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China's Low-Carbon Competitiveness and National Technical and Economic Zones

Policy Trends and Drivers of Low-Carbon Development in China's Industrial Zones

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China's Low-Carbon Competitiveness and National-Level Economic and Technological Development Zones
Policy Trends and Drivers of Low-Carbon Development in China's Industrial Zones

March 2015

Written by Dave Sawyer and Hubert Thieriot

Summary

A dynamic greenhouse gas and energy policy environment is emerging in China that is oriented towards transitioning industrial zones to low-carbon and cleaner futures. This transition is a top priority of the central government, placing pressure on the industrial zones to respond to a growing and diverse set of demands to improve energy and greenhouse gas emission performance. IISD is providing a business view on the emerging policy environment, conducting a number of activities, including: providing a systematic review of over 100 policies and programs relevant to low-carbon policy for industrial zones; reporting on a business survey of over 200 firms to identify which policies are important to industry; providing a review of the first commitment period for the Beijing emission trading pilot; and identifying how industry can better respond to the emerging greenhouse gas and energy policy environment and where government can improve policy design.

This paper provides the results of the first deliverable of the project: a survey of 100 emerging energy and greenhouse gas policies and programs currently in place or announced.

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1.0 Overview

With China's 2009 Copenhagen Accord commitment to reduce the greenhouse gas (GHG) intensity of its economy by 40–45 per cent by 2020, the government has moved on regulations and incentives to improve energy efficiency and increase the mix of low GHG-emitting energy sources in the economy. Another key driver, of course, is the poor air quality that is systemic in so many of China's large cities. Also adding to the drive to decarbonize and improve air quality is energy security, which is both an issue outside of China's borders and an interprovincial issue. Some provinces with a heavy reliance on domestic coal are seeking to generate more non-emitting electricity at home, while simultaneously supporting innovation and technology development.

Therefore, we can see a whole host of nationally driven policies and programs that are beginning to cascade down to the provinces, the municipalities and the industrial zones. But we also see a more distributed effort to develop policy from the bottom up. This is of course supported by central guidance at the national level that sets overarching performance targets, which are then allocated out of the provincial and municipal levels. Policy design is then left to local regulatory authorities to achieve their targets, following central guidance on policy design.

As the provinces, municipalities and industrial zones start to design and implement the policies, we can expect that they will take into account local circumstances. This jurisdictionally distributed policy setting has the impact of catalyzing a dynamic policy learning process both within and outside government. But of course there are headwinds. Notably, such a disparate system of policies and programs, with limited central guidance on implementation detail, is leading to an overlapping and complex set of policies that industry must sort out.

Such complexities are leading to industry uncertainty about what is required and how best to respond. Not only is it difficult for industry to understand and interact with this growing dynamic ecosystem of policies and programs, but also there is a risk of high regulatory costs associated with multiple transactions for compliance. Policy complexity can also lead to inefficiencies, with the regulated entities perhaps not entirely understanding what is required of them for compliance, leading to decisions that can hamper competiveness. At the very least, uncertainty in the policy environment will lead to inaction and deferred decisions with respect to major capital investments that could improve energy and GHG performance in time. At worst, it could lead to high-emitting capital lock in, where technology choices now lock in high-emitting industrial processes that are more expensive to transition to low-carbon alternatives in the future.

It is in this dynamic environment that IISD is conducting original research that looks for emerging energy and GHG emission policy trends that affect businesses at the national, provincial, municipal and zone levels. A secondary objective is to help policy-makers better coordinate their energy and GHG policies and to learn how industry may respond to those policies.

This paper provides a synthesis of over 100 policies and programs targeted at industry, identifying trends in policy design that are likely to be key determinants of the policy impact on industry. While not an exhaustive review of all low-carbon and energy policies in China, with literally hundreds of policies emerging at the provincial and municipal levels, the paper nevertheless provides a good overview on the emerging policy environment, focusing how central-level guidance is cascading down to industry.

2.0 Approach

Our approach to the policy and program review was conceptually straightforward. First, we conducted a broad literature review to identify major policy and program documents, focusing on how national policies cascade down to the industrial zones in Beijing, Tianjin and Zhenjiang. Policies included were implemented prior to September 2014.

Key accountability documents such as 11th and 12th Five-Year Plans (FYP) were reviewed, as were cascading work plans, specific measures and guidelines in the three regions. A key focus was to identify those policies and programs that will affect businesses in the industrial zones. Note that there are so many policies emerging that our database should not be considered a comprehensive list, but rather a sample from which to draw key trends. There are literally hundreds of policies, rules, guidelines and regulations that can be traced to national-level action. With the documents assembled, we developed a detailed database and collected information in the following areas:

- Policies and programs were first sorted with respect to their correspondence to main priorities in the 12th FYP, such as energy or carbon intensity, air pollution, renewable energy, structural change and the circular economy.
- At the highest level, we identified whether or not policies are work plans for target setting that set general directions and guidance, are specific industry measures targeted to change behaviour or are tools to help with things like compliance.
- General information was collected, such as when the policies came into force, their administrative level and geographic region. Agencies responsible for administration were also identified.
- Policies and programs were then differentiated as command-and-control regulations, economic incentives, information programs and certification, and other programs such as awards and green procurement. Capacity-building efforts were also identified. For each of these categories, a number of subcategories were identified—for example, within economic incentives there are technology subsidies, tax rebates and conditional finance currently in use.

To our knowledge, this survey represents one of the first efforts to comprehensively identify the emerging low-carbon and energy policy environment.

3.0 Key Results

With China's 12th FYP placing a heavy emphasis on energy conservation and emission reductions, a mix of market-based and other regulatory instruments are being pursued. While the seven regional emissions trading system pilots tend to dominate the headlines, there are also whole host of other instruments being implemented.

In this section, we look at the key results, starting with the all-important 12th FYP. From there, we move on to explore key national-level policies implemented by the State Council, the National Development and Reform Commission (NDRC) and other national authorities. We then discuss how these policies are cascading down to the regional level, including focusing on the range of instruments that are being developed.

3.1 The 12th Five-Year Plan

The 12th FYP represents a continuation of broad policy directives set down in the 11th FYP. Key themes include rebalancing the economy, addressing social inequality and protecting the environment. It is clear the 12th FYP places strong emphasis on climate change and environmental issues in general, with a focus on energy. In the plan, there are number of important environment- and energy-related objectives that are relevant to industrial zones, set out to be achieved by 2015:

- Energy consumption per unit of GDP to be reduced by 16 per cent from 2010 levels.
- Carbon dioxide emissions per unit of GDP to be reduced by 17 per cent from 2010 levels (China has set a national target to cut carbon intensity emissions per unit of GDP by 40 to 45 per cent between 2005 and 2020).
- A movement away from fossil fuel use to increase non-emitting from 11 per cent of primary energy consumption up to 11.4 per cent by 2015.
- Air pollutants are also targeted with sulphur dioxide and nitrogen oxide targets as well as some wastewater and heavy metal pollution targets. There is also greater emphasis on reducing water consumption.
- Finally, there is a renewed focus or a heavy focus on research and development expenditures to 2.2 per cent of GDP.

It is clear that the 12th FYP provides a very comprehensive enabling environment that starts with strategic planning and moves on to specific measures such as carbon trading and low-carbon pilot projects. Pressure points that can be expected for the industrial zones include accelerating economic restructuring, deploying more low-emitting and clean energy, promoting energy conservation, developing a circular economy substituting away from emission-intensive products, launching low-carbon development pilot projects to speed up low-carbon industrial zone development and implementing emissions trading.

With the 12th FYP in place, we start to see a real increase in activity around energy and climate change work notices, specific policy measures and new emerging tools. In the next section, we provide a general overview of this trend.

3.2 Trends in Carbon and Energy Policy

This section summarizes and examines the over 100 programs we identified. Recall, this is not a comprehensive review of all policies but instead focuses on key national policies and how they cascade down to the industrial zones (focusing on the three regions). Following this general overview of the trends in national policy and programs, we provide observations on what is being rolled out at the provincial and municipal levels.

3.2.1 The Number of Policies Is Steadily Increasing in Time

With the broad and overarching policy thrusts identified in the 12th FYP, in 2012 we have seen significant movement to fill out a broad carbon and energy policy agenda. While there has been a steady increase in the number of policies implemented since 2006, we can see that in 2010 there was a significant increase, with a doubling over the previous years. Through 2014, this number continues to trend upwards (Figure 1).

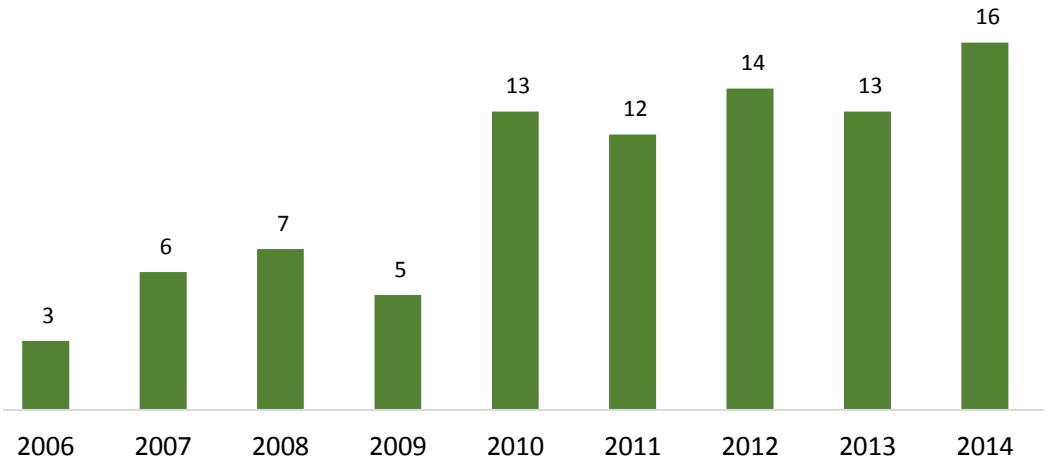

FIGURE 1: NUMBER OF NATIONAL MEASURES AND WORK PLANS

3.2.2 High-Level Guidance to Start, But Specific Measures Are Flowing

There has been a significant amount of high-level guidance to start the process moving forward. Indeed, a full one third of the programs assessed are providing overall guidance for low-carbon or energy policies, which are the work-plan or target-setting programs represented in Figure 2. Specific measures then make up about 55 per cent of the remaining policies and programs. There has been significant movement since 2010:

- For high-level guidance such as work plans, 75 per cent of the policy programs have been announced since 2011.
- For specific measures that provide implementation guidance, 77 per cent have been implemented since 2010.
- Starting in 2013, we see a significant increase in the number of tools and guidance provided.

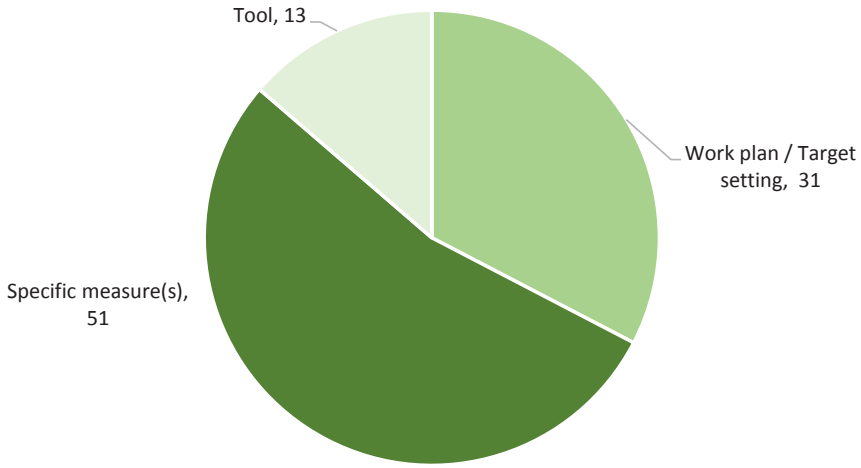

FIGURE 2: POLICY ACTIVITY BY LEVEL OF POLICY

3.2.3 The Focus of Policy

For each policy, we identified their primary focus in five areas, including water, energy, carbon, structural change and air pollution. By far, most measures are focused on energy (Figure 3). As with the 12th Five-Year Plan, most of the policies and programs include multiple objectives: about 30 per cent of all programs include references to at least two objectives such as carbon and energy, while 15 per cent of the programs focused on more than two areas.

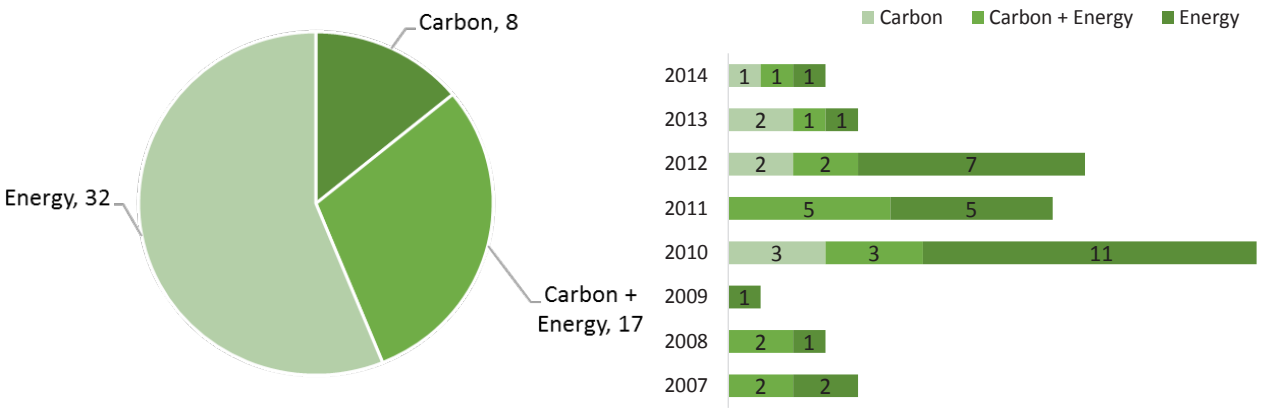

FIGURE 3: FOCUS OF THE POLICY, 2007 TO 2014

3.2.4 A Wide Range of Grouped Policies

There are 10 major policy groupings that are of interest to the industrial zones. Of these, by far the most policies identified were those for the carbon trading system, with 26 policies (and guidelines, etc.) of the 100. Phasing out productive capacity, or the rationalization of inefficient and likely small industries, was also a dominant policy. Of course, the Top 10,000 Energy Consuming enterprises (Top 10,000) program, focused on energy efficiency in major industrial facilities, was also a dominant category. Policies specifically targeted at the economic development areas or zones totaled 15 (or 15 per cent). Phasing out productive capacity was also a major theme with 10 policies, followed

by a number of energy conservation programs that primarily made up the rest of the groupings. The exception is differential energy pricing, which included five policies that were identified. Figure 4 provides the results.

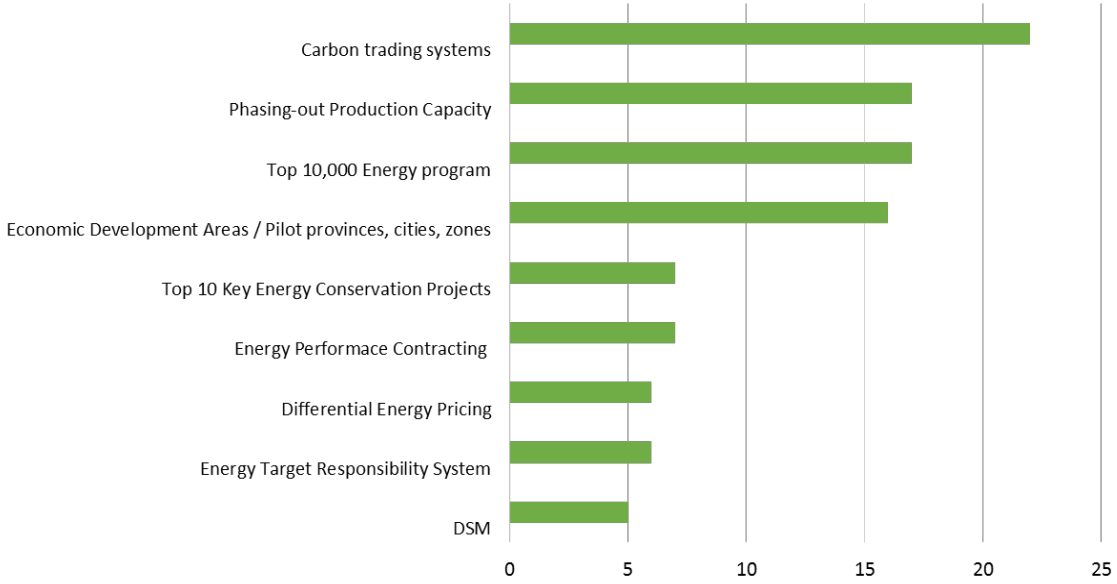

FIGURE 4: GROUPED POLICIES

3.2.5 A Diverse Policy Mix, Trending Toward Economic Instruments

Of interest for industry is understanding the type of policy instruments that are emerging that could affect business and how the government intends to influence industrial behaviour. In the past, there was a heavy focus on command-and-control instruments—or as some call them, "command-and-do"—where changes in behaviour are specifically identified leaving little flexibility for industry to make cost-effective choices. As mentioned above, there has been a recognition that these fiat-based regulations have not typically been as successful as hoped. Perhaps in response to this, emerging is a rich and diverse policy environment based on a wide range of policy instruments, enabling more flexibility for industry to determine how it complies.

Figure 5 below provides an overview of the types of instruments identified in the 100 policies and programs. Our main observation is that there is clearly no reliance on one single approach. For example, "other instruments," which include awards, covenants, green procurement and specific target setting, were identified in 45 of the 100 policies. Information programs are also prevalent, accounting for 41 of the 100 programs. Perhaps most interesting is that regulations and economic instruments are included in about half of the policies.

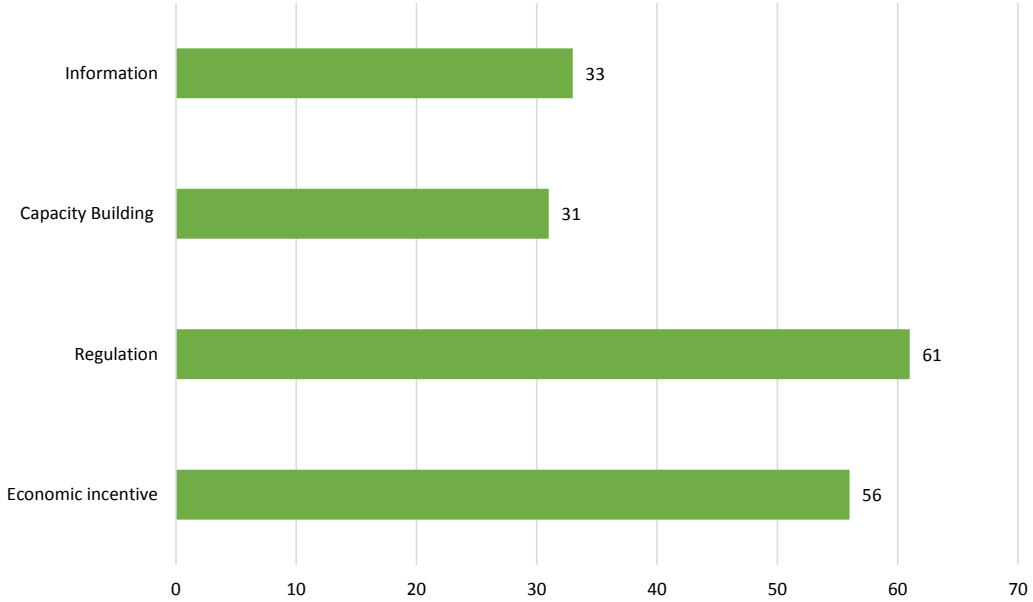

FIGURE 5: TYPE OF INSTRUMENT USED

It is clear that there has been a significant increase in the use of economic instruments relative to regulations since 2010. Figure 6 below indicates that there has been a steady rise in the number of economic instruments being implemented in the 12th FYP period, from two in 2009 to a high of 10 in 2013. This really indicates for industry that more compliance flexibility is being enabled in the emerging policy mix. This compliance flexibility means that industry will be given more latitude to make decisions about how to minimize costs given the targets or requirements being set to carbon and energy policy.

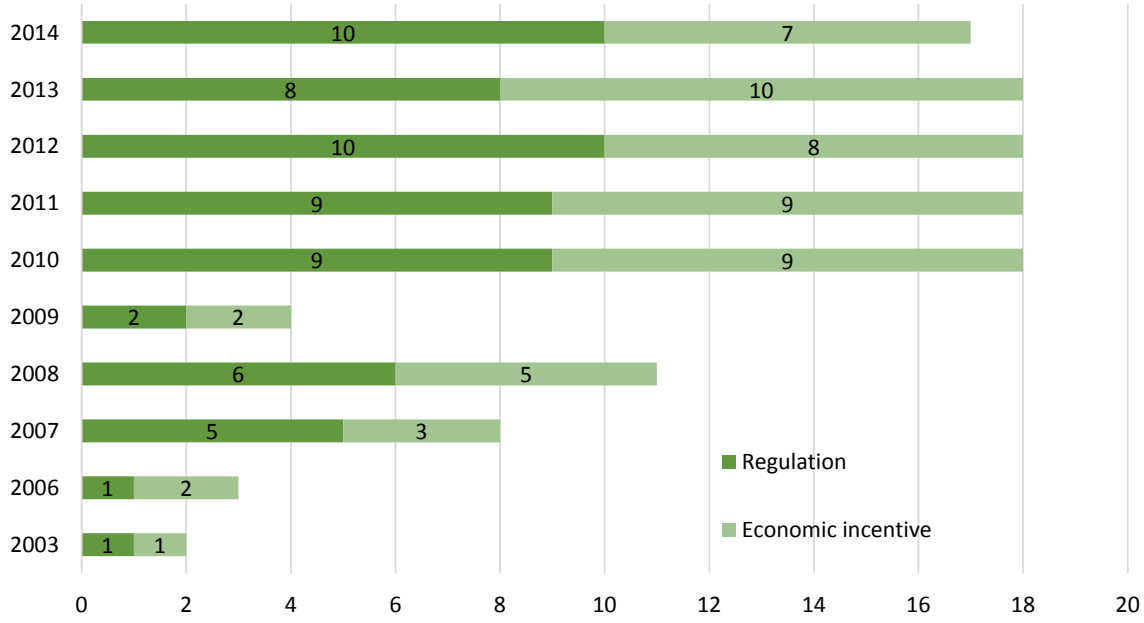

FIGURE 6: A RISE IN THE USE OF ECONOMIC INSTRUMENTS

3.2.6 Economic Instruments: A Focus on Subsidies and Cap and Trade

A major theme of the guidance flowing from the central government is the use of fiscal instruments and financing mechanisms, clearly becoming integrated deeply in the national-level policies. Still, at this early stage of implementation, program specifics are just starting to emerge. Based on our review, we identified six types of economic instruments that are prevalent in the policies and programs reviewed:

- Grants that are targeted at a variety of activities (22 per cent)
- Cap and trade (19 per cent)
- Energy pricing or reforming energy prices (7 per cent)
- Conditional finance associated with the project finance (6 per cent)
- Tax rebates (10 per cent)
- Technology subsidies (16 per cent)

That said, subsidy policies account for the majority of the economic instruments identified, with carbon pricing instruments including trading and pricing reform accounting for the remainder (Figure 7). This points to an opportunity for the industrial zones to help finance low-carbon and energy-efficient investments.

In the last two years, there has been a significant increase in the number of economic instruments that are making their way into policy guidance, with programs in 2013 and 2014 accounting for about 58 per cent of all economic instruments identified.

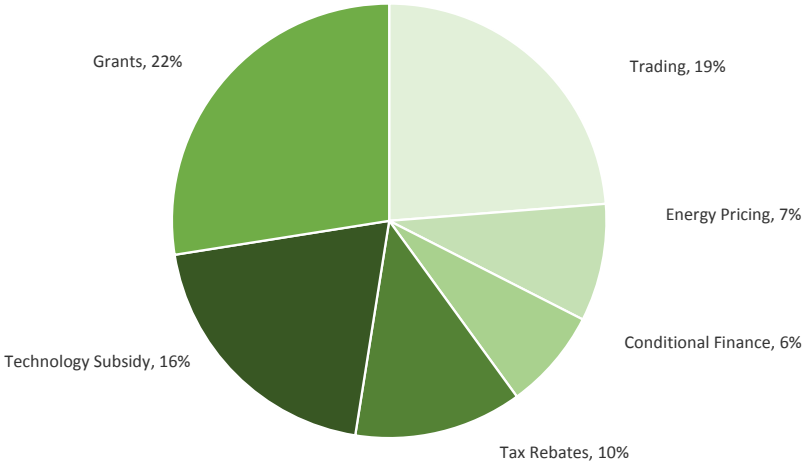

FIGURE 7: ECONOMIC INSTRUMENTS BY TYPE AND YEAR

3.2.7 Regulations Are Becoming More Flexible

The types of regulations in use include controls on products such as coal or the closure of plants; the requirement to implement practice management such as GHG emission inventories; emission and energy performance or intensity standards; and technology-prescriptive regulations such as equipment standards. Across these five types of regulatory instruments we see a balanced approach, with practice management guidance and emission and energy performance standards dominating. Closure of inefficient plants and a ban on products account for about 13 per cent of the regulatory activities, while technology prescriptive regulations make up only about 8 per cent of the programs we reviewed (Figure 8).

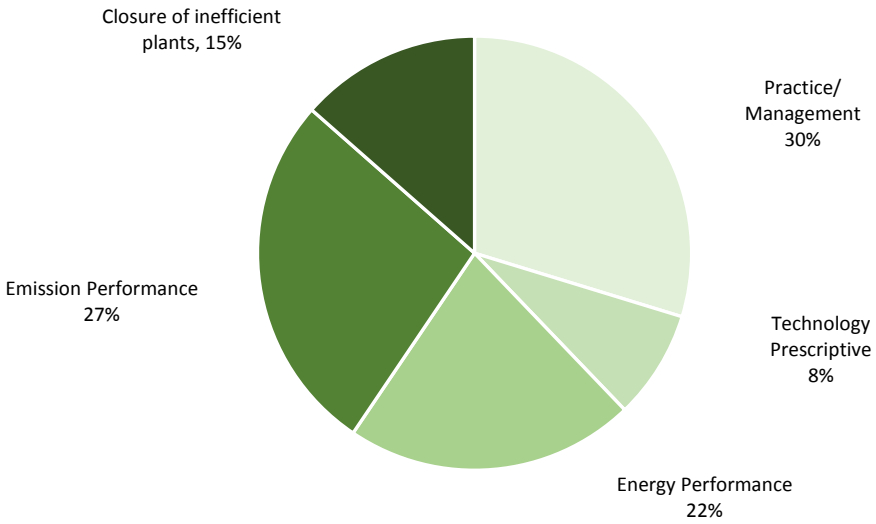

FIGURE 8: REGULATORY APPROACHES BY TYPE AND YEAR

While the number of regulatory-based approaches has more or less remained stable since 2007, averaging in the order of 12 per year, we see a significant shift away from the more inflexible instruments that include bans and technology standards. Figure 9 groups the regulations into three categories: practice and management guidance; flexible instruments that include GHG emission and energy performance intensity standards; and more inflexible options that include bans, plant closures and technology standards. In the pre-2010 time frame there was a somewhat balanced mix between flexible and inflexible regulations. This balance then gets totally shifted after 2010 when more flexible policy instruments such as intensity standards are being used at a rate of 4 to 1. This bodes well for industry, where there will be more opportunity to comply cost-effectively when flexible regulations are available.

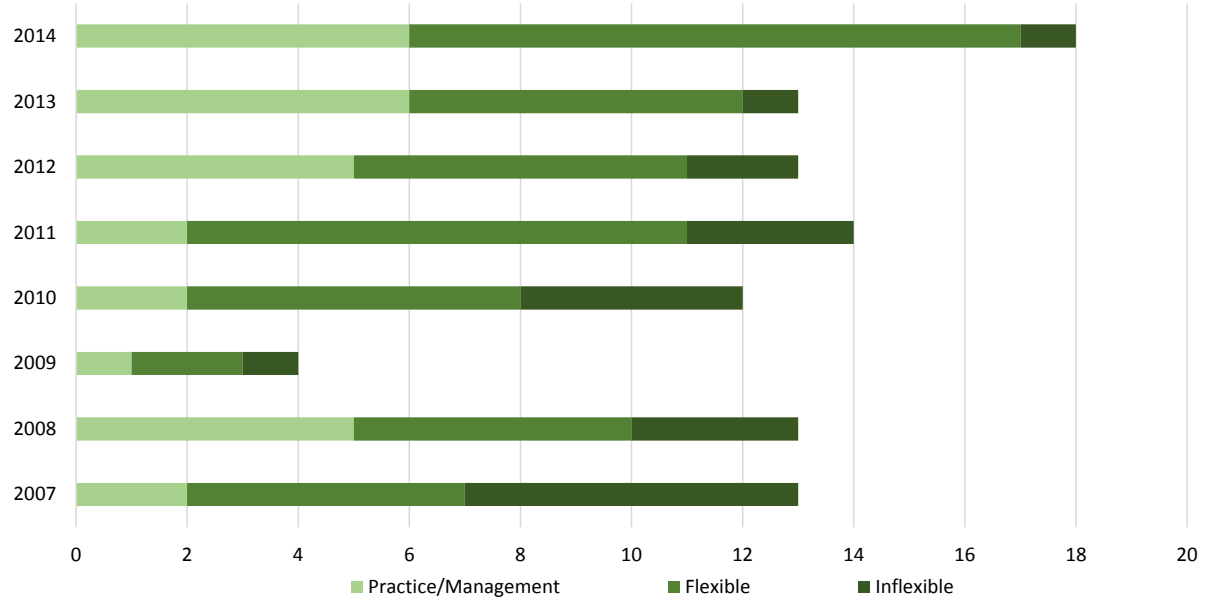

FIGURE 9: REGULATORY APPROACHES ARE BECOMING MORE FLEXIBLE

3.2.8 Information Programs, Audits On the Rise

Across all the programs reviewed, about 45 per cent included a reference to information programs, which includes standards and guidelines, product labelling, accreditation and audit. An interesting trend we see is an increase in auditing. Over the period reviewed between 2007 and 2014, almost 25 per cent of all the programs made some mention of audit. Since 2011 there was a significant uptick in the mention of audits, likely corresponding with both the rollout of cap and trade and the need to verify GHG inventories, but also likely associated with the rise of performance targets for emission and energy intensity improvements. Many of the recent work-planning documents, for example, mention improving the audit capacity of local government. Auditing will likely become an increasingly important part of carbon management for industry in the near term.

Standards and guidelines have been a constant of policy development since 2007. We see a rise in the number of guidelines being posted since 2010, accounting for about 13 per cent of all the policies we reviewed. We also see accreditation trending upwards. Figure 10 provides an overview of the results for the information programs.

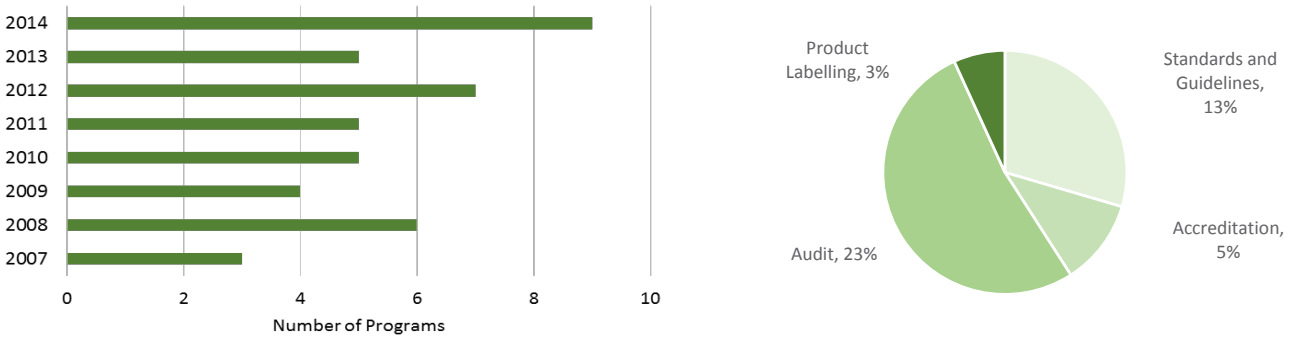

FIGURE 10: INFORMATION APPROACHES BY TYPE AND YEAR

3.3 National Guidance and Action Plans

Given the cascading of national policies down to the provincial, municipal and zone levels, it is worth taking a look at trends in the national level policies. With the 12th FYP in place, the State Council and the NDRC set major work-planning guidance, with a host of other departments and agencies providing support. This section examines the movement by the State Council and the NDRC to coordinate and catalyze climate and energy action.

3.3.1 Action by the State Council

Starting in 2010 the State Council implemented at least eight major work-planning initiatives that have a focus on energy-intensive industries, power generation and other small to medium-size enterprises. Thematic coverage ranges across promoting energy conservation, low-carbon development, eliminating backward production, energy efficiency, resource taxation and air pollution.

Starting in 2010 the initial thrust was adjusting or eliminating backward production and a focus on energy efficiency. Then in 2011 there was a greater focus on low-carbon development and controlling GHGs consistent with the 12th FYP. More operationally oriented guidance was provided in 2013 and 2014 on air pollution and low-carbon development. Initiatives mentioned in recent work plans and opinions (which set actions in motion) include low-carbon development pilot programs in provinces and cities, low-carbon industrial parks and a focus on low-carbon products including standards labelling, verification and low-carbon consumption.

There is also evidence that the statistical accounting agencies and their systems and practices are to be strengthened at the local level to increase accountability and track performance for both local governments and industry. We can, therefore, expect in time that accountability systems for climate and energy compliance will be strengthened, as more standards and rules are implemented. Mandates for participating institutions within the various jurisdictions will increasingly be better defined in time, to clarify lines of accountability.

Figure 11 summarizes the instances where different types of policy instruments are mentioned in the eight national-level work-planning documents we reviewed. While most provide some target to be achieved, the use of economic instruments—including emission trading, tax provisions and concessional loans—is significant. Regulations, including bans on certain types of production, are mentioned quite often. Capacity building and information to complement the other instruments is also present. In the next section, we provide a summary of some of the work-planning documents that are included in the data set supporting Figure 11.

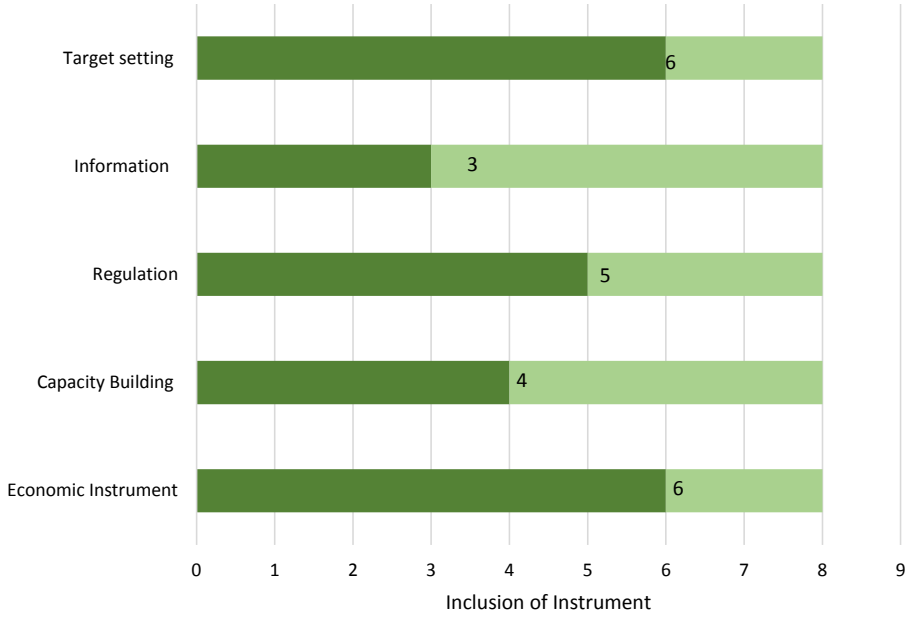

FIGURE 11: REFERENCES TO INSTRUMENTS IN WORK PLANS FROM THE STATE COUNCIL

3.3.2 National-Level Examples

Typical of this comprehensive mix of policy instruments is the *Action Plan for Low Carbon Development for Energy Conservation and Emission Reductions, 2014–2015*. This action plan specifies more clearly local governments' responsibilities in key regions and mentions building a national carbon emission trading program on top of the existing regional pilot schemes. In support of both energy and low-carbon development objectives of the 12th FYP, the action plan lays out a number of areas with a specific focus on the industrial emitters:

- First, promote industrial restructuring. This includes addressing excess capacity, accelerating development of low-emission industries and optimizing energy consumption, and promoting efficient and clean technologies.

- Second, accelerate the construction of energy-efficiency projects that will lead to reductions in carbon emissions. Also, with a focus on industrial demonstration projects, accelerate the renovation of older coal-fired power boilers and implement upgrades and other energy-saving projects.
- Third, strengthen monitoring and reporting of energy use and GHG emissions.
- Fourth, strengthen enforcement and surveillance.
- Finally, strengthen local governments with restrictions on regional energy growth and improved attainment of energy conservation targets.

The *2013 Action Plan for Air Pollution Prevention and Control* initiates provincial-level actions to control GHGs from coal consumption and slow down coal demand, supports energy savings and puts in place GHG reduction targets under the 12th FYP. With significant improvements in the energy intensity of the economy in 2010, in the order of 9 per cent, energy efficiency seems to be on track to achieve the 60 per cent target in the 12th FYP. Some argue that the economic downturn has helped achieve this plan, but still we find evidence of work plans indicating further energy-efficiency improvements are needed.

This action plan also includes a number of financing measures that typically have not seen this type of effort in the past (Greenovation: Hub, 2014). A whole series of measures are proposed that withdraw support from enterprises that have been identified to have excess capacity. Similarly, new projects will not be approved and financial institutions will not provide credit to support these industries. Transitioning climate finance away from just government finance to include more private sector involvement is also a major theme. Basically, guidance and motivation are being provided by public financing to combine with and leverage commercial financing to help push climate and energy objectives. A focus on divestment from coal seems to be permeating the system, with the commercial lenders likely viewing new investment as high risk.

3.4 NDRC and its Partners

The NDRC and its partners often implement the work plans and opinions of the State Council, setting targets and developing operational guidance. We assessed 22 policies and guidance documents that have been implemented by NDRC and its partners since 2006. We found that, generally, there is a good balance of policy instruments being implemented in thematic areas such as energy, climate and air quality. In terms of the types of instruments that are being brought forward, there is an increasing focus on economic instruments, with 13 of the 22 policies or 60 per cent mentioned. Many of the documents provide overall guidance that is expected to cascade down through provincial and municipal jurisdictions. As such, target setting is frequently mentioned in these documents. Figure 12 below provides an overview of the mix of instruments that are being implemented through NDRC and its multiple partners.

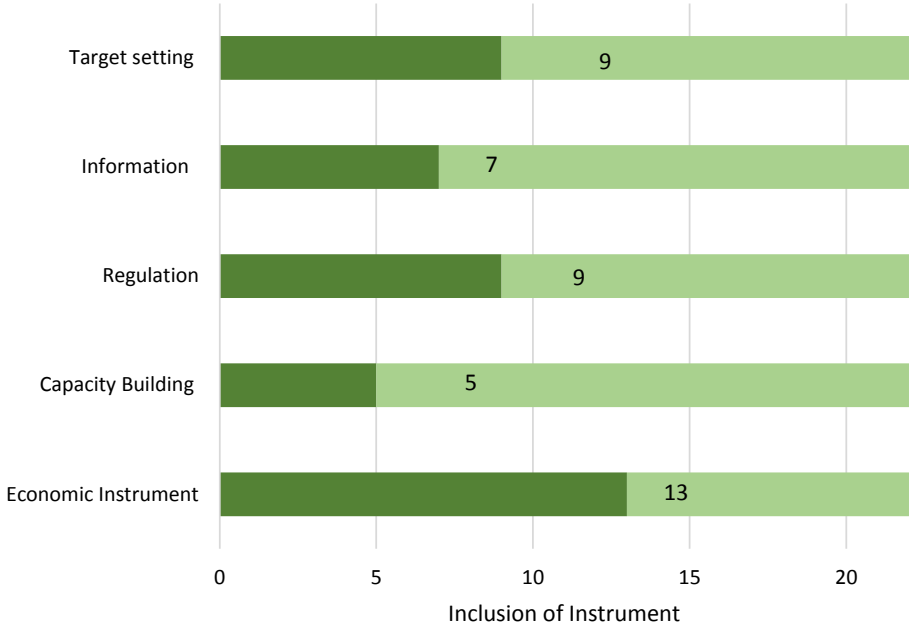

FIGURE 12: REFERENCES TO INSTRUMENTS IN WORK PLANS FROM THE STATE COUNCIL

3.4.1 NDRC and Other Ministry Case Examples

The NDRC established the Low-Carbon Pilot Program in 2010 as part of its emerging climate change agenda. As part of the pilot program, designated local governments are encouraged to develop long-term low-carbon development plans; implement reform for institutions; use policy instruments to lower carbon emissions and develop low-carbon fees, buildings and transportation. Developing GHG accounting and management systems are also encouraged, as is improving lifestyles and consumption toward low-emitting activities.

Further promoting industrial restructuring to improve industrial efficiency, in February 2013 the NDRC amended the Guideline Catalog for Industrial Restructuring. This update reinforced the strategic principle of energy-saving and emission reductions by seeking to improve and upgrade industry as well as close inefficient operations. Also in 2013, NDRC issued the Restructuring Plan on the Old National Industrial Basis (2013–2022). This plan is oriented to restructuring and upgrading industries to enhance competitiveness and improve industrial structure by adopting new technologies. Under the 12th FYP, the NDRC also initiated the National Low Carbon Technology Innovation and Model Industries Project, which is a pilot of 34 model projects in the coal, electric power, construction and building material sectors.

To support the development of clean energy, the NRDC's October 2012 Natural Gas Development Plan set ambitious supply capacity targets to 2015 for natural gas, with subsidies to support the utilization of shale gas.

To help improve energy efficiency, the NDRC and the Standardization Administration collaborated to issue in the order of 60 energy-saving standards since 2012 under their One Hundred Energy Efficiency Standard Promotion Projects program. We see evidence that this program is cascading down, with Shanghai in 2014 releasing a list of 876 energy-intensive enterprises that are to be targeted for energy-efficiency improvements.

As well, the NDRC, the Ministry of Industry and Information Technology (MIIT), the Ministry of Science and Technology and the Ministry of Finance issued a fifth promotion catalogue of national key energy-saving technologies, listing 49 technologies for 12 industries.

Increasingly, we are seeing the emergence of the policy architecture to enable emission trading schemes to both setup provincial- and city-level programs, but also to facilitate emission trading through developing systems and practices for monitoring, reporting and verification (MRV); GHG emission registries; third-party verification; and a whole host of supporting regulations and notices. The development of the emissions trading pilots is proceeding at an orderly pace, with trades underway in the seven regions and MRV, registry and allocation activities all underway. Central to this process was the NDRC's publication of the GHG Calculation Methods and Reporting Guidance for Enterprises. Also important was the publication of the Interim Measures for the Administration of Voluntary Greenhouse Gas Emission Reduction Transactions, which would help set up a domestic offsets system. By March 2014 a third batch of voluntary GHG-reduction methodologies were released, bringing the total to 177.

The Ministry of Environmental Protection developed the Environmental Protection Tax Law (2013). Initial indications from the Minister of Finance are that the tax will ultimately be collected, with media reports that the highest levels of government were discussing a carbon tax in the order of CNY10 per tonne (Greenovation: Hub, 2014). Institutional wrangling between those that prefer cap and trade to carbon tax will only slow the implementation of the carbon tax.

3.5 Provinces and the Municipal Level

We found evidence that national-level policies are starting to cascade down, with provinces and municipalities taking responsibility for achieving targets under their jurisdictions. Major policy thrusts include pilot projects, emission trading systems and improved accounting for GHG emissions.

In the policies reviewed, 39 are being implemented at the provincial or municipal levels. That said, only five of the programs are listed as provincial programs. Figure 13 indicates that the use of policy instruments at the municipal level, and in some cases at the provincial level, is very balanced, with no one instrument dominating the mix. We do, however, observe a significant uptick in the number of instruments that have been implemented since 2012. Figure 14 highlights how the national policy is starting to cascade down to the provincial and municipal levels. Much of the spike in activity is attributable to the implementation of regional emissions trading. In the next section, we explore the regional trading pilots in more detail.

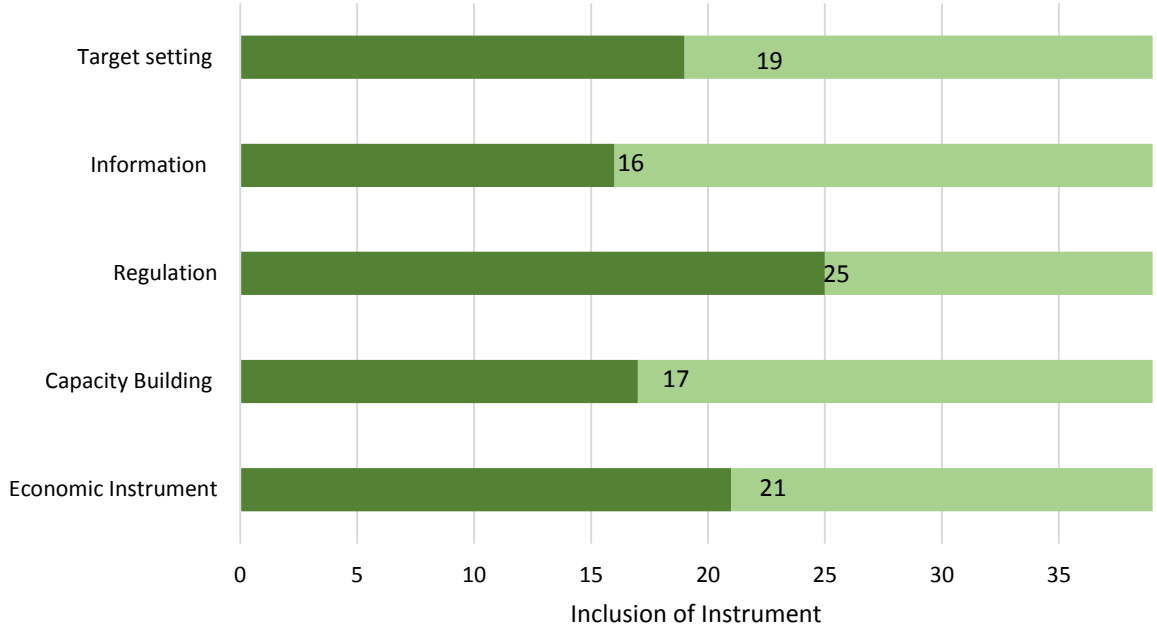

FIGURE 13: REFERENCES TO INSTRUMENTS BY PROVINCES AND MUNICIPALITIES

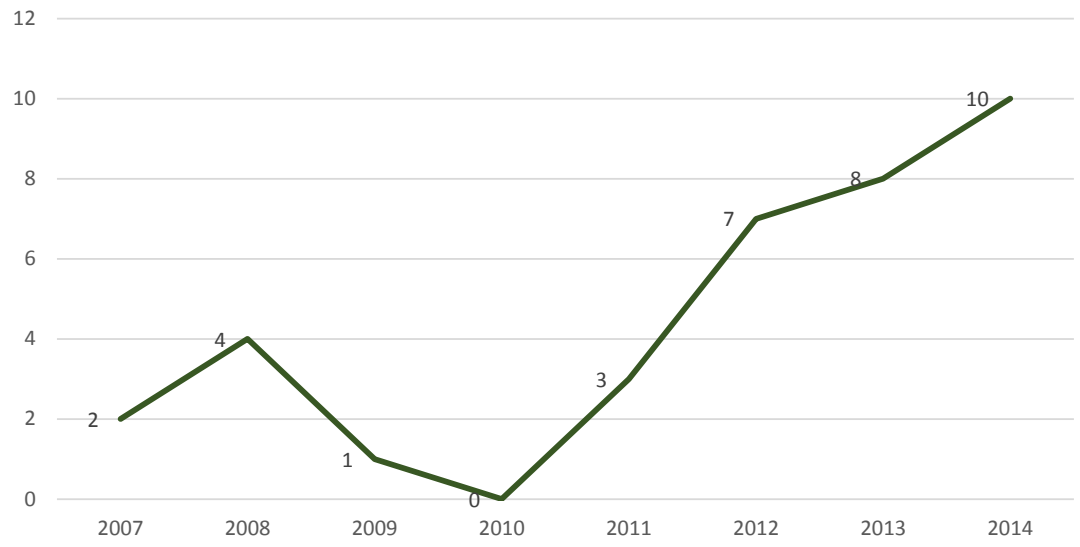

FIGURE 14: NUMBER OF PROVINCIAL AND MUNICIPAL POLICIES IMPLEMENTED BY YEAR

3.5.1 Regional Trading Case Examples

There are number of factors that helped prompt the movement or trial of regional emission trading systems by China's central government. First, the development of the Clean Development Mechanism (CDM) in China, and its success,has led many to believe that emissions trading could provide an alternative to the historical command-and-control approach. China's 11th FYP relied heavily on command-and-control approaches. The perceived inability of

these command-and-control approaches to significantly address both air quality and energy efficiency led to a culture of policy experimentation (Huang, 2013). A complementary view is that other command-and-control measures were somewhat successful at reducing the energy intensity of industry by 20 per cent by 2010, but that further using these instruments would lead to high-cost and inefficient outcomes. With CDM success and challenges with command-and-control approaches, coupled with the rise of a market economy, it seems inevitable that emissions trading would be attempted.

With carbon intensity targets in the range of 40–45 per cent by 2020 outlined in the 12th FYP, further pressure was placed on policy-makers to deliver, but command-and-control's shortcomings became apparent. Market-based instruments then became more pervasive as a means to send the incentives and innovation signals to align technology choice and behaviour with the long-term aspirations for carbon-intensity improvements. This transformation from command-and-control-based and centrally planned policy instruments to more geographically distributed and flexible policy instruments really has come to the fore in the 12th FYP. Indeed, the swift transformation toward a wide range of policy instruments designed and implemented subnationally is rather impressive.

In the spirit of more distributed policy development and implementation, local authorities then became responsible for designing and implementing regional programs, including designing and implementing sophisticated market-based cap-and-trade systems, but also then became accountable for delivering on emission reduction targets in the short term. In this way, national-level targets cascaded down through the provinces and municipalities and ultimately to the industrial zones. Traditional lines of accountability for achieving economic growth objectives were then complemented by energy and emission objectives.

Starting in 2010 the NDRC selected a number of low-carbon zones that would spearhead this new shift toward more distributed and bottom-up policy development and implementation. Eight cities, including Tianjin, were chosen to test the new approach, with a range of activities implemented, including: the formulation of low-carbon development guidelines, the development of supportive policies facilitating low-carbon development, the establishment of low-emissions industries, GHG inventory management systems and changing behaviour in consumers and households.

In Tianjin, for example, the emerging carbon trading system has likely benefited from practical experience gained through implementing energy-efficiency trading in commercial buildings. Energy-efficiency trading is enabled by the pilot phase of the Civil Building Energy Efficiency Reserve Fund. There are plans to roll this out more broadly to public, commercial and residential buildings in the city, and to then expand it into a more broadly based regional trading scheme in the building sector (Zhang, 2013). Two benefits are evident from this early experience in energy-efficiency trading:

- Experience in the governance structures associated with emission trading schemes was gained. Building new governance experience is key, given that past policy development approaches relied on command-and-control measures that were really centrally dictated. Better defining the roles and responsibilities of local government, and providing learning-by-doing opportunities, has set the stage for the emerging carbon trading.
- Learning-by-doing opportunities for participants and for the market architecture, such as the energy-efficiency trading systems, have likely smoothed the transition to carbon trading. Lessons learned and familiarity with energy-efficiency trading can only help facilitate the implementation of the carbon trading system.

What is interesting about these emerging emission trading systems is that they are targeting sectors that traditionally have had tight central government control given their economic importance, including power generation, iron and steel, and chemicals (Zhang, 2013). But of course these sectors are also heavy emitters that contribute significantly to both climate and air-quality problems.

Imposing carbon costs on these regulated and highly traded entities poses a specific challenge in China. With such a dynamic investment environment in China, there is real concern that constraints to reduce carbon will drive up costs and lead to the mobility of production within China (or production leakage). To address competiveness concerns, the trading schemes adopt energy and carbon-intensity benchmarks to set performance standards (so-called baseline credit systems) that do not set absolute emission caps. Using intensity benchmarks enables absolute emissions to grow and to accommodate economic growth, thus dampening competiveness concerns. Production levels can increase so long as the carbon or energy-efficiency targets are met. The regulator then transfers or translates these intensity benchmarks into targets through some sort of efficiency improvement, ultimately translating these into terms of emissions or quantity of energy.

The second benefit of adopting energy or emission-intensity benchmarks for the trading system is that it aligns with existing energy-efficiency and carbon policies and programs. Emission and energy-intensity targets have existed for a number of years, including in the 11th FYP rolled over into the 12th FYP. Using known and established targets makes the transition to these market-based instruments easier by allowing a gradual shift in policy architecture towards the market-based instruments starting from a known and established base. Another operational benefit is that the onerous process of GHG quantification and verification can start from existing methods established to track emission and energy-intensity targets.

Finally, there are some challenges. The coordination of the multiple regulatory initiatives is clearly an issue. An unclear regulatory context in the face of all the policies across a number of areas could hinder the implementation of both carbon and energy policy. That said, a gradual implementation of trading in a stepwise fashion, respecting local capacities and building private sector capacity at the same time could be key conditions of success.

There will be significant learning-by-doing going on with respect to GHG reporting. It is such a central feature to cap and trade—yet it is a new function for many industries and also for the regulators—that challenges are inevitable. With unclear enforcement mechanisms, and some institutional overlaps and unclear accountabilities, it could be some time before the system functions effectively and third-party verification can start to flourish. One has to wonder whether or not the MRV functions for monitoring compliance are sufficient to ensure compliance with the many elements of the emerging emission trading system. That said, a strong focus on bolstering statistical agencies at the provincial level means that established data collection systems will help the new GHG inventory efforts succeed.

Initially, the regional cap-and-trade systems will likely have low levels of compliance and enforcement, to basically allow the market to flourish and not penalize early movers and early market participants. In time, however, there is an expectation that monitoring enforcement and compliance will be ratcheted down.

4.0 Summary of Results

In this paper, we presented the results of a review of over 100 energy and climate policies and programs in China. We focused on identifying how national-level guidance is cascading down through various administrative and jurisdictional channels to the industrial zones and their member companies. We sought to identify major policy trends with a focus on informing industry about how the emerging policy environment might affect their operations and to identify actions that can be taken to position their operations to participate.

Based on our review, there are a number of important trends worth summarizing:

- **The number of policies is steadily increasing in time**. Starting with the 12th FYP in 2010, the number of energy and climate policies have increased significantly. This proliferation includes central-level work plans and target-setting documents, specific measures that implement the high-level work plans and targets, and finally tools to help guide implementation. The focus of these policies has primarily been on improving energy performance and, to a lesser extent, on reducing carbon emissions. There is also a mix of dual-focus policies that include lowering emissions and using energy more efficiently. This dual focus indicates that carbon policy is tightly bundled with energy policy, starting with the central-level work plans and target-setting guidance.
- **A comprehensive set of programs is being implemented, covering many emission sources.** Four main policy thrusts or programs dominate the survey results, namely: the regional carbon trading systems, phasing out unproductive capacity, the Top 10,000 program and a focus on economic development areas and pilot projects in cities and zones. A broad suite of other programs that focus on energy conservation and demand management, improving energy performance and altering energy is also being implemented. This broad suite of policies implies a broad level of policy coverage across many emission sources.
- **Policies and programs are well balanced, with a mix of regulations, capacity building,** economic instruments and information programs. There is, however, clearly a trend towards more flexible economic instruments, which are adding compliance flexibility to industry, thereby leading to lower compliance costs and likely fewer competitiveness impacts.
- **The trend towards economic instruments has really taken off since 2012 when work got underway to frame up the regional cap-and-trade programs**. We see a real mix in the types of economic instruments that are being implemented. Rebates, green finance, energy pricing, grants and subsidies, and trading are all evident in the emerging policy environment. Policies supporting cap-and-trade implementation, however, are proliferating.
- **Regulations are becoming more flexible, thereby lowering compliance costs.** While the closure of inefficient plants is a dominant policy focus in our survey, in recent years, performance standards are outstripping the more traditional fiat-based regulations. Performance standards based on hitting a target, as opposed to implementing a technology (or closing a plant), allow industry to make choices that are cost-effective and appropriate for their own operations. The trend towards more flexible regulations, such as performance standards, is good news for industry.

- **The need to develop GHG inventories and an increase in audits.** Whether it is the requirement of obtaining a low-carbon or eco-industrial park certification, or for participation in the pilot emission trading systems, facilities and industrial parks are increasingly required to develop GHG emission inventories. Closely aligned to this is auditing being increasingly mentioned in policies and programs. Industry can therefore expect a rise in auditing to demonstrate the achievement of a range of energy and emission targets. This requirement to develop facility-level performance indicators on emissions and energy will be driven from the national level, which will place requirements on provinces, municipalities and industrial zones to demonstrate achievement in their nationally allocated targets and priorities. Multiple pressures will be exercised on the industrial zones to develop emission and energy inventories to demonstrate performance.
- **Finally, we see significant evidence that the state-level policies are indeed cascading down to the provincial and municipal levels**. We see a rapid increase in municipal and provincial policies since 2010, indicating that state-level guidance is translating into action on the ground.

5.0 Implications for Industry

Given this dynamic and—at times—overlapping and uncertain energy and emission policy environment, the question for industrial zones is how to maintain low-carbon competitiveness? Just how do firms prepare for an uncertain policy environment? There are two ways to think about this question:

- First, there are risks associated with how firms or zones choose to respond to the policy environment. The main risk is making wrong investments that could delay action, which would lock in expensive and high-emitting capital now that may have to be switched out later, or result in making early investments that result in overcompliance (reducing too much) at a higher cost than is needed.
- Second, there clearly are significant opportunities for industry to engage in and take advantage of subsidy and green finance opportunities, which will help competitiveness through lowering costs. The number of policies and programs that include grants and subsidies, with links into the banking sector for green finance, clearly indicate an opportunity for industry to better take advantage of funding sources for the low-carbon transition.

Given these risks and opportunities, we can identify some no-regrets actions that industry can prepare for now to better take advantage of and respond to the policy environment. These no-regrets actions can be undertaken with confidence to mitigate future risks and to prepare to take advantage of policy opportunities as they arise. Below, we identify four no-regrets actions.

First, communicate the priority to senior management. Investments will be needed that will require senior-level buy-in. At the very least, budgets and human capital will need to be initially allocated to better understand the emerging policy mix. Ultimately, larger blocks of financing will likely be needed to develop and maintain GHG emission inventories, to develop strategies to interact with the policy environment and to ultimately implement energy performance and emission reduction technologies and practices.

Second, understand the emerging policy environment and keep track of the trends. There is a real need to better understand the policy environment and to keep track of policy trends. One of the key challenges is that policies and programs are incoherent and uncoordinated, leading to uncertainties in requirements for compliance. Allocating personnel to keep track of these trends is a no-regrets action. Managers must become policy savvy and read the signs in terms of how policies and programs will affect operations or how to identify opportunities for green finance.

Third, quantify and better understand energy use and emission inventories. No-regrets actions include understanding baseline energy use, including electricity and developing a GHG baseline emission inventory that highlights emission sources in the facility (or zone). This foundational information then forms the basis of developing strategies to take action.

Fourth, understand strategies to manage energy and emissions. Inevitably, there will be a need to demonstrate performance and take action. As a result, there needs to be a strategy within the organization that communicates opportunities for compliance while minimizing costs. Typically, the strategic options include energy-saving efficiency improvements, changes in management practices to improve emission and energy performance and, finally, more expensive investments, such as fuel switching or process changes.

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