IDDRI

SciencesPo.

Learning Platform
CLIMATE POLICIES

www.learning-platform.org

WORKING PAPER

N°17/11 DECEMBER 2011 | CLIMATE

What are the key issues to be addressed by China in its move to establish Emissions Trading Systems?

Elie Bellevrat (IDDRI)

METHODS AND APPROACH

- The ETS should be a tool at the service of the transformation of the Chinese economy, and it must be considered in a broader low-carbon development strategy.
- Elements of the ETS design should be in line with the national and/or provincial Chinese context and the objectives assigned to the instrument.
- Paying due attention to the consistency of the energy and climate policy package in which the ETS is inserted is of paramount importance, bearing in mind the long-term decarbonation objectives.

LESSONS FROM THE EUROPEAN EXPERIENCE

- The initial negotiations process may be long and tough in order to gain stakeholders' support, with many political implications and obstacles encountered.
- The EU ETS is working with a resulting price and a minimum of liquidity, despite real scarcity has never been encountered and a sometimes hectic and low-carbon price.
- Market participants do not necessarily act as rational agents in the carbon market, especially in the early development of the ETS.
- Institutional aspects are of great importance in order to provide visibility and stability to the market players, and thus not only to trigger short-term abatements (e.g. in the power sector) but also to provide an incentive for long-term investment in low-carbon technologies.

SPECIFICITIES OF CHINA

It is crucial to factor in several specificities of the Chinese context during the implementation of domestic ETS, mainly with regards to the:

- uncertainty on economic growth and its content;
- regulation of the power sector and its reform;
- need for improved MRV on carbon emissions.

www.iddri.org

Institut du développement durable
et des relations internationales
27, rue Saint-Guillaume
75337 Paris cedex 07 France

Quotation: Citation: Bellevrat, E., 2011. *What are the issues to be addressed by China in its move to establish Emissions Trading Systems?*, Working Papers N°17/11, IDDRI, Paris, France, 16 p.

This paper was developed in the framework of IDDRI's Global Learning Platform on Climate Policies. This programme has been initiated in 2011 with China and India, with the support of the European Commission (DG Climate Action). A draft version of this paper was presented at the International Conference on ETS for China in Beijing, 26th July 2011, co-organised by the Chinese State Information Centre (SIC) and IDDRI (http://www.iddri.org/Activites/Conferences/China-ETS-Establishment-Based-on-Global-Experiences/). This piece of work will be complemented with further materials to support decision-making for long-term transition of China toward a low-carbon economy, in the next development of the Learning Platform,

The author would like to thank Emmanuel Guérin, Xin Wang, Thomas Spencer and Pierre Barthélemy of IDDRI for their careful readings and suggestions. Special thanks to Jean-Yves Caneill of EDF for his very useful comments on the draft version of the paper, and to Hubert Kieken from Stratégies durables for his lessons from the EU ETS experience. However, the author is solely responsible for this paper.

☆☆☆

For more information about this document, please contact the authors:
Elie Bellevrat – elie.bellevrat@iddri.org

What are the key issues to be addressed by China in its move to establish Emissions Trading Systems?

Elie Bellevrat (IDDRI)

ABSTRACT

China's climate policy is moving from an extensive use of administrative regulation-based policies to more economic instruments, with the underlying argument that, in theory, market mechanisms allow environmental targets to be reached at the lowest economic cost. As detailed in the Chinese 12th Five Year Plan, the country aims to introduce pilot Emission Trading Systems (ETS) by 2013. This paper tries to identify the main characteristics of the Chinese economy that should be considered when establishing ETS. We show that it is not possible to simply copy the experience of existing ETS, e.g. that of the EU, given the specificities of the Chinese economy. The pace of the Chinese economic growth and its content should be taken into account in order to define the main features of the Chinese ETS, in particular their coverage, cap-setting and allocation modes. Main design choices will have impacts in terms of compliance and administrative costs, environmental effectiveness of the schemes, possible adverse effects and market failures such as low incentive to invest, loss of competitiveness, carbon leakage, etc. The ETS should absolutely be assessed within the existing and planned regional/national climate and energy policy framework, in order to identify the possible overlaps and gaps in the future policy mix, but also the possible interactions between polices and the transformational effects that could affect the Chinese economy over the longer term. A key issue is whether the ETS should and could be used as a policy means to manage the Chinese industrial economy. We show that a very detailed mapping of historical emissions, together with a good vision of the relative abatement costs of the future liable entities, are necessary to design the pilot ETS. Further, the establishment of efficient ETS will necessitate a robust MRV system, which itself will depend on the ETS design.

Keywords: ETS, design options, China

INTRODUCTION

For the first time, China plans to make use of cap-and-trade instruments as part of its climate policy portfolio. The new Chinese strategy for economic development has been approved with the 12th FYP in March 2011 (Fulton, 2011), and includes the development of 6 pilot ETS in 6 Chinese provinces (including 4 cities), to be established by 2013. The selected cities are Beijing, Shanghai, Tianjin and Chongqing, and the selected provinces are Guangdong and Hubei.

During the last decade, the experience accumulated with ETS worldwide has brought valuable lessons and design issues have been extensively addressed in a wealth of literature (Hood, 2010). The largest experience certainly comes from the EU ETS (Ellerman et al, 2010), with unequalled lifetime, market size and number of liable entities involved, use of flexible mechanisms... The wide spectrum of existing carbon schemes, both in space and time, constitutes an important background for policy makers and allows for drawing policy recommendations for some configurations.

However, there is no silver-bullet that could be replicated in every case, and no prescription coming from any existing schemes should be blindly reproduced without a careful attention paid to the local conditions and policy priorities.

Concerning the establishment of cap-and-trade carbon markets in China, the underlying policy objectives need to be clearly identified as a matter of priority:

- Should they allow reaching given local and/or sectoral targets at the lowest cost, by introducing an additional flexibility to the existing set of regulations, which themselves proved to be costly in terms of economic and social impacts during the 11th FYP (Price, 2011)?
- Should they be considered as local experiments and meant to be extended at the national scale in a second phase, following the tradition of Special Economic Zones since the start of the Chinese economic reform (Yeung, 2009)?

It is very likely that the planned ETS will rather contribute to the national ongoing economic reform, with enhanced use of market-based mechanisms to address environmental and resources objectives generally. More specifically, carbon schemes could be used to manage the industrial sector in a cost efficient way. But tensions between short-term perspectives – introduction of additional policies and measures in order to reach the next FYP environmental targets - and long-term ambitions - possible integration of the 6 provincial trials into a greater scheme - should clearly be under consideration at the early stage of the pilot ETS definition, in order to best serve the broader transition towards a low-carbon economy.

This paper will detail some key issues for consideration in the design and implementation of the ETS program in China, starting with an international comparison of the existing schemes worldwide, followed by the identification of specific features of the Chinese economy. The subsequent two sections will address the specific issues related, first, to the choice concerning coverage, and second, to the cap-setting and allowances distribution modes[1]. The different design options will be discussed with respect to the pursued objectives. The last section will emphasize the systemic issues related to ETS design, including competitiveness and transformational issues.

1. A VARIETY OF ETS SCHEMES WORLDWIDE

Many ETS schemes already exists worldwide, the first significant one being the New South Wales (NSW) scheme in Australia, implemented in 2003, and the largest one being the European ETS (EU ETS), with over 2 $GtCO_2$ covered.

1. See Fankhauser and Hepburn (2010a, 2010b) for an ETS toolbox for design both in time and space and a list of key decisions to undertake when establishing cap-and-trade systems.

It is important to notice here that there are as many configurations as there are schemes. Many of them manage the power sector emissions only (e.g. the Regional Greenhouse Gas Initiative, RGGI) while another one covers the whole economy (New Zealand); some cover a wide variety of GHG gases (New Zealand, EU ETS from 2013) while others cover only CO_2; most of them are mandatory (e.g. EU ETS), whil one (Switzerland) is voluntary; one has output-based cap (Alberta, Canada) while the others have absolute caps (RGGI, EU ETS…); some use auctioning mechanism (e.g. the UK CRC Energy Efficiency Scheme) while the others use grandfathering allocation (e.g. Tokyo), etc.

For the time being, existing schemes are all independent, but possible integrations in the future are discussed extensively in the research community. It is however important to consider that initial development phases of ETS are interesting to test a variety of design options and challenges, in relation with the local context. The integration of schemes worldwide, even if possibly under consideration in a long-term perspective, should not dictate the way countries design their own scheme, especially in the very special case of China (economic, social, political…). Of course, it might also be important that China make design choices that do not prevent for further linking to existing schemes worldwide.

The EU ETS is the only scheme to be connected to the Kyoto Protocol flexibility mechanisms. Looking at this extreme variety of schemes (see table below), it is important to keep in mind that to a given design corresponds a given context and a given objective.

In addition to China, a lot of GHG cap-and-trade schemes are under consideration worldwide, with different levels of development. The list below lists most of them with their possible implementation time horizon:

- Western Climate Initiative, WCI (USA, Canada, 2012)
- California (USA, 2012)
- Follow-up of the H.R.2454 ACES Act (USA, post-2012)
- Follow-up of CPRS (Australia, 2015)
- Korea (2013)
- Brazil, Japan, Chile, Turkey, Mexico, Ukraine…

2. SPECIFIC FEATURES OF THE CHINESE ECONOMY TO FACTOR IN FOR ETS IMPLEMENTATION

The macro-economic dynamics may constitute the biggest difference between China and other regions, which have already had experience with ETS. Indeed, to date, all existing ETS have taken place in OECD areas (Hood, 2010). In comparison with these regions, China's macro-economic specific features are the following:

- **Fast growing economy,** but still medium revenues country (the average Chinese GDP per capita is around USD 3700 in 2009, in comparison to the OECD average of USD 38600, according to the World Bank), with very particular underlying economic growth drivers (investment broadly prevails over consumption with over 90% investment contribution to GDP growth in 2009 according to the National Bureau of Statistics) that are expected to change somewhat in the next economic development phase;
- **Structurally highly industrialized country**, with the share of industrial VA in GDP reaching almost 50% (currently still growing) and the share of heavy industries in industrial VA exceeding 70% in 2008 (also still growing) according to CPI Beijing, even though the 11^{th} FYP officially targeted a limitation of heavy industry; and with the Chinese tertiary sector expected to develop a lot in the future;
- **Institutional and governance specificities**, with top-down allocation of economic performance objectives to provincial level, and the potential tension concerning the implementation of economic objectives between the provincial and central levels of governance; more specifically in the field of energy (Andrews-Speed, 2011)
- **The ongoing economic reforms**, in particular the power sector reform since the end of the 1990's, including the unbundling and introduction of competition in electricity generation (Ngan, 2010), but also the other industrial policies, mixing free market and command-and-control regulations.

The huge uncertainty over the future Chinese economic growth and its content must be emphasized. For instance, GDP growth assumptions for China usually range from 4% to 7% on average[2] over the period 2020-2030, according to IEA and NDRC-ERI for instance (leading to over 30% divergence in levels in a decade only). Looking backward confirms that the past economic development of China has been difficult to properly anticipate. Indeed, China caught up with Japan in terms of GDP in 2009, five years before what was actually planned by Chinese authorities and most observers. Such levels of uncertainty over the future national economic activity will certainly have

2. Assumptions from IEA and NDRC-ERI energy scenarios for instance.

Table 1. Existing ETS schemes worldwide and their main features *(from Hood, 2010)*

Scheme	Gas	Coverage	Number of entities	Cap setting	Allocation mechanism
NSW, Australia (2003)	CO_2	Power sector			
EU ETS, Euope (2005)	CO_2 + some industrial gases (from 2013)	Energy (>20MW) and Industry (largest emitters) + Aviation (from 2012)	11 500 covered installations (over 2 000 $MtCO_2$ covered)	6.5% below 2005 levels for 2008-12, then 1.74%/year	Mainly free allocations (to be progressively auctioned)
Alberta, Canada (2007)	CO_2	Electricity and Industry (larger emitters)	100 very large emitters (> 100 ktCO2/year)	Initial reduction of emission intensity by 12% (then 2%/year)	Output-based, no free allocation
Switzerland (2008)	CO_2	Power sector (voluntary participation)	350 companies (around 3 MtCO2 covered)	Negotiated on case-by-case basis	Free allocation
New Zealand (2008)	KP gases	Economy-wide	1 200 participants (upstream and downstream),about 100 $MtCO_2$	No cap	Free allocation to energy-intensive industry, not power
RGGI, USA (2009)	CO_2	Power sector (>25 MW)	200 generators, covering 170 $MtCO_2$	Stabilization emissions over 2009-2014	Auctioning by state
Tokyo, Japan (2010)	CO_2	Commercial buildings and factories (largest emitters)	1 400 covered entities (around 11 $MtCO_2$ covered)	25% emissions reduction by 2020 on 2000 levels	Grandfathering, free allocation
CRC, UK (2010)	CO_2	Businesses and public sector organizations (largest consumers)	5 000 large businesses (> 6000 MWh)	Firstly fixed price and no cap, then cap	All allowances auctioned/sold by the government

many consequences over the design issues of ETS in China. We will further detail this issue in this paper.

3. ETS COVERAGE: RATIONALE, FEASIBILITY AND IMPLICATIONS

3.1. Rationale for ETS coverage choice

The main design choice of an ETS is related to the definition of its boundaries. They will firstly affect the future size of the ETS, establishing the share of total emissions to be effectively covered by the scheme. A set of decisions concerning that field has to be taken:

- the greenhouse gases covered by the scheme (CO_2 only, Kyoto Protocol gases, other GHG gases);
- the sectors and fuels included in the scheme;
- the liable entities covered by the scheme, and more especially the thresholds used to identify them (e.g. physical output thresholds, emissions output or energy consumption thresholds);
- the choice between upstream (i.e. permits are allocated for fuels at the first point of entry into the supply chain) and downstream obligations (i.e. emissions are attributed to the relevant point sources covered).

The sectoral perimeter should be identified in order to fit with the emissions reduction objectives and to avoid or limit adverse effects, like carbon leakage and unbearable economic costs for sectors, market inefficiencies or instability, etc.

First and foremost, a mapping of GHG emissions should be realised in order to support decision on the future ETS coverage. It should be as detailed as possible, including rough estimates of the abatement potentials and the associated abatement costs for the various economic sectors. The necessary information should be extended to the number and status of emission sources, their energy consumption and emissions outputs. The nature of economic actors that are emitting and their market exposure could also be interesting information to be gathered. The coverage choice for ETS usually results from a trade-off between the desired size of the market and its expected efficiency. An accurate mapping of historical emissions would be based on existing MRV standards, and may thus be difficult to undertake, as discussed later in this paper.

The definition of the sectoral perimeter for Chinese ETS will result from a trade-off between two options: introducing sectors with similar marginal abatement costs or introducing sectors with significantly different marginal abatement costs. Depending on where the cursor is placed between these two ends, total abatement costs, traded flows (and thus market liquidity), resulting structural economic transformations, abatement levels in the various sectors, etc. will clearly be different.

From the theoretical point of view, the fact that a carbon market price can be unbearable for some sectors while fully manageable for others is a desired effect of introducing market-based mechanisms, but socially and politically this might not be the most efficient way to perform smooth but sustainable transition of an economy. Therefore, it is sometimes necessary to implement special conditions and exemptions or limit the extension of the ETS coverage, and this is part of the negotiation process when establishing a cap-and-trade system. On the one hand, mixing sectors with too different marginal abatement costs could prevent from having a sufficient price signal to trigger the necessary short-term emissions reduction or long-term investments in strategic sectors. On the other hand, widening the market coverage is the best way to lower mitigation costs for a given aggregated reduction objective in the economy.

In Europe, emissions covered by the EU ETS represent approximately 40% of total GHG emissions over a total of 30 countries (including all EU Member States). CO_2 emissions from large industrial and power sector point sources have been firstly introduced in the scheme; the aviation sector will join after 2012 and additional GHG will be introduced in the next phase (from 2013).

3. 2. Consistency between ETS coverage and Chinese objectives

The example of the EU ETS or any other existing scheme is certainly not to be copied without investigating the specific implications for China. Above all, the Chinese ETS coverage should be in line with the overall objective of the market-based instrument and adapted to the national (or provincial) context. For instance, depending on the objectives pursued by the introduction of an ETS policy, the power sector or the building sector could be first targeted.

- The Chinese power sector could be considered for the introduction of carbon markets in place of the regulations which focus on small inefficient plants, often considered as expensive, both economically and socially. In addition, the power sector is generally considered as a large source of low-cost abatement[3].
- The building sector in China is expected to develop at a very quick pace in the future, and could become a very large source of CO_2 emissions. Pilot ETS in China, especially the ones considered on cities, could be focused on this sector as a matter of priority and may involve the biggest residential and/or commercial buildings, as indeed the Tokyo scheme does (WB, 2010).

It is clear that the ETS design will broadly differ whether the power or/and the building sector is involved. But the two objectives may also co-exist, and the ETS coverage should then be carefully assessed over time to remain efficient.

If coverage has consequences on the ETS effectiveness, of course this choice is not set in stone, even if it may be easier to opt-in additional gases, sectors or regions in an existing ETS rather than opt-out already included entities. It is clearly possible for a design in space to evolve over time, but the merging of several heterogeneous pilot schemes into a greater one may raise concerns, both technical and economical, due to the transaction costs and uncertainty faced by market players during the transition period.

The burden-sharing among sectors for a given economy-wide emissions target will also induce structural transformation of the economy, much beyond the only sectors that are actually covered by the ETS. When designing sectoral coverage, consideration needs to be given to sectoral decarbonization trajectories within the context of economic wide objectives, in order to ensure that the ETS induces statically and dynamically efficient contributions from the covered sectors. In particular, consequences must be assessed with respect to the sustainability of future economic development, and to the general coherence of the policy framework, in which the ETS will be one instrument among others (see section 2.3).

3.3. Data systems and MRV in the ETS development

The state of the Chinese Monitoring, Reporting and Verification system (MRV) and its national/provincial energy and emissions statistics in general is discussed by Wang (2011). It is compared with the European standard, as developed for the EU ETS. The Chinese statistical organization has improved a lot over the last decade but still lacks details in comparison with standards of OECD countries. Establishing an ETS requires a lot of information, but many useful data are still not made available or merely inexistent in China.

MRV requirements will depend on the ETS design and more precisely on the GHG scope and its spatial coverage (geography and sectors). But they are also central to the definition and good management of the carbon markets. Energy auditing has been recently developed in China, in order to

3. According to the International Energy Agency (IEA, 2010), low-carbon technologies would account for 78% of China's power generation by 2035 in the 450 Scenario, up from 19% today.

monitor the effects of the 11th FYP energy policies. But the Chinese energy auditing capacities still show gaps (Shen et al, 2010).

In Europe, several reasons have been put forward to explain why there has been a systematic over-allocation during the first National Allocation Plan (NAP) of the EU ETS in 2005. The negotiations process and the related asymmetry of information is clearly one of them (Egenhofer, 2007). Further, data quality has been suspected to contribute a lot to that failure, stressing the importance of good data and MRV systems.

On the other hand, the European experience has shown that the implementation of an ETS could also be an opportunity to improve data systems and MRV standards. An isolated learning-by-doing phase may be necessary to gather data while preventing carryover of allocation inconsistencies arising from data gaps to subsequent phases.

Data quality has thus an important role in both the design phase and during the operating lifetime of an ETS. This is crucial to obtain an efficient working scheme but also to ensure the robustness of the cap setting.

- In the design phase of the ETS, reliability of data (e.g. concerning abatement costs and potentials) is crucial in order to ensure that economically rational coverage choices are made. Detailed mapping of emissions should be drawn with the objective to define thresholds for liable entities to be included in the scheme. Data quality requirements will also depend on the allowances allocation mode. They would be high in case of grandfathering and lower in case of auctioning.
- During the operating life-time of the ETS, MRV must be credible and transparent, and registry systems secure in order to avoid frauds[4]. Emissions data must be timely available and accurate in order to contain price volatility, and enhance long-term visibility for economic actors.

One of the Chinese specificities is the fast economic development and the likely change in economic structure. Hence, a challenge for China will be to timely identify and manage new emissions sources to be included in the ETS (called "new entrants" in the EU ETS, which has been confusing for many actors), depending on the general coverage choices, but more especially on the possible thresholds set for liable entities (see next section for a discussion on thresholds issue). This entails to elaborate specific monitoring system, in order to ensure new liable entities will not escape their obligations.

3.4. Administrative feasibility and related costs

There is a cost-benefit trade-off between the environmental efficiency and the administrative feasibility when defining the ETS coverage. Including rather diffuse emission sources in a carbon scheme has consequences on costs for liable entities (compliance, monitoring and reporting…) and for the administration (system management, verification…). The relation between administrative costs and the minimum entity size covered by an ETS is exponential (Ellerman et al, 2010). In addition, the ETS management costs must factor in the whole policy mix in place (see next section for more details).

The average size of emissions sources in China is much smaller than in the EU. According to the Ministry of Industry and Information Technology, SMEs, which broadly make part of the industrial sector, account for almost 99% of China's registered companies[5]. Therefore it is important to carefully assess appropriate thresholds on production capacities or emissions levels for the coverage definition.

But in this case, the feasibility of setting thresholds should clearly be assessed. For instance, would the thresholds define clear boundaries between covered and not covered entities (i.e. the number of emission sources around the threshold should be compared with the average level of uncertainty on emissions levels)? Would the new coverage choice still be large enough to ensure effectiveness of the scheme?

For instance, at the national level, the energy-related CO_2 emissions of the Top-1000 Energy-Consuming Enterprises Program were estimated at 2,153 $MtCO_2$ in 2010, representing around 30% of the Chinese emissions (according to Price et al, 2011, assuming the 11th FYP targets are met). But would the inclusion of these energy-intensive companies be enough to ensure the required liquidity on the ETS on each province? How many liable entities would this program correspond to, especially when introducing thresholds? And would they be enough at the provincial level to design the pilots[6]?

4. In early 2011, hackers embezzled €28m worth of allowances from various EU Member States registries, following previous major VAT frauds during 2008 and 2009, estimated at around €5bn worth damages, due to regulation weaknesses.

5. http://news.xinhuanet.com/english/2009-12/27/content_12711495.htm

6. For instance, there are only 10 enterprises of the Top-1000 Program which are located in Beijing.

The power sector is also rather distributed: in 2009, only a third of thermal power plant units exceed 600 MW, and a third of them are below 300 MW (CPI, 2011). However, the power sector has shown a large concentration trend for the last decade and this move is supposed to continue in the future (Berkeley Lab, 2011). This evolution is mainly due to a stock effect because new "greenfield" facilities are usually bigger than the existing stock average.

The concentration trend is slower in other industrial sectors and, for instance, manufacturing industries are still composed of rather small facilities (Price et al, 2011). Therefore, the issue of administrative feasibility is probably more critical in the manufacturing industry than in the power sector. China used to regulate these small industrial entities with command-and-control measures like during the 11th FYP with the small plant closures program. Cost-benefits analyses should be conducted in order to identify the best way to tackle these diffuse industrial emissions, either by continuing to make use of regulations or by integrating them in an economic instrument.

If the emissions mapping reveals that the ETS have to include other diffuse emission sources (e.g. buildings and transport emissions) in order to guarantee a minimum of environmental effectiveness of the future carbon market, then management costs should be carefully assessed. In such case, one option could be to set up upstream obligations and also integrate energy imports, especially electricity imports, into the scheme (e.g. electricity imports included in the RGGI).

3.5. Consistency and effectiveness of a climate policy framework

In China, there are actually risks of inefficiencies linked to the high number of existing energy policies. Mapping existing policies related to both the covered and non-covered sectors allows for estimating the possible overlaps with the ETS policy but also the gaps in the national climate policy (i.e. sectors not covered by any policy) (CPI, 2011).

Supplementary policies should target market imperfections and barriers in sectors already covered by the ETS instrument. These market failures are mainly due to consumers' behaviour, and to low incentive for the deployment of low-carbon technologies (Hood, 2010). Indeed, consumers act with a bounded rationality, and low-carbon technologies are usually more expensive than conventional technologies during their initial market introduction. Supplementary policies should aim to minimize the long-term overall cost for ETS compliance, and lower the carbon market price.

Complementary policies should address emissions in the non-covered sectors (and gases) in order to develop a climate public policy framework involving the whole economy, as price signals from the ETS to downstream sectors will not overcome other market failures. The nature of complementary policies can be command-and-control (e.g. laws and regulations, norms and standards…), or other economic instruments like taxes and subsidies. For instance in Europe, climate policies which tackle energy efficiency in buildings and transport complement the EU ETS, which itself focuses on industrial facilities, including the power sector.

There is also an issue of policy mix consistency over time, which should clearly be addressed with regards to the overall objectives of the ETS and their expected effects in the short and long terms. For instance complementary policies for renewables and energy efficiency could be set up and adapted to the ETS objectives; their infrastructural requirements could be supported by additional public policies (e.g. grid development in China and access for renewables…). This is particularly true for the power sector in China, in order to leverage and direct new investments in cleaner power plants (including clean coal and renewables), while limiting the impacts on the existing facilities.

By way of illustration, the EU ETS is the central instrument of the European Climate and Energy Package, but it is accompanied with specific targets on renewables and energy efficiency and their associated milestones (objective "20/20/20": saving 20% of GHG emissions and 20% of primary energy consumption, inclusion of 20% of renewables in energy consumption). The revision of one aspect of the European policy mix has implications on the whole framework, generating intense debates on policies interactions. This is currently the case with the discussions around the future energy efficiency measures to be undertaken at the EU level and their possible implications on the EU ETS (Guérin, Spencer, 2011).

4. CAP-SETTING AND ALLOWANCES DISTRIBUTION MODES

Beyond the coverage of an ETS, cap setting and allowances distribution modes constitute crucial design choices. They will shape the future functioning of the scheme, its overall efficiency and the possible impacts on the whole economy.

The European experience has brought valuable lessons on these issues. For instance, the initial over-allocation and inflated projections over the first phase of the EU ETS induced a collapse of the carbon market price at the end of the period (also because banking was not allowed between periods). Further, allowances used to be given for free during the first two periods of the EU ETS, which generated huge windfall profits for some industrials (Sandbag, 2009).

Different combinations of cap definition and/or allowances distribution modes across the covered sectors may be used in order to better anticipate inefficiencies and adverse effects of an ETS. In the EU ETS, auctioning is set to become the rule rather than the exception from 2013, with around half of total allowances to be auctioned. But if this is the rule for all power producers, many other industries will receive allowances for free, at least in the short term. In the European case, this process is identified as being able to tackle both the issue of windfall profits and the risk of carbon leakage.

But is this model to be recommended for the future Chinese ETS? Indeed, the issue should be evaluated with regards to 1) the objectives followed for the Chinese ETS and the way to reach them and 2) the existing and forecasted economic conditions in which the ETS will develop.

To some extent, the ETS can be used to manage the national industrial policy and act as a driver for the transformation of the industrial economic structure over the long run. But in this case, the general economic goals should be defined before setting the cap and choosing the allowance distribution mode. For instance, a set of design options may focus on energy efficiency in the covered sectors.

4.1. Translation of the carbon intensity target for the ETS

The 12th FYP national carbon intensity target could be translated into absolute emissions targets for the sectors covered by the future ETS. This supposes to make assumptions on the future Chinese economic activity on each of the economic sectors and at the provincial level.

In a context of huge uncertainty on future economic development, allocation rules and especially cap setting should be adjusted between successive phases of the ETS. Defining milestones *ex-ante* is crucial to inform market players from the early ETS design stage that the scheme will evolve over time. But this should not appear as market manipulations and eventually undermine the credibility of the scheme.

Output-based cap setting is also an option to be considered and could even be closest in its philosophy to the definition of the national target in terms of carbon intensity. If this option theoretically allows reaching the same efficiency as historical-based allocations, there is no direct control on total emissions, which can even increase a lot over time as they are fully dependent on the activity variables used for intensity calculation. Further, such a design requires robust data for both emissions and production (or activity) levels, and reaching an agreement on benchmarks in complex sectors like steel and iron seems difficult within a tight schedule. In addition, relative caps do not allow pass-through mechanisms which can constitute a drawback if we consider that long-term transformation of consumption patterns should be triggered by price effects.

In very specific sectors, like power generation, index-based performance would be easier to monitor at facility levels. But as these schemes appear to have an exponential level of complexity for implementation at a large scale, in particular with regards to the integration of several sectors from very different nature, it is unlikely to be useful in the Chinese case.

4.2. Issues related to allocation modes and new projects

Rules for allowances allocation can differ between existing liable entities and new projects. New projects will quickly constitute the largest share of emissions increase in the future. A critical issue raised for China is thus to know how to allocate allowances to them.

During the early phases of the EU ETS, reserves for “new entrants” were completely inhomogeneous across European countries, which induced adverse effects in some countries, with incentives for carbon-intensive industries to develop in some cases (Betz, Sato, 2006). In the third phase of the EU ETS, rules for the new projects are planned to be harmonized among Member States.

But the situation is obviously very different in China, mainly because of high economic growth rates. New projects in the future Chinese ETS will not be marginal volumes as they are in the European scheme. On the contrary, they will quickly play a major role in the functioning of the future ETS, and they should be considered with due attention. One option for China would be to systematically auction allowances to new entities, forcing producers to internalize the carbon constraint in their total production costs and investment decisions.

4.3. Economic visibility and market stability

It can be difficult to maintain a clear price signal for economic actors involved in a carbon market as shown by the multiple experiences worldwide. For instance, the EU ETS revealed that a carbon market can be subject to high CO_2 price fluctuation over time. A scheme can be both very sensitive to endogenous and exogenous factors, and this is especially true if cap setting is defined in absolute emissions. The market price stability over a long-term horizon is not guaranteed as it will depend on assumptions made on the future activity of the covered sectors.

One of the possible options to increase market stability is to fix price ceilings and price floors. But one should bear in mind that if the admissible price range is too small, the ETS could become less attractive and actually approach the effect of a carbon tax, with low liquidity. In addition, the emissions trajectory could be different from the cap set at the definition stage of the ETS[7].

Introducing flexibility mechanisms could be useful in order to reduce the compliance cost. For instance, offset credits could be created within the Chinese economy, by developing certified projects in the building or transport sectors, or by allowing the transfer of certified emissions reduction across regions, from not covered to covered ones. But this should necessary remain limited in order to avoid undermining the transformative incentives of the ETS. Indeed, the carbon market price could drop or become too unstable if too many no-regret options (at very low or near zero cost) are introduced into the scheme, or if too many offsets are allowed.

5. RISKS OF ADVERSE EFFECTS ASSOCIATED TO ETS IMPLEMENTATION

5.1. Price signal transmission and unexpected economic transformations

Introducing market-based mechanisms includes risks of unexpected economic structure transformations due to uncontrolled signals sent to economic agents. In other words, *ex-ante* estimation of the economic interactions between the covered and non-covered sector is absolutely necessary during the design phase of a CO_2 cap-and-trade. The future balance of supply and demand for energy, goods and services should particularly be emphasized.

In particular, the issue of price signals transmission (i.e. the level of "permeability" across the border between covered and non-covered sectors) is crucial and may have significant consequences on the functioning of the scheme and the economy in general. High pass-through rates to the final consumer may be desirable in order to preserve the price signal to energy consumption and hence economic efficiency. This explains why there is a higher risk of transformational or inefficiency effects in regulated markets.

For instance, with low price signal transmission, the productive system can be deeply impacted by the carbon constraint, while demand sectors are much less incentivized to make structural transformations: demand for goods could remain unchanged, even if less carbon is embodied. However, there is no doubt that goods and services themselves should evolve in a low-carbon perspective. With low pass-through, the ETS would at best produce short-term effects such as fuel switch and energy efficiency at the supply-side, at worst adverse effects such as competitiveness losses and carbon leakage. Adverse effects could even be worse if pass-through is differentiated among energy commodities, because of transformational effects of the whole energy prices system. This is the case in China with regulated electricity prices but free coal prices.

Complementary and supplementary policies have to factor in possible interactions between the covered and non-covered sectors. They can also be used in order to compensate a low permeability across sectors. But the policy framework should then be constantly re-assessed, and the policy package adjusted in real time.

5.2. Specific issues with the Chinese power sector

China is clearly concerned with such a price signal transmission issue in its power sector. To date, the domestic electricity prices remain strictly regulated, even if the power generation is opened to private investors (Ngan, 2010). This is why it is crucial that the organisation of wholesales markets, including price formation issue, and their possible interaction with the ETS implementation should clearly be assessed first. In addition, issues of power interconnection between provinces and grid management must be assessed with respect to the introduction of ETS.

The sequence between power market reform and ETS implementation is thus a critical issue not to be overlooked by Chinese policy makers. Should the power market reform be completed before the introduction of the ETS, or should the ETS adapt its design to the actual functioning of the power markets? What are the implications for the power markets in the first case and for the ETS design in the second case?

7. The emission cap can be overshot when the carbon market price reaches the price cap.

In a context of regulated prices, as is the case in the Chinese power sector, there is an increased risk of subsidizing energy consumption when a carbon constraint is introduced. Increasing electricity prices due to a newly introduced climate policy is in conflict with the social objective to maintain low energy prices for the consumers. Indeed, the containment of final prices to consumers has recently become a critical political issue in China, because of increasing inflation.

But if power prices cannot reveal the CO_2 content of the generated electricity (eg. for coal-based electricity), then consumers' behaviour will not adapt to the evolution of supply costs, with possibly two major consequences: at the supply-side power companies may become unprofitable due to unsustainable production costs and decreased margins, and at the demand-side energy efficiency or desired behavioural changes will not be triggered due to the absence of price signals. This has been the case in China with the recent increase in coal supply costs for power plants, which is almost impossible to pass through in the end-user tariff.

Evidence shows there are already risks of power shortage in China (30 GW in summer 2011 as estimated by the China Electricity Council). The implementation of ETS should not worsen the power security of supply and deter firms more from maximizing the power output. Maintaining high incentive to invest in the power sector should also remain a constant source of concern in designing the ETS. In particular in the Chinese case, the technical feasibility of renewables integration to power grid is crucial and should clearly be accompanied with dedicated policies, beyond the ETS itself.

In such a regulated context, the carbon constraint should clearly be introduced in a slow and steady pace. That would trigger short-term emissions abatements, mainly through fuel switch across existing capacities and the establishment of a new merit order. But, carbon market players should not be deterred from producing and investing, in order to satisfy future growing power demand. Such a smooth incentive should be established avoiding initial over-allocation like has been done in the early phases of the EU ETS and RGGI for instance, in order to maintain a meaningful carbon constraint for utilities.

5.3. Competitiveness and carbon leakage issues

China could possibly face competitiveness and carbon leakage issues at two different levels when implementing carbon markets. The first could take place between covered and non-covered provinces/sectors during the development of the pilot ETS. The second could possibly occur at the international level if a nation-wide ETS is developed by 2015, as already suggested by Chinese officials.

Between provinces/sectors

The first level of competitiveness issues is domestic with possible leakage from provinces where a carbon value is implemented toward provinces free of or with a lower carbon constraint.

The establishment of ETS must be assessed with due attention on the new investment decisions, and the potential risk of deterring investments in pilot provinces, especially if allowances are fully auctioned to new projects. The initial trial period offers poor visibility to what will happen next, and actors would presumably think a nation-wide integrated market will be established in a next phase. But what would actually be the impacts of the ETS on short-term investment decisions?

There is of course an issue of balance of production between provinces. A company which does not face any carbon constraint has a competitive advantage to sell its product in an adjacent province where an ETS exists. This company would thus be incentivized in producing more goods and exporting them into one of the pilot provinces.

Multi-provincial companies will have more flexibility to address the competitiveness issue by rebalancing their production across their industrial units, factoring in complete production costs (including carbon constraint) plus transport costs to reach their markets. As a consequence goods transport could increase between provinces, as well as overall CO_2 emissions for a given "social welfare".

Depending on the ETS design, firms could be incentivized to use accounting scams in order to escape their obligations. Moreover, they could virtually change their economic classification or the technical features they publish, or create multiple fictive subsidiaries in order to spread their total production across many units and fall below the ETS thresholds. In addition, provisions for intra-firms permits trade should be carefully assessed.

In the power sector, risks of carbon leakage should be accounted for with a lot of attention paid to the import/export of electricity across provinces borders. This last issue is of course strictly linked to the regulation of the power market.

At the International scale

At the international scale, the issue could be much different. For instance, sectors at risk of international carbon leakage in China would be much different than those identified at the provincial level (e.g. the power sector).

The establishment of a nation-wide ETS would certainly reinforce Chinese credibility and prove the international community that comparable climate policies are established in this country. Further, it is well known that China wishes to depend less on energy-intensive exports, mainly for energy security concerns and in order to preserve its national energy resources. China is already implementing economic instruments like the EVRET, which in some way could be considered as a domestic climate policy (Wang, Voituriez, 2010). China aims at developing high value added sectors for new tradable goods (ie. the so called Strategic Emerging Industries in the 12^{th} FYP), which could be facilitated by the introduction of such a domestic carbon market.

The actual carbon leakage threat would be limited to the Chinese domestic market for energy-intensive products. The risk would finally depend on the climate actions undertaken by the other World regions and the comparability of efforts across them. But that seems quite unlikely or limited in the short term, because very few countries could plausibly threaten China with environmental dumping.

The European experience has shown that the issue of carbon leakage is very difficult, first, to assess, and second, to tackle. There is no consensus on the intensity of this phenomenon in Europe, neither during the first two phases of the EU ETS (*ex-post* assessment), nor for the future phases (*ex-ante* assessment) as shown by Reinaud (2008). The actual solution found in Europe is to distribute free allowances to energy-intensive and internationally exposed industries, based on benchmarks. Non-exposed industries, like the power sector, will be auctioned their permits in Phase 3 of the EU ETS. To date, the threat of Border Adjustment (BA) has not been turned into effective measures, because of the risk for long-lasting disputes at the WTO.

CONCLUSION

Designing an ETS should not be limited to copying existing experiences. On the contrary, an ETS should rather be established with great attention paid to the national and/or provincial conditions and the objectives that are followed. It is thus crucial for China to factor in the following considerations ahead of the establishment of its ETS pilots by year 2013:

- Clearly establish the objectives in a time perspective (definition of phases and milestones), with the idea to adapt and gradually improve rules and MRV standards over the ETS lifetime (ie. coverage, cap definition and allowances distribution modes), especially if the perspective is a nation-wide linkage;
- Identify the Chinese institutional specificities (administrative, governance, etc.) and its main economic features at the provincial level, but also at the national level, in order to ensure feasibility and cost-efficiency of the schemes themselves in relation with their overall objectives and to provide a minimum of homogeneity across the pilot ETS;
- Assess the new ETS instrument within the existing policy framework and implement the necessary supplementary and complementary policies, that will ensure the effectiveness of the ETS and possibly allow managing some aspects of the overall Chinese economy (e.g. carbon markets as fully part of the industry policy framework); and ensure that the possible economy-wide transformational effects are desired and in line with the general objectives of the scheme and national economic development goals.

REFERENCES

Andrews-Speed, Philip. 2011. The institutions of Energy Governance in China. Note de l'IFRI.

Betz, R. Sato, M. 2006. Emissions trading: lessons learnt from the 1st phase and the EU ETS prospects for the 2nd phase. Climate Policy. 6 (2006) 351.

CPI Beijing. 2011. Review of Low Carbon Development in China: 2010. Climate Policy Initiative Report, Beijing.

Egenhofer, C. 2007. EU ETS Options for Cap Setting, Allocation and Distribution of Allowances after 2012. Background Paper. CEPS Task Force on Completing the Review of the EU ETS.

Ellerman, D.A. Convery, F.J., de Perthuis, C. 2010. Pricing Carbon: The European Union Emissions Trading Scheme. Cambridge University Press, Cambridge.

Fankhauser, S. Hepburn, C. 2010a. Designing carbon markets. Part I: Carbon markets in time. Energy Policy 38 (2010) 4363–4370.

Fankhauser, S. Hepburn, C. 2010b. Designing carbon markets, Part II: Carbon markets in space. Energy Policy 38 (2010) 4381–4387.

Fulton, M. 2011. 12th Five Year Plan – Chinese Leadership Towards A Low Carbon Economy. Deutsche Bank Group.

Guérin, E. Spencer, T. 2011. Strengthening the European Union Climate and Energy Package: To Build a Low-Carbon, Competitive and Energy Secure European Union. Iddri and Climate Strategies.

Hood, C. 2010. Reviewing Existing and Proposed Emissions Trading Systems. IEA Information paper. November 2010.

International Energy Agency. 2010. World Energy Outlook.

Ngan, H.W. 2010. Electricity regulation and electricity market reforms in China. Energy Policy. 38 (2010) 2142-2148.

Price et al. 2011. Assessment of China's energy-saving and emission-reduction accomplishments and opportunities during the 11th Five Year Plan. Energy Policy. 39 (2011) 2165–2178.

Reinaud, J. 2008. Issues behind Competitiveness and Carbon Leakage - Focus on Heavy Industry. IEA Information paper. October 2008.

Sandbag. 2010. Carbon Fat Cats 2009. Company Analysis of the EU ETS. http://www.sandbag.org.uk/site_media/pdfs/reports/fatcats2009.pdf

Shen, B. Price, L. Lu, H. 2010. Energy audit practices in China: national and local experiences and issues. LBNL Paper. LBNL-4159E.

Wang, X. 2011. Building MRV for a successful emissions trading system in China. Draft paper prepared for the conference on ETS implementation in China. 26th July 2011. Beijing.

Wang, X. Voituriez, T. 2010. China's export tax and export VAT refund rebate on energy-intensive goods and their consequence for climate change. In Soares, C.D., Milne, J.E., Ashiabor, H., Kreiser, L., and Deketelaere, K. (ed), Critical issues in environmental taxation, International and comparative perspectives, Vol. VIII, Oxford University Press, New York.

World Bank. 2010. Cities and Climate Change Mitigation: Report on Tokyo's Emissions Trading System. http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1226422021646/Tokyo_ETS_Padeco.pdf

Yeung, Y. Lee, J. Kee, G. 2009. China's Special Economic Zones at 30. Eurasian Geography and Economics, 2009, 50, No. 2, pp. 222–240.

What are the key issues to be addressed by China in its move to establish Emissions Trading Systems?

Elie Bellevrat (IDDRI)

IDDRI

SciencesPo.

www.iddri.org

IDDRI'S PUBLICATIONS

- Building MRV for a successful emissions trading system in China. X. Wang. *Working Papers* N°16/2011, IDDRI.
- Climate-related policies in India and China: current state and prospects. E. Bellevrat. *Working Papers* N°20/2011, IDDRI.
- Chinese renewable energy and technology policies: Legal compatibility with WTO rules & Economic interactions with other countries' climate and industrial policies. E. Guérin & J. Schiavo. *Idées pour le débat/Working Papers* N°02/2011, IDDRI.
- Getting the carbon price right through climate border measures: A Chinese perspective. T. Voituriez & X. Wang. *Climate Policy* 11 (2011) 1257-1261.
- An analysis on the short-term sectoral competitiveness impact of carbon tax in China. X. Wang, J.-F. Li, Y.-X. Zhang. *Idées pour le débat/Working Papers* N°03/2010, IDDRI.
- Post-2012 Climate Change Agreement: Why MRV is important. M. Wemaëre. *Idées pour le débat/Working Papers* N°07/2009, IDDRI.

Publications available online at : www.iddri.org

The Institute for Sustainable Development and International Relations (IDDRI) is a Paris and Brussels based non-profit policy research institute. Its objective is to develop and share key knowledge and tools for analysing and shedding light on the strategic issues of sustainable development from a global perspective.
Given the rising stakes of the issues posed by climate change and biodiversity loss, IDDRI provides stakeholders with input for their reflection on global governance, and also participates in work on reframing development pathways. A special effort has been made to develop a partnership network with emerging countries to better understand and share various perspectives on sustainable development issues and governance.
For more effective action, IDDRI operates with a network of partners from the private sector, academia, civil society and the public sector, not only in France and Europe but also internationally. As an independent policy research institute, IDDRI mobilises resources and expertise to disseminate the most relevant scientific ideas and research ahead of negotiations and decision-making processes. It applies a crosscutting approach to its work, which focuses on five threads: global governance, climate change, biodiversity, urban fabric, and agriculture.
IDDRI issues a range of own publications. With its *Working Papers* collection, it quickly circulates texts which are the responsibility of their authors; *Policy Briefs* summarize the ideas of scientific debates or issues under discussion in international forums and examine controversies; *Studies* go deeper into a specific topic. IDDRI also develops scientific and editorial partnerships: among others, *A Planet for Life. Sustainable Development in Action* is the result of collaboration with the French Development Agency (AFD) and The Energy and Resources Institute (TERI), and editorial partnership with Armand Colin.

To learn more on IDDRI's publications and activities, visit www.iddri.org