Non-state and subnational climate action in China

An overview of the current landscape, emission reduction potential and implementation

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Summary

Due to the top-down characteristic of the Chinese political system, climate change action has to this point been largely driven by national policies. Although the fragmented authoritarian political system allows for certain room for subnational policymaking, non-state and subnational actors are mainly considered as implementors of national targets. Moreover, given the large share of state-owned enterprises (SOEs) in China, particularly in the large emitting heavy industries, transformational change in this sector is to large extent reliant on governmental action.

To this point, the engagement of Chinese subnational and non-state actors with international initiatives has been limited, leading to analyses based on global databases underrepresenting the potential of non-state and subnational climate actions. Based on this, studies published to date using global databases indicate that the expected emission reductions through non-state and subnational climate actions additional to current national policies are limited.

However, there are signs that the non-state and subnational action landscape is quickly changing as an increasing number of Chinese actors are taking part of international initiatives to increase ambition and climate action. A notable rise in Chinese memberships in corporative initiatives such as RE100 and the Science Based Target initiative (SBTi) has been observed in recent years, yet with a sharp increase during 2021. This rise can be linked to recent announcements such as president Xi Jinping's pledge for China to become carbon neutral by 2060 in September 2020.

Despite the top-down governmental structure, there could be substantial room for subnational governments, including provinces and cities, to take the lead in accelerating climate action and achieve early carbon peaking and long-term decarbonisation targets. The heavy industry sector, particularly important in terms of emissions as well as contribution to the national economy, makes a challenging case. Concentrated in a few provinces, local protectionism causes provincial governments to be cautious about transformational changes lowering competitive advantage. As a large share of heavy industry companies is state-owned or under substantial state influence, there is limited room for unilateral corporate action, making the decarbonisation of heavy industries reliant on political will.

The differences across provinces in terms of socio-economic status, energy and natural resources and economic activities gives provinces differentiated ability to address climate issues. Yet, provinces, autonomous regions and municipalities are responsible for the undertaking of carbon emission reductions. In this aspect, partaking in international initiatives could be instrumental in sharing experiences and developing roadmaps and learning from countries and regions with similar socioeconomic and/or industrial structures. Similarly, frontrunner provinces such as Beijing, Yunnan, Sichuan and Guangxi can serve as good examples and share lessons learned for other provinces.

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1 Introduction

As the global climate emergency is growing more potent, national governments are under increasing pressure to deliver on the Paris Agreement, yet their current policies are highly insufficient to limit global warming to 1.5°C (Höhne *et al.*, 2020). Recent literature shows that the collective ambition from subnational governments and non-state actors could have an instrumental role in narrowing that gap (Kuramochi *et al.*, 2020; Lui *et al.*, 2021). Although it is still in a nascent state, bottom-up climate action has in the last few years gained increased momentum as non-state and subnational stakeholders are increasingly taking individual action through target setting and pathways development. The number of cities and regions having made quantifiable pledges to reduce emissions beyond the year 2020 in ten major emitting economies increased by 70 regions and 1,500 cities between 2019 and 2020. Similarly, the number of companies and participators in international cooperative initiatives (ICIs) is increasing substantially (Takeshi Kuramochi *et al.*, 2021).

As the largest greenhouse gas (GHG) emitter globally, and economically dependent on energy-intensive industries which alone would be among the top three emitting countries in the world (Climate Trace, 2021), China faces challenges in realising the transformational and structural changes needed to achieve the objective of the Paris Agreement. The 14th Five-Year-Plan (FYP), released in March 2021, presents limited improvements in terms of climate action compared to the 13th FYP. Several recent developments have, however, provided reasons for optimism following president Xi Jinping's announcement in September 2020 that China aims to become carbon neutral by 2060, which was officially submitted to the UNFCCC in October 2021. Being the first time China has suggested a peak year for coal consumption, president Xi Jinping announced in April 2021 that China would "strictly control coal consumption" during the 14th FYP period, following the phase down of coal consumption after that (Climate Action Tracker, 2021). Moreover, at the United Nations General Assembly in September 20201, president Xi Jinping announced that China would end the overseas building of coal plants (Yi, 2021b). An updated and improved NDC was submitted in October 2021 yet current plans including the 14th FYP and the updated NDC show little in terms of a concrete plan towards peaking emissions before 2030 and achieving the carbon neutrality goal by 2060. This is currently being developed under the *1 + N* framework, which will be the first major climate policy document post the carbon neutrality announcement, developed by a newly set up working group under the Ministry of Ecology and Environment. Under the framework, a carbon peaking action plan is to be developed, covering actions from all major emitting sectors (Schäpe and Tsang, 2021).

Despite these positive developments, however, the current policy emissions trajectory is not sufficiently ambitious to meet the objectives of the Paris Agreement (Climate Action Tracker, 2021). Achieving carbon neutrality by 2060 will ultimately be dependent on the contributions of subnational actors, as the target responsibility system in the Chinese political structure delegates the implementation of national targets to the subnational level. Through engagement with international initiatives, subnational governments and non-state actors therefore have the potential to accelerate the transformational change needed towards reaching those objectives. In this regard, hard to abate industries are of particular interest as they contribute to a major part of national emissions, and as a key economic driver of many provinces.

Yet, the engagement of Chinese subnational and non-state actors with international initiatives has to this point been limited. This results in an underrepresentation of the potential of non-state and subnational climate actions in analyses based on global databases, leading to such studies published to date indicating limited additional expected emission reductions through non-state and subnational climate actions compared to current national policies in China.

This study aims to enhance the understanding of the subnational and non-state environment in China, and to qualitatively assess the potential impact of additionality in subnational and non-state action. As

such, the study first gives an overview of the status of non-state and subnational climate action in China, including individual cities, provinces, companies, and ICIs. China's top-down political system is then analysed from a climate perspective, followed by the assessment of non-state and subnational action as part of Chinese climate governance. To conclude we conduct a qualitative analysis on the potential impact non-state and subnational action could have on China's emissions.

2 Landscape of non-state and subnational action in China

2.1 Individual cities, provinces and companies

2.1.1 Short- to mid-term GHG emission reduction targets (up to 2030)

Quantifiable emission reduction pledges by individual non-state and subnational actors in China cover about 20% of China's 2016 total emissions (Kuramochi *et al.*, 2020).[1] Of these individual actors, cities make up the largest share of pledges, while pledges by provinces and companies are limited compared to other major emitters, especially the EU (Table 1). Considering non-GHG targets, more targets have been set at the sectoral level as 25 cities had set renewable energy targets and/or policies, covering a total of 321 million people - corresponding to about 38% of the Chinese urban population (REN21, 2021a).

Table 1: Number of subnational and non-state actors' targets by target year in China, in comparison with the European Union plus the United Kingdom (Kuramochi *et al.*, 2020).

2016 GHG emissions coverage by subnational and non-state actors (unit: $MtCO_2e$/year)

Country	Regions	Cities	Companies	Net total (share in national total emissions including LULUCF)
China	313 (n=2)	2170 (n=27)	129 (n=607)	2510 (20%)*
EU27+ÙK	801 (n=33)	808 (n=5707)	729 (n=4572)	1500 (38%)

** For national total GHG emissions in 2016, the average values of high and low estimates were used.*

2.1.2 Long-term net zero targets

Not many Chinese non-state and subnational actors have committed to net zero emission targets to date. As of September 2021, only seven Chinese cities and 38 companies headquartered in China have signed up to the UNFCCC Climate Action Alliance, which brings together actors that are working towards achieving net zero CO_2 emissions by 2050 (UNFCCC, 2021). In 2020, a total of six Chinese cities were developing net zero targets, out of which two are more ambitious than the national objective to achieve carbon neutrality by 2060; Dalian has set a target to achieve net zero emissions by 2050 while Rizhao has had a similar target since 2008 (REN21, 2021b).

[1] Including emissions from land-use, land-use change and forestry.

2.2 Landscape of international cooperative initiatives in China

ICIs aim to contribute to GHG emission reductions through their diverse functions. Globally, among the 297 ICIs covered in the Climate Cooperative Initiative Database (C-CID), roughly 50% focus mainly on mitigation (Chan *et al.*, 2021). This trend is even more prominent for China; 72 out of 77 initiatives in which China is a participant focused on mitigation[2] (Chan *et al.*, 2021). Of the 72 mitigation-focused ICIs, 35 focus exclusively or partly on the energy sector. This is followed by the industry (25 ICIs), transport (22), and human settlements and buildings (13) (Figure 1). The shares of ICIs focused on industry, energy and transport are significantly higher than the global average, while the share of land-use ICIs is significantly lower; the findings reflect the relative importance of sectors for mitigation action.

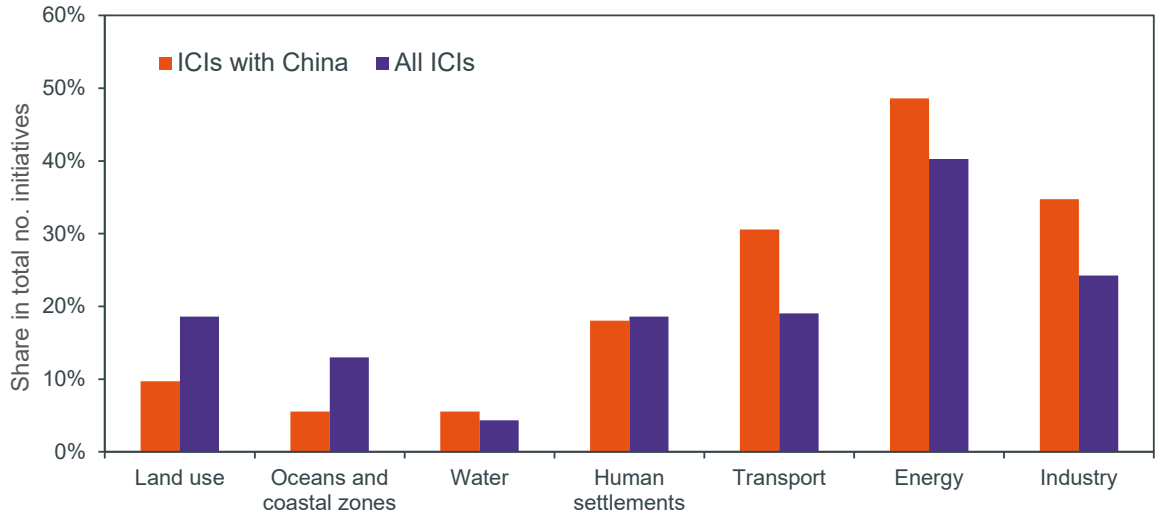

Figure 1. Mitigation-focused ICIs, with China as a member and all ICIs globally, by focus sector (Chan *et al.*, 2021).

Out of 72 analysed mitigation-focused[2] ICIs in China, the most common functional focus is related to indirect impact through 'knowledge dissemination', representing about 50% of ICIs (Figure 2). In terms of direct action, 'technical on-the-ground implementation' and 'new or enhanced standards and norms' are the second and third most common functional foci, representing about 39% and 38 respectively.

[2] Includes ICIs that mainly focuses on mitigation as well as those that equally focus on both mitigation and adaptation objectives.

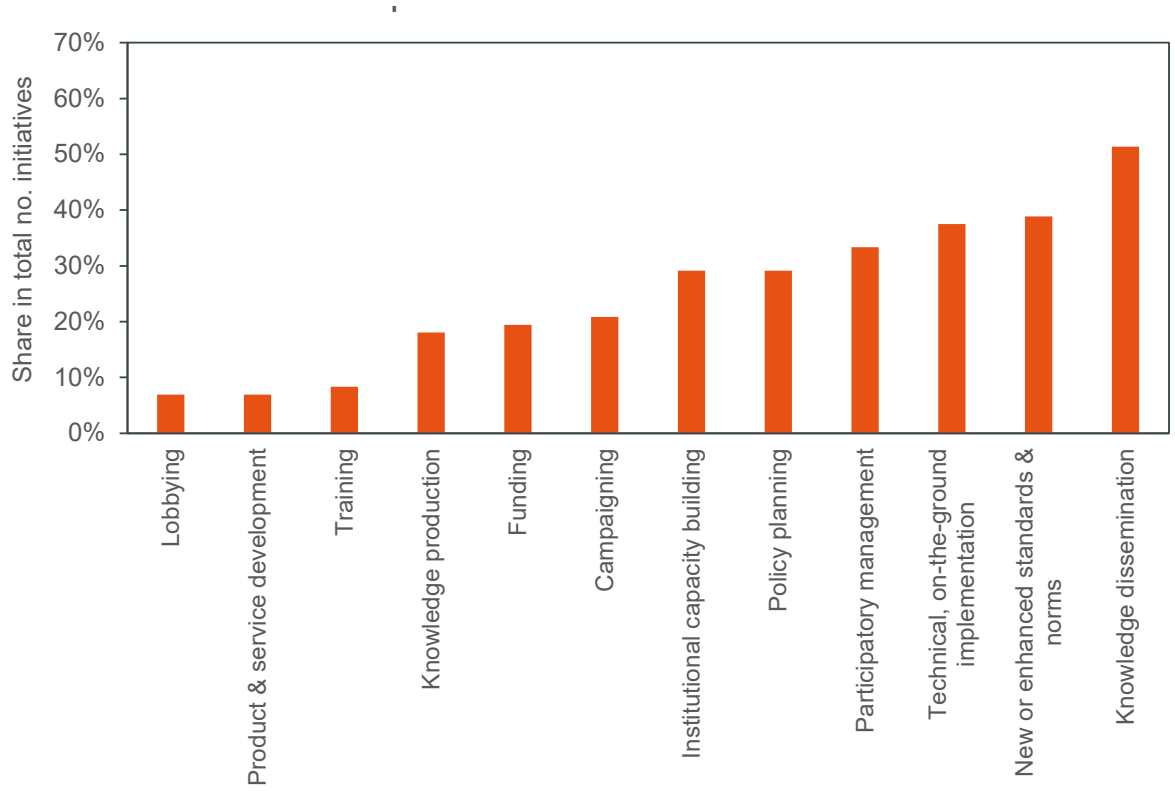

Figure 2. Functional foci of mitigation-focused international cooperative initiatives operating in China (Chan *et al.*, 2021).

Due to the fragmented authoritarian set-up of the Chinese political system (see section 3.4 for detail), ICIs could have substantial mitigation impact in China, with cities and provinces as the group of actors with by far highest expected potential. Other sectors including non-CO_2 GHGs and energy efficiency could also contribute to moderate emission mitigation (Lui *et al.*, 2021a).

Chinese cities are increasingly taking part in ICIs. Some of the major ones include the International Council for Local Environmental Initiatives (ICLEI)[3] and the C40 coalition[4]. As of September 2021, seven and 13 Chinese city governments are members of ICLEI and C40, respectively (C40, 2021; ICLEI, 2021).

2.3 China's top-down, state-controlled system

The Chinese one-party state has a hierarchical character where tasks are delegated through a top-down system. Yet, as the particular governmental system, commonly referred to as "quasi-federalist' or "fragmented authoritarian", allows substantial authority to lower levels of government, it can from some perspectives be viewed as one of the most decentralized countries globally (Harvard Global Institute and Tsinghua University, 2020).

Similar to other policy implementation in the country, climate policies are formulated at a national level through the lead ministries, which are subsequently adopted to provincial and local regulation. By doing

[3] ICLEI is a global network of local and regional governments working through knowledge exchange, capacity building and alliances with international stakeholders for sustainable urban development.
[4] C40 focuses on collaborative efforts among cities globally to promote action on climate change and sustainable development.

so, the aim is to harmonise the implementation of policy nationally while allowing certain free room to adapt policies to local conditions (Hart, 2019b).

National level ministries each have subnational counterparts where provinces and municipalities have the possibility to regulate activities to a certain extent. Vertical authority is mainly limited to target setting for their respective lower levels of government (Hart, 2019a).

In terms of climate policy, the central government commonly sets goals according to its practice for other policy areas under its *target responsibility system*. Specific targets are further delegated to the next level of lower government (Hart, 2019b). As such, subnational governments have low autonomy in policy direction and target setting, but high autonomy in choosing how to implement policies to satisfy the national objective (Gong *et al.*, 2020).

Chinese development and policymaking is based on the development of and continuous following of Five-Year-Plans (FYPs). Following the publication of the national FYP, each ministry as well as provinces and major municipalities develops its own corresponding FYP, developing measures and implementation strategies addressing particular issues. As the five-year period proceeds, FYPs are typically revised as new information and international developments become available, which in some cases can result in updated targets (Hart, 2019b). Climate change mitigation has been a national policy priority since the 12th FYP (2011-2016), and increasingly pronounced in subsequent FYPs (Gong *et al.*, 2020).

The complex political system in China, involving both horizontal and vertical levels, prompts competition across different bureaucratic levels in the process of climate policy formulation and implementation, which make joint efforts challenging to realise (Figure 3) (Gong *et al.*, 2020). On the national ministerial level, the Ministry of Ecology and Environment (MEE) was formed in 2018 as the successor of the Ministry of Environmental Protection (MEP) and took over the responsibilities of the higher ranked National Development and Reform Commission (NDRC) for climate change and carbon mitigation. However, following the establishment of a “Leading Small Group” on climate change lead by the NDRC, in mid-2021, the responsibilities of charting the roadmap for cutting emissions and cleaning up carbon-intensive sectors was essentially reversed back to NDRC (Bloomberg, 2021). The main task of the Leading Small Group is to support carbon reduction efforts and the achievement of the peaking and carbon neutrality objectives (Tillu, 2021). Such shift could lead to more efficient policy implementation, particularly as the NDRC remains responsible for the energy sector. Splitting climate change and energy sector responsibilities between the MEE and NDRC has previously prompted disagreements between the two, for instance during the establishment of the national carbon market, which delayed the whole process. Instead, the MEE is now responsible for the carbon market, emission reporting and international cooperation (Bloomberg, 2021).

In terms of climate change policy implementation at the subnational government levels, local governments often remain focused at attempting to sustain economic growth, often dependent on carbon consumption, which may lead to emerging conflicts with respect to the central governments’ emission reduction objectives (Gong *et al.*, 2020). At the same time, and as a result of energy-saving goals and green development being incorporated in the local officials’ promotion evaluation process, provincial governments are increasingly setting more ambitious targets.

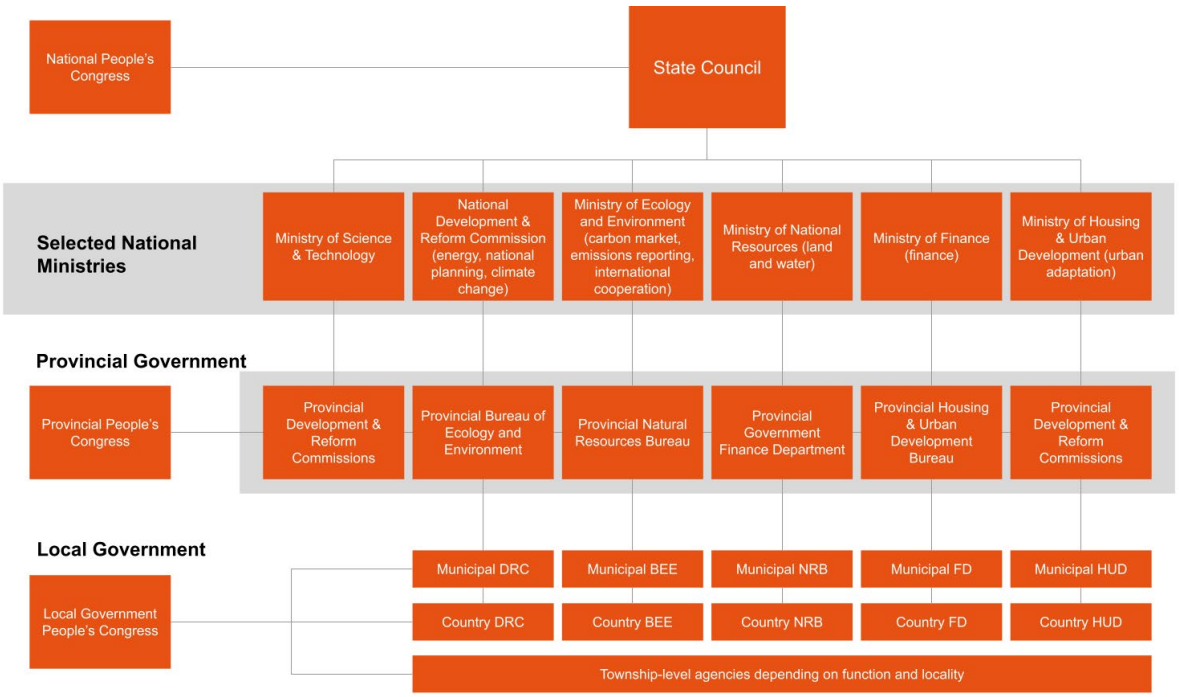

Figure 3. Overview of Selected National Ministries and Respective Subnational Agencies. Modified version of original figure in Hart (2019a).

As part of its efforts to mitigate climate change impacts, national coordinating bodies such as the National Committee of Climate Change Experts have been created at the national level. Similarly, with the aim to guide and coordinate subnational policies and implementation, provincial governments have put in place their own expert committees (Hart, 2019b). Given that cities are the primary source of China's carbon emissions, this is a particular focus for the Leading Small Group led under the NDRC (Tillu, 2021). According to interviews conducted by Gong et al. (2020) with officials from MEP, the Chinese government recognises that the traditional "top-down" policy approach will not be able to fully to do the job to achieve the emission reduction targets set out in the national plan, but will be dependent on the collaboration with the third sector (i.e. private sector alongside other social resources) (Gong *et al.*, 2020). Through a number of initiatives between the central government and non-state and subnational actors, such collaboration has intensified in recent years. A particularly important attribute of Chinese climate policy formulation has been the collaboration with provincial governments in conducting low-carbon pilots.

3 Non-state and subnational action as part of Chinese climate governance

3.1 Cities and provinces serving as testing grounds

By letting selected provinces and cities serve as testing grounds, provincial and city low-carbon pilot projects contributes to increased expertise and provides a base for climate policy making at the national level. Through running numerous pilots simultaneously, adopting a learning-by-doing approach, lessons can be drawn from various approaches, or similar approaches in different contexts (Harvard Project on Climate Agreements, 2020). Low-carbon development pilot projects are launched by the Chinese government, yet provinces and municipalities have substantial authority and are typically responsible for the implementation (Hart, 2019b; Harvard Project on Climate Agreements, 2020). The pilots have

been launched in three batches since 2013, totalling to an amount of 87 provinces and municipalities (Ying et al, 2021).

These pilot projects have not only shown successful results in terms of carbon emission reductions but have also spurred ambition among the cities. Out of Chinse provinces and municipalities having published carbon peaking targets, the majority have been low-carbon pilot cities (Ye *et al.*, 2020). As of February 2021, a total of 74 provinces and municipalities had set peaking targets, out of which all but one was a none-pilot province (Ying et al, 2021). In Mi and Sun (2021), leading provinces are analysed with regard to emission mitigation through the development of a climate change mitigation index. The analysis finds a large geographical overlap with pilot cities among the leading provinces, including Beijing, Yunnan, Sichuan and Guangxi (Mi and Sun, 2021).

An important example of a pilot initiative is China's carbon Emissions Trading pilot program which was launched in 2011 by the NDRC. The pilot was launched in seven provinces and cities in order to inform the design and implementation of the national ETS (Hart, 2019b) which was put in operation in 2021 covering the power sector (Farand, 2021). By using cities as testing grounds, valuable experience in setting targets, legal enforcement and market supervision could be assembled and used in the set-up of the national ETS (Gong *et al.*, 2020). The pilots were led by provincial Development and Reform Commissions (DRCs) which coordinated with expert institutions from respective provinces and further received additional support from national and international organisations (Hart, 2019b).

Based on this, the objective of a national ETS was established in 2015 by the highest level of government, which was further confirmed in the 13th FYP. Subsequently, the national level ETS was politically launched in December 2017 and came into effect in February 2021. At this stage, the ETS is limited to regulating companies in the power sector emitting more than 26,000 tCO_2 per year (ICAP, 2021). In the future, the ETS will potentially be expanded to cover other emission-intensive industries. However, such expansion is expected to take years. Moreover, the ETS is projected to have limited effect on emission reductions in the short term as the system does not put a cap on emissions, but imposes limits on the carbon intensity of each unit of electricity generated by a power plant (Farand, 2021). As such, the current system fails to encourage the replacement of coal power by instead promoting more efficient coal power production. In this line, there is significant room for non-state and subnational action to play an important role in mitigating emissions before the ETS is further expanded and fully functional.

Beyond nationally initiated initiatives at the subnational level, Chinese subnational governments are increasingly engaging in own initiatives. In efforts to peak emissions ahead of schedule of the national target, the Alliances of Peaking Pioneer Cities (APPC) was co-founded by eleven provinces and municipalities in 2015 during the first China-U.S. Climate Smart/Low Carbon Cities Summit under the Obama administration (APPC, 2016b; Harvard Project on Climate Agreements, 2020). Under the alliance, provinces and municipalities announces targets for reaching peak GHG emissions together with related policies and actions (Harvard Project on Climate Agreements, 2020). As of 2020, the alliance was a network of 23 cities and provinces engaged in sharing experiences and promoting best practices in low-carbon development (Ye *et al.*, 2020). Although the project has been dormant in recent years (APPC, 2016a; Under2 Coalition, 2021), their individual peak year targets are still valid and the APPC member cities are at the core of more than 80 Chinese cities that proposed peak year targets (Xue and Xu, 2021).

However, despite increased recent efforts in setting provincial and city-level peaking targets, many provinces and cities view peaking targets as an inhibitor to development and are not actively seeking to develop their own peaking targets. Moreover, some provincial and cities peaking targets that have been put forward are below the national requirements which also can be partly related to insufficient research capacities (Ying et al, 2021). Further, in some provinces and cities, there is an inconsistency between targets at different levels; the peaking targets of some cities do not match with the targets of its

corresponding province, which may contribute to city-level policies not contributing to meeting the provincial target. The Yunnan province is an example of such a case, where the provincial target is ahead of the peaking targets of various cities within its jurisdiction (Ye *et al.*, 2020).

Another important aspect to consider is the significant provincial differences with respect to indicators such as economic development, industrial structure, energy system, resource endowments and capacity awareness (Xiaomei *et al.*, 2021). In 2019, the highest performing province (Beijing) in terms of GDP per capita was 4.98 times higher compared to the lowest performing province (Gansu), while the corresponding difference with regards to energy intensity was 8.46 (Ningxia highest and Beijing lowest) (Xiaomei *et al.*, 2021).

One area of significant difference is the industrial structure of various provinces. Much of the heavy industry activities are concentrated to a few provinces which are economically dependent on their industries and their accessibility to fossil natural resources. Although recent efforts have been made to improve energy efficiency and address overcapacity, some provinces have initiated new industrial projects during the 13th FYP period, leading to carbon-intensive technology lock-in effects, further complicating the transition to a low-carbon economy (Ying et al, 2021).

Based on this, is does not seem like a rational option to distribute equal peaking targets across provinces, but provincial decarbonisation strategies must be developed taking local and regional challenges and opportunities into account. Further, the undertaking of low-carbon pilot projects in various settings can play an important role in raising ambition and setting good examples, but also by sharing experiences and good practices which can be translated to other provinces.

3.2 Corporate climate action

While national policymakers set initial targets, which are further distributed to lower levels of government, focus is primarily concentrated to climate change impacts on a more abstract level. Contrarily, local governments deal more directly with local stakeholders and businesses, having to pay closer attention to economic growth, employment, and local climate change impacts (Hart, 2019b).

Directly impacted by the top-down policies, businesses in China are pressured to find ways to mitigate emissions while maintaining economic growth. As businesses' increase efforts to improve energy efficiency and adopt more innovative technologies, their valuable experience and data have strengthened the interaction with the government which is dependent on market data and prediction to inform policymaking (Gong *et al.*, 2020).

Even though Chinese businesses have increasingly committed to or set emission reduction targets through initiatives such as the Science Based Target initiative (SBTi) in recent years, it is evident that Xi Jinping's announcement of achieving carbon neutrality by 2060 in September 2020 has sent a clear signal to the private sector. As public investments are increasingly directed toward low-carbon transformation initiatives to align with Chinas carbon neutrality target, businesses setting ambitious targets will increase their chances in accessing public finance.

Business-oriented ICIs such as the SBTi has seen a recent rise in memberships of Chinese companies. The absolute number of targets/pledges through the SBTi have increased steadily over time, yet even more sharply after the carbon neutrality announcement. As of December 2021, 12 companies headquartered in China have set either 'well below 2°C' or '1.5°C' targets approved by SBTi and 36 more companies are committed to setting emission reduction targets through the SBTi, of which 25 signed up in 2021 (SBTi, 2021).

In the meantime, additional initiatives for corporate climate action are emerging. In December 2020, WWF China launched the Climate Business Hub China which aims to support corporate climate action,

enhance understanding, promote early-movers and facilitate communication with policymakers, utilities and renewable energy developers. The initiative focuses on target-setting, renewable energy procurement and low-carbon innovation, and is led by local Chinese experts (Riley, 2020).

An important first step for Chinese businesses toward increased climate action is the disclosure of environmental data. According to CDP, a non-for-profit organization running a global disclosure system for investors, companies, cities, states and regions, around 1,400 Chinese companies disclosed environmental data in 2020, suggesting a rising interest among Chinese businesses to level up climate action. A further positive observation from the disclosing companies in 2020 was that the majority of companies are suppliers, which indeed is good given China's position in global value chains as it can have impact beyond national borders (Zhang and Yue, 2020).

Since December 2020, following the carbon neutrality announcement, several major businesses have announced carbon neutrality pledges. Among the first ones to react to the announcement were state-owned major emitters including the China National Petroleum Corporation (CNCP), Sinopec and the China National Offshore Oil Corporation (CNOOC). Although all businesses announced that they were developing carbon neutrality roadmaps, concrete action plans and timelines are still lacking. Other major emitters and tech giants have already made concrete plans. One of the world's major steel producers, Chinese Baowu Steel, has announced it will achieve carbon neutrality by 2050, ten years ahead of the national target. It further outlines the roadmap to get there by striving to peak carbon emissions by 2023, and to achieve 30% emission reductions by 2035. Similarly, the China Three Gorges Corporation, which is a major power generating company, strives to peak carbon emissions by 2023, and to reach carbon neutrality by 2040 – 20 years ahead of the national target. The tech business Ant Group committed to achieve net zero emissions by 2030. However, of these, only the Ant group has specified which emission scopes their targets include, which makes it difficult to quantify the impacts of those targets. Further, without clear roadmaps, the case may be that businesses are committing to carbon neutrality without a clear vision with regards to how to get there. Nevertheless, it seems likely that pledges from big businesses and state-owned enterprises will send clear signals to the market and impact investment decisions (Zhe and Yunong, 2021).

Beyond companies' individual commitments, there has also been a recent surge in ambition at the sectoral level. Several emissions-intensive industry sectors, including steel and aluminium, have announced emissions peaking targets. The steel and aluminium sectors both aim to reach peak emissions by 2025 – 5 years ahead of the national peaking target. The steel sector further aims to reduce emission by 30% compared to the peak level by 2030, while the aluminium sector aims to reduce emissions by 40% by 2040 compared to the peak (Li, 2021; Zhang and Chow, 2021).

3.3 Emission-intensive industry companies

Accounting for the main part of global supply, the Chinese energy and emissions intensive heavy industry sectors are responsible for a substantial share of China's national emissions. Although a rise in production is logical in a fast-developing country, the Chinese industry sector has since long suffered from overcapacity (Feng and Yan, 2019). The issue of overcapacity has been partly linked to government support as opposed to an industrial structure developed by market force, as well as competition between subnational jurisdictions (Feng and Yan, 2019). Moreover, the issue of overcapacity is further exacerbated by the unwillingness of local governments to shut down obsolete or polluting plants due to the fear of such actions resulting in unemployment (Song *et al.*, 2019). Previous fiscal stimulus packages, such as in the wake of the 2008/2009 financial crisis have had a substantial focus on infrastructure projects, which has contributed significantly to the issue of overcapacity. This naturally leads to the potential risk of similar patterns following stimulus packages following the Covid-19 pandemic. The Chinese stimulus package revealed in May 2020 was largely focused on infrastructure projects, aiming to create more jobs (Su, 2021). As such, the relief package is taking a

government and business-centred approach, directing a large share of spending to SOEs which contributes to about 30% of China's GDP (Su, 2021). That is particularly the case in the heavy industry sector. This resulted in China's emissions growing at the fastest rate seen in a decade by early 2021 (Myllyvirta, 2021). Nevertheless, following a slowdown in property development coal shortages, emissions declined in the third quarter of 2021 (Reuters, 2021).

Taking the steel industry as an example, Chinese production has risen sharply in the last decades, today accounting for 53% of global supply (World Steel Association, 2020). Out of the 50 top steel companies in 2016 globally, 18 were SOEs out of which 16 were Chinese SOEs (Zhong, 2018). Although the share of SOEs in China's steel production is decreasing, a substantial part is still dominated by SOEs, enjoying competitive advantage due to local protectionism and subsidies (Jingrong *et al.*, 2020). Such advantages among SOEs might complicate efforts by private steel companies to invest in innovative decarbonisation technologies, further limiting the potential of non-state and subnational action. A stronger participation among subnational governments could therefore be instrumental in driving ambition in China's heavy industry.

Looking beyond the steel industry, publicly available data suggests that there is a lack of ambition among targets set by individual companies in the Chinese industry sector, and that there is a strong focus on the near-term. We assessed emission reduction targets of individual China-based industrial companies using a consolidated database of company responses to the CDP Climate Change Questionnaire 2020 (CDP, 2020), provided by CDP for NewClimate Institute et al. (2021). Companies in the following sectors were covered: chemicals, coal mining, metal smelting, refining and forming, oil and gas processing, plastic product manufacturing, and wood and rubber products. Out of a total number of 33 identified quantitative targets as of 2020, the majority (64%) of targets had an emission reduction objective of less than or equal to 10%, while only 6% of targets had an ambition level of above 30%, of which one a target of 50% (Figure 4). The generally low emission reduction targets indicate a stronger focus on measures such as energy efficiency on current technology, rather than transformational changes.

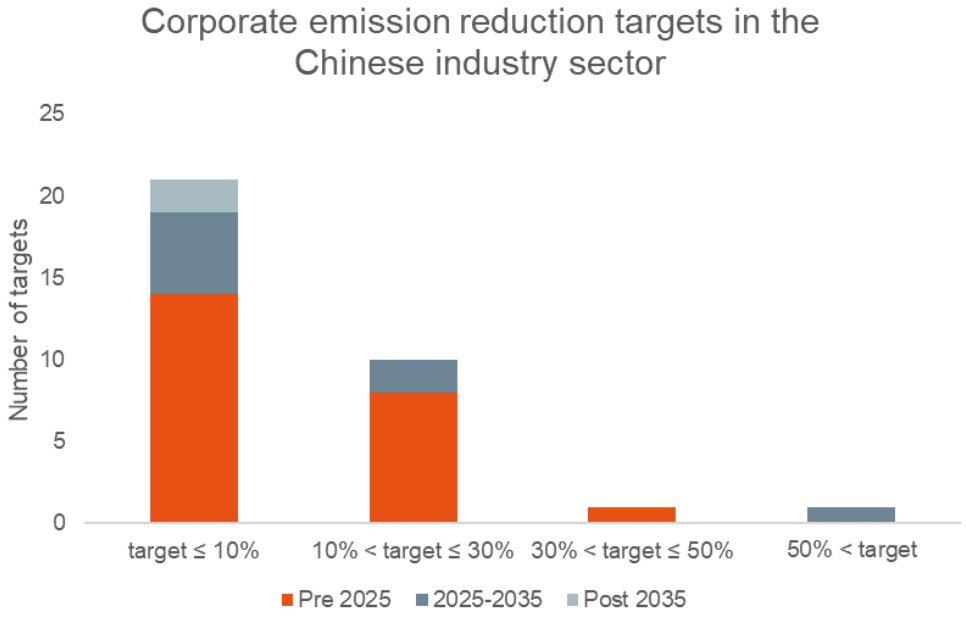

Figure 4. Corporate emission reduction targets of companies in the following sectors headquartered in China: chemicals, coal mining, metal smelting, refining and forming, oil and gas processing, plastic product manufacturing, and wood and rubber products. Targets include a mix of scope 1, 2 and 3 emissions and have differing base years. Source: Consolidated database of company responses to the CDP Climate Change Questionnaire 2020 (CDP, 2020), provided by CDP for NewClimate Institute et al. (NewClimate Institute et al., 2021).

On the other hand, given that the majority of targets have been set for the short term (pre-2025), there is room for improvement in the mid- to long term. As indicated by the rising trend of net zero targets from the SBTi data, there might be reasons similar trends could be expected in the industry sector as a result of the carbon neutrality announcement.

3.4 National government-led partnerships

Beyond individual actors, the central government is increasingly engaging in international partnerships for climate change mitigation. An example of such is the Belt and Road International Green Development Coalition (BRIGC), which was jointly initiated in 2019 by the MEE and international partners (BRIGC, 2020). The coalition brings together 152 institutes including governments, local and international organisations, private sector enterprises and other relevant stakeholders to strive for the green development of the BRI and towards the achievement of SDGs and the Paris Agreement long-term objective.

In addition to multilateral ICIs, bilateral collaborations could bring significant value to China's decarbonisation efforts as well as to the international climate mitigation sphere. The EU-China Partnership, established in 2005, strives to strengthen cooperation on climate change and energy between the two parties by working closely together on topics including CCS, energy efficiency, energy conservation and renewable energy (European Commission, 2005).

Following political distrust between the US and China under the Trump administration, resulting in a deteriorating relationship between the two, the Biden-Jinping relationship remains somewhat unstable. However, despite disagreement on other topics, the two counties released a joint declaration on climate change at COP26 in November 2021, in which the two nations "further recognise the seriousness and urgency of the climate crisis" and "are committed to tackling it through their respective accelerated actions in the critical decade of the 2020s, as well as through cooperation in multilateral processes" (Carbon Breif, 2021).

As the Biden administration has promised to put the US on a pathway to net zero emissions by 2050, and president Xi Jinping's announcement to reach carbon neutrality by 2060, their converging interests could provide a basis for improved collaboration and policy dialogues. Such cooperation could involve national as well as subnational stakeholders and exchanges. The recent proliferation of city and municipal level initiatives in the US and the multiple provincial and municipal level policy pilot projects in China could deliver valuable experience to both parties (Ramasubramanian, 2021). Further, a bilateral partnership built on trust and candid dialogue could contribute to increased impact in international efforts and climate negotiations.

During 2021, president Xi Jinping has increasingly emphasized the need for international and multilateral collaboration to achieve the objectives of the Paris Agreement (Ministry of Foreign Affairs of the People's Republic of China, 2020; Kurtenbach, 2021). In combination with China's increased climate ambition, this sends a clear signal to the world, but also to the Chinese private sector and its subnational governments.

4 Potential impact and progress of non-state and subnational action in China

Although the top-down policy structure in China allows for limited room for subnational and non-state action, it is the provinces and municipalities which undertake the main control over carbon emissions. Given the substantial differences across provinces in terms of economic and industrial structure, but also access to research capacity and support, the role of international initiatives could have an instrumental role in sharing experiences and scientific support. Cities, which are significant emitters themselves, are also important innovation hubs. Their engagement in international initiatives could thus bring significant potential for ambition raising.

Achieving China's national peaking target, and further reaching carbon-neutrality in the long term, will be heavily reliant on the action and leadership of cities. In 2030, China's cities are expected to be responsible for more than 80% of national emissions, making their efforts to early peaking crucial to meeting the national target of peaking before 2030 (Ye *et al.*, 2020). To this point, the majority of cities having outlined carbon peaking targets are low-carbon pilot cities, suggesting that such approach might be instrumental in kickstarting low-carbon development and innovative thinking on the city-level. Further, experiences from the APPC have been successful in achieving emission reductions and proves that meeting climate goals and economic benefits are interlinked (Shan *et al.*, 2018; Peng and Deng, 2020). Economically developed provinces of the country must thus take the lead in exploring low-carbon development solutions and share experience with other provinces. However, despite recent progress, cities must increase their efforts in developing roadmaps and enhance ambition. Many cities with existing peaking targets have not developed any concrete roadmaps on how to achieve their targets, while the ambition level of some targets still suggest room for improvement (Ye *et al.*, 2020). This remains a gap which international support and cooperation could help fill. In this context, ICIs focusing on sharing knowledge and best practices among cities and regions, such as the C40 and ICLEI, could play an important role. In addition to national initiatives such as the APPC, Chinese cities and provinces could benefit from global counterparts with similar socio-economic status, industries, and natural resources. As Chinese cities are increasingly taking part of such initiatives, their experiences through doing so could be shared with other Chinese cities and provinces and inspire them to follow suit.

As provincial governments are somewhat limited to operating with expert organisations within their jurisdictions, this provides an incentive to take part of ICIs more actively. Though ICI participation, provincial and local governments could expand their portfolio of expert consultation and knowledge sharing. Similar to cities, low-carbon pilot provinces could take a leading role in low-carbon development and ambition raising. Experiences from low-carbon pilot provinces and cities suggest that those have a higher tendency to develop targets and low-carbon development roadmaps beyond the national requirements, and how to achieve those while maintaining economic growth. As such, provinces and cities show a large potential to increase ambition and achieve emission reductions additional to the national targets.

Numerous organisations and experts have expressed the need for China to peak emissions in 2025 rather than by 2030. According to a study conducted by the World Resources Institute, early peaking could bring social and economic benefits worth of USD 1 trillion (Yi, 2021a). This not only puts an increased responsibility on provinces, but also provides them with the opportunity to further enhance ambition towards early peaking and the further transition to a carbon neutral society. As such, through the cooperation with and support from ICIs, provinces and cities have a substantial potential in driving China's low-carbon transition.

As one of the major challenges in reducing GHG emissions and to a large extent represented by SOEs, subnational governments will need to take more responsibility of the decarbonization of the Chinese

heavy industry. Reducing emissions in heavy industry will require the adoption of novel technologies and a significant restructuring of the current system. As SOEs can enjoy a smaller risk in terms of trialling new technologies and innovation, these can be important drivers through the support of local governments.

4.1 Non-state and subnational policies additional to national policies

The Chinese climate policy structure lays the main responsibility of controlling GHG emissions on provinces. Yet, the top-down nature of the political system has led to the majority of provincial governments to base their policies on national-level requirements. Even so, the decentralised structure provides an opportunity for provinces to turn the top-down structure into bottom-up through the implementation of policies additional to the national level requirements. This is already being observed in various provinces and cities, and across different sectors.

An example of an area where provinces have put additional efforts is electric mobility and the transport sector. Ever since the initiation of national direct electric vehicle (EV) subsidies was introduced in 2016, it has been gradually reduced over time. In response to this, many provincial level governments have implemented additional subsidies or other supporting mechanisms to promote the continuous deployment of EVs (IEA, 2020). For instance, at least nine cities complement the national level New Energy Vehicles policy by offering EV subsidies. Moreover, at least five Chinese cities including Beijing, Foshan, Hong Kong, Lhasa and Shenzhen have published individual EV targets (REN21, 2021b).

Shenzhen is a successful example of advanced EV deployment. The city has achieved a surge in EV adoption rates in recent years following the introduction of various policies including purchase and operational subsidies, emission standards, and infrastructure-related policies such as subsidies on the construction of charging infrastructure and mandates and support policies for low industrial electricity prices (Crow *et al.*, 2019). As of 2019, about 35% of the city's fleet of delivery vehicles were electric, while nearly the complete fleet of buses and taxis were electric – the first city globally to achieve that (McLane and Mullaney, 2019). The city is also collecting granular data on its progress and lessons learned which can be shared to inform policy decision making in other cities and provinces (Crow *et al.*, 2019).

Related to the transport sector and EVs, a number of Chinese cities and provinces are trialling fuel cell vehicles through the introduction of hydrogen hubs and have developed individual hydrogen development plans (Verheul, 2019). The district Huangpu in the fourth largest city, Guangzhou, is rapidly deploying hydrogen technology through the implementation of policies including company registration incentives, capital expenditure alleviation, and a fund to draw the interest of new companies and projects (Deorsey, 2020). Further, Shanghai, Shandong, Zhanhjiagang, Wuhan and Foshan are other examples of cities and provinces which have developed hydrogen-related development plans and policies, which has resulted in several local hydrogen economies emerging in the country (Verheul, 2019).

In other sectors, examples of subnational frontrunners on climate policy are Handan, Taiyuan and Xingtai which have implemented bans on the use of fossil fuels in buildings. Between 2018 and 2020, Jiaozuo offered a deduction of CNY 40 per m^2 of heating area in buildings if shifting from coal to biomass CHP or heat pumps. Further, aiming to promote the deployment of renewables, Beijing, Guangzhou, Shanghai and Xian are to provide a subsidy on distributed solar PV per generated kWh through 2025 (REN21, 2021b). Initiatives like these are positive signs and could provide inspiration and valuable lessons learned for other subnational governments.

5 Conclusion

The engagement of Chinse subnational governments and companies in ICIs could generate significant additionality in climate action. The study concludes that, despite a rising trend in non-state and subnational climate action in China, substantial differences across provinces in terms of socio-economic status, natural resources and industrial structure have resulted in an uneven rate of progress towards the national emission reduction targets. The top-down and target responsibility political system in China requires the active participation of subnational governments towards the achievement of the national emission reduction targets. As such, provincial and city frontrunners can provide valuable experiences with other provinces and cities which can be complemented by international experiences through the participation in ICIs.

However, certain challenges related to provincial competition and local protectionism further complicates decarbonisation efforts in the major emitting heavy industry sector. Further research on the dynamics and the potential importance of subnational action and the impact of SOEs in this sector is thus needed.

Further, future research should focus on conducting quantitative analysis on the emission reduction potential of non-state and subnational action in China. One specific area would be to investigate to which extent current subnational and non-state actions are contributing to additional emission reductions under a current policy scenario, and to what extent there is potential for improvement. It would also be important to investigate how non-state and subnational action could generate and ambition loop, in which enhanced ambition is driven by initiatives from subnational governments, private corporations and civil society. Further analysis should be made on the potential targets and climate action in downstream consuming sectors and companies could have on upstream actors. A key challenge of doing so is the compilation of accurate data. Increased efforts are therefore needed in collecting and harmonising data relevant to subnational and non-state climate action, aiming to make data aggregable and measurable through the formulation of key indicators across sectors.

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Appendix

Table 2. List of cities and provinces that are members of the APPC and their respective peaking targets (Rocky Mountain Institute, 2017)

City/province	Peaking target year
Ningbo	2018
Wenzhou	2019
Beijing	2020
Suzhou	2020
Zhenjiang	2020
Nanping	2020
Qingdao	2020
Guangzhou	2020
Wuhan	2020
Shenzhen	2022
Jincheng	2022
Ganzhou	2023
Jinlin	2023
Guiyang	2025
Jinchang	2025
Yan'an	2025
Hainan	2029
Sichuang	2030
Chizhou	2030
Guilin	2030
Guangyuan	2030
Zunyi	2030
Urumqi	2030

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