LANCET COUNTDOWN
TRACKING PROGRESS
ON HEALTH AND
CLIMATE CHANGE

清華大學
Tsinghua University

Lancet Countdown 2017 Report: Briefing for Chinese Policymakers

31st October, 2017

Introduction

To provide a unique national analysis and policy recommendations for health and climate change, here a national policy brief for China is presented. China is a hotspot country in health and climate change because it has the world's largest population, with the second largest burden of disease and the largest total carbon dioxide emissions of any country.[1,2] To highlight key climate change impacts on health in China, national response measures to climate change and health impacts, and the associated challenges and opportunities in China, this policy brief presents four indicators from the Lancet Countdown on Health and Climate Change:

- Climate-sensitive infectious diseases
- Coal phase-out
- Exposure to air pollution in cities
- Sectorial contributions to air pollution and premature deaths

Acknowledgements

The concept of this brief was developed by the Lancet Countdown on Health and Climate Change. The first draft was written by Wenjia Cai, Peng Gong, and Little Hui (Tsinghua University). Contributions, comments and suggestions were provided by Jinxuan Hui, Can Wang, Bing Xu, Qiang Zhang and Yixuan Zheng (Tsinghua University). Review of the brief and edits were provided by Nick Watts and Nicola Wheeler (Lancet Countdown).

Strategic Partners

THE LANCET wellcome

About the Lancet Countdown

The Lancet Countdown: Tracking Progress on Health and Climate Change is a global, interdisciplinary research collaboration between 24 academic institutions and inter-governmental organisations. It monitors progress on the relationships between health and climate, and their implications for national governments, reporting annually. It was launched following the 2015 Lancet Commission on Health and Climate Change, which concluded that, left unmitigated, climate change will undermine 50 years of public health gains, whilst responding to it could represent "the greatest global health opportunity of the 21st century".

The 2017 report presents data on the indicators selected following a consultation process in 2016. These span 5 domains, from impacts and adaptation to mitigation, and the economics and politics of climate action.

About Tsinghua University

Tsinghua University is one of China's leading universities, advising the Chinese government on a range of important issues. With the motto of "Self-Discipline and Social Commitment" and the spirit of "Actions Speak Louder than Words", Tsinghua University is dedicated to the wellbeing of Chinese society and global development.

Recommendations

Our key recommendations for Chinese policymakers are as follows:

Recommendation 1

Further analyse the role of climate change on diseases and on human health to make more customized prevention policies.

Recommendation 2

Continue the phasing-out of coal, while properly handling the consequent social problems.

Recommendation 3

Integrate health in the climate policy-making process.

Recommendation 4

Tighten the emission control on growing large-emission sectors, such as the transport and building sectors, to avoid potential lock-in effects.

Health and Climate change:

The health impacts of climate change are experienced through both direct and indirect pathways. These may take the form of an increase in the frequency or severity of extreme weather events such as heatwaves, floods, droughts, and storms. These directly impact human health, resulting in heat-related mortality, injury, and loss of livelihoods. Indirectly, climate change may interact with other environmental systems, for example, altering the burden and pattern of distribution of vector-, water-, or food-borne infectious diseases. Increasingly, the effects of climate change interact with already vulnerable social systems, for example by threatening the availability of adequate nutrition or safe drinking water.

These challenges interact with many of the social and environmental determinants of health, presenting an unprecedented threat to human health which, left un-mitigated, could work to reverse the last half-century of gains made in public health.

Conversely, the response to climate change presents the potential for enormous health co-benefits. For example, efforts to phase-out coal-fired power not only reduces greenhouse gas emissions, but also reduces local air pollution, thus improving the cardiopulmonary health of surrounding populations.

It is vital to understand a) the impacts that climate change is having on human health and b) the health consequences of the global response to climate change. This is the role of the Lancet Countdown: Tracking Progress on Health and Climate Change, an international, interdisciplinary research collaboration, comprised of 24 academic institutions and United Nations agencies.

The Lancet Countdown will do this from now until 2030 by reporting annually on indicators arranged in to five thematic groups:

- Climate Change Impacts, Exposures and Vulnerability
- Adaptation Planning and Resilience for Health
- Mitigation Actions and Health Co-Benefits
- Economics and Finance
- Public and Political Engagement

Climate-Sensitive Infectious Diseases

Aedes aegypti and Aedes albopictus are two climate-sensitive mosquito vectors of infectious diseases, such as dengue, Yellow Fever, Chikungunya, Mayaro and Zika viruses. There is evidence of a clear and consistent increase in China's average vectorial capacity (VC) in both vectors since 1950, as shown in Figure 1. The mean surface temperature in China has risen by 0.9°C to 1.5°C since 1909[3], which may have increased the range and frequency of mosquito activities. VC in China could increase by a further 1.5% and 1.7% from 2015 to 2030 (6.7% and 7.5% overall increase relative to 1950 levels) for Aedes aegypti and Aedes albopictus, respectively. This is only one example. Other evidence on how climate change affects human health in China directly and indirectly is mounting.[4]

VC is "the rate (usually daily) at which a bloodsucking insect population generates new inoculations from a currently infectious case"

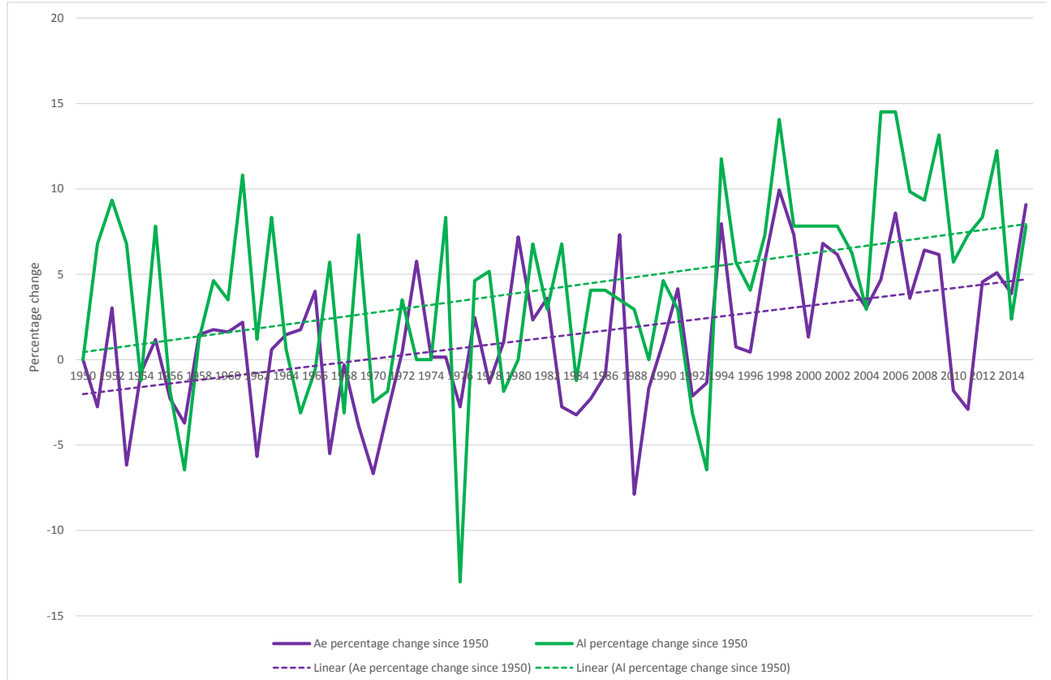


Figure 1. The vectorial capacity change of two mosquito vectors (Aedes aegypti) and (Aedes albopictus) in China since 1950.

Coal Phase-Out

Coal use has accounted for around 70% of energy demand and supported decades of China's rapid economic growth[5]. However, this growth in coal use has also resulted in a significant deterioration of air quality. The Chinese government has decided to strictly control coal consumption, in order to address the climate change and air pollution challenges coal causes. The landmark Action Plan for Air Pollution Prevention and Control in 2013 set specific targets that the share of coal in total energy consumption in China should decrease to less than 65% by 2017. Especially for Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta regions, they should reduce their coal consumption in absolute terms. In 2016, China's 13th Five-Year Plan (2016-2020) sets out an ambitious target to decrease the proportion of coal in primary energy consumption from 64% in 2015 to 58% by 2020.[6] At the same time, China's Energy Development Strategy Action Plan (2014-2020) also set a cap on annual primary energy consumption at 4.8bn tonnes of the standard coal equivalent until 2020.[7]

These policies have achieved remarkable effects. The 2015 primary coal supply level in China represents a reduction from the high point of 85.4 EJ (exajoule) in 2013 (see Figure 2), an encouraging indication that China's coal consumption has peaked and is now in decline. The share of coal-fired power plants in total installed capacity and their annual generation hours have also decreased in recent years[8] (see Figure 3). It is worth mentioning that, phasing-out coal in the electricity sector will also increase the clean energy share in the building and transport sectors from a life-cycle perspective, which can also bring benefits to human health and climate change.

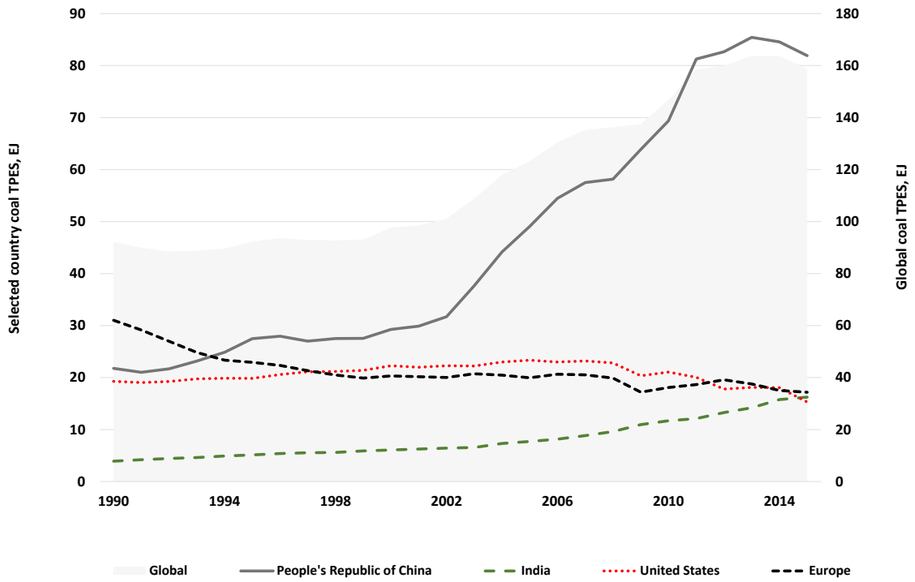


Figure 2. Total primary coal supply in China, India, Europe, the US and globally (shaded area against secondary y-axis), 1990-2015.

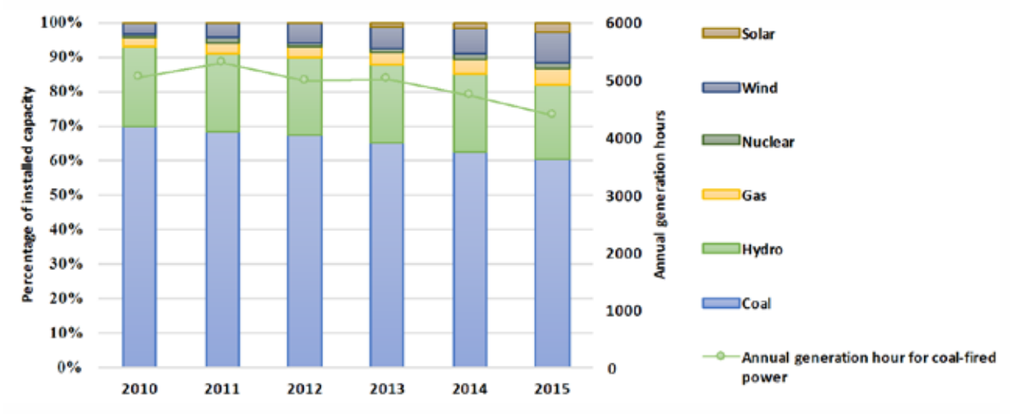


Figure 3. Power generation trends in China, 2010-2015.

Though phasing-out coal brings a lot of benefits in terms of climate change and human health, the Chinese government estimated that one-fifth of the workers in the coal industry would be laid-off in 2016 as result of coal plant closures.[9] Therefore, the government decided to spend more than $15 billion [10] to help relocate them. However, those workers being laid-off still face huge challenges to find re-employment because of the mismatch of skills in the labour market. These social problems brought by the phasing-out of coal must be handled properly and with care.

Exposure to Air Pollution in Cities

Except for coal phase-out, China has developed many other policies to address climate change, including adjusting the industrial structure, optimizing the energy structure and conserving energy and improving energy efficiency (see annex Table 1).[11] These policies, together with other air pollution control measures, have greatly reduced exposure levels to air pollution in China's cities. From 2013 to 2015, China's overall pollution level showed a significant decline (see Figure 4)[12] . Specifically, in the Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta regions, the annual PM2.5 concentrations had declined by 27.4%, 20.9% and 27.7%, respectively.[6] The population-weighted annual mean PM2.5 concentrations decreased by 21.5% over China during 2013–2015, reducing from 60.5gm−3 in 2013 to 47.5gm−3 in 2015. Subsequently, the national PM2.5-attributable mortality decreased from 1.22 million in 2013 to 1.10 million in 2015, which reduced by 9.1%.[12]

Despite this progress, health is not yet the mainstream guiding principle in climate change policy-making. Criteria that policy makers usually consider are greenhouse gas emission reduction effects, technical and economic costs, and social acceptability. However, a clear tendency is that people are increasingly concerned about the policy's health effects. Besides, much research[13,14] has already proved that greenhouse gas mitigation in China can bring significant health co-benefits that might even offset the overall mitigation costs. Therefore, there is an urgent need to include health in the policy-making process, as it might substantially change the technology and policy preference.

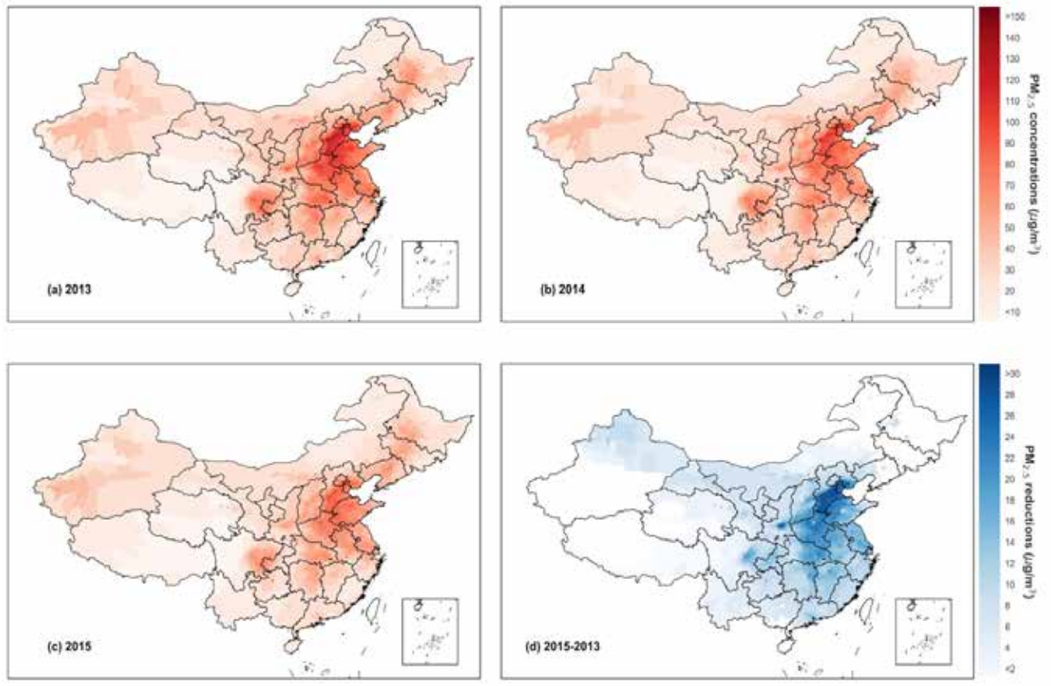


Figure 4. PM2.5 concentrations throughout China, 2013-2015.

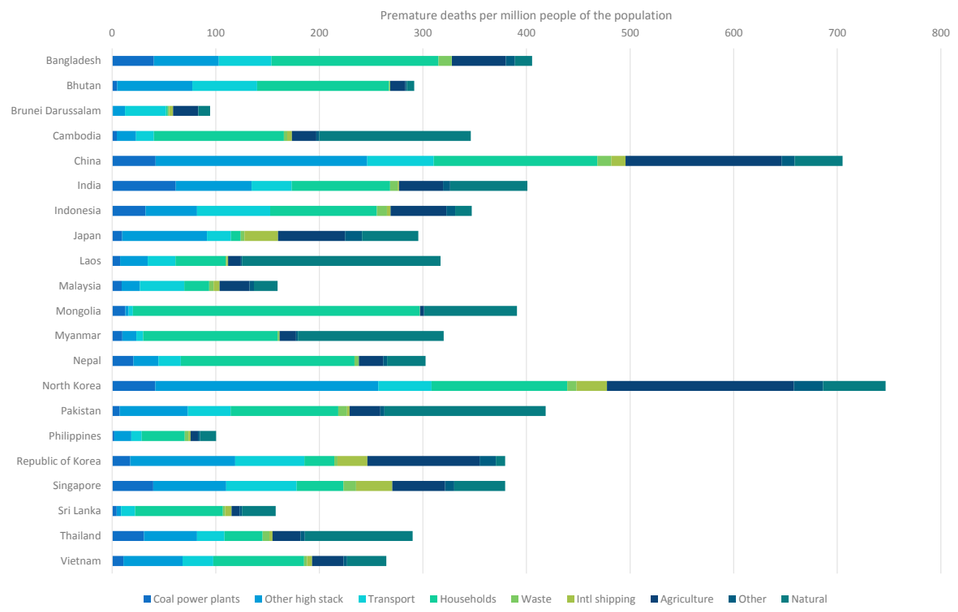


Figure 5. Health impacts of exposure to ambient PM2.5 in terms of annual premature deaths per million inhabitants in South and East Asian countries in 2015, broken down by key sources of pollution.

Sectoral Contributions to Air Pollution and Premature Deaths

In China, the major energy consumers are the industry, building, transport and agriculture sectors. The Lancet Countdown shows that energy-related PM2.5 in 2015 mostly came from the building sector (48%), followed by the industry and transport sectors; energy-related NOX mostly came from the industry, transport and electricity sectors. Given the size of energy consumption and emissions in industry sectors, it has become the major target for climate and air pollution control policies.

However, the current policies are insufficient to effectively control emissions from the transport and building sectors. Not enough policies have been implemented to set a cap on fuel-powered vehicles – with the explosive expansion in China's fuel-powered vehicle fleet in urban areas, road transport contributes more than 20% of total PM emissions in Shanghai and Guangzhou, more than 30% in Beijing and more than 40% in Shenzhen[15]. Energy efficiency policies and appliance standards to mitigate appliance and electronics energy demand in the building sector are missing.[16] Furthermore, almost half of China's population still rely on the use of solid fuels (biomass and coal) for cooking and heating, with household air pollution linked to around 1.2 million premature deaths in 2015.[15] The contribution of different sectors to air pollution, and in turn premature deaths, is important to understand in order that policies can be implemented that have the biggest benefits. In China, 705 people in every million die prematurely as a result of air pollution. Some of the biggest contributing sectors are high stack sectors (204 premature deaths for every million people), households (157 premature deaths for every million people), and agriculture (150 premature deaths for every million people) (Figure 5).

With the improvement of China's industrial structure and people's living standard, the air pollution share in the industry sector might fall rapidly in future. The transport and building sectors are expected to become the major contributors to national energy consumption, greenhouse gas emissions and air pollution. As products in these sectors usually take decades to exit the market, immediate actions need to be introduced for the building and transport sectors to avoid the "lock-in effect".

Recommendations

Our key recommendations for Chinese policymakers are as follows:

Recommendation 1

Further analyse the role of climate change on diseases and on human health to make more customized prevention policies. Although China has established a fairly good detection, early-warning, preparedness and response system to health emergencies, further analysis and better understanding on the drivers are needed, especially the role of climate change, behind the change of disease incidence rate or vectorial capacity of mosquitos. This will greatly facilitate a prevention-oriented and more cost-effective response strategy to climate change.

Recommendation 2

Continue the phasing-out of coal, while properly handling the consequent social problems. Systematic solutions, including developing new industrial fields and products, expanding domestic and overseas markets, providing free training and career guidance, developing market-oriented vocational education, and giving adequate government support for those who want to start their own businesses, are urgently needed to avoid social unrest.

Recommendation 3

Integrate health in the climate policy-making process. Fully consider the health effects of potential climate technologies and policies, in order to re-evaluate the proposed policy, develop more cost-effective and socially acceptable technology roadmap and policies, and maximise the health benefits of climate change mitigation and adaptation.

Recommendation 4

Tighten the emission control on growing large-emission sectors, such as the transport and building sector. Study and publish more policies to encourage climate-friendly productions and consumptions in the transport and building sectors (such as, speeding up the development and deployment of electric vehicle and strengthening the standards of energy conservation in building sector), in order to avoid the potential lock-in effects.

Additional Information

- Lancet Countdown Website: http://www.lancetcountdown.org/

WHO UNFCCC Climate and Health Country Profiles

The WHO UNFCCC Climate and Health Country Profiles form the foundation of WHO's national level provision of information, and monitoring of progress in climate change and health. The climate and health country profiles, first published in 2015, are developed in collaboration with ministries of health and health determining sectors with the aim of empowering Ministers of Health to engage, advocate and act to protect health from climate change. The most recent and relevant scientific evidence from the health, environment and meteorological communities is presented to highlight country-specific climate hazards and the potential health impacts facing populations. National action on health adaptation and mitigation is reported in the profiles and opportunities to promote actions that improve health while reducing carbon emissions are presented. For more information on the WHO UNFCCC Climate and Health Country Profiles please visit the website and watch the introductory video.

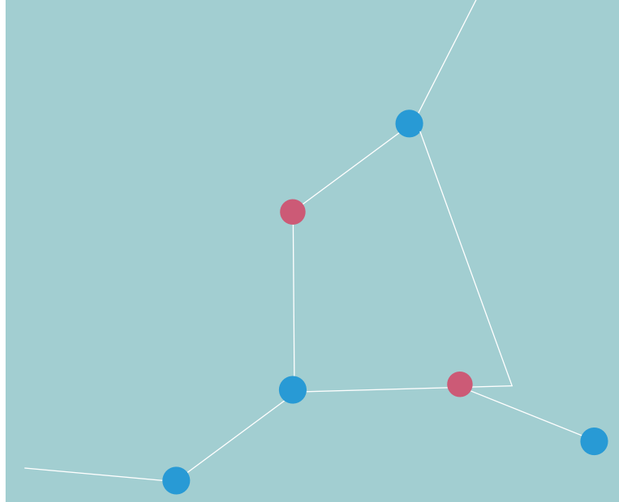
References

1. Feigin VL, Abajobir AA, Abate KH, et al. Global, regional, and national burden of neurological disorders during 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet Neurology 2017; 16(11): 877-897.
2. International Energy Agency. CO2 Emissions from Fuel Combustion online data service 2017 edition. https://www.iea.org/statistics/relateddatabases/co2emissionsfromfuelcombustion/ (accessed Oct 9, 2017)
3. The Third National Assessment Report on Climate Change. 2015. http://www.ccchina.gov.cn/Detail.aspx?newsId=56949 (accessed Oct 9, 2017) [in Chinese]
4. Zhang JF, Mauzerall DL, Zhu T, et al. Environmental health in China: progress towards clean air and safe water. Lancet 2010; 375(9720):1110–1119
5. International Energy Agency http://www.iea.org/statistics/statisticssearch/ (accessed Oct 9, 2017)
6. Clean Air Alliance of China. China Air Quality Management Assessment Report (2016) http://en.cleanairchina.org/product/8348.html (accessed Oct 9, 2017)
7. Energy Development Strategy Action Plan (2014-2020) http://www.lse.ac.uk/GranthamInstitute/law/energy-development-strategy-action-plan-2014-2020/ (accessed Oct 9, 2017)
8. China Electricity Council http://www.cec.org.cn/guihuayutongji/tongjxinxi/ (accessed Oct 9, 2017) [in Chinese]
9. Protests Rise as China Lays Off Millions of Coal Workers. 2016. https://www.technologyreview.com/s/600927/protests-rise-as-china-lays-off-millions-of-coal-workers/ (accessed Oct 9, 2017)
10. China unveils plans to help laid-off steel, coal workers. 2016. http://www.chinadaily.com.cn/business/2016-04/18/content_24618585.htm (accessed Oct 9, 2017)
11. Brookings-Tsinghua Center for Public Policy. Review of China's 12th low carbon development. 2017. https://www.brookings.edu/wp-content/uploads/2017/08/e2809ce58d81e4ba8ce4ba94e2809ce4bd8ee7a2b3e-58f91e5b195e59b9ee9a1be.pdf (accessed Oct 9, 2017) [in Chinese]
12. Zheng Y, Xue T, Zhang Q, et al. Air quality improvements and health benefits from China's clean air action since 2013. Environmental Research Letter 2017. https://doi.org/10.1088/1748-9326/aa8a32 (in press)
13. Xie Y, Dai H, Dong H, et al. Economic impacts from PM2. 5 pollution-related health effects in China: a provincial-level analysis. Environmental science & technology 2016; 50(9): 4836-4843.
14. Wu R, Dai H, Geng Y, et al. Economic Impacts from PM2. 5 Pollution-Related Health Effects: A Case Study in Shanghai. Environmental Science & Technology 2017; 51(9): 5035-5042.
15. International Energy Agency. Energy and air pollution WEO 2016 special report. https://www.iea.org/publica-

tions/freepublications/publication/WorldEnergyOutlookSpecialReport2016EnergyandAirPollution.pdf (accessed Oct 9, 2017)
16. International Energy Agency. Building Energy Use in China: Transforming Construction and Influencing Consumption to 2050. https://www.iea.org/publications/freepublications/publication/PARTNERCOUNTRYSERIESBuildingEnergy_WEB_FINAL.pdf (accessed Oct 9, 2017)

Annex Table 1 China's Mitigation Policies and their Performances

National policies and plans		Details	Targets	Performance			
				Energy intensity reduction	Carbon intensity reduction	SO2 reduction	NOx reduction
11th FYP	Comprehensive Work Scheme of Energy Saving and Emission Reduction for the 11th FYP	Allocating energy conservation targets to local governments, implementing an assessment system and releasing quarterly reports on the completion of energy conservation targets in each region.	By 2010: 20% energy intensity reduction (compared to 2005)	19.1% (compared to 2005)	21% (compared to 2005)	14.29% (compared to 2005)	
	National Plan for Addressing Climate Change	Outlining objectives, basic principles, key areas of actions, as well as policies and measures to address climate change for the period up to 2010.					
12th FYP	12th FYP for Energy Saving and Emission Reduction	Outlining three main tasks and relative targets: - Adjusting and optimizing the industry structure - Improving the level of energy efficiency - Strengthening the emission reduction of major pollutants	By 2010: - 16% energy intensity reduction (compared to 2010) - 17% carbon intensity reduction (compared to 2010) - 11.4% non-fossil fuel in primary energy 21.66% forest coverage	18.4% (compared to 2010)	20% (compared to 2010)	18% (compared to 2010)	18.6% (compared to 2010)
	Comprehensive Work Scheme of Energy Saving and Emission Reduction for the 12th FYP	Allocating energy conservation targets to local governments, implementing an assessment system and releasing quarterly reports on the completion of energy conservation targets in each region.					
	Work Scheme Controlling Greenhouse Gas (GHG) Emissions for the 12th FYP	Setting targets and outlining multiple control measures (such as increasing carbon sinks, launch low carbon pilot projects and creating carbon emission trading market etc.) for controlling GHG.					



Created by

LANCET COUNTDOWN
TRACKING PROGRESS
ON HEALTH AND
CLIMATE CHANGE

Tsinghua University