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China's Carbon Emission Trading

An Overview of Current Development

Guoyi Han, Marie Olsson,
Karl Hallding, David Lunsford

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About the Study

China has embarked on one of the largest endeavours in climate economics ever, to establish a national carbon emission trading system by 2015. As a first step, carbon-trading pilots have been initiated in seven provinces and cities. The success or failure of those experiments will to a large extent determine the future of climate policies in China. This report evaluates the progress so far and examines the key challenges ahead. While the attempts to develop a domestic carbon trading are sincere and ambitious, there are considerable difficulties. Many of the challenges are not particular to China, but common to any emission trading system. But there are also more profound worries about how to operate a market-based instrument given the current shortcomings of the Chinese market system in general.

Foreword

As the world's largest carbon emitter, growing rapidly, there is no doubt that China will determine the fate of global climate change. Maybe the most important reform for China is the attempt, about to be initiated, to create a domestic Chinese price of carbon through emissions markets. If the seven pilot emission markets in China succeed or fail, is therefore one of the most important questions of environmental policy of our time, something we hope that this study will elucidate.

Not long ago, experts claimed that China was neither administratively nor economically ready for emissions markets. Now Beijing is determined to create a nationwide emissions market by 2015. This decisions stems from two realisations by Chinese policy makers: Firstly that China must curb its use of fossil fuels, irrespective of what other major powers do, both because of energy security and China's domestic vulnerability to the effects of global warming. Secondly that the command and control measures to reduce emissions used by Chinese authorities up to now, such as closing down coal plants by fiat, are less efficient than a market based trading system. The question now is how China will react when confronted with the practical and political problems that inevitably accompany the creation of such a novel market, even the most successful emissions trading system operating today, that of the EU.

This report, the product of a joint FORES and SEI initiative, provides an overview of ongoing efforts to develop carbon markets in China, and to gauge their implications both for China's national targets on climate, energy and the environment, and for climate change mitigation worldwide. It is based on a review and synthesis

of the research literature, news reports, and Chinese government documents, complemented by selected interviews.

The report begins by explaining the context for the debate and the development of carbon emission trading in China. The second section looks at the status of these initiatives, including both pilot cases and the overall situation. The third section outlines a set of critical issues for developing carbon emission trading in China, and the conclusion examines the outlook for the next several years. The development of carbon trading in China is still in its infancy, and we expect a potentially rapid evolution as the country experiments with different options. Beyond this, the prospects for a national carbon emission market in China remain uncertain, dependent on key institutional and market reforms. The outcome will have far-reaching global implications for carbon emission trading as well as climate mitigation.

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Executive Summary

In the early 2000s, it became obvious that the supercharged growth of the Chinese economy had reached a level at which keeping up with energy demand would increasingly pose serious challenges. Realising that energy, climate change mitigation, and economic development are tightly interlinked, the Chinese government developed an ambitious set of energy-security and climate-related policies as a cornerstone of the 11th Five Year Plan (2006–2010).

The programme was implemented through strict top-down command and control measures. This had the advantage of fitting well with the Chinese administrative system, but came at a higher cost than alternative financial or market-based measures. Still, it is hard to imagine how China could ever have met its ambitious targets without strict top-down regulation: to reduce energy intensity by 20 per cent and increase the share of renewables in the energy mix from 6 to almost 10 per cent by 2010.

The success in meeting the 11th Five Year Plan targets, combined with mounting international pressures on China to commit to absolute emission targets and growing concern about energy security, has intensified the government's efforts to shift to a lower-carbon, more resource-efficient development pathway. Recognising the limited efficacy of top-down measures and the difficulties in sustaining their effects, China is now looking at market-based instruments such as environmental/carbon taxation and emission trading as potentially valuable policy tools to help reduce the energy- and carbon intensity of its economy. If China can effectively link its domestic markets with international markets, it

could also secure its position as a seller of offsets, selling surplus credits abroad.

This is the context in which, in its 12th Five Year Plan (2011–2015), the Chinese government announced its intent to establish a national carbon trading system by 2015. As a first step, the National Development and Reform Commission of China has initiated carbon trading pilots in seven provinces and cities.

This report, the product of a joint SEI and FORES initiative, evaluates the progress so far and examines the key challenges ahead. It is based on a review and synthesis of the research literature, news reports, and Chinese government documents, complemented by selected interviews.

We find that China has embarked on a sincere and ambitious attempt to develop a domestic carbon trading system, but that the plans to have a functional national system in place by 2015 are extremely bold and face considerable difficulties. Several of these difficulties are not particular to China, but rather are issues that any emission trading system would have to deal with. But there are also more profound worries about how to operate a market-based instrument given the current shortcomings of the Chinese market system in general.

Contrary to what news reports might suggest, carbon trading in China is still in its infancy, with much experimentation but few results to date. By any real measure, there is no functional carbon market in China, aside from activities related to the Clean Development Mechanism (CDM). China certainly does not have a regulated carbon market yet, and experiments with voluntary markets are limited, with only a handful of deals – mostly symbolic – done since the Beijing and Tianjin exchanges were founded in 2008, for

example. Yet the growing consensus is that, sooner or later, carbon market development is inevitable in China.

With the seven regional carbon trading pilots, and the potential for sectoral pilots to also be initiated under the 12th FYP, China is moving into an intensive phase of testing carbon trading, and we believe the success or failure of those experiments will to a large extent determine the future of carbon markets development in China. The country's experience with other types of environmental pollution emission trading – starting in the late 1980s, and involving pollutants such as sulphur oxides – has generally been negative, with multiple pilot programmes that yielded few results.

Research on these prior efforts suggests that China needs to start by measuring emissions more accurately, and it also needs to establish a better legal infrastructure, with clearly defined emission rights, permit allocation systems, trading rules, monitoring, and enforcement and accountability. There is also a need for capacity-building at the administrative level.

Our own analysis finds that setting emission caps – an essential departure point for any emission trading scheme – and allocating permits equitably could be challenging for China, given the wide differences in economic structure, growth rates, energy consumption and carbon intensities across Chinese provinces. There is also a lack of reliable carbon emission data, which makes it very hard to set a realistic target, given uncertainties about baselines.

The Chinese government said in October 2010 that it was building an updated national greenhouse emission database, the first publicly available database to include provincial level data since 1994. However, while this is a positive step, and China's general stance toward measurement, reporting and verification (MRV)

has also become more positive, there is still a need for legal frameworks to support MRV. China has only recently started developing such a framework, which also includes setting standards, creating a regulatory framework, and establishing the trading infrastructure for exchanges.

China also needs to decide whether it should adopt an absolute emissions cap, or an intensity-based one. An absolute carbon cap has the advantage of making emission reductions predictable. But the alternative, a carbon intensity cap, is less controversial within China, because it is seen as less likely to conflict with rapid GDP growth. Whatever the outcome, it is likely that unlike most existing cap-and-trade systems, China's system will allow for additional emissions growth – just less than would be expected without a carbon market. There are also proposals to include a nationwide "energy cap" and trade quotas based on energy consumption.

While China experiments with carbon markets under the 12th FYP, it is highly probable that it will also initiate environmental/carbon taxation, either for pilot testing or to be adopted nationally. While this is feasible, it is unclear how taxes will be integrated and coordinated with the carbon trading market. Some of the pilots may follow the example of Australia, where a carbon tax is being introduced this year, but in the long term, tradable permits will replace it.

The prospects for eventual integration of the Chinese carbon trading market with existing and future international trading schemes remain unclear, given that the pilots are all under design and will not be operational for some time. Since the pilots are testing various existing models and their suitability for China, they may also facilitate integration later on. Domestically, meanwhile,

much work remains to be done to determine how regional and sector-based trading schemes might be integrated. Detailed regulations will be needed to ensure that carbon credits are interchangeable, and that standards are consistent. For now, however, the focus is on building the markets.

China will also need extensive capacity-building, not only to ensure it has qualified staff to manage and to oversee the markets, but also to prepare the participating industries. Corporate executives and financiers would have little practical knowledge on how to effectively manage an emissions portfolio, for example, because the government sets all the prices. Even if a carbon market were effectively set up in China at this point, traditional corporate behaviour and resistance could prevent any substantial trading from taking place. Changing the behaviour of financiers and the industrial workforce could take years. Lessons learned by Chinese entities while operating in the CDM market might be only loosely transferrable to managing emissions for compliance purposes underneath a cap. International support and advice will be critical.

The most fundamental question, however, is whether a carbon trading scheme – meant to be a strong market-based instrument – can function well without a mature free-market economy. After more than three decades of market economy-oriented reform, on one hand, China today is closer than ever to a real market economy. On the other hand, it still differs from a mature free-market economy in several substantial ways, including heavy government control and intervention, the significant share of the state-owned enterprises, as well as a non-liberalised price control system and distortions within the financial sector, not to mention widespread corruption and a culture of distrust in business. These all would

have profound implications on the operation of a carbon market, even with good rules and design. The success or failure of China's efforts to build a carbon market may ultimately come down to enforcement.

Still, despite all the reasons for concern, we must note that China's determination has served it remarkably well in many other ways in the past decades. That same "crossing the river by feeling the stones" spirit could well enable China to build a unique, innovative carbon market that effectively curbs its now-soaring emissions.

Sammanfattning på svenska

Redan under inledningen av 2000-talet blev det uppenbart att den kinesiska ekonomin hade nått en nivå där energiförsörjningen blir en betydande utmaning. Insikten om att energisäkerhet, klimatförändringar och ekonomisk utveckling är tätt sammanvävda bidrog till att den kinesiska regeringen till den 11:e femårsplanen (2006-2010) tog fram en rad ambitiösa mål kopplade till energisäkerhet och klimat. Målen innefattade att minska energiintensiteten, det vill säga energiåtgången i förhållande till produktionen, med 20 procent och öka andelen förnybar energi från 6 till 10 procent fram till 2010.

Femårsplanens mål uppfylldes genom hårt toppstyrda administrativa åtgärder, i enlighet med kinesisk praxis. Men att uppfylla målen med administrativa styrmedel medförde höga kostnader jämfört med alternativa, marknadsbaserade åtgärder. Det är emellertid svårt att föreställa sig hur Kina någonsin skulle kunnat nå målen utan de toppstyrda administrativa åtgärderna.

Att man med möda lyckades nå den 11:e femårsplanens mål har tillsammans med ett stigande internationellt tryck och den ökande oron för landets energisäkerhet intensifierat regeringens ansträngningar att utvecklas på ett mer resurseffektivt sätt, med lägre utsläpp av koldioxid. Givet de administrativa styrmedlens begränsade effekt tittar nu Kina åt marknadsbaserade styrmedel som koldioxidskatt och utsläppshandel för att minska ekonomins energi- och kolintensitet.

Mot denna bakgrund meddelade den kinesiska regeringen i sin 12:e femårsplan 2011 att man till 2015 ämnar upprätta ett nationellt system för handel med utsläppsrätter. Det första steget blir

att inrätta försöksprogram med utsläppshandel i sju städer och provinser.

I denna rapport från SEI och FORES utvärderas utvecklingen fram till nu och de kommande utmaningarna diskuteras. Rapporten baseras på en genomgång och sammanställning av forskningslitteratur, nyhetsrapportering och kinesiska regeringsdokument, som kompletterats med intervjuer.

Kina genomför ett uppriktigt och ambitiöst försök att utveckla en inhemsk utsläppsmarknad. Men att redan år 2015 ha en fungerande marknad är ett djärvt mål och Kina står inför flera betydande utmaningar. Flera är allmängiltiga för försök att upprätta utsläppsmarknader. Men det finns också en djup oro för hur ett marknadsbaserat instrument kan fungera i Kina, givet den kinesiska marknadsekonomins nuvarande tillkortakommanden.

Tvärt emot vad nyhetsrapporteringen indikerar är utsläppshandel i Kina fortfarande i en inledande fas, med mycket experimentlusta men få resultat. Det kan i dagsläget inte sägas finnas någon fungerande utsläppshandel i Kina, bortsett från handeln kopplad till FN:s system för köp av utsläppsminskningar utomlands, CDM. Kina har ännu ingen lagstiftad marknad och de frivilliga marknaderna fungerar endast i mycket begränsad omfattning. Endast ett fåtal symboliska affärer har genomförts på börserna i Beijing och Tianjin sedan de grundades 2008. Icke desto mindre framträder en ökande samsyn kring att en utveckling mot utsläppshandel i Kina är ofrånkomlig, förr eller senare.

Den 12:e femårsplanen innebär att Kina går in i en intensiv fas, utöver de sju regionala försöksprogrammen tillkommer eventuellt även försök med sektorsmarknader. Resultaten av dessa experiment kommer med stor sannolikhet bli avgörande för den fram-

tida utvecklingen av utsläppsmarknader i Kina. Landets tidigare erfarenheter från utsläppshandel, exempelvis med utsläpp av svaveldioxid, har emellertid varit negativa. Flertalet försöksprogram har generat skrala resultat.

Utifrån tidigare försök kan Kina dra lärdomen att landet behöver mäta utsläppen mer noggrant, samt att det behövs en bättre juridisk infrastruktur med tydligt definierade utsläppsrätter, hur tilldelningen av utsläppsrätter ska ske måste också klargöras. Handelsregler, övervakning, efterlevnad och ansvarskrävande krävs. Det finns också ett behov av att stärka den administrativa kapaciteten.

Enligt vår analys kommer beslut om utsläppstak – en nog så viktig del i ett utsläppshandelssystem – och en rättvis tilldelning av utsläppsrätter bli stora utmaningar för Kina. Särskilt beror det på de stora regionala skillnaderna inom landet, vad gäller ekonomisk struktur, tillväxttakt, energianvändning och utsläppsintensitet. Det råder också brist på tillförlitlig utsläppsdata, vilket kraftigt försvårar möjligheten att bestämma utsläppstak.

Enligt den kinesiska regeringen (oktober 2010) pågår arbetet med att upprätta en uppdaterad nationell databas för växthusgasutsläpp, den första officiella databasen sedan 1994 som inkluderar utsläppsdata på provinsnivå. Även om detta är ett steg framåt och Kina i allmänhet blivit mer positiva till mätning, rapportering och verifiering (MRV), finns fortfarande ett behov av ett juridiskt ramverk som stödjer MRV. Kina har inte förrän nyligen påbörjat arbetet med ett sådant, vilket inkluderar att sätta riktmärken, skapa ett regelverk och upprätta nödvändig infrastruktur för handel via utsläppsbörser.

Kina behöver också fatta ett beslut huruvida man ska anta ett

absolut utsläppstak eller ett intensitetsbaserat tak. Det absoluta taket har fördelen att utsläppsnivåerna då blir förutsägbara. Men alternativa mål, baserade på utsläppsintensitet, är mindre kontroversiella i Kina eftersom det anses vara mindre troligt att de hamnar på kollisionskurs med den snabba BNP-tillväxten. Oavsett vad dessa diskussioner resulterar i är det sannolikt att Kinas system tvärt mot de flesta andra utsläppsmarknader inledningsvis kommer att tillåta en ökning av utsläpp, men i en flackare kurva än vad som varit fallet utan utsläppsmarknaden. Det finns även förslag om ett nationellt ”energitak” och handelskvoter som baseras på energikonsumtion.

Parallellt med Kinas experiment med utsläppsmarknader är det också troligt att landet under den 12:e femårsplanen kommer att införa miljö- och/eller koldioxidskatter, antingen som regionala försöksprogram eller genom ett nationellt program. Samtidigt som detta vore genomförbart, är det i nuläget oklart hur skatterna kommer att samordnas med utsläppshandeln. Det är möjligt att man gör försök att följa exemplet från Australien, där man i år inför en koldioxidskatt som över tid kommer att ersättas med utsläppsrätter för handel.

Möjligheterna att koppla samman en kinesisk utsläppshandel med andra utsläppsmarknader är fortsatt oklara, givet att försöksprogrammen fortfarande utformas och inte kommer vara i användning ännu på ett tag. Eftersom försöksprogrammen ser olika ut och för att testa ut vilken modell som bäst anses passa Kina, kommer de möjligen att över tid utformas så att de underlättar sammankoppling. Även inom Kina återstår emellertid mycket arbete innan det är klart för de olika regionala och sektorsbaserade kinesiska programmen att kopplas samman. En noggrann utform-

ning är nödvändigt för att säkerställa att utsläppsrätterna kan användas i olika system och att olika standarder är kompatibla. I nuläget ligger emellertid fokus på att bygga marknader.

Kina kommer att behöva omfattande kapacitetsbyggande, inte bara för att säkerställa tillgången till kvalificerad arbetskraft och för att övervaka marknaderna, men också för att förbereda de industrier som ska delta. Företagschefer och finansiärer har liten praktisk erfarenhet av att effektivt hantera exempelvis en utsläppsportfölj, eftersom de är vana att regeringen sätter priset. Även om en utsläppsmarknad skulle upprättas i Kina, skulle i nuläget företagens invanda beteende hindra alla meningsfull handel. Att förändra finansiärers och arbetskraftens beteende kan ta åratal. De lärdomar som kinesiska aktörer har dragit av att vara del av CDM-marknaden kan bara ytligt användas i en utsläppshandel med utsläppstak. Internationellt stöd och råd kommer därför vara avgörande.

Den grundläggande frågan är emellertid huruvida en utsläppshandel – tänkt att utgöra ett starkt marknadsbaserat verktyg – kan fungera i ett land utan en mogen marknadsekonomi. Efter mer än tre decennier med marknadsorienterade reformer är Kina å ena sidan närmare en riktigt marknadsekonomin än någonsin. Å andra sidan skiljer sig Kinas ekonomi från en mogen marknadsekonomi i flera betydande aspekter, inklusive regeringens starka kontroll och många interventioner, den stora andelen statlig ägda företag, det rigida priskontrollsystemet samt snedvridningarna i den finansiella sektorn. Till detta kan läggas den utbredda korruptionen och misstron i näringslivet. Dessa faktorer kommer alla ha en betydande inverkan på utsläppshandeln, oavsett hur bra systemen utformas. Utsläppshandelns framgång eller misslyckande i Kina

kan till slut bero på möjligheten och viljan att med kraft genomföra åtgärderna (enforcement).

Mot de många utmaningarna och skälen till skepsis kan ställas den beslutsamhet med vilken Kina genomfört andra åtgärder under de senaste årtiondena. Samma ”gå över floden genom att känna stenarna”-mentalitet kan nu möjliggöra för Kina att bygga en unik, innovativ utsläppshandel som effektivt tyglar de nu stigande utsläppen.

Chapter 1

Introduction

The development of carbon emission trading in China is of great interest to many. Internationally, such concern stems primarily from China's indispensable role in determining the success of any global climate mitigation effort. China today accounts for almost a quarter of global greenhouse gas emissions and about half of annual emissions growth (Steckel et al. 2011). Moreover, such trends are expected to continue. The International Energy Agency (IEA 2009) has estimated that about half the growth in global energy-related carbon dioxide (CO_2) emissions from now until 2030 will come from China. China's emission growth trajectory is therefore a critical factor in the world's chances of keeping global warming below 2°C. Furthermore, there is a great urgency. In its most recent global carbon emission trends report, the Joint Research Centre of the European Commission and the Netherlands Environmental Assessment Agency (Olivier et al. 2011) found that China's per capita CO_2 emissions had already reached 6.8 tonnes, higher than France's and on a par with Italy's.[1] The report also projected that, if the current trends continue, China's per emissions

1. China's per capita CO_2 emissions have increased from 2.2 to 6.8 tonnes since 1990, while they have decreased from 9.1 to 7.9 tonnes in the EU-15, and from 19.7 to 16.9 tonnes in the U.S., according to the PBL and JRC analysis (Olivier et al. 2011).

may surpass those of the U.S. as early as 2017. These trends have caused great alarm, highlighting the urgency of more effective mitigation measures in China.

China has made economic growth its top domestic priority, but it faces a serious energy and climate security dilemma (Hallding et al. 2009). While China's remarkable economic growth in the past decades has lifted hundreds of millions of people out of poverty, it has also resulted in escalating environmental pressures, ecosystem destruction and increasing scarcity of resources, including energy. China today is confronted with a range of compounded sustainability challenges, from economic imbalances and social inequality, to resource and environment constraints, including climate change. It is therefore also an urgent and keen national interest of China to embark on a low-carbon and resource-efficient development pathway (Jiang, Sun, and Liu 2010; Liu and Peter 2010; Zhang 2010). Seeking cost-effective emission reduction measures is central to the green development strategy in China, as evidenced by the current 12th Five Year Plan (FYP).

Until the 12th FYP, carbon emissions control in China had not been integrated into explicit environmental or resource use targets. Some reductions had been achieved, however, as a co-benefit of improving energy efficiency – a vital component of the energy security strategy in China. In addition, since 2006, China had rather quickly produced an impressive and convincing package of climate-related policies, situated in the context of sustainable development in general and energy security in particular. In 2007, China was the first developing country to issue a National Climate Change Program (NDRC 2007); in 2008, a White Paper on China's actions and strategy on climate change was published (State Coun-

cil Information Office 2008). In 2009, prior to the United Nations climate change conference (COP15) in Copenhagen, China committed to voluntarily reduce the carbon intensity of its GDP by 40 to 45 per cent by 2020 relative to 2005 levels. Notably, a compulsory target on carbon intensity has been included in the 12th FYP to reduce the carbon intensity by 17 per cent by 2015, relative to 2010 levels.[2] Achieving this target would likely ensure that China fulfils its international pledge, given that China reduced its carbon intensity by nearly 20 per cent during the 11th FYP. As many analysts have pointed out, China's international commitment and its own national targets, while voluntary and driven by national interest, are ambitious and compatible with what would be required for a global trajectory for a 450 ppm stabilisation scenario (e.g., Zhang 2010; Stechel et al. 2011).

Reversing the rapidly growing trend in carbon intensity is essential, and requires not only improving energy efficiency but also transforming the Chinese energy system.

So far, China's approach to controlling greenhouse gas emissions has been based on a direct regulatory (command and control) system, mainly through administrative and political measures. Energy intensity targets have been set at the national, provincial and large-company level. Reductions in energy intensity have largely been achieved by enforced closure of inefficient power plants and factories. Economic tools (resource taxes, tax breaks, and channelling of subsidies and investment) have played a limited role (Wu 2011). While China came very close to achieving the 20 per cent energy intensity of GDP reduction target[3] during

2. The energy intensity target for the 12th FYP is a 16 per cent reduction between 2010 and 2015.
3. According to the official number announced by Minister Xie (2011), during the 11th FYP, China reduced energy intensity of GDP by 19.1 per cent. The average energy consumption growth rate was 6.6 per cent, while the average

the 11th FYP (2006-2010), this was not without tremendous difficulties. In order to achieve the reduction targets, "black-outs" of industries and certain cities were not uncommon at the end of 2010. A number of provinces were forced to shut down large swathes of industrial capacity as part of last-ditch efforts to meet 2006-2010 energy intensity targets.[4]

The 11th FYP showed the inadequacy and cost-inefficiency of heavy reliance on administrative and political measures. These lessons also provide a strong motivation for the Chinese government to build and rely much more on market-based instruments, such as environmental taxation and emission trading schemes to ensure continued energy and carbon intensity reduction. As clearly expressed in the 12th FYP, China is now anxious to use market mechanisms to avoid a repetition of the experiences of the 11th FYP. European governments have indeed promoted and encouraged the uptake of market-based instruments for a number of years. Chinese delegations have also visited European governments and private sector constituents in the European Emissions Trading Scheme (EU ETS) on numerous fact-finding missions since the adoption of the Kyoto Protocol, some of which may have been influential.

Since the Copenhagen climate conference in 2009, the Chinese government has increasingly encouraged and supported research, design and experimentation to develop a carbon emission trading system. In the 12th FYP, released in October 2010, Beijing announced its ambition to establish a national carbon trading

GDP growth rate was 11.2 per cent. This energy intensity reduction has avoided about 1.5 billion tonnes of CO2-equivalent emissions (GtCO2e).

4. See Reuters (2011). "China eyes steel, cement sectors for carbon credit trade-report." Available at http://www.reuters.com/article/2011/08/04/china-emissions-trading-idUSL3E7J407J20110804.

system by 2015, and high-level officials began talking openly about the issue. In November 2011, the National Development and Reform Commission of China officially approved the initiation of carbon trading pilots in seven provinces and cities. By all indications, China is rapidly moving on with carbon emission trading experimentation.

Market-based instruments such as environmental/carbon taxation and emission trading are now widely recognised as indispensible policy tools that would help China meet its energy and carbon intensity targets – both domestic and international – in a more controlled, monitored, and/or predictable way (Wu 2011). Carbon trading is also seen as a major market-based instrument for improving energy efficiency, which remains the primary concern for the Chinese government in addressing the climate challenge. The idea is that putting a price on carbon will drive businesses to use energy more wisely, increasing their energy efficiency and getting more of their energy from renewable sources – both of which would reduce carbon intensity.

2

Chapter 2

The State of Carbon Emission Markets In China

A short introduction to carbon trading

The basic principles of carbon trading are rather straightforward: an emission cap is set, and under that cap, allowances are distributed amongst participating companies, industries, stakeholders, etc. In this system, every metric tonne of carbon dioxide (tCO_2) emitted requires an emissions permit, which is either grandfathered (i.e. distributed at no cost) or sold at auction. There is thus no limit on emissions from any single installation, but there is a limit on the total emissions allowed within the system as a whole, with allowances capped in accordance with the defined emissions target. If permit-holders emit less than they're allowed, they can sell their surplus allowances and make a profit. If emission levels are high, permits become scarcer, driving up their price. Entities whose emissions exceed their allowances can either buy permits from others, as long as there is available supply, or purchase reductions from an offsetting programme. For example, the

European Union Emissions Trading Scheme (EU ETS) was linked to an offsetting programme under the Kyoto Protocol, the Clean Development Mechanism (CDM), in 2004, creating demand for CDM project development in developing countries.[1] Non-emitting stakeholders are also allowed to participate in the EU ETS voluntarily, further reducing the number of allowances in circulation for emitting entities to purchase at any point in time.

A carbon trading system requires several elements to function smoothly, especially in terms of administrative and monitoring capacity. In general, the construction of a carbon trading system involves five main components: 1) setting the total emission limit (or cap); 2) allocating the quota (or permit, credit, allowance); 3) prudent greenhouse gas (GHG) accounting and verification rules; 4) trading infrastructure, such as registries and exchanges; and 5) an accountability system in case of non-compliance. Each of these components is indispensable, and together they require not only creditable carbon emission measurement and statistics, but also a fair allocation mechanism, free market conditions and reliable oversight, as well as strict monitoring. Any one of those aspects has the potential for misuse and rent-seeking, thus corrupting the system as a whole and rendering it ineffective. The performance of carbon emission trading markets is normally measured by the resulted emission reduction (effectiveness), the emission reduction cost (cost-effectiveness or efficiency), innovation and investment in clean technology, and any resulting carbon leakage (i.e., whether it has led to shifting of production thus emission spatially) (Lu 2011).

1. Linking Directive (2004/101/EC). See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:338:0018:0023:EN:PDF.

Since the emergence of the European Union Emission Trading Scheme (EU ETS) in 2005, the world has seen a rapid growth in carbon markets. In 2011, the global carbon market reached US$142 billion[2]. Despite the recent "bad patch" due to a range of reasons from Europe's economic downturn to the uncertainty of the future of CDM, which remains uncertain until a new climate agreement has been reached, many believe that carbon markets remain one of the most trusted and attractive instruments we have to combat climate change (Fankhauser 2011, p35).

Table 1 gives a summary of the existing and major emerging carbon trading schemes in the world. These markets also provide models for the design and operation of future Chinese carbon markets.

2. Many are now worried though that a down-turn is coming up. For example, due to over allocation, unforeseen recession, as well as confidence issues and conflicting complementary policy, the EU ETS is currently struggling.

Table 1. Summary of carbon trading schemes around the world

Established schemes

Kyoto Protocol	Established in 2005. The target is to reduce emissions by 5 per cent below 1990 levels in 2008-2012, collectively, for the 37 countries with mandatory targets. Countries can reduce emissions at home, buy permits from one another, or buy carbon offsets from projects in developing countries under the Clean Development Mechanism (CDM).
European Union Emissions Trading Scheme (EU ETS)	Established in 2005, mandatory for all 27 EU members, plus Iceland, Liechtenstein and Norway, covering about half of total EU carbon emissions. The target is to reduce emissions by 21 per cent below 2005 levels by 2020. Under the scheme, member states allocate a quota of emission allowances to 11,000 industrial installations. Companies get most permits free during the second phase based on historical emissions, but many electricity generators will have to pay for all these from 2013 (third phase) . More than 3,000 airline operators will join the scheme in 2012. *
New Zealand emissions trading scheme	Launched July 1, 2010. Mandatory, with the target to cut greenhouse gas emissions between 10 and 20 per cent by 2020 on 1990 levels. Under the scheme, emissions units are allocated based on an average of production across each industry. Sectors include forestry, electricity, industrial process emissions and transport, waste (start 2013), and agriculture (start 2015). From July 1, 2010, to Jan. 1, 2013, emitters have the option of paying a fixed price of NZ$25 per tonne of carbon, and will only have to surrender 1 unit for every 2 units of emissions.
Northeast U.S. Regional Greenhouse Gas Initiative (RGGI)	Launched January 2009, covering carbon from power plants in 10 states in the U.S. Northeast. The target is to reduce emissions by 10 per cent below 2009 levels by 2018. Allows offsets from five different types of clean energy projects, including capturing methane from landfills and livestock manure, but only if a US$7 per tonne price trigger is hit.
Japan: Tokyo metropolitan trading scheme	Launched April 2010, covering around 1,400 top emitters in the metropolitan area. Japan aims to cut emissions by 25 per cent by 2020 from 1990 levels. Under the scheme, Tokyo sets emission limits for large factories and offices, which can be met by using technology such as solar panels and advanced fuel-saving devices.

* Twenty-six national governments, China included, met in Moscow to discuss the airline industry's response to the aviation sector's inclusion into the EU ETS on 21 February 2012. The meeting aimed to affirm the role of the International Civil Aviation Organisation (ICAO) in addressing international aviation emissions and thereby urged airlines to take several alternative actions and measures in response to the EU ETS.

Emerging schemes

Australia: Clean Energy Bill	Adopted by the Australian Parliament, covers emissions from all sources except agriculture and land use, or the combustion of biomass, biofuels and biogas. The national target is to cut emissions by 5 per cent below 2000 levels by 2020. Under the scheme, 500 companies will pay a tax of A$23 per tonne of carbon from July 2012, rising by around 5 per cent a year, and move to a market-based trading scheme in 2015.
California climate change law (AB32)	To be launched in 2013, with the first permit auction in November 2011. Covers emissions from power plants, manufacturing and transportation fuels (starting in 2015). The target is to cut the state's emissions to 1990 levels by 2020. Most of credits will be allocated free in the early years, and emitters will be allowed to use offsets to fulfil up to 8 per cent of their compliance obligation.
Western Climate Initiative (WCI)	To be launched in January 2013, covering California, Canada's British Columbia and Quebec, and possibly also Ontario. The target is to cut emissions by 15 per cent below 2005 levels by 2020. Under the scheme, emitters such as power plants will have to buy offsets to cover their emissions.
South Korea emissions trading scheme	Expected to start in 2015, covering about 470 companies from all sectors that together produce about 60 per cent of the country's emissions. The South Korean government has set a 2020 emissions reduction target of 30 per cent below projected "business as usual" levels.
India: Perform, Achieve and Trade system	Trading is set to begin in 2014 after a three-year rollout period. It is a mandatory energy efficiency trading scheme covering eight sectors responsible for 54 per cent of India's industrial energy consumption. India has pledged a 20 to 25 per cent reduction in emissions intensity from 2005 levels by 2020. Under the scheme, annual efficiency targets will be allocated to firms. Tradable energy-saving permits will be issued depending on the amount of energy saved during a target year.
China: Pilot carbon trading schemes	In November 2011, China approved pilot tests of carbon trading in seven provinces and cities – Beijing, Chongqing, Guangdong, Hunan, Shanghai, Shenzhen and Tianjin. Some of the pilot regions can start trading as early as 2013/2014. A national trading scheme is expected by 2016.

Source: Authors' summary of Reuters factbox.**

** Reuters (2011). "Carbon trading schemes around the world." Available at http://www.reuters.com/article/2011/07/11/us-carbon-schemes-idUSTRE76A2GJ20110711.

The history of carbon emission trading in China

The introduction of the carbon-trading concept in China came with the adoption of the CDM in 2004. Since then, there has been growing interest in carbon markets within the Chinese government, leading to a recent decision by the National Development and Reform Commission (NDRC) to start carbon trading pilots in seven provinces and cities. This section describes some of the major development such as CDM related carbon trading, the establishment of the carbon exchanges, and carbon trading pilots – both regional and sectoral. But first, in Table 2 below, we provide a chronological summary of the major developments concerning carbon trading in China since 2004, with some key policy initiatives highlighted.

The 12th FYP is the first official government document that explicitly identifies carbon trading markets as one of the major measures for achieving the energy and carbon intensity reduction targets. It is also the first time that the issue of climate change is given a dedicated chapter, an unprecedented level of attention (Yuan and Zuo 2011). Carbon markets are mentioned, along with statistical and auditing systems for GHG emissions, among many measures to reduce energy and carbon intensities, without any detail (State Council 2011).

In late November 2011, the State Council Information Office released a White Paper on China's Climate Change Policies and Actions. In the White Paper, the government outlined in more detail its plans for "gradually establishing" a carbon market:

"China will, drawing on the experience of the international carbon emissions trading market while taking into consideration its actual conditions, gradually promote the establishment of a carbon emissions trading market. The country will further reform the price formation mechanism of carbon emissions trading by standardising voluntary trading in emission reduction and discharge rights, gradually establish trans-provincial and trans-regional emissions trading systems, so as to give full play to the fundamental role of the market mechanism in optimising the allocation of resources, and realize the objective of controlling greenhouse gas emission at minimum cost." (State Council Information Office 2011).

Table 2. Summary of major developments in carbon trading in China

Year	Major development
2004	After initial hesitation, China endorses the implementation of CDM in China. The National Development and Reform Commission (NDRC) issues a white paper with CDM guidelines.
2005	In October 2005, carbon trading under the CDM begins in China, administered at the national level by the NDRC. A CDM management centre to provide technical support is set up at the Energy Research Institute of NDRC. China starts to implement the 11th FYP, in which a 20 per cent energy intensity reduction is set as compulsory target. The policy measures, however, are predominantly administrative and political (i.e., command and control). On the other hand, SO2 emission trading is tested to reduce the total discharge of SO2 – another major compulsory environmental target for the 11th FYP.
2007	The NDRC issues China's first National Climate Change Program, laying out policies and actions to cope with climate change. Carbon markets are not highlighted.

2008	Establishment of several environment and carbon exchanges, including the Tianjin Climate Exchange, China Beijing Environment Exchange, and Shanghai Environment and Energy Exchanges.
2009	In the lead-up to COP15, China commits to a 40- to 45 per cent carbon intensity reduction by 2020 compared to 2005 levels.
2010	August: The Chinese government, through the NDRC, initiates low-carbon development pilots in five provinces and eight cities.* Carbon trading is encouraged as part of the overall development strategy. October: State Council, in the "Decision for Enhancing the Cultivation and Development of Novel Strategic Industries", mentions for the first time the establishment of carbon trading mechanism. In the same month, the Shenzhen Emission Exchange is established. October: China hosts, for the first time, a United Nations Framework Convention on Climate Change (UNFCCC) negotiation session in Tianjin. The Chinese government organises several side events on carbon trading markets. November: The outline of the 12th FYP is made public, listing carbon markets as one of the key measures for reducing carbon and energy intensities and coping with climate change.
2011	April: Officials from the NDRC (Department of Climate Change) announce that pilot carbon trading markets will begin in selected cities and provinces, with the hope that actual trading will start as early as 2013. November: The State Council issues the "Workplan for Controlling Greenhouse Gas Emission during the 12th FYP". The need to establish carbon trading schemes is highlighted. Immediately following the release of the Workplan, in mid-November, the NDRC officially approves carbon trading pilots in seven provinces and cities. The State Council issues its second White Paper on climate change policy and actions prior to COP17 in Durban.
2012/ 2013	Design phase of the piloting regions; the NDRC is expected to review and approve emission limits and allocation, as well as detailed implementation plans from the carbon emission-trading pilot regions.
2014	Pilot region carbon trading to be operational.
2016	National carbon emission trading system to be established in China.

* The five provinces are Guangdong, Liaoning, Hubei, Shannxi, Yunnan; the eight cities are Tianjin and Chongqin (provincial level), Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang (sub-provincial level), and Baoding (prefecture level).

Now we will examine China's experience with the CDM, the establishment and practice of the carbon exchanges, and the planned carbon trading pilots during the 12th FYP. We will then return to an overall assessment of the state of carbon trading market development in China.

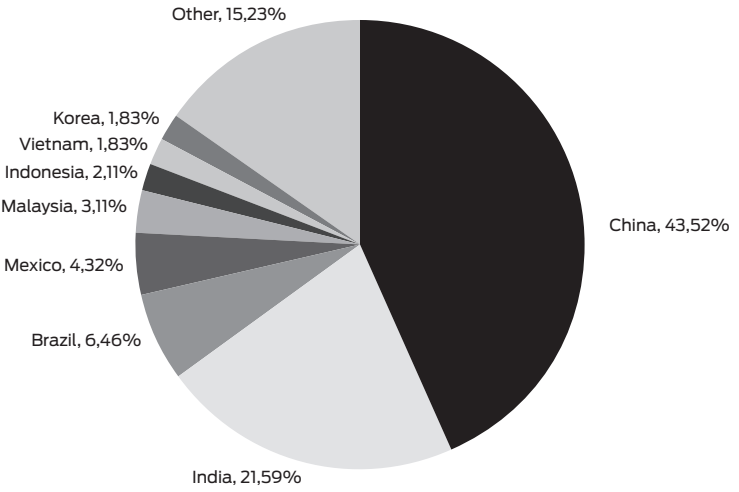
The Clean Development Mechanism: trading as it's known today

The Kyoto Protocol introduced three market-based mechanisms, of which the only one relevant to developing countries is the Clean Development Mechanism (CDM). The CDM is an offset market in which investors from developed countries obtain "carbon credits" by implementing a project in a developing country that reduces emissions relative to an agreed and verified baseline.

China endorsed the CDM in 2004 and issued the "Measures on the Operation and Management of Clean Development Mechanism Projects" in 2005.[3] Since then, China has quickly become the dominant CDM carbon credit supplier (see Figure 1). By July 2011, China had approved 3,154 CDM projects, mainly focusing on new and renewable energy, energy conservation and the enhancement of energy efficiency, methane recycling and reutilisation and other areas. A total of 1,560 Chinese projects have been successfully registered with the CDM Executive Board, accounting for 45.67 percent of the world's total registered projects, and the resulting certified emission reductions (CERs) has reached an annual issuance volume of 328 million tonnes of CO2e, accounting for 63.84

3. This CDM guideline was amended in 2010 to increase the efficiency of CDM project development, validation, and verification.

Figure 1. Figure CDM projects share by the end of 2011*



Source: UNEP Riso's CDM Pipeline http://www.cdmpipeline.org/.

* With the most recent data released in February 2012, the CDM project share of China, India, Brazil, and Mexico combined has dropped to 65 per cent. (http://www.cdmpipeline.org/).

percent of the global total (State Council Information Office 2011).

While the CDM has been a positive channel for introducing the concept and practice of carbon trading into China, it has a series of shortcomings that would differentiate it substantially from a functional domestic carbon trading system in China. First of all, the buyers are almost exclusively from outside of China, and thus it does not encourage competition within sectors or between regions in China to find low-cost ways to reduce carbon intensity and increase energy efficiency.

Second, while China means a great deal for the CDM, the CDM means much less for China in terms of actual emission reductions and what would be expected. Globally there about 3000 registered CDM projects, and it is estimated that from its inception to 2012, the entire CDM will have reduced global carbon emissions by about a billion tonnes of CO2 (Fankhauser 2011). Meanwhile, with a 10 per cent annual growth, China's CO2 emission reached 8.95 billion tonnes in 2010 (Olivier et al. 2011). This means, the one year increase from 2009 to 2010 in China is close to the entire reduction through CDM globally over the eight years. Comparing to other policy measures, China had avoided about 1.6 billion tonnes of CO2 emission through energy intensity reduction during its 11th FYP.

Third, uncertainty over the future of the CDM, is an increasing concern and consequent driver for China to develop its own stand-alone domestic trading system, while at the same time staking out its position in a global trading system (Liu 2011).

Lastly, envisioning the growing importance of the global carbon market, many in China now argue that, in the long run, being able to participate adeptly in international trading will be more profitable than selling CERs at a very low prices under CDM (Zhu, Huang, and Jiang 2010; FU and LI 2010; Lei et al. 2011).

It is worth noting that, out of the more than US$800 million in fees that it has levied on CDM projects, China's CDM Fund is currently working with its partners to determine which sectors are best to be included in a carbon trading system. The CDM Fund, managed by the Ministry of Finance, is also providing grants to different regional pilots.

Carbon trade exchanges and practice

China has seen a rapid establishment of many "climate exchanges", "carbon exchanges" or "environment exchanges" in recent years. In 2008 and 2009, the China Clean Development Mechanism Fund and Management Centre, the Tianjin Climate Exchange (TCX), the China Beijing Environment Exchange (CBEEX), and the Shanghai Environment and Energy Exchange (SEEEX) were established. In 2010, the Shenzhen Environment Exchange was established. In addition to those main four, China today has more than one hundred other "exchanges" either launched or under development, all aiming to trade carbon in the future.

Several important observations should be made about those exchanges. First, why have these exchanges been set up? Who drives the establishment of those exchanges? No doubt, carbon trading as a potential lucrative financial business opportunity has been one of the primary drivers. But, at the same time, the strong government support of those exchanges is also an indication that this is part of an overall national strategy of developing the basic "carbon trading infrastructure". On paper, none of the exchanges are owned by the government, as they are all registered as corporate environmental equity trading platforms. Yet all the exchanges have a strong government backing, either directly or indirectly. For example, the TCX, the first climate exchange in China, was set up as a joint adventure between the Chicago Climate Exchange, the municipal government of Tianjin and the asset management unit of PetroChina, the country's largest oil and gas producer. CBEEX, initiated by the China Beijing Equity Exchange (CBEX)

and authorised by the Beijing municipal government, has signed a deal with BlueNext[4] to build a platform for carbon credit trade in June 2009. It is interesting also to note that the CDM Fund bought a roughly 20 per cent stake in SEEEX when it officially opened in December 2011 (Chen and Reklev 2011).

Second, it is worth noting the two main types of transactions these exchanges are handling: CDM and so-called VER – Voluntary Emission Reductions. Facilitating CDM transactions has been the main carbon trading practice to date (see previous section), but as China moves towards implementing a mandatory cap-and-trade scheme, VERs could be used by companies as a way to gain deeper understanding on emission trading prior to the schemes' commencement. It has been reported that the Shanghai Environment and Energy Exchange has completed China's first "Standard for Voluntary Carbon Emission Reduction", approved by the NDRC in 2011. This is China's own "carbon standard", which standardises carbon emission measurement, verification, sectoral benchmarks, etc.[5] In addition to the carbon standard, it is expected that NDRC will release the "Interim Measures for the Administration of National GHG Emission Voluntary Trading Activities" before the end of 2012. Despite all the efforts and promotion by the exchanges, voluntary trading is virtually non-existent to date. Therefore, these exchanges are not currently providing significant carbon trading services, as their European counterparts do. They are mostly playing a public relations role at this moment, organising events on carbon trading, gathering carbon market

4. BlueNext is Europe's largest carbon credit exchange.
5. According to report, on 13 November 2011, the Shanghai EEEX completed the first carbon trading in the building sector in China according to the Standard. The trading was a symbolic 2012 ton carbon purchase by a real estate developer (Shanghai Hongtai Real Estate) with the price of 38 yuan/ton (about 6$).

experiences from abroad and undertaking research on what type of carbon market they may build in the future.

Third, what is the role of those exchanges in developing China's national carbon trading market? Exchanges might play a critical role – both at the regional and sectoral levels. The exchanges are working on establishing registries and developing standards and methodologies for trading Chinese emission reductions.[6] At this time the exchanges are closely linked with provincial and municipal government offices, which have nominated many of them to lead the execution of a registry system and platform for carbon trading in the near future.

Despite the efforts of exchanges and other stakeholders, China lacks the capacity to implement carbon trading on a large scale. The research-and-development function of exchanges could support the necessary capacity-building that is now at a very early stage. An example of a successful recent knowledge-sharing venture is the collaboration between CBEEX and BlueNext, which developed a voluntary offset standard together, known as the Panda Standard. This standard is foreseen to be used for carbon credits generated within the forestry and agricultural sectors, so as not to interfere with CDM-eligible sectors. However, only one project has been developed under the Panda Standard thus far. SEEEX also reportedly developed a project under the Carbon Standard for Voluntary Emission Reduction in mid 2011, but we could not obtain any detailed information about the project.

Without an established carbon trading business model at this time, exchanges have been searching for international funding and partnership opportunities with major international exchanges,

6. Climate Focus, Client Briefing

and running international collaborative programmes as well. For example, the TCX is working with the Asian Development Bank (ADB) to tailor its carbon trading platform (Liu 2011). The ADB has also funded work to develop a carbon finance district in Beijing (Dongcheng district) and to promote and enhance the CBEEX platform as a major carbon market in the country (Friedman 2010). While the NDRC has not yet clarified how carbon markets are to be piloted during this Five Year Plan, the exchanges are eager to establish themselves with talented staff and substantive business models so that they become cornerstones of any national or regional carbon market developments when the central government eventually takes the lead.

Pilot carbon emission trading

In addition to CDM-based carbon trading experiences, China's most significant step toward a full-fledged carbon trading system is the decision by the government to establish pilot cities and regions for carbon emission trading under the 12th FYP. The pilots are meant to test the waters and provide valuable lessons for the design of a national system in the near future. Their successes or failures will therefore have far reaching implications for carbon market development in China, not only in terms of government confidence and willingness, but also terms of trust in a national carbon trading market.

After much expectation, in November 2011 the NDRC ordered seven Chinese cities and provinces to set up pilot carbon trading systems during the 12th FYP, including Beijing, Shanghai, Tianjing, Chongqin, Shenzhen (the five cities) and Guangdong and

Hubei provinces.[7] [8] At the same time, there have also been various proposals for sector-based carbon trading schemes targeting energy-intensive industrial sectors (The Climate Group 2010). In this section, we first provide an overview of the carbon trading pilots, followed by a short case study of the piloting in Guangdong Province.

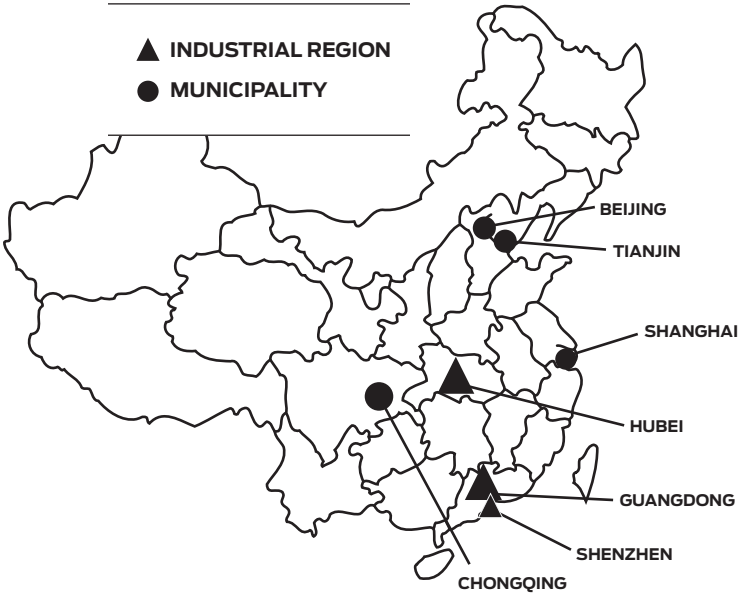
Overview of the regional pilots

The seven regional pilot sites (see Figure 2) were selected to reflect the regional diversity in terms of development. Many of them are also part of the low-carbon development pilots initiated in August 2010.[9] All piloting are required to submit proposals explaining how carbon emission targets will be allocated, establish a dedicated fund to support the carbon trade market, and present detailed implementation plans for approval by the State Council by the end of 2012. Afterwards, implementation will take place, with the goal of having pilot carbon trading at a regional level by 2014 and at a national level by 2016. During the pilot phase, local governments can decide upon the means of capping and select capped sectors themselves (Wu 2011).

The first step for the pilot regions is to set a carbon emission reduction target. While the State Council's targets for the cities and provinces are intensity-based, many of the pilot regions will set a target in absolute terms, particularly in relation to the cap established on total energy consumption.[10] The carbon exchanges

7. Among the seven pilot regions, Shenzhen city was added later as the only sub-provincial level cities. It is partly because of its location, and more importantly, for its history of always being a "testing ground" for major policy reforms in China.
8. Xinhua (2011). "China to pilot carbon trading scheme: NDRC." China Daily. Available at http://www.chinadaily.com.cn/business/2011-11/23/content_14145909.htm.
9. Except Beijing and Shanghai.
10. Reuters (2011). "China eyes steel, cement sectors for carbon credit trade-report." Available at http://www.

Figure 2. Map of approved pilot carbon trading schemes in China



will then allocate permits based on the calculation of the respective sectoral average emissions, but making the permitted amount somewhat lower than the current average in order to begin reducing emissions.

The pilot sites that will take on and test various modes of trade, are currently at different stages of development, and are opting for different implementation paths. For instance, Guangdong province

reuters.com/article/2011/08/04/china-emissions-trading-idUSL3E7J407J20110804.

aims to design China's first regional carbon market with trading in key sectors. The Guangdong Provincial Government has delegated some local research institutions to propose an implementation plan. In the next two years, they will be looking at every aspect of the EU ETS for lessons they can apply locally, including modelling to set emissions targets, analysing impacts on sectors and deciding on allocation methods. Legal frameworks and GHG monitoring, reporting and verification (MRV) principles will also be examined. Guangdong may consider inter-provincial trading, which could eventually pave the road to a national Chinese carbon market (Wu 2011). Authorities in Guangdong and Hubei have already expressed interest in establishing carbon trading together, but it is currently unclear how these jurisdictions might eventually collaborate. The Shanghai province authorities have commissioned an options study for the use of carbon trading in the building sector.[11]

The Hubei Development and Reform Commission recently designated Wuhan Optics Valley United Property Rights Exchange to help design and implement the provincial carbon market. The exchange will decide the total amount of CO2 that the participating companies will be allowed to emit each year, distributed in the form of emission permits. In the initial trading phase, which is slated to start in 2014, it is anticipated that between 50 and 100 Hubei-based companies will be required to participate. The selection of the participating companies will be made by the Department of Environmental Protection of Hubei province.

Based on the current status of the seven regional pilots, it seems that Guangdong is taking a lead with strong political will, understanding, and pure determination to pilot emissions trading.

11. Climate Focus, Client Briefing

The Guangdong ETS pilot case

Guangdong Province is located in southern China and is a main thoroughfare to the Pearl River Delta region. Guangdong's GDP in 2010 reached $689 billion, making its economy roughly the same size as that of Turkey or Indonesia. The province is now one of the richest in the nation, with the most billionaires in mainland China. It possesses about 50 per cent of the region's power generating capacity, most of it from thermal power plants.

Guangdong has the highest carbon emissions of any Chinese province, 500 million tonnes of CO2e per year. In the 12th FYP, the central government gave Guangdong provincial authorities a target to reduce the carbon intensity per unit of GDP of their economy by 19.5 per cent from 2005 levels by the end of 2015 and 45 per cent from 2005 levels by the end of 2020.[12]

The Guangzhou Institute of Energy Conversion (GIEC) under the Chinese Academy of Sciences is in charge of the design and implementation of the Guangdong pilot Emissions Trading Scheme (GD ETS).[13] The institute is working closely with the Guangdong Academy of Social Sciences and the Development and Reform Commission of the Guangdong Province. They are evaluating the implications of setting up an ETS covering the power generation and building material sectors. Specialist teams are undertaking the tasks of establishing a GHG emission inventory, monitoring system, registry and emissions trading platform.

GIEC is responsible for compiling the GHG emission inventories of industrial production in Guangdong. The GIEC team is

12. Bloomberg BNA (2012), "China's Guangdong Province to Cut Carbon Intensity 19.5 Percent by 2015, 45 Percent by 2020." 11 January. Available at: http://climate.bna.com/climate/summary_news.aspx?ID=186881.
13. Guangzhou Institute of Energy Conversion (2011). "'Building Guangdong ETS: Design of China's first regional carbon market with pilot study in key sectors' Project Launched." Chinese Academy of Sciences, 22 September. Available at http://english.giec.cas.cn/rh/rp/201109/t20110922_75493.html.

almost finished calculating GHG emissions from cement production, lime production, iron and steel production, magnesium processing, equipments production for electrical power transmission, semiconductor production and HFC production in the province.[14] Workshops were held with industry associations throughout 2011 in order to facilitate interaction with the private sector, although no companies have been directly involved in GD ETS discussions at this point.

The Guangzhou Exchange Services Group has been identified to host trading under the GD ETS. The exchange is part of the main research group that is working on the registry software design and trading platform. This work is at a very early stage, though some observers expect for technical specifications to be included that would allow for CERs from CDM projects in other Chinese regions to be traded on the exchange platform and stored within the registry system. Inter-provincial trading with Hubei is a possibility but discussions on how regional linkage might take place have not begun. ETS cooperation between municipalities and provinces might require the direction to be set at the central government level.

Some challenges currently confronting the design team involve GHG measurement and the allocation of reduction responsibility. While both matters have been dealt with under the EU ETS, special consideration will be given to industrial conditions in Guangdong. The challenges related to GHG accounting, monitoring and allocation will depend significantly on the amount of inter-departmental collaboration in the Guangdong government,

14. Guangzhou Institute of Energy Conversion (2011). "GIEC Convened Guangdong GHG Emission Inventories Preparation Seminar." Chinese Academy of Sciences, 30 January. Available at http://english.giec.cas.cn/rh/rp/201101/t20110130_64928.html.

as departments have been measuring and monitoring related targets for many years. For example, the Environmental Protection Department (EPD), which manages Guangdong's Sox/Nox programme, the Economic & Information Committee (EIC), which manages energy intensity goals, and the Guangdong Science & Technology Department (GSTD), which manages total energy consumption goals, could work together in order to get the GD ETS off the ground in an expedient manner. The climate division, which manages the carbon intensity goal, is newer and has fewer resources than the aforementioned divisions. Strong intergovernmental cooperation would help the GD ETS to start trading in 2013.

GIEC considered and evaluated the options of trading in carbon intensity or absolute emission levels for many months before opting for an absolute cap. Although such a cap could affect growth in some sectors, Guangdong is likely to place absolute caps only on sectors that don't expect significant near-term growth, such as iron and steel production. Otherwise, GIEC may select entities within a sector without including entire sectors to participate in the GD ETS. Both scoping methods are being assessed as options for permit allocation. Regulators do not want to seriously dampen growth for the sake of meeting carbon intensity targets.[15]

Similar to the EU ETS, the GD ETS will likely trade units denominated in tonnes of carbon dioxide equivalent (tCO2e). The scheme might also trade CERs, possibly analogous to those now traded in the EU ETS.[16] The NDRC currently states that China will

15. Guangdong has announced a CO2 cap of 660 million tonnes in 2015, a 30 per cent increase on its 2010 emissions. http://www.pointcarbon.com/news/1/1798440.
16. Point Carbon (2011). "Guangdong CO2 trading scheme to allow U.N. offsets." 27 September. Available at http://www.pointcarbon.com/news/1.1590804.

pilot emissions trading as well as develop CDM projects, without going into further explanation on how both systems could function mutually in the same jurisdiction. With mutual acceptance of equivalent international offset credits, carbon prices in the EU ETS and GD ETS would be indirectly linked. However, without knowing details on how the target will be allocated in Guangdong, it is too early to presume the degree of connectedness. However, a significant GD ETS cap will surely raise the price for Chinese CERs, as well as those traded in Europe, and thereby encourage the further development of CDM projects in China.

International investors in CDM projects should welcome the implementation of the GD ETS, as it signifies another possible demand source for their product.[17] While European governments have expressed an aversion to new CDM projects in China post-2012, the GD ETS is being structured in a way that could offset the lost European demand. A deeper understanding on how this might work will come as CER eligibility details for the GD ETS are released in the coming months. But if a pilot ETS in China is open to foreign investment and participation, it should be viewed as a Chinese vote of confidence for the international offset market.

When viewed alongside the other pilot ETS zones in China, Guangdong's current stage is quite far advanced. The provincial government has strong intent to become a model for the low-carbon economy across China; a well-designed ETS is a pillar of a broader low-carbon plan.[18] As all seven pilot zones gear up for emissions trading, focus should remain on activities in Guang-

17. Carr, M. (2012). "China May Withhold Carbon Offsets After 2015 to Meet Own Goal." Bloomberg, 30 January. Available at http://www..bloomberg.com/news/2012-01-30/china-may-keep-emission-offsets-after-2015-adb-official-says.
18. China CSR (2009). "Guangdong Will Pilot Development of Low-carbon Economy." 26 November. Available at http://www.chinacsr.com/en/2009/11/26/6665-guangdong-will-pilot-development-of-low-carbon-economy.

dong, and the Pearl River Delta region. Officials in the region have a history of success and a flair for innovation and international dealings. When the Chinese national government pilots policies and measures, it looks for successful cases to expand upon. The GD ETS might become the model for a China national ETS that is said to be under discussion for the 13th Five Year Plan. [19]

Depending on the outcome of the current design and implementation process, the GD ETS could eventually link directly with ETS in other jurisdictions, such as the EU ETS, New Zealand ETS, Australia ETS and more. Design decisions for the GD ETS that are made during this time could have a profound impact on the linkability of the scheme in the years ahead. Observers and GHG trading experts from abroad should provide their insights on the design and execution of the GD ETS if they are approached. The Chinese stakeholders in this market are hungry for new ideas and foresight. A GD ETS that exemplifies transparency, liquidity and environmental integrity is in the best interest of both the local and international carbon market communities. Much work still needs to be done on the GD ETS pilot to make sure that it meets valued market criteria, although provincial research teams appear to be headed in the right direction.

19. Argus Media (2012). "China moves towards outright emissions caps." 16 January. Available at http://www.argusmedia.com/pages/NewsBody.aspx?id=782198&menu=yes.

Sector-based carbon emission trading

In addition to the seven regional carbon-trading pilots, China is also preparing for experimentation with sector-based carbon trading market development. This section looks at the power and building sectors as examples.

The electricity sector

Studies have suggested that energy-intensive sectors and large emitters should be included in trading programmes first. As in many nations, the electric power sector in China is often a top candidate, as it is consolidated into "the big five" power companies (Huaneng, Datang, Haidian, China Power Investment Corporation, and Guodian) and provincial owned power producers, so implementation is easy relative to other industries. Consequently, the power sector is extremely important.

The power sector has piloted several important projects. According to the Energy Resources Institute, a research institute under the NDRC, two of the top five power companies (Datang and Guodian) have started piloting GHG emissions measurement and reporting in preparation for future trading. In a small group of power plants, trading simulations were expected to roll out but were delayed because there was no incentive to accurately report data and no reward for early participation.

In 2010, China implemented "inter-grid trading" among regional grid companies to save energy; this programme adjusts the distribution and usage of electricity across regions. Although power companies are taking important first steps towards a carbon market, they require stronger incentives. One of the big concerns for the power sector is how carbon pricing can work

when the price of power is regulated by the market. The Chinese power sector is especially susceptible to any increases in operating costs, as the price of electricity in controlled by the central government. Some Chinese power generators are already operating at a loss, due to rises in energy commodity prices without corresponding increases to the electricity price. This leads Chinese policy-makers to be cautious and conservative as China studies how industry-wide emission targets could be implemented in its electricity sector, which relies heavily on coal, the biggest source of CO2 pollution.

The building sector

The Chinese building sector consumes more than 650 million tonnes of coal-equivalent annually – more than Germany's total primary energy consumption. With the on-going rapid urbanisation, 2 billion square meters of new buildings are built in China every year. At the same time, of the existing buildings, 80 per cent are classified as "non-energy efficient", with excessive energy demand for heating and cooling (Greiner and Lieberg 2011; Wu 2011). Previous instruments addressing energy efficiency in buildings range from mandatory efficiency standards and subsidy schemes to energy consumption monitoring. These instruments, however, have failed to incentivise comprehensive approaches to energy savings and emission reductions. Energy efficiency standards – the main tool to stimulate energy efficiency – are limited to the building design, without any requirements on efficiency levels during building operation.

To effectively incentivise emission reductions, a scheme has to target actual emission levels, while allowing for flexibility in

reducing emissions. This is where a trading scheme can provide a viable alternative or complement the existing policy framework. The Chinese Ministry of Housing and Urban-Rural Development (MOHURD) has developed different options for carbon trading for the building sector (see examples in the text box). The options are about to be tested in a handful of pilot cities. While MOHURD's primary intention is to put a lid on the huge amount of energy that is wasted, the application of a carbon trading scheme in the building sector has to be aligned with China's overall climate change strategies. At the moment, MOHURD is among the first to present detailed options for a carbon trading scheme among the sectoral ministries. The Beijing Development and Reform Commission (DRC) has recently indicated that major public buildings will be covered under Beijing's pilot ETS (Wu 2011).

The dilemma with both the electricity and building sectors is that they are both growing rapidly, so concerns over the potential impact are really barriers to implementing sector-wide schemes. Using the same logic, other sectors such as cement, iron and steel are less controversial, as the growth rates of those sectors is expected to start to decline in the near future.

Cap-And-Trade for Non-Residential Buildings

This is the first trading scheme proposed to cap the emissions of large non-residential buildings:

· **Participants:** Mandatory for owners of buildings with a floor area exceeding 20,000 m2.

▪ **Target:** Each participant receives an allocation of allowances reflecting the emissions to which he/she is entitled over the compliance period. The amount of allowances is determined on the basis of historic emission levels, factoring in a reduction by a pre-defined percentage. In case of new buildings, emission benchmarks are established using modelled energy consumption based on building design and the mandatory building code applicable to the respective region.

▪ **Organisation:** In order to maintain emissions within stipulated levels, owners of targeted buildings are in charge of implementing measures to reduce carbon emissions, including energy management, energy retrofits and the application of renewable energy technologies. By the end of each compliance period, an independent third party verifies the amount of emissions the building has generated, based on which the building owner is required to submit a corresponding number of allowances. In case the emissions of a building exceed the allowed levels, its owner is required to purchase additional allowances –or pay a penalty. Excess allowances can be sold.

Controlled Growth of Emissions from Heat Supply Facilities

This proposed trading scheme caps the emissions from existing large-scale heat supply installations while allowing the sector – and potentially emission levels – to grow to supply heat to new settlements.

Participants: The scheme targets all heat supply facilities of a certain scope.

Target: Existing facilities receive free emission rights that reflect their historic emissions. At the same time, they face the obligation to reduce emissions by a pre-defined percentage. Emissions of new heat supply capacities have to be offset with emission reduction credits, or additional emission rights have to be purchased.

Organisation: The participants are obliged to reduce carbon emissions through retrofit of the heat generation facilities, improvements of heat transmission grids and increases in energy efficiency in the buildings connected to the heat supply system. For any emission reduction beyond the stipulated target, tradable energy reduction credits can be claimed that have to be verified by an independent third party. At the end of a defined compliance period, all participants have to hold emission rights equivalent to their emissions and meet the required emission reduction targets.

Source: (Greiner and Lieberg 2011)

An overall assessment of the state of development of carbon markets in China

From this review, we can draw several insights:

China's domestic carbon emission market is still in an R&D stage. Despite its strong momentum and heated attention and discussions, carbon market development is still at the infancy stage. By any real measure, there is no functional carbon trading market in China, aside from the CDM, to date.

There are basically two types of carbon markets: the voluntary market and the regulated market. China does not yet have a regulated market by far, and the experiments with the voluntary market are limited and therefore could be considered as unsuccessful. Researchers at the Beijing and Tianjin exchanges told us in interviews that there have only been a handful of deals since the exchanges were founded in 2008, and most of them are more symbolic than practical. Yan Xiong, the honorary director of the board for the China Beijing Environment Exchange, told China Youth Daily in an interview at COP17 in Durban that carbon trading market in China now is still at the stage of discussion and strategy-making. Much of the trading is for "show" rather than indicating any substantial progress.[20] Yet, the increasing consensus is that, sooner or later, carbon trading market development is inevitable in China.

20. According to a report from the China Youth Daily (November 22, 2011), since it was established in 2008, the total carbon trading handled by the China Beijing Environment Exchange (CBEE) is about 3 million tonne, which is less than what happens in a day in the EU ETS.

The current carbon trading activities are primarily under the CDM. China's carbon trading is almost exclusively CDM-based. China has been the biggest seller of carbon offsets through the CDM system. In 2009 alone, Chinese sold carbon credits worth nearly US$1.3 billion, according to the China Beijing Environmental Exchange.

Yet the CDM is becoming insignificant as a source of support for emission reduction in China. First the CDM Executive Board rejected 10 wind power projects from China in early 2011, then in July 2011, it rejected another 20 CDM projects from China, including 11 wind farms and 9 hydropower projects, citing additionality concerns. For these reasons plus the uncertain future of the Kyoto Protocol, China will be reluctant to depend significantly on the CDM, politically and economically, for attaining international low-carbon finance (Wu 2011).

The coming five years will test the future of carbon markets in China. With the seven regional carbon trading pilots and potentially other sectoral based pilots initiating under the 12th FYP, China will be moving into an intensive phase of testing carbon trading domestically. The success or failure of those experiments will to a large extent determine the future (at least the near future) of carbon markets development in China. These efforts will have a great impact on the potential for China to meet defined carbon and energy intensity goals and the global effort of climate mitigation. As called for within the Guangdong ETS case study, now is the time for input and influence from the international communities with expertise and concern. The stakes are high.

Chapter 3

Critical Issues

As we noted, there are virtually no carbon trading experiences in China from which lessons can be drawn. But important lessons can be relevant from similar experiences. While carbon emission trading is new in China, experimentation with environmental pollution emission trading can be traced back to the late 1980s and early 1990s, when China shifted environmental quality management approach from "concentration standard based" to the so-called "Total Loading Control" or the "Total Control Policy".[1] A series of pilot tradable pollution permit projects were launched at city level in the early 1990s.

There had been major piloting programmes for environmental pollution trading. For example, from 1990 to 1994, the State Environmental Protection Administration (SEPA, now known as the Ministry of Environmental Protection) implemented a major pilot programme to promote the usage of emission permits, covering 16 large cities, and allowed six cities to trade pollution permits among themselves. The programme did not achieve much success, however.

1. The first environmental markets were set up in the U.S. in the 1980s and 1990s. Most notable was the U.S. Acid Rain Program, which created a market for sulphur dioxide emissions trading.

Since the late 1990s, there have been numerous international collaborations exploring pollution permit trading in China. For instance, in 2001, SEPA and the U.S.-based Environmental Defense Fund (EDF) initiated a major cooperation project, which experimented with emission trading in four provinces (Shandong, Shanxi, Jiangsu and Henan), three cities (Shanghai, Tianjin and Niuzhou), and two of the nation's largest power production companies (Hua Neng Group).[2] The results, again, were limited.

In 2002, SO2 emission trading was suggested by the State Council of China as part of its 10th FYP for Preventing and Controlling Acid Rain. The experience with SO2 emission trading was still largely unsatisfactory. In 2004, SEPA issued a proposal for regulations of emission permits, stipulating that emissions and discharges from polluting sources would be regulated through a permit system and the system would be implemented on an "area-by-area" and "step-by-step" basis (Change and Wang 2010, 3361). "Pollution permit" systems do exist today in China and are administrated by the environmental protection bureaus at all levels. As part of the administrative and bureaucratic system, those permit systems, however, were never fully market-based. They mainly served the role of legitimising pollution fines and, to some extent, encouraged pollution control technology upgrading.

Those experiences, while in the past and not focused on carbon trading per se, do raise serious concerns about the prospect of future carbon emission trading market development in China. Based on a review of environmental regulation and emission trading experimentations in China over the past 20 years, Chang and Wang (2010) identified three main lessons learned:

2. Also known as the "4+3+1 Programme".

- Accurate emission measurement is the foundation, and the current situation in China is far from satisfactory.

- The legal system is lagging behind. Emission rights and permits, trading rules, monitoring, collection of emission data, verification, enforcement and punishment for non-compliance – all those key aspects that enable a functioning emission trading scheme need to be backed up by and embedded in a solid legal system. Lack of legal support in two specific areas – accountability and permit allocation – were highlighted.

- There is a lack of administrative capacity, particularly in terms of the cross-level and cross-sectoral coordination.

The sulphur dioxide emission trading during the 11th FYP – to date the only emission trading practice for atmospheric pollutant in China – is the most recent relevant experience from which useful lessons can be drawn about critical issues concerning the development of carbon trading markets (Chan et al. 2012; Lu 2011).

An in-depth study of the Taiyuan SO2 emission trading programme by Lu (2011) largely confirmed the lessons cited above. The Taiyuan SO2 emission trading is representative of a major emission trading programme established during the 11th FYP. Based on the SO2 emissions permits allocated in 2007, the top 45 emitters were selected as the participants, which covered 99 per cent of total emission in Taiyuan city. Lu found the programme was not successful. Table 3 lists some key reasons indentified

by the interviewed company managers and the trading system administrators, which in this case is the Taiyuan Environmental Protection Bureau.

Table 3. Key failings of the Taiyuan SO2 emissions trading market.

Insecure emissions rights due to defective design
Unreasonable linkage policy
Asymmetric information causes weak implementation
The government administrative department lacked the enthusiasm of regulating the emissions trading market
There is no emissions exchange due to weak market structures
Most enterprises did not fully understand emissions trading
The alternative methods for complying with the caps were effective
It was difficult to reach an agreement on the emissions trading price
There were not enough participants in the programme

Source: Lu (2011, P35), based on interviews with company managers and trading system administrators.

Tao and Mah (2009), in a thorough assessment of the SO2 trading pilot programme, concluded that the success of the trading schemes have been constrained by major governance capacity problems at the state, policy-making and administrative levels. Furthermore, they argued that these problems reflect deeper and more profound dilemmas of market transition experienced by the Chinese government in the past three decades, which has resulted in a "state-led" pseudo-market, instead of a full and "autonomous"

market for emission trading in China (Tao and Mah 2009).

Below we apply these lessons to the development carbon market in China.

Emission right/limit allocation

The departure point for any emission trading scheme is setting an emission cap and, based on that, distribution of emission allocations, with equity and efficiency as key principles to consider. With different economic structures and growth rates, there is substantial difference in energy consumption and carbon emissions across Chinese provinces. For instance, in 2008, the province with the highest GDP (Guangdong) had a carbon intensity six times higher than the province with the lowest GDP (Tibet). At the same time, there is also considerable variation between GDP levels and carbon intensities. In allocating emissions, while various approaches and principles have been proposed by various research institutions in China (e.g., Li and Han 2011; Wei, Ni, and Du 2011; Yi et al. 2011; Zhou et al. 2011), given the wide economy and emission intensity discrepancy of Chinese provinces, this will be far from straightforward.

Designing two different hypothetical carbon schemes, a paper by Li and He (2011) looks at the implication of different principles of emission permit allocations for different provinces. The two quota allocation systems tested in the paper are an emission quota per province based on historical emissions (the larger the historical emissions, the greater the emission rights available), and an emission quota based on carbon emission per capita (larger populations get more emission permits).

Li and He find that from an equity perspective, both scenarios will increase the regional disparity relative to no emission trading. The per capita scenario is somewhat "fairer" and also results in substantially more trading than the historical scenario. This is because in the historical scenario, allocations are more or less consistent with current demand, thus resulting in limited trading of quotas. They also find that the western provinces with rich energy resources but scarcer populations relative to the eastern provinces will face the largest welfare losses in both scenarios, compared with other provinces. In contrast, the developed provinces in the eastern parts of the country with high emissions and low emission intensity will suffer small welfare losses.

In practice, emission target-setting in China is still largely by command and control. With the national 12th FYP carbon intensity reduction target set (17 per cent), the State Council will allocate the corresponding targets for the provinces and cities according to their varying economic and energy use context. For example, Guangdong has a target of 19.5 per cent, 2.5 percentage points higher than the national one. The "emission right" of the provinces therefore will be derived from the carbon intensity reduction target which they are obliged to achieve.

An additional challenge for emission quota allocation is the lack of reliable carbon emission data, which makes it very hard to decide on the "realistic target", creating the risk that emission limits will be set either too high or too low.

Monitoring, reporting and verification

MRV of emissions in China has been central to the international climate negotiations and related press coverage, but has in recent years moved from controversy to a constructive and cooperative discussion. Most recently this was seen at COP16 and COP17, where China was open to developing a process for international consultation and analysis, leading many observers to believe that such differences can and will be overcome in the next few years. In fact, China said at the fourth round of the UN climate talks in Tianjin in October 2010 that it is working on an up-to-date, national greenhouse emission database, the first publicly available database to include provincial level data since 1994.

However, China still lacks essential legislation and enough third-party verification companies to support domestic carbon trading. Issues where progress is needed include designing legal frameworks to developing a system for monitoring, reporting and verification of emissions data. Nevertheless, China does already have some existing infrastructure in place for measuring pollution such as sulphur oxides (SOx) and energy consumption, including a handful of designated third-party verification companies (determined by the NDRC).

China has only recently started developing the MRV framework for the implementation of a carbon trading scheme. This includes the development of national GHG inventories,[3] monitoring and verification standards, the establishment of trading infrastructure at exchanges, and the regulatory framework.

3. The Energy Research Institute of the NDRC and other research institutes are developing GHG inventories for different sectors of the economy and establishing a GHG inventory database. This allows for quantifying emission levels and defining emission reduction obligations for specific sectors.

Absolute cap vs. intensity-based target

There is no consensus in China on whether an emission cap should be absolute or intensity- based. An absolute carbon cap has the advantage of making emission reductions predictable. The alternative approach, a carbon intensity cap, is less controversial within China, because it is seen as more compatible with the needs for continued GDP growth. On the other hand, intensity- based targets do reduce the environmental certainty by linking the absolute impacts closely with the speed of the economic growth.

In contrast to the EU ETS, it seems a carbon cap in China (either absolute or intensity-based) would still allow for emissions growth early on to accommodate development needs. For example, total emissions could still increase in a trading scheme, but increase less compared with a model in the absence of trading. This is the target-setting approach that South Korea recently spearheaded during legislative debates on emissions trading. Otherwise, Chinese authorities might cap only a few select installations during the pilot phase. Any trading schemes designed are meant to help China achieve the short- (within the 12th FYP) and medium-term (to 2020) targets effectively but not far beyond. In this sense, carbon emissions will still be growing in real terms. As a result, a declining cap is currently considered unfeasible by many.

There are also proposals to include a nationwide "energy cap" and trade quotas based on energy consumption. Regions that are not going to develop ETS pilots can still impose energy caps in some sectors. If applied in ETS pilot areas, energy caps should

be calculated that are harmonious to carbon caps of the trading programmes. However, there is no agreement as to whether China will implement national energy or carbon caps (Wu 2011). It was reported prior to the official publication of the 12th FYP that China will cap the total energy consumption by the 2015 to 4.1 billion tonnes of coal equivalent (tce)[4], but this proposed ceiling was not included in the official plan of the 12th FYP. Nevertheless, one may think that this absolute tce "cap" could serve as a "hidden" reference point when the national target is distributed at the provincial level.

Integration of carbon trading scheme with other market instruments

During the 12th FYP, it is also highly probable that China will initiate environmental/carbon taxation, either for pilot testing or to be adopted nationally. While this is feasible, it is unclear how taxes will be integrated and coordinated with the carbon trading market.

Some of the pilots may adopt the Australian model, a combined "carbon tax to carbon trade". During the initial years, a yearly increasing but fixed carbon price will be paid by all to purchase carbon emission permits; then the scheme will "liberalise" the carbon price and leave it to be decided by the market, so carbon trading starts to take place to sustain the market.

In addition to potential carbon taxation, during the 12th FYP, China will also implement a variety of measures to adjust its industrial structure, energy structure, and to improve energy con-

4. China's annual energy consumption reached 3.25 billion tce in 2010. If the current trend continues, China will consume about 5 billion tce by 2020, equivalent to about 13 to 14 $GtCO_2$.

servation and use efficiency, as well as increasing forest coverage. Those measures will be a mix of administrative and market-based instruments, including carbon trading schemes. The overlap between the low-carbon development pilots and the carbon trading pilots illustrates this – as we noted, most of the carbon training pilot sites are also low-carbon development pilot sites. In other words, carbon trading is meant to be integrated into the overall low-carbon development strategy.

One complementary feature would be to reform the electricity pricing system in China, which many argue is fundamental (but often overlooked) in establishing a carbon trading system in China. What is needed is an energy/electricity market where power plants have the ability to purchase electricity at varied price levels. Chinese wholesale and retail electricity prices are currently set by the NDRC, which is good for reliability and supply but would limit the ability of a power plant to absorb a carbon price. In such a situation, one also might not be able to expect a market-based carbon price to reflect the real cost of making emission reductions. Power plants will need more flexibility in fuel sources and price to reduce emissions efficiently and effectively.

Linkage with existing trading schemes internationally

The prospects for eventual integration of the Chinese carbon trading market to the existing international trading schemes remain unclear, given that the pilots are all under design and won't be operational for some time. In general, since part of the piloting is to test the various existing models (i.e., the EU ETS, the Austral-

ian "Tax + Trade" model) and their suitability for China, those schemes are being carefully researched in China. This may enable an easier integration if desired later.

Domestically the integration of regional as well as sector-based trading schemes still needs to be sorted out. Detailed regulations are needed to ensure the interchangeability of carbon credits from the different regions and sectors, uniformity of standards and consistency in monitoring and verification. A similar framework would be required to link the scheme to carbon markets in other countries. For the time being, however, the focus is on regional market development.

Shortage of technical knowledge, human resources and market-oriented behaviour

"Carbon trading is not only new to the businesses that we hope will be part of the trading, but also for many of us who are in the trading business," one of the researchers we interviewed at the China Beijing Environment Exchange said. The shortage of experts qualified to design and administer carbon exchanges is a common challenge for all the pilot regions. The Wuhan carbon exchange team, for example, had only five staff members in 2011.

Since the government fixes electricity and energy commodity prices, corporate executives and financiers would have little practical knowledge on how to effectively manage an emissions portfolio. Even if a carbon market were effectively set up in China at this point, traditional corporate behaviour and resistance could prevent any substantial trading from taking place. Changing the

behaviour of financiers and the industrial workforce could take years. Lessons learned by Chinese entities while operating in the CDM market might be only loosely transferrable to managing emissions for compliance purposes underneath a cap.

The demand for support from international communities with expertise is strong. International support and advice is therefore not only welcome but also critical. One of such support is currently through a major Asia Development Bank grant (US$750,000) to support the Tianjin municipality to lay the groundwork for its carbon emission trading system, which is also aimed to begin operation in 2013. The ADB will help to design the platform, including the trading rules and regulatory framework, as well as supporting the commissioning of the trading platform.

4

Chapter 4

Conclusion

As shown in this report, China has demonstrated a growing desire to establish carbon emission trading schemes as part of its overall strategy for achieving both domestic and international energy and carbon intensity reduction goals. However, our assessment indicates that, while much has been discussed and planned, there is no domestic carbon trading in China yet by any real measure. The on-going carbon trading activities in China today remain limited to the Clean Development Mechanism.

That said, China has shown a strong interest of experimenting with carbon market trading. The debate and hesitation, if there ever were any, is over now. The factors driving China's determination are both internal and external. Internally, China is keen on shifting much more towards the use of market-based instruments to reduce the cost and increase the efficiency of its efforts to reach carbon and energy intensity goals, which are essential to its energy security. Lessons learned from the 11th FYP – the inadequacy of heavy reliance on administrative and political measures – serves as a big motivator. Externally, the limitations and uncertain future of the CDM, the significant financial potential for new global or regional carbon markets to emerge, as well as the possible emer-

gence of "new market mechanism" from the international climate negotiations are all factors that motivate China to establish its domestic carbon trading system in a timely fashion. Thus, there is little doubt that China would have an eye on the future potential integration with other existing international carbon trading systems such as the EU ETS, or other regional ones in the Asian Pacific rim, such as in Japan and Australia, so that China can benefit from global or regional carbon trading. In the short term, however, the focus is on testing it domestically.

By all indications, the coming five years will be an intensive period of experimentation with carbon trading schemes. The economic impacts that the ETS pilots have on the Chinese economy by the end of the 12th FYP may determine whether or not China implements a national ETS. The hope is that a carbon trading system will be economically advantageous compared to the administrative methods used in the 11th FYP. If carbon trading can help China meet its energy efficiency goals in a more cost-effective and politically popular way than dividing reduction goals by province, it will likely move forward (The Climate Group 2010).

This leaves one final question: What is the proper measure of success for a carbon trading market in China? Looking into the future, the ultimate and perhaps most critical issue is still the uncertainty about whether a carbon trading scheme – meant to be a strong market-based instrument –can function well without a mature free-market economy. Around the world, for all the existing carbon trading systems (excluding offsetting mechanisms such as CDM), the mature free-market economy has been the given condition. After more than three decades of market economy-oriented reform, on one hand, China today is closer than ever to

a real market economy. On the other hand, it still differs from a mature free-market economy in several substantial ways, including heavy government control and intervention, the significant share of the state-owned enterprises, as well as a non-liberalised price control system and distortions within the financial sector, not to mention the widespread corruption and the lack of trust in business culture. These all would have profound implications on the operation of a carbon market, even with good rules and design. Enforcement, as has been learned from many other environmental and resource management experiences in China, may prove to be the missing piece that renders large scale carbon trading schemes in China improbable in the near future.

On the other hand, China's determination has served it remarkably well in many other ways in the past decades. That same "crossing the river by feeling the stones" spirit could well enable China to build its own unique kind of carbon market that is innovative and effectively curbs the soaring emission growth in China.

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China has embarked on one of the largest endeavours in climate economics ever, to establish a national carbon emission trading system by 2015. As a first step, carbon-trading pilots have been initiated in seven provinces and cities. The success or failure of those experiments will to a large extent determine the future of climate policies in China. This report evaluates the progress so far and examines the key challenges ahead. While the attempts to develop a domestic carbon trading are sincere and ambitious, there are considerable difficulties. Many of the challenges are not particular to China, but common to any emission trading system. But there are also more profound worries about how to operate a market-based instrument given the current shortcomings of the Chinese market system in general.