expenditures to emission reduction investments and that those investments typically result in a higher return compared to the average corporate capital investments. Cost curve analyses for China show a similar picture. Roughly 2/3$^{rd}$ of the improvements required to bring China on a deep decarbonisation pathway come, according to McKinsey's China's green revolution report, from investments that have a positive economic return or only slight to moderate economic costs over time. At the same time, the window of opportunity is closing rapidly. China is still in the middle of rapidly expanding its capital stock in commercial buildings, power plants and industrial facilities. Given the lifetime of such capital stock additions, it is essential to embark on the decarbonisation pathway better sooner than later.

Low carbon development will help decoupling the economic performance of enterprises from resource

**Companies with ambitious, yet realistic 2 °C compatible targets can make the difference, it is time to act now!**

consumption. Improved market competitiveness can be an internal drive for companies to carry out emission reduction measures. The external incentive for low carbon development is China's ambitious emissions peak target and decarbonisation pathway. It's time for China's corporate sector to commit to ambitious, yet realistic 2°C compatible targets. Companies embracing such targets can make the difference and they can profit from doing so. Let's take up the challenge, now!

# WWF Preface:

As the world's largest emitter of greenhouse gas (GHG) emissions, China plays a critical role in curbing greenhouse gas emissions and keeping global temperatures below 2°C. What China does or does not do inevitably defines our chances of avoiding dangerous anthropogenic interference with the climate system.

To date, China has already made considerable progress through a rapid scale up of renewable energy and the implementation of ambitious programs aimed at improving energy efficiency across a number of industrial sectors. However, with the rapid growth that the country has experienced in recent decades, efforts need to be redoubled in order to stabilize emissions and transit towards a low-carbon development track.

Last year, China along with the United States of America – responsible for over 45% of the world's carbon emissions – made a historic joint announcement pledging to curb greenhouse gas emissions within the next decades. Through this statement, China has committed to peak its GHG emissions by 2030 and to supply at least 20% of its primary energy demand from fossil-free sources.

The corporate sector in China, responsible for over 50% of the country's GHG emissions, plays a critical role in achieving this target along with the current 2020 goal. In order to achieve this, corporates in China need to assume a leading role in the reduction of GHG emissions and the scale-up of renewable energy. According to the analysis presented in this report, companies in China should aim to reduce its carbon intensity in a range of 0.8 to 2.7% every year. Rapid decarbonisation needs to take place particularly in the energy sector, in which the carbon intensity needs to decrease by 8% every year.

While the challenge is considerable, the rewards for leading companies are also sizeable. Evidence from companies that have taken substantial decarbonisation efforts shows that reducing GHG emissions is not only good for the planet, but also good for the bottom line. According to data compiled by We Mean Business , energy-efficiency investments in industria[1] processes yield average returns of 23%. Proprietary analysis by WWF shows that ambitious climate action by the corporate sector in different countries (e.g. Mexico, USA) contribute to increasing the competitiveness of the industry in those regions and to the overall growth of the economy.

With such compelling evidence, and the imperative to curb greenhouse gas emissions to protect those more vulnerable to climate change, we trust that this report will inspire companies in China to seize the opportunities behind a low-carbon transition and to take ambitious action in line with the goal of peaking GHG emissions in the coming years.

***Samantha Smith***
***Leader Global Climate & Energy Initiative,***
***WWF International***

[1] *http://www.wemeanbusinesscoalition.org/sites/default/files/The%20Climate%20Has%20Changed_0.pdf*

# Ecofys Foreword:

China's role in the international effort to combat climate change can hardly be overstated. As the world's largest emitter and as manufacturing base of millions of products used globally, it is essential for China to play its role in mitigating emissions and in providing the solutions needed. There is certainly progress in the international climate negotiations, but it essential for businesses to embrace the climate change challenge as well, independently from the often slow developments in international climate policies.

This reports provides guidance for China's companies to set targets in line with the global ambition to limit global warming to 2°C. There is wide agreement on this ambition level, but a key question is: what does this ambition mean for individual companies? The method presented in this report answers this question, based on the best of science that we have available today. The method takes into account that companies differ from in each other in many ways, and there is no one-size-fits-all. The sectoral approach takes into account these differences. The work is based on a thorough analysis of scenarios for China, within the global context.

The targets suggested in this report are ambitious, but technically feasible and in many cases, very much profitable, even more if the economic damage from inaction is taken into account. The report calls on China's corporate community to embrace ambitious greenhouse gas reduction targets, and make them part of their business operations. Only then can the increasingly impactful business risks related to climate change be avoided and can the opportunities be seized.

Ecofys works already for 30 years at the forefront of energy and climate solutions, for clients both in the private and in the public sector. Based on our work, we can confirm: active participation of the private sector in combating climate change is absolutely essential and increasingly provides a positive business case. Doing nothing is no option anymore, it's time for China's corporate sector to act and make China's emissions peak happen.

***Kornelis Blok***
***Director of Science, Ecofys***

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# 1 Introduction



# 1. Introduction

The fifth and latest assessment report by the Intergovernmental Panel on Climate Change (IPCC) further confirms what we already know. “Human influence on the climate system is clear. This is evident from the increasing greenhouse gas (GHG) concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system” [2].

Without additional efforts global GHG emissions will continue to increase and will result, according to IPCC, in an increase of global temperatures of 3.7 to 4.8°C towards the end of the century[3] as compared to pre-industrial times. This is well beyond the 2°C limit that is widely agreed among scientists and governments across the world as a limit above which the implications of climate change become increasingly impactful and dangerous. Drastic reductions in GHG emissions, up to 40-70% globally in 2050 as compared to 2010, are needed to bring the world on track to a 2°C scenario[4].

The industry and business sector will be seriously affected by rising temperature levels. Issues with water supply, disruption in the supply chains, rising energy, commodity and insurance costs are all the likely result. At the same time, the corporate sector is pivotal in combatting climate change. The corporate sector was responsible for well over half of the global GHG emissions in 2010[5]. At the same time, the innovative climate friendly solutions developed by entrepreneurs and the corporate sector are vital for the transition towards a less GHG emitting global economic system. It is time for the global business community to act.

If the above is true at the global level, then even more for China. China’s rapid economic growth and urbanisation brought China among the world’s largest economies. The challenges China faces in terms of natural resource constraints and emissions and pollution levels are enormous. The latest annual update of the Global

[2] IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[3] IPCC, 2014: Summary for Policymakers, In: Climate Change 2014, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlomer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press,Cambridge, United Kingdom and New York, NY, USA.

[4] Idem

[5] Idem, page 8. Industry and the electricity and heat production and other energy industries account for 25%, 21% and 10% respectively with the corporate sector also contributing significantly to the emissions from buildings (6%), transport (14%), and agriculture, forestry and land-use emissions (24%).

# 1 Introduction

Carbon Budget shows that China's $CO_2$ emissions per person overtook emissions in the EU for the first time in 2013. China is now the largest $CO_2$ emission emitter, with emissions higher than those of the US and the EU-28 combined[6]. China's vital role in fighting climate change can thus hardly be overestimated. And also in China, the corporate sector has to play a big role in this, both as significant contributor to the GHG emissions challenge and as a source for innovative solutions to deal with the global challenge.

It is against this background that WWF China, building on similar initiatives internationally[7], commissioned this report to support the Chinese corporate sector in addressing climate change. The study aims to:

1. Provide meaningful $CO_2$ emissions reduction targets for the Chinese corporate sector that are science-based, technologically possible and in line with the fair share of Chinese domestic cuts in a global 2°C scenario[8].
2. Give insight in typical technologies and approaches that are required to meet such targets.
3. Provide evidence from literature and case studies showing that reducing GHG emissions in many cases yields positive financial returns and is overall beneficial for business, also in terms of additional export opportunities.

Many Chinese companies are already well aware of climate change risks and are taking steps to strengthen their climate resilience and investments in a low carbon future. WWF via its Climate Savers[9] programs for example already actively works with Chinese companies such as Yingli solar and Vanke to set GHG reduction targets. At the same time, as becomes clear from the recent CDP China 100 Climate Change Report 2014, the number of Chinese companies committing to absolute or intensity based GHG reduction targets remains limited. Only 16% of companies investigated set targets for emissions reduction, of which only two disclosed the scope of their

[6] According to the Global Carbon Budget 2014 annual update (http://www.globalcarbonproject.org/carbonbudget/14/hl-full.htm), global $CO_2$ emissions were dominated by emissions from China (28%), the USA (14%) and the EU (28 Member States; 10%). The per capita $CO_2$ emissions in 2013 were 6.8 t $CO_2$ per capita in the EU-28, 7.2 t $CO_2$ per capita in China and 16.4 t $CO_2$ per capita in the USA.

[7] Worth mentioning are e.g. the recently launched "We mean Business Coalition" (www.wemeanbusinesscoalation.org) and the Mind the Science, Mind the Gap initiative introduced later on in this study.

[8] This study focuses on $CO_2$ emissions from fuel combustion and industrial process only, representing the majority of the corporate sector GHG emissions as will become evident from Chapter 2.

[9] The WWF Climate Savers program consist of partnerships between WWF and international corporations, aimed at delivering real, measurable and additional reductions in $CO_2$ emissions. At the time of writing this report, Yingli solar and Vanke have become Chinese WWF Climate Savers.

absolute target, base year, and target year and emission reduction with details. Three companies disclosed detailed carbon intensity targets, and only one company disclosed the influence of the carbon intensity target on the absolute target. There is thus room for a much deeper and committed engagement from China's corporate sector to act in order to keep global temperatures rise below 2°C[10].

In terms of methodology, this study builds on publicly available existing literature and data on China's emissions, target setting methods and emissions scenarios. An important input into the target setting part of this report is the ongoing "Mind the Science, Mind the Gap" initiative by the World Wide Fund for Nature (WWF), the World Resources Institute (WRI), the Carbon Disclosure Project (CDP) and the United Nations Global Compact (UNGC). In Chapter 2, we zoom in on China's current emissions and emissions scenarios towards 2050 that are in line with a 2°C scenario. In Chapter 3, we derive intensity based $CO_2$ emissions reduction targets for in total seven corporate sectors, i.e. emissions reduction targets per unit of output. Combined with growth expectations for each of those sectors, this also yields insight into the absolute emissions trajectories towards 2050 for these sectors in line with the 2°C scenarios. In Chapter 4, we describe the type of technologies and approaches required to achieve the decarbonisation pathways per sector. We assess briefly to which extent taking action yields positive economic returns and present a number of case studies of Chinese companies already actively working on the reduction of GHG emissions from their operations.

[10] CDP, 2014, China 100 Climate Change Report

# 2 China's emissions and emission projections


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# 2. China's emissions and emission projections

## 2.1 China's current emissions

China surpassed the US as the largest emitter of GHG emissions and is now the country with most GHG emissions. China accounts roughly for one quarter of the global GHG emissions[11]. An overview of the emissions by source category for the total GHG emissions and, in a bit more detail, for the $CO_2$ emissions from fuel combustion and industrial processes is given in Figure 1.

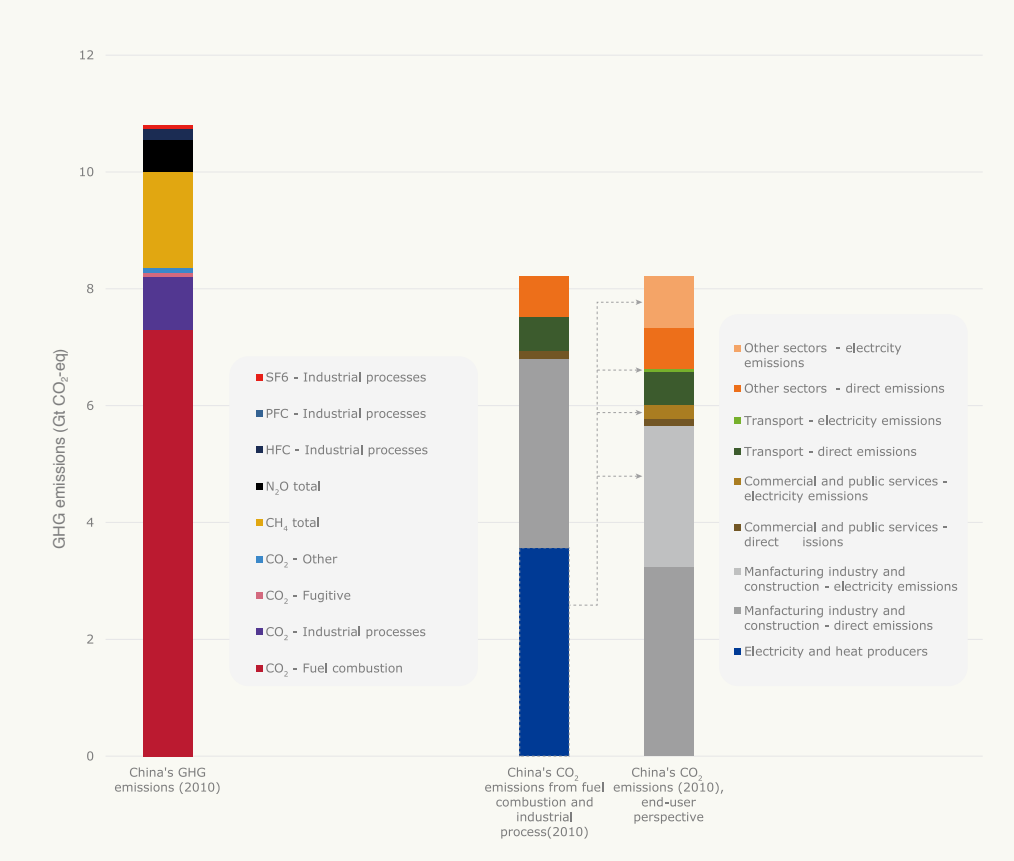



Figure 1 GHG emissions in China, 2010 (Gt $CO_2$-eq.) [12]

[11] Climate Change 2014, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlomer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press,Cambridge, United Kingdom and New York, NY, USA.

[12] IEA, 2013, $CO_2$ emissions from fuel combustion statistics, 2013 edition. Excluding emissions from Land Use, Land Use Change and Forestry, which according to the 2012 2nd National Communication on Climate Change of the People's Republic of China amounted to -454 Mt $CO_2$-eq. in 2005 (no more recent data available). Categorisation in the graph on the left hand side in line with country reporting format used by the Intergovernmental Panel on Climate Change (IPCC). Emissions from electricity and heat producers in the right hand side graph distributed to end-use sectors based on the relative shares of electricity consumption in the final consumption.

The graph clearly shows the large share of $CO_2$ emissions from fuel combustion and industrial processes in the overall GHG emissions for China and the dominant role of the corporate sector. $CO_2$ emissions represent about 3/4$^{th}$ of China's total GHG emissions and the corporate sector represents about 3/4th of those emissions, so approximately half of China's total GHG emissions. In this study, we focus on the $CO_2$ emissions from the manufacturing industry and the commercial public services, which is a fair approximation of the total corporate emissions in China[13]. A more detailed overview of the emissions in those sectors is provided in Figure 2.

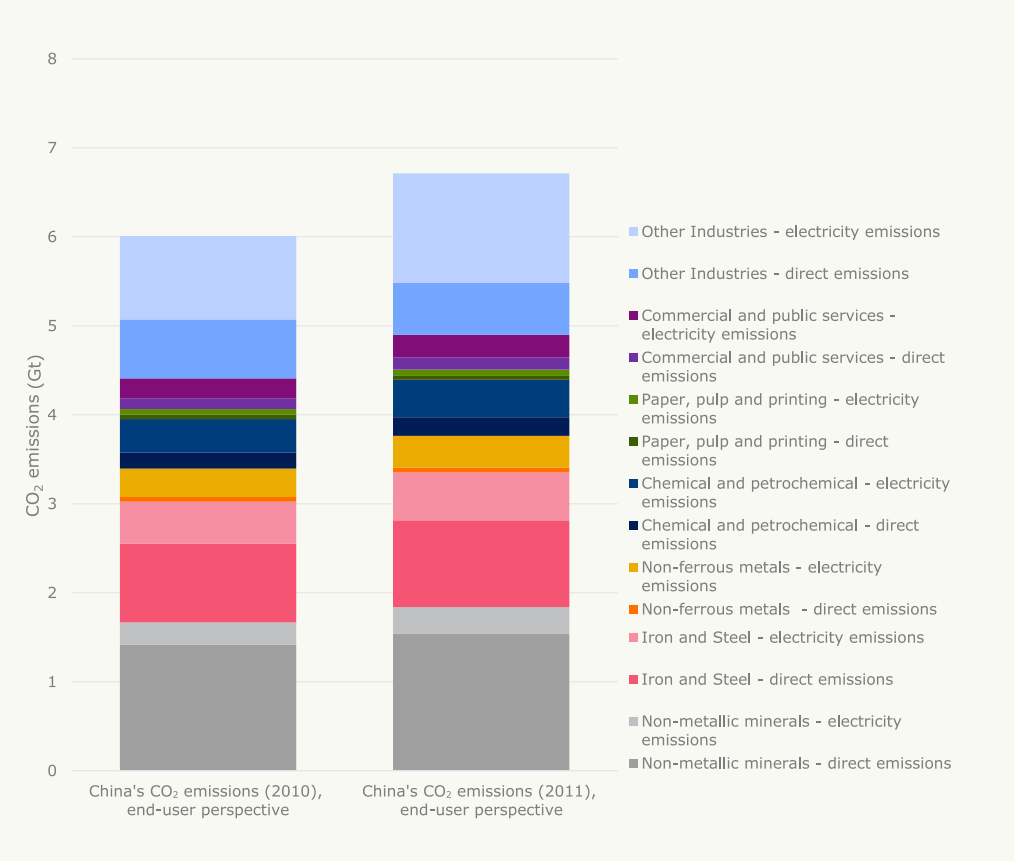



Figure 2 $CO_2$ emissions from fuel combustion and industrial processes by corporate sub-sector in China, 2010 and 2011 (Gt $CO_2$) [14]

[13] We use the definitions used in the IEA statistics, i.e. the sum of the manufacturing industry and construction sector and the commercial and public services sector. Corporate emissions outside these sectors include those in agriculture and transport, but due to limited data availability for the corporate share in those emissions, we do not focus on those. Emissions in the commercial and public services sector include also a share of non-corporate emissions, i.e. those related to public services.

[14] Based on IEA, 2013, $CO_2$ emissions from fuel combustion statistics, 2013 edition and own calculations. Emissions from electricity production in right hand-side graph distributed to end-use sectors based on the relative shares of electricity consumption in the final consumption. Industrial process emissions are allocated to the non-metallic minerals sector where, according to the 2005 Second National Communication on Climate Change of the People's Republic of China, over 90% of the industrial process $CO_2$ emissions occur. For 2011, industrial process emissions are estimated based on the growth of fuel combustion emissions between 2010 and 2011.

The corporate sector's $CO_2$ emissions are very much dominated by a few very energy and thus emissions intensive industries. Non-metallic minerals (of which cement is by far the largest contributor), iron and steel, non-ferrous metals, chemicals and petrochemicals, and paper pulp and printing in total contribute to roughly 2/3rd of the corporate sector's $CO_2$ emissions with the remaining 1/3rd originating from the less emissions intensive other manufacturing industry and from the commercial services.

## 2.2 The 2°C challenge for China

Projecting GHG emissions over time is never easy due to the multiple factors that play a role:

- The speed of economic growth over time
- The structural composition of the economic activity (i.e. agriculture, industry, services) and changes in this economic structure
- Technological changes that bring down or increase the emissions intensity of the economic activity.

There are many studies attempting to project China's GHG emissions over time such as those by China National Development Reform Commission Energy Research Institute (ERI)[15], the Energy Technology Perspective studies by the International Energy Agency (IEA)[16], a recent study by The Institute for Sustainable Development and International Relations (IDDRI)[17], the Climate Action Tracker[18] and modelling efforts that are e.g. compiled in the scenario database resulting from the "Low climate Impact and the Implications of required Tight emissions control Strategies (LIMITS)" project[19]. Out of a selection of those sources, Figure 3 was compiled.

The red line gives China's $CO_2$ emissions projections from IEA's Energy Technology Perspective (ETP) 2°C scenario (2DS). The 2°C mitigation scenario (2°C scenario – 2DS) is consistent with the latest generation of IPCC 2°C scenarios, called the Representative Concentration Pathway (RCP) 2.6 scenarios[20]. The ETP uses a technology-rich model and has a breakdown in several industrial sectors. It is an important input also in the next chapter that zooms in GHG reduction targets for the corporate sector. The grey line gives an assessment done in the Climate Action

[15] Energy Research Institute, 2009, China's Low Carbon Development Pathways by 2050

[16] IEA, 2014,Energy Technology Perspective

[17] IDDRI, 2014,Pathways to Deep Decarbonisation, China section, page 74

[18] Climate Action Tracker, China country update

[19] The LIMITS project aims at advancing the understanding of the implementation of climate policies consistent with 2°C Celsius. LIMITS results, resulting from in total seven global integrated assessment models, were relied upon extensively in preparing the IPCC 5th Assessment Report. Figure 3 gives $CO_2$ emissions from fuel combustion and industrial processes from all China 450 ppm 2°C scenarios in the database. The scenarios are based on global integrated assessment models with varying level of detail included for China, which partly explains the wide range of scenarios, also already in 2020.

[20] These pathways are identified by their approximate total radiative forcing in 2100 relative to 1750, see the IPCC AR 5 Report (footnote 2) for more details on the scenario definitions.

Tracker of China's $CO_2$ emissions trajectory towards 2020 based on the current pledge to reduce the GHG emissions intensity of its economy (expressed per unit of GDP) by 40 – 45% in 2020 as compared to 2005. The line shown relates to the enhanced policies scenario in the 2012 2nd National communication on Climate Change with corrections for industrial $CO_2$ emissions. Note that absolute emissions resulting from the pledged emissions intensity target in 2020 is a best estimate. To reflect the significant uncertainty in this pledged line given that it is to a large extent dependant on the actual GDP development, an uncertainty bar is added.

The green area represents high and low $CO_2$ 2020 estimates under the current policies in China, as assessed by Climate Action Tracker[21]. The lower limit of the line is based on current policy assessment in the 2012 World Energy Outlook[22]. The World Energy Outlook assessment shows that with all policies implemented before 2012, China is already close to reaching the emissions pledge towards 2020. Given the various policies implemented since then and future plans for enhanced policy action, such as the emissions trading pilots that should converge to a national scheme, further policies to stimulate renewable energy and ongoing efforts to limit the use of coal, it is likely that China will meet its 2020 emissions intensity pledge.

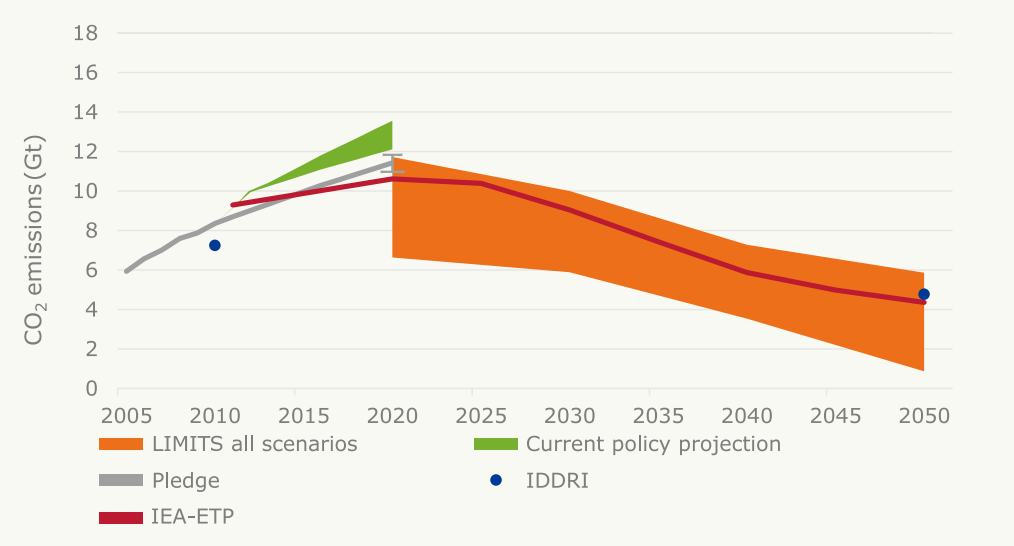



Figure 3 450 ppm (2°C) scenarios for $CO_2$ emissions from fuel combustion and industrial processes in China, 2020 – 2050 (Gt $CO_2$)[23]

[21] Climate Action Tracker, www.climateactiontracker.org, data for the China assessment for 2013 was used in this graph, adapted to reflect only $CO_2$ emissions.

[22] IEA, World Energy Outlook, 2012

[23] See text for explanation on sources used

The blue dots for 2010 and 2050 represent a deep decarbonisation pathway for fuel combustion $CO_2$ emissions by experts from Tsinghua University and China National Centre for Climate Change Strategy developed for a report by the Institute for Sustainable Development and International Relations (IDDRI). The projections are part of IDDRI's Pathways to Deep Decarbonisation report. The 2050 projection is very similar to IEA ETP one. The IDDRI report includes most data for the years 2010 and 2050 only, without giving explicitly a trajectory of emissions over time.

As a result of the significant uncertainties with respect to economic growth projections and the structure of the Chinese economy, Chinese academic experts and institutes are divided on the question about when China $CO_2$ needs to peak in order to reach the longer 2°C scenario term objectives. Researchers from the Massachusetts Institute of Technology (MIT) and China's Tsinghua University find that by continuing current efforts to reduce the carbon intensity, emissions will level off between 2030 and 2040. In an accelerated effort scenario, emissions will level off between 2025 and 2035[24]. Jiang Kejun, a leading researcher from Energy research Institute National Development and Reform Commission, finds that if China aggressively pursues these policies and others such as promoting carbon capture and storage, China's emissions could peak even before 2025[25]. The China Academy of Social Sciences quote in a recent study that slowing rates of urbanisation would likely mean that industrial emissions would peak around 2025-2030 and start to fall by 2040[26]. These forecasts laid the theoretical foundation of China's recent post-2020 $CO_2$ reduction target announced by President Xi on 12th November, 2014: China intends to achieve the peaking of $CO_2$ emissions around 2030 and to make best efforts to peak earlier[27].

The need for such a peak is confirmed by the international scenario work on 2°C emission scenarios globally and for China. The orange box gives the range of all $CO_2$ emissions scenarios for China that are included in the LIMITS[28] scenarios database and that are consistent with a 450 ppm or 2°C scenario. This gives a good indication of what the Chinese and international scientific community sees as a necessary $CO_2$ trajectory that is in line with a 2°C scenario. It shows, depending on assumptions on the share of emission reductions done by China in relation to other economies in the world and other modelling assumptions in the underlying models in the database, that $CO_2$ emissions in China by 2050 should have been reduced by 30 – 90% as compared to 2010 levels for China to develop in line with a global 2°C scenario. It also shows that China's emissions should peak sooner rather than later with most models

[24] MIT-Tsinghua China Energy and Climate Program, 2014, An Energy Outlook for China

[25] Kejun Jiang, Xing Zhuang, Ren Miao, Chenmin He, 2013, China's role in attaining the global 2 °C target

[26] China Academy of Social Sciences, 2014, Study of Climate change

[27] China peak announcement published by China Ministry of Foreign Affairs, 2014

[28] See Footnote 19 for details on the LIMITS database

indicating that an emissions peak well before 2030 would be needed for China.

From the graph, we can draw the following conclusions:

- The current 40-45% GHG intensity target and the policies implemented to achieve this target have helped China to start decoupling its economic growth from its GHG emissions. As a result, gradually the $CO_2$ emissions of China develop towards stabilisation making the discussion on when China's emissions will peak a very relevant one.
- Currently implemented and planned policies will likely be sufficient to comply with the current pledge, although there is some uncertainty related to the actual GDP growth. What is also clear, however, is that China has to step up its ambitions significantly quickly in order to come close to what science sees as necessary for China towards 2050. The recent statements by President Xi on China's intentions to peak the emissions as soon as possible can be very much welcomed in that respect.
- For China to develop in line with a 2°C scenario, such an emissions peak is needed sooner rather than later with most models indicating a peak well before 2030 would be needed.

## 2.3 The role of the corporate sector

What do the above scenarios mean for Chinese corporate community? It is clear that involvement of China's companies is essential to further bring China on a decarbonisation pathway. Corporate GHG emissions need to go down and the climate friendly innovative products developed by the corporate sector are essential to bring down emission in all sectors of the economy. For this to happen, it is vital that the total corporate sector in China voluntarily embraces and embodies ambitious targets to bring down the GHG emissions from their operations, following the example of leading international and Chinese companies that did so before. Government action alone will not be sufficient. Without a committed corporate sector embracing the low carbon challenge and acting to make it happen, China's low carbon ambitions are set to fail. The pathways as shown in this chapter should inform science-based target setting for China's corporate sector, in line with 2°C. Let's zoom in now, on how such targets could look like.

office building ©freeimages.com-beermug

# 3 Meeting the challenge – sector targets

# 3. China's emissions and emission projections

## 3.1 Methodology

In developing guidance on target setting for the Chinese corporate sector, this study builds on the already introduced Mind the Science, Mind the Gap Initiative. In a joint effort, WWF/WRI/CDP/UNGC launched this initiative to engage companies in setting ambitious GHG reduction targets in line with climate science. A part of this initiative is to develop guidance for companies to set science-based targets to reduce GHG emissions in line with a 2°C decarbonisation pathway. In doing so, companies can align their strategies with climate science to play a key role in decarbonising the economy. Raising the ambition on corporate target setting levels will drive bolder business solutions and promote innovative approaches to corporate GHG target setting. In addition, it will demonstrate to policymakers the scale of ambition in industry to reduce their emissions and act as a positive influence on international climate policy.

Based on feedback from a technical advisory group, two stakeholder workshops in London and Washington DC and a webinar for Asian stakeholders, the methodology has recently been finalised and is published for broader public consultation (see www.sciencebasedtargets.org). The methodology, called the Sectoral Decarbonisation Approach (SDA), builds on existing approaches that allocate a carbon budget to companies based on their contribution to the economy. The methodology looks at sector specific decarbonisation pathways that are compatible with the 2°C threshold rather than applying a generic decarbonisation pathway for all companies regardless of the nature of their operations.

The global SDA methodology takes the following approach. It is mainly based on the IEA Energy Technology Perspectives (ETP) 2014 2DS scenario. The ETP uses a technology rich model including an assessment of the emission reduction opportunities as well as the feasibility of those options per sector. The 2DS scenario corresponds to an emission pathway to limit global warming to 2°C with a probability of at least 50 percent and is consistent with the IPCC's RCP 2.6 pathway.

Basically, The SDA methodology uses sectoral activity level projections and emissions projections from the IEA ETP 2 DS to break down the global $CO_2$ budget for staying within the 2°C threshold to sector carbon budgets, which can then be used to define

corporate budgets. A sector emissions intensity pathway, i.e. a pathway of the development of emissions relative to the output of sectors, is created by dividing the emissions pathway by the activity growth. The sector emissions intensity pathways form the basis to define the targets for companies based on their current carbon intensity (so, emissions per unit of output) and the required pathway. For homogenous sectors (power production, cement, iron and steel, pulp and paper, aluminium) physical indicators (kWh of electricity, tonne of production) are used as an output parameter to which the emissions intensity relates. For the public and commercial service companies, the number of square metres of buildings is used as an indicator for the output. To derive company targets out of the sector targets, it's in the global SDA assumed that the carbon intensities of companies in a homogeneous sector converge to the same level in 2050. In this study for China, we focus on the average sector targets only.

For the heterogeneous sectors (other industry and chemicals/ petrochemicals), added value is used as an indicator and the added value is assumed to grow proportional to GDP growth[29]. To set targets at the company level, the SDA methodology assumes the carbon intensities of companies in heterogeneous sectors to decline at the same rate as the sector to stay below 2°C global temperature rise.

In the next paragraph, China specific estimates for a 2°C scenario compatible development of the emissions intensity of seven sectors are developed. Together with expectations on the absolute development of those sectors, this yields an emissions trajectory for China's corporate sector over time.

## 3.2 Emissions intensity targets for China's corporate sectors

In Table 1, we provide average annual intensity based scope 1 and scope 2 targets for the 2011 -2050 timeframe. The resulting intensity pathway for the scope 1 emissions intensity is shown in Figure 4. The averages have been derived based on analysis of the 2011 and 2050 emissions intensity in the studied 2°C scenarios and then assuming an equal year on year annual emissions intensity decline over time, given the focus of this study on year-on-year emissions intensity targets that are robust for a longer period. In reality, the emissions intensity decline over time can vary from year to year depending on e.g. the availability and uptake of certain technologies under different fuel prices developments etc[30].

[29] In the SDA approach, a separate scenario for the chemicals / petrochemicals sector is developed, but due to a lack of consistent data for this sector, this sector is in this study included in the Other Industry sector.

[30] See WWF/WRI/CDP/UNGC: the sectoral decarbonisation approach (SDA), draft for public consultation, 2014 for global examples and IDDRI: IDDRI Pathways to Deep Decarbonisation, 2014, for example pathways for China.

| Sector | Indicator | Scope 1 average annual emissions intensity decline required 2011 -2050 | Scope 2 average annual emissions intensity decline required 2011-2050 | Total average annual emissions intensity decline required 2010 2011-2050 |
|---|---|---|---|---|
| Power production | kWh | 8.1% | - | - |
| Cement | t cement | 1.3% | 7.9% | 1.7% |
| Iron and steel | t steel | 1.6% | 7.8% | 2.2% |
| Aluminium | t aluminium | 0.8% | 8.9% | 4.6% |
| Pulp and paper | t paper | 2.3% | 9.7% | 4.0% |
| Services | m2 floor area | 1.4% | 6.3% | 3.4% |
| Other industry | Added Value | 2.7% | 8.2% | 4.4% |

Table 1 Average 2 °C compatible annual emissions intensity decline between 2011 and 2050 [31]

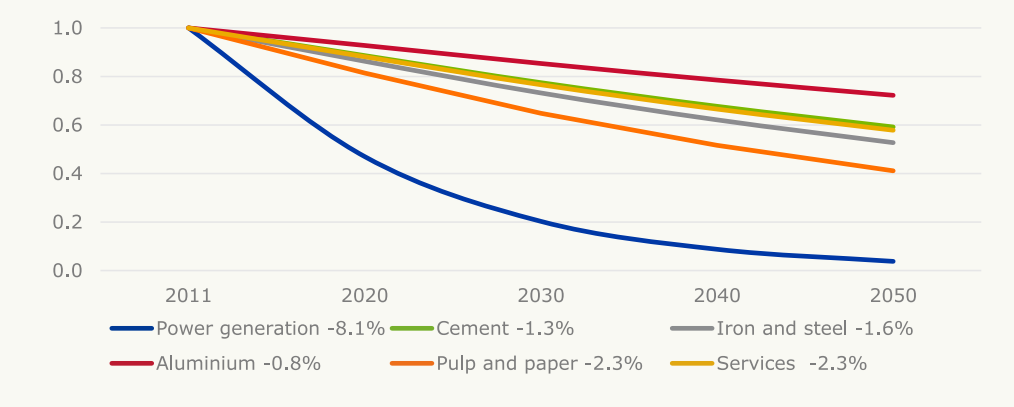



Figure 4 Scope 1 emissions intensity pathways for the seven sectors (index, 2011 = 1)

Most 2°C compatible scenarios assume a close to fully decarbonised electricity production by 2050 in China, which translates into a required annual emissions intensity decline of about 8% per year, with the exact number depending on the exact emissions intensity level assumed for 2050 and the exact allocation of emissions related to heat production in power stations to end-users[32]. WWF's China's future Generation report also shows that China has the potentially to largely decarbonise its power sector by 2050[33].

[31] Data derived from an own analysis of restricted web accessible data from IEA, Energy Technology Perspectives, 2014 as well detailed China data used in the IEA Energy Technology Perspectives 2014 received via personal communication with the ETP team, complemented with data from other low carbon energy scenarios for China such as IDDRI: IDDRI Pathways to Deep Decarbonisation, 2014, LBNL, China's Energy and Carbon Emissions Outlook to 2050 and ERI, China's Low Carbon Development Pathways by 2050, 2009. For a definition of the sectors, we refer to WWF/ WRI/CDP/UNGC: the sectoral decarbonisation approach (SDA), 2014. Other industry includes the chemical industry, which is in the SDA approach separately included. The authors take responsibility for the results given in this table. The results are by no means endorsed by or under the responsibility of any of the organisations mentioned in this footnote.

[32] In IDDRI Pathways to Deep Decarbonisation, 2014, an intensity decline from 743 to 32 kg $CO_2$ / kWh is for example given between 2010 and 2050, corresponding to an average annual intensity decline of 7.6% over this period.

[33] WWF, 2014, China's Future Generation

The scope 1 emissions intensity decline for the basic material industries varies between 0.8% and 2.3% per year. This lower emissions intensity decline can, in general terms be explained by the more limited abatement possibilities for direct fuel related $CO_2$ emissions (as compared to the multiple options available for power generation) as well as the occurrence in some sectors of difficult to abate non-fuel related process emissions. In some cases, the limited availability of recycled material can limit the uptake of less emission intensive production routes. The scope 1 emissions intensity of commercial buildings needs to be reduced by 1.4% per year based on the scenarios studied and the emissions intensity decline for the other industry needs to be reduced by 2.7% per year. Although not identical, the patterns are quite similar to the emissions intensity pathways derived in the global SDA, highlighting the need for a low carbon technology convergence globally in order to stay within or close to a 2°C limit.

Depending on the development of the electricity intensity of the various sectors over time, the scope 2 emissions intensity needs to reduce at a rate slightly above or slightly below the rate required for the power production sector. Sectors that become more electricity intensive over time have a scope 2 emissions intensity decline slightly below the emissions intensity decline for the power sector. This is the case for example in the iron and steel industry sector where gradually the share of electricity intensive secondary steel making becomes more important[34] as well as for the service buildings sector that gradually becomes more electricity intensive. Sectors that have a reduced electricity consumption per unit of output over time, should reduce their scope 2 emissions at a rate above the emissions intensity decline of the power sector like the aluminium sector where the electricity intensity of primary aluminium making further declines over time and the importance of less electricity intensive secondary aluminium production becomes more important over time.

Depending, on the relative share of electricity emissions in the total, this implies that the typical combined scope 1 and 2 emissions intensity reduction requirement ranges between 1.7% for the fuel and process emissions intensive cement industry to 4.6% for the electricity intensive aluminium industry with the other sectors in between.

[34] In LBNL: China's energy and carbon emissions outlook to 2050, the share of secondary steel making by electric arc furnaces is for example assumed to increase to over 30% in 2050 compared to a current share below 10%.

[35] In LBNL: China's energy and carbon emissions outlook to 2050, for example, cement production is expected not to increase anymore from current levels, and steel production is expected to peak around 2025. In ERI's China's low carbon emissions pathways, 2009, both cement and steel production are expected to peak between 2020 and 2030.

The emissions intensity pathways are driven by the uptake of energy efficient technologies, fuel shift and the shift to less GHG intensive process routes within the sectors such as the shift to production from secondary materials. The absolute emissions trajectory associated with these emissions intensity pathways depends on the growth of the respective sectors of the economy over time. Simply speaking, if the growth of the sector exceeds the emissions intensity improvements, there will still be a growth in the total emissions and if the growth is below the emissions intensity improvement, there will be a decline in emissions for the sector. Most scenarios for China project that, in a 2°C compatible scenario, the demand for and production of the key materials used in construction (cement / iron and steel) will gradually start to saturate over time, peaking somewhere between 2020 and 2040, with some scenarios even projecting an absolute decline towards the middle of this century in the production of those materials and a peak already before 2020[35]. On November 4, 2014, China's National Development and Reform Commission released the National Plan for Climate Change, 2014-2020. The 2014-2020 Plan states that by 2020, total GHG emissions from steel and cement sectors should stabilise at 2015 levels which confirms the trends of gradually stabilising emissions from these sectors[36].

The saturation results from gradually saturating urbanisation rates, and the resulting lower need for (new) infrastructure and construction. Demand for the other basis materials projected in this study (i.e. aluminium and pulp / paper included in this study) is projected to continue to increase, albeit at lower rates in the future[37]. A gradual shift towards higher added value, less emissions intensive industries and the service sector will result in a continued growth of those sectors resulting gradually in a lower relative importance (as share of the economy) of the energy intensive industries. A combination of the above factors on the development of the economy, in combination with the technology based emissions intensity trajectories given above, results in corporate emissions in China that grow at a slower and slower pace before starting to decline somewhere in the 2020 – 2040 timeframe, a trajectory that is also required for China's total $CO_2$ emissions in Figure 3.

As examples, we show in Figure 5 and Figure 6, the corporate emissions pathways from the ETP 2 DS scenario from the IEA and the industry pathway from the deep carbonisation pathway developed by IDDRI.

[36] China National Plan for Climate Change, 2014-2020, 2014, China National Development and Reform Commission

[37] An exception is ERI's China's low carbon emissions pathways, 2009 that projects aluminum production to also decline towards 2050 with paper production saturating beyond 2030.

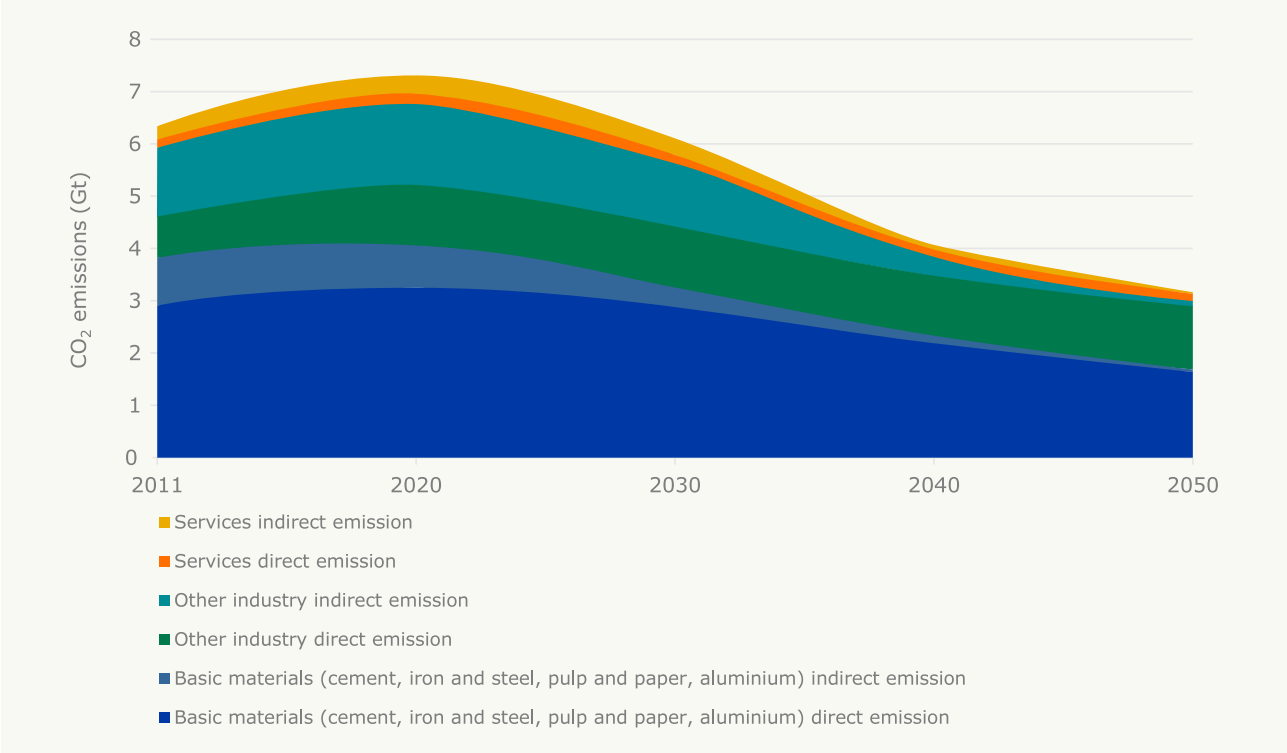



Figure 5 Example of a 2°C scope 1 and 2 $CO_2$ emissions pathways for (parts of) China's corporate sector 2011 – 2050: the IEA ETP 2 DS scenario for the industry and services sector (fuel combustion and process emissions)[38]

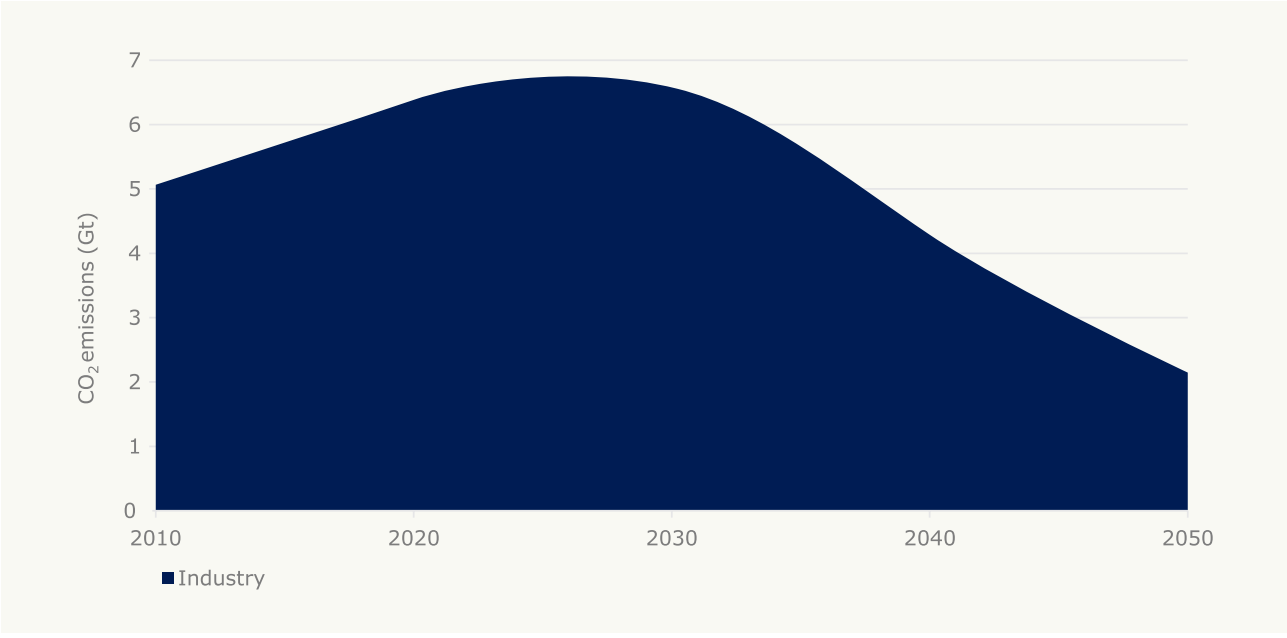



Figure 6 Example of a 2°C scope 1 and 2 $CO_2$ emissions pathways for (parts of) China's corporate sector 2010 – 2050: the IDDRI Deep Decarbonisation pathway for China (fuel combustion only) [39]

[38] Data derived from an own analysis of restricted web accessible data from IEA, Energy Technology Perspectives, 2014 as well detailed China data used in the IEA Energy Technology Perspectives 2014 received via personal communication with the ETP team.

[39] See footnote 17 for the source used

### 3.3 Taking on the challenge

The above analysis shows that the corporate community (excluding utilities) in China should take on annual emissions intensity reduction targets for their combined scope 1 and 2 emissions of typically 1.7 – 4.6% per year to bring China on a deep decarbonisation pathway. China's power sector in its turn should start reducing the emissions intensity of electricity production with as much as 8% per year to reach a very low carbon power mix towards the middle of this century. The generic high-level sector indicators derived in this chapter provide a good marker for the typical emissions intensity targets that companies active in the sectors identified would need to take on to bring China on a 2°C pathway. They can be used as a starting point for China's corporate sector to derive company specific and absolute greenhouse gas reduction targets that take into account more specific information such as the expected growth of the company, the type of production processes used, the status of the technology used in comparison with the sector etc. Adding such company specific information is important in order to derive realistic and achievable company targets. Ambitious GHG reduction targets are certainly challenging to achieve, but the technologies are there to make it happen and taking on such targets often makes a lot of good business sense as we show in the next chapter.

# 4. Feasible and often profitable

### 4.1 Routes towards low carbon emissions

The specific technologies required to achieve the deep decarbonisation for the corporate sector that is needed to bring China on a 2°C compatible pathway vary from sector to sector and even from company to company.

All business activities will be influenced if China follows a low carbon pathway. The Chinese corporate sector will need to respond quickly and proactively to mitigate business risks and to grasp the business opportunities that arise from the challenge. It is time to move ahead of the curve by setting ambitious targets as outlined in the previous chapter and to develop the related strategies to reach such targets. There will be investments required, but also benefits associated if done in the right way. The corporate sector needs to discover the abatement opportunities that are technical and economically viable, mobilise capital and collaborate with policy makers and other stakeholders in a joint effort.

In Chapter 3, we have drawn possible low carbon pathways in China and developed the emission trajectories by sector from now until 2050. Building on other studies[40], four major approaches, outlined in Figure 7 can be distinguished as viable and often profitable options in achieving deep carbon emissions reductions.

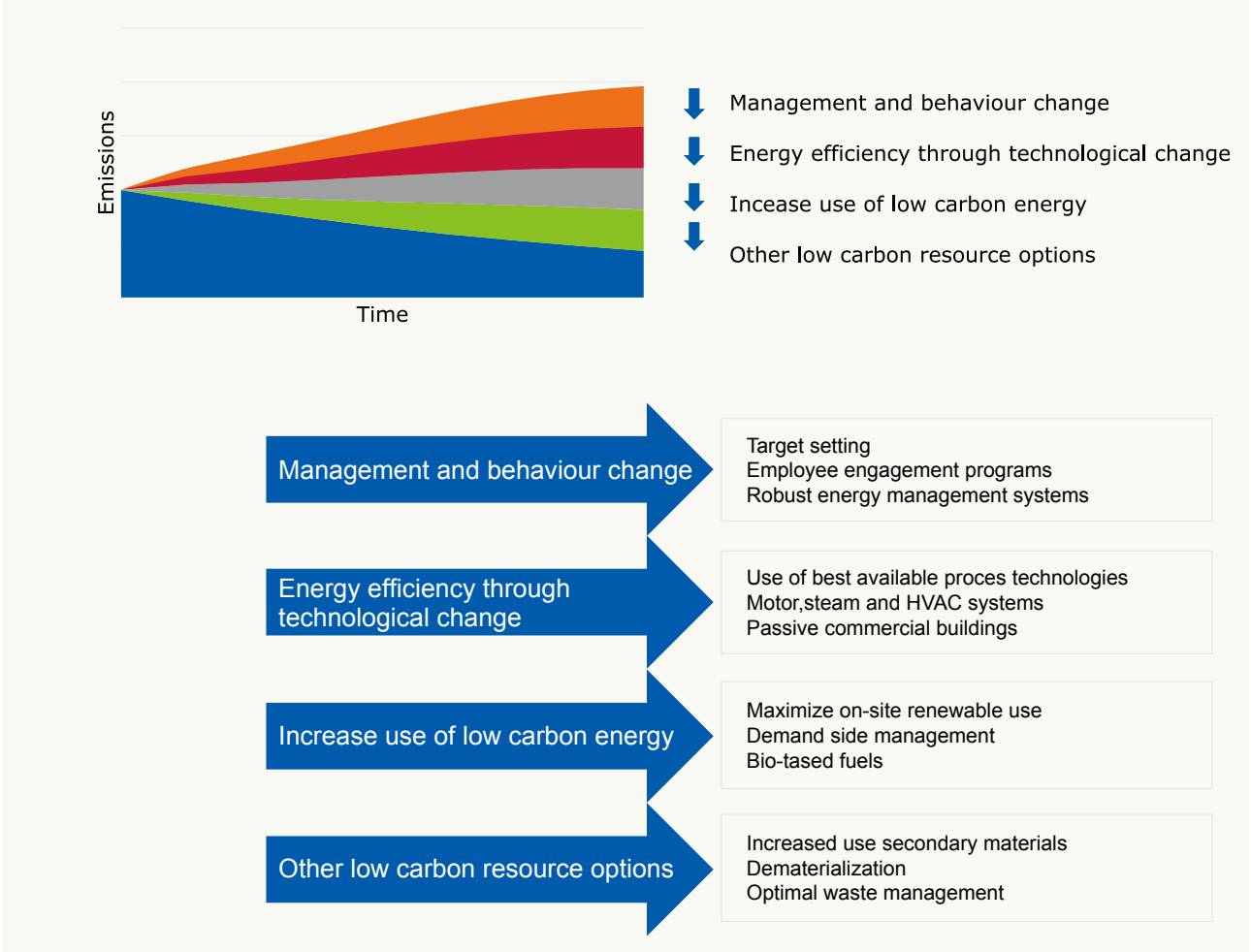



Figure 7 Options for low carbon pathways

1. **Management and behaviour change.** This part of the potential is instrumental to the other three and can be achieved without doing any significant investments. Securing buy-in and support from senior management can help putting low carbon business development on the agenda and enforce certain changes across the business organisation. Global business leaders' show an increasing awareness in recent years. More and more companies have started to monitor their energy use and emissions and set targets to reduce them. China's corporate sector should follow this trend. According

[40] The WWF / CDP, the 3% solution report for the US for example distinguishes energy efficiency improvements through technology improvements, energy efficiency through management and behaviour changes and increased use of low-carbon energy as the major levers towards low carbon pathways.

to a recent CDP report, 71% of the 45 companies responding to the annual survey to the 100 largest Chinese companies have an individual or sub-set of the Board or other committee appointed in charge of climate change matters and the corresponding risks and opportunities. However, only 16% of the companies set targets for emissions reductions and only two of them disclosed absolute targets with details[41]. A similar pattern arises from the We Mean Business initiative report where solid conclusions on China are difficult to draw due to the lack of companies disclosing targets. These percentages should go up to much higher levels in order for China's corporate sector to fulfil the potentials as outlined below. Only in companies where energy and GHG emission performance targets are part of the corporate culture, there will be a chance of energy efficient operational practices (switching off lights, paying attention to energy leaks, energy monitoring) being fully embraced by the organisation, which is of the most cost-effective ways to tap the low hanging fruit in terms of energy efficiency improvements that is present in most companies.

2. **Energy efficiency through technological change.** Energy efficiency has for some time been called the world's hidden fuel, but is recently is more often referred to as the world's first fuel. Retrofitting existing technology and consistently applying the best available new technology can lead to significant energy savings. All 2°C scenarios for China foresee a pivotal role for energy efficiency for both the industrial and services sectors in China. In industry, cross-cutting technologies and measures such as efficient motor systems, electronic control systems, as well as reduced air and steam leaks can help to optimise performance of industrial processes and improve plant efficiency cost-effectively with both energy savings and emissions benefits. Deployment of best available process specific technology such as best practice cement and steel technology can further derive down emissions. In building, optimisation of heating, ventilation and air conditioning (HVAC) systems, use of efficient Light Emitting Diode (LED) lights and the construction of passive or zero energy buildings can drive down emissions while the use of the most energy efficient appliance and electric equipment can help to reduce the effect of the increasing appliance use in the service sector. Businesses can lead the way in setting ambitious energy efficiency standards that can serve as benchmarks for the industry. In the longer term, innovative new processes will be needed to align to a 2°C pathway, including for example low carbon steel making technologies, large scale production of bio-based chemicals etc. It is essential that industry and governments work together to achieve this.

3. **Renewable energy options.** To increase the overall use of low carbon energy in China, the power sector is key. Low carbon scenarios for China all foresee and target a power mix for China towards the middle of the century that is almost fully decarbonised. McKinsey's 2030 abatement scenario projects already in 2030 a coal share of only 34% in China's power generation with the remainder coming from lower carbon sources such as gas (8%), hydro (19%), wind (12%), nuclear (16%) and solar (18%)[42]. 2050 low carbon scenarios such as those by LBLN, WWF, the IEA and ERI, all project a mix of various renewable resource in China's power generation in 2050. Although the level of influence of the non-utility corporate sector on the development of the large scale power production is limited, there is still a role the non-utility corporate sector can play. Deploying on-site renewable energy, such as solar panels on the roofs of offices and warehouses and urban wind turbines cannot only reduce carbon emissions, but also combat inflated energy prices or increasing uncertainty about energy supply. In fact it is a development that already takes place. Renewable power has been increasingly deployed in Asia and emerging economies. Asia as a whole deployed more than half of global solar (photovoltaic) PV additions in 2013, with China being the leader[43]. Via purchase agreements of renewable energy, corporates can also reduce their scope 2 emissions, thereby putting an upward pressure on the deployment of renewable energy in China. Last but not least, corporates can play a role in improving the efficiency of their electricity use and in electricity demand side management, helping to stabilise a grid with an increasing share of fluctuating renewable energy.
4. **Other low carbon options.** Other options for the corporate sector in China to reduce emissions is an increased use of secondary materials (such a recycled steel and aluminium), and better re-use of waste streams. Outside the scope 1 and 2 emissions, corporates can reduce their scope 3 emissions by reducing transport, and business travel. Via their products, industry also plays an important role in driving down consumer emissions. Examples include low emissions cars, energy monitoring equipment for households etc. Integrative product design can help to ensure a better recyclability of materials and prolonged durability to reduce material demand thereby driving down emissions.

Apart from making changes inside their own operations, companies can actively engage external stakeholders within their customers and suppliers and beyond policy makers, business association and NGO to create wider impact.

[41] CDP, 2014 China 100 Climate Change Report

[42] McKinsey, China's green revolution, prioritising technologies to achieve energy and environmental sustainability, unknown year

[43] IEA, 2014, Energy Technology Perspectives

## 4.2 Cost-effectiveness

Low carbon actions are available but in many cases require upfront investment. This is a challenge that stops companies potentially from implementing low carbon measures. However, there is increasing evidence that companies taking up the challenge are in fact better off compared to those not taking action. Many renewable technologies have substantially advanced in performance and cost. A growing number of renewable energy technologies have achieved a level of technical and economic maturity to enable deployment at significant scale. For example, improvements in photovoltaic (PV) technologies and manufacturing processes, along with changed market conditions (i.e., manufacturing capacity exceeding demand) and reduced non-hardware costs, have substantially reduced PV costs and prices[44].

Low carbon investment can produce high returns. Depending on the sector and the scale of the investment, the internal return rate (IRR) on low carbon projects can be as high as 20%[45]. In China, such rates (between 10% and 20%) are for example confirmed for small scale projects (under 30KW) of solar panels installed on roofs based on internal Ecofys analysis. Investment data shows that 79% of the US companies in the S&P 500 that report to CDP earn more from investments aimed at reducing carbon emissions than on their overall capital expenditure[46] . The same analysis shows that deep decarbonisation can be achieved if the US corporate sector would devote about 3% to 4% of its capital expenditures to emission reduction measures. The McKinsey cost curves for China estimate that achieving a low carbon development scenario for China will overall require a substantial incremental carbon investment of up to 150-200 billion Euro per year. Approximately one third of those come with an overall positive economic return over the lifetime, with another third being available at only low to moderate net costs over their lifetime. For the corporate sectors, the McKinsey analysis show even more positive shares of cost-effective savings. At the same time though, the window of opportunity is closing rapidly. China is still in the middle of rapidly expanding its capital build up in commercial buildings, power plants and industrial facilities. Given the lifetime of such capital stock additions, it is essential to embark on the decarbonisation pathway sooner rather than later.

Companies still face internal hurdles and have to compete with other projects to raise capital. The general assumption by the management of the corporate sector is that by investing in energy efficiency or low carbon energy, the companies will either face a higher opportunity cost of investment or low return which is not worth

[44] Climate Change 2014, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlomer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press,Cambridge, United Kingdom and New York, NY, USA.

[45] The climate has changed, report by the We mean Business Coalition (www.wemeanbusinesscoalation.org), 2014

[46] WWF and CPD, 2013, the 3% Solution, driving profits through carbon reductions

pursuing. Investment on renewable energy and energy efficiency technology upgrade therefore sometimes still need support if their market shares are to be increased. Additional enabling policies are needed to address issues associated. To tackle opportunity cost, cheap financing specifically tailored to energy saving measures could help increase the attractiveness of abatement measures. Furthermore, as market growth stabilised, their profit focus evolves to embrace the benefits of eliminating system loses. In the long term, carbon pricing can support the adoption of low GHG energy technologies.

## 4.3 Case studies of companies leading the way

"Yingli is committed to transforming cutting-edge technologies into high-performance products and to providing affordable renewable energy for people. While pursuing this target, we have been constantly reducing energy consumption and GHG emissions in production and operation in order to provide GREENER and CLEANER solar electricity for everyone." - Mr. Liansheng Miao, Chairman and CEO

The following case studies give good examples of emissions reduction targets by some key Chinese companies.

### Yingli to provide affordable green electricity

Yingli's efforts on energy savings and emissions reductions are strongly supported by the company's leadership with the vision to promote the healthy development of the solar manufacturing industry. Yingli is the first company in China to have a Chief Climate Change Officer. They have established a Committee on Integrated Utilisation of Resources to manage projects on energy efficiency and clean productions.

As the first of WWF Climate Savers in China, Yingli sets a good example of making climate strategy and ambitious targets to reduce GHG emissions from 2010 to 2015. For each megawatt of PV module produced, Yingli is committed to:

- 13% cut of direct emissions and indirect emissions from consuming power and heat (Scope 1 and 2);
- 7% cut of emissions from purchased goods and services (Scope 3 emissions);
- 10% cut of emissions intensity from upstream transportation (Scope 3 emissions);

Yingli is also the first company in China to pledge a renewable electricity target. By 2015, at least 4% of the electricity consumption will come from renewable sources, particularly from solar. In 2013, Yingli already managed to go beyond all of the targets that are mentioned above.

"Lenovo is dedicated to reducing our global carbon footprint. We have developed a comprehensive strategy to address all aspects of our business, set aggressive objectives and targets, and we are measuring our performance against each objective and target to insure that we stay on track" - Mr. Yuanqing Yang, CEO

### Lenovo aims for zero emissions

Lenovo is committed to "minimise its climate impact" and acknowledges the need to reduce GHG emissions from its business activities worldwide. Governed by the Climate Change Policy[47], Lenovo has been reporting its GHG emissions from 2008 and successfully reducing its total emissions by setting clear and measureable targets, including getting rid of all scope 1 GHG emissions by 2011, cut scope 2 emissions step by step, and reduce the emissions from supply chain and products

as well as the emissions from process significantly. By 31st March 2011, Lenovo has realised zero emissions from scope 1 carbon sources, and reduced its scope 2 emissions by 10% compared to 2009 level. Lenovo has consecutive targets in the following years, which will potentially lead to a total of 20% GHG emission reduction from 2009 to 2020. Lenovo has implemented over 70 operational energy efficiency projects, such as installation of low energy lighting, energy efficiency improvement to HVAC system and data centres, and application of solar PV and solar hot water system in some office buildings. Lenovo is taking actions to green its own business and its suppliers, and build the blueprint for low carbon production.

### Vanke to build green houses

"As the largest residential developer in the world, we feel it's our responsibility to lead GHG emissions reduction in the industry. We believe only when leading companies take more responsibilities for emissions reduction can the industry improve its carbon footprint as a whole," - Mr. Mao Daqing, Vice President

Vanke has put the energy saving and emissions reduction as one of the core issues for the company. It started to build the company's GHG inventory and will report every year from 2013. As a first step, Vanke measured its carbon emissions sources in Scope 1,2 and 3. The results show that Vanke emitted 18.7 Mt $CO_2$ equivalent in 2012. 99.92% of it comes from Scope 3 emissions. Vanke sets specific GHG emissions reduction targets of 2018 with focus on improving the environmental quality of its real estate products and removing the carbon footprint of building materials procured, using 2012 as the base year. On November 13th 2014, Vanke became WWF's second Climate Savers company in China. Vanke commits for the period 2013 to 2018 to:

- Develop at least 49 million square metres industrial housing products[48] to cut 1.46 Mt $CO_2$ equivalent emissions from upstream sectors, including 1.08 Mt $CO_2$ equivalent carbon sequestration;
- Maintain the growth rate of 3-star green new buildings by at least 15% to save about 2.56 Mt $CO_2$ equivalent emissions;
- Promote renewable energy in residential buildings, ensure at least 560,000 square metres of new buildings with PV solar water heating systems to save another 1.28 Mt $CO_2$ equivalent emissions;
- Increase the usage of renewable electricity for self-used office buildings to 27%, and to install solar PV power generation systems on the self-used office buildings.

[47] Lenovo's climate change policy, effective from August 6th 2010, http://www.lenovo.com/social_responsibility/us/en/climate_policy.html

[48] Model residential building with integrated energy and resource use

### WWF Climate Solvers[49] develop smart products and services to realise a transition towards a 100% renewable energy future globally

Since 2011, in total fourteen Chinese innovative low carbon solutions have been awarded in the WWF Climate Solvers project. Examples include .

- A zinc-bromine battery developed by ZBEST that provides a viable energy storage option for the renewable energy market so that it can grow even faster,
- A smart meter developed by San Franco Electronic Co., Ltd. that enables big reductions in power consumption for its users
- A photovoltaic ceramic tile developed by Zhejiang Heda Solar Technology Company that allows integration of solar energy in building materials
- A new furnace developed by Miluo Xinxiang Carbon Products Co., Ltd. that allows for a significantly more energy efficient production process for the production of graphite materials

These are examples of new, innovative products developed by the Chinese entrepreneurial community that can help their costumers worldwide to significantly reduce their energy consumption and to make a switch towards a 100% renewable energy future. In order for more Chinese innovations like these to become global success stories China need to strengthen domestic demand for innovative solutions by increased climate ambitions, Chinese corporate players and venture capitalists should become more active in mergers and acquisitions in this space compared to leading countries. This way China can more fully take economic advantage of being a 'Strong commercialiser' of solutions, for example already having the world's most mature initial public offering (IPO) market for expansion capital to the cleantech sector[50].

[49] The WWF Climate Solver Project is an award designed to identify and promote innovative low carbon solutions developed by small to medium sized enterprises (SMEs), with the vision to realise the low carbon transition around the world. Built upon a multi-stakeholder platform, the project aims to support winning SMEs/innovations through increased financial access, market penetration and media exposure. Climate Solver was initiated by WWF Sweden in 2008 and was introduced to China in 2011. So far, fourteen Chinese innovative low carbon solutions were awarded covering renewable energy utilisation, energy efficiency improvement and conservation, etc.

[50] WWF/Cleantech Group: Global Cleantech Innovation Index 2014 – Nurturing Tomorrow's Transformative Entrepreneurs

# 5. It is time to act now

Industry and business will be seriously affected by rising temperature levels. More extreme weather effects, issues with water supply, disruptions of supply chains can all be significant risk factors for China's corporate sector resulting from climate change. At the same time, the corporate sector is also pivotal in combatting climate change, both as significant contributor to the emissions and as provider of the innovative climate friendly solutions required to make the low carbon transition happen. It is time for the Chinese corporate sector to act and to contribute to China's ambition to have a peak in its emissions rather sooner than later in order to achieve the reductions required in the rest of the century.

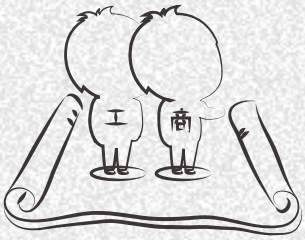
This report shows that the emission intensity of the Chinese corporate sector should decrease by 1.7% to 4.6%, depending on the sector, to stay on track for a low carbon future.Only then will China's emission peak in the coming decade and only then emissions will decline towards the middle of this century, in line with what global scientists think is required for China to stay within a 2°C world. The specific actions and technologies required to achieve a deep decarbonisation pathway for China's corporate sector will be different for all, but there are opportunities all around, and the evidence is building up that those taking action are better off compared to those lagging behind.

Low carbon development will help decoupling the economic performance of enterprises from resource consumption. Improved market competitiveness can be an internal drive for companies to carry out emission reduction measures. The external incentive for low carbon development is China's ambitious emissions peak target and decarbonisation pathway. It's time for China's corporate sector to commit to ambitious, yet realistic 2°C compatible targets. Companies embracing such targets can make the difference and they can profit from doing so.
It is time to act now and follow the likes of companies like Yingli, Vanke and Lenovo. Take the responsibility and set ambitious targets to meet China's decarbonisation challenge!

# WWF Climate Savers

http://www.wwfchina.org/climatesaver/

## About Climate Savers programme



### WWF Climate Savers

A global programme that positions companies as leaders of the low-carbon economy.

### Member companies take on two commitments to show their leadership in climate change

To become the best in class in reducing greenhouse gas emissions.

To influence market or policy developments by promoting their vision and achievements.

### The programme also acts as a sounding board

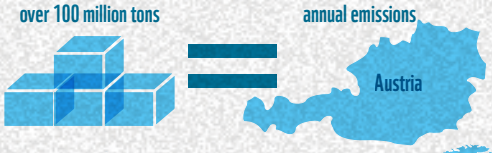
by providing valuable guidance to companies seeking to shrink their carbon footprint while growing their business and enhancing brand equity.

## Milestones

**1998**
WWF Netherlands first proposed the concept of Climate Savers programme, stimulating top companies to reduce carbon emissions.

**1999** Johnson&Johnson IBM Polaroid
WWF United States took the initiative. Johnson-Johnson, IBM and Polarorid were the first member companies.

**Up to 2011**
The Climate Savers members companies had reduced GHG emissions by over 100 million tons, which is equivalent to the annual emissions of Austria.




**Up to 2014**
WWF Climate Savers programme had developed in 13 countries, including Netherlands, France, The USA, Sweden, Switzerland, Italy, Mexico, Austria, China, Japan, Denmark, Belgium and Canada.


**2013** YINGLI SOLAR
Yingli Green Energy, the world's leading PV module manufacturer, became the first Chinese company to join Climate Savers.

**2014** Vanke
Vanke Co Ltd, the world's largest real estate developer, joined Climate Savers programme.

**Up to now**
30 leading international companies have joined Climate Savers programme.
Current Climate Savers member companies are:

Johnson&Johnson · Nike · alpro · Xanterra · Catalyst · novo nordisk · SONY · SOFIDEL · hp · Diversey · The Coca-Cola Company · ADITYA BIRLA NOVELIS · Fairmont · NATIONAL GEOGRAPHIC · Eneco · VOLVO · SUPERVALU · resolute · ARJOWIGGINS GRAPHIC · kpn · Sprint · SKF · YINGLI SOLAR · LEGO · swisscom · SV Group · MIGROS · SWISS POST · coop · Vanke

100%
RECYCLED

## 100 million tons

Up to 2011, The Climate Savers members companies had reduced GHG emissions by over 100 million tons.

## 1999

WWF Climate Savers is a global programme initiated in 1999, and it was launched in China in2009.

## 30

So far 30 leading international companies have become Climate Savers.

## 13

WWF Climate Savers has teams in 13 countries.

WWF

**Why we are here**

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.wwfchina.org

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