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Mitigation Actions in China: Measurement, Reporting and Verification

E3G

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This paper seeks to facilitate progress on the provisions in the BAP by examining how Chinese climate change policy and the implementation of these policies is monitored at the domestic level and may offer insights to the international community as they consider an international structure for measuring, reporting and verifying developing country actions. China provides a rich set of examples of such policies due to its active efforts to cut its growth in energy use and reducing its dependence on fossil fuels. The paper therefore looks at mitigation policies and measures in China across a variety of sectors and at policies and measures that employ both qualitative and quantitative measurement systems.

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On Behalf Of E3G (Third Generation Environmentalism)

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GLOSSARY OF ACRONYMS

AEEI	Annual Energy Efficiency Improvement
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China
BAP	Bali Action Plan
CAAC	Civil Aviation Administration of China
CCTDA	China Coal Trade & Development Association
CNCA	Certification and Accreditation Administration of the People's Republic of China
CNCCP	China's National Climate Change Programme
CNIS	China National Institute of Standardization
ECPGD	Energy Conservation Power Generation Dispatch
MEP	Ministry of Environmental Protection
MOF	Ministry of Finance
MLR	Ministry of Land and Resources
MOHURD	Ministry of Housing and Urban-Rural Development of the People's Republic of China
MOS	Ministry of Supervision
MOST	Ministry of Science and Technology
MOU	Memorandum of Understanding
MRV	Measurable, Reportable and Verifiable
MWR	Ministry of Water Resources
NBSC	National Bureau of Statistics of China
NAMAs	Nationally Appropriate Mitigation Actions
NDRC	The National Development and Reform Commission
SERC	State Electricity Regulatory Commission
SAC	National Standardization Administration Committee of China
SASAC	State-owned Assets Supervision and Administration Commission of the State Council
SD-PAMs	Sustainable Development Policies and Measures
SEPA	State Environmental Protection Agency (old name for MEP)
SIIC	Shanghai Industrial Investment Corporate

EXECUTIVE SUMMARY

A review of mitigation actions in China - measurement, reporting and verification related provisions

The Bali Action Plan, adopted by the Conference of the Parties to the United Nations Framework Convention on Climate Change in 2007, offers an opportunity to create a new space for enhanced mitigation action in developing countries through Nationally Appropriate Mitigation Actions (NAMAs). The benefit of NAMAs is the focus on national priorities and national circumstances, and the opportunities to garner support for these actions at the international level.

It is therefore worth assessing examples of national policies and measures that can be measured, reported and verified (MRV), as called for under the Bali Action Plan . Examining how countries themselves currently undertake domestic mitigation policies and measures, and monitor the programs for progress, could provide some useful lessons for the international MRV structure. China provides a rich set of examples of such policies due to its active efforts to cut its growth in energy use and reducing its dependence on fossil fuels.

This working paper seeks to facilitate progress on the provisions in the Bali Action Plan by examining how Chinese climate change policy and the implementation of these policies is monitored at the domestic level and may offer insights to the international community. It aims to help policy-makers, UNFCCC negotiators and civil society groups navigate the variety of NAMAs and MRV relevant structures in China, and to demonstrate the linkages between provisions and processes on the ground and the high level discussions under the UNFCCC. To do this, the paper looks at mitigation policies and measures in China across a variety of sectors and at policies and measures that employ both qualitative and quantitative measurement systems.

This paper seeks to answer several pertinent questions including:

- Does the use of a wide range of metrics, across a variety of sectors lend itself to MRV?
- How can the diversity of national priorities, policies and circumstances be accommodated in a centralized MRV system?
- How can capacity be built around methodologies to better measure GHG reductions?
- How can the international systems best integrate the variety of reporting and verification procedures that already exist on the ground?
- Where verification processes do not exist, how should an MRV system go about filling this gap?
- What type of MRV system would be most effective at linking actions to support and how?

By understanding national MRV related systems, the international community can gain a head start on identifying opportunities and risks associated with the creation of an MRV system that contributes to the global goal of mitigation of greenhouse gases and sustainable development.

INTRODUCTION

The Bali Action Plan (BAP) (United Nations, 2007), adopted by the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2007, calls for "measurable, reportable and verifiable" (MRV) policies and measures to mitigate greenhouse gas (GHG) emissions in developing countries. These "Nationally Appropriate Mitigation Actions" (NAMAs) are to be supported by parties through financing, technology and capacity building. The BAP provisions offer an opportunity to consider the types of policies and measures that best suit individual countries' circumstances, in light of these countries development challenges, institutional strengths and approaches to mitigation.

In considering how such a tailored approach to individual country actions would work under a global agreement, it is worth assessing examples of countries policies and measures that can be measured, reported and verified ("MRVed" in the UNFCCC vernacular) and examining how countries themselves currently undertake efforts to diversify their fuel mix. China provides a rich set of examples of such policies due to its active and varied policy efforts to cut its growth in energy use and its dependence on fossil fuels. Although many of these policies are new or only reaching the implementation stage, there are others that already have MRV structures associated with them.

These policies and measures cover a range of sectors and are grouped under a set of national goals. The aim of this report is to profile a number of policies across a variety of sectors to draw some lessons on MRV for the current negotiations under the UNFCCC.

Guide to this Paper

This paper begins with an introduction to the concept of MRV. The following section looks broadly at the current framework for climate change policies and measures in China. This section also looks at the quantitative targets that exist, procedures for the gathering of energy data, and the more qualitative targets employed. The third section aims to highlight the specific structures that exist in sectors to support the process of measurement and reporting, and in some cases verification of policies and measures. The last section looks at lessons and reflections for the international climate community based on our review of measurement, reporting and verification structures in China, These lessons are limited by the availability of data and due to the fact that many of the structures that pertain to MRV are relatively new and untested. This section does however make the link between the essential questions that need to be answered at the international level and the reality on the ground in China.

Throughout the paper there are tables of NAMAs which summarize the various potential NAMAs that have been reviewed as part of this research, the scope, the metrics associated with the policy or measure and the system of measure, reporting or verification associated with it.

SECTION I. MRV AS AN ELEMENT OF A GLOBAL CLIMATE CHANGE AGREEMENT

Article 3.1 of the UNFCCC states: "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof" (United Nations, 1992). This principle recognizes that an equitable and effective global agreement depends on a set of variables that differ among countries, based on factors such as their contribution to climate change and their ability to commit financial resources towards a solution. Under the Kyoto Protocol (United Nations, 1997), this principle has manifested itself in the distinction between Annex I countries (consisting of most of the OECD and eastern European countries), which have legally binding emission limits, and non-Annex I countries, which have non-binding responsibilities. The BAP builds upon this formulation, but also creates a new space for developing countries to commit to enhanced actions in return for enhanced support.

Text from the Bali Action Plan

The BAP calls for "enhanced national/international action on mitigation of climate change, including consideration of:

(ii) "Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner."

The BAP provisions acknowledge that developing countries are already making efforts to reduce emissions and move towards a low carbon pathway. China is a good example: it has an ambitious set of policies and measures, which are discussed in detail in the next section. The BAP also creates a new space for developing countries to receive support for such actions. It stipulates that these countries will be provided with technology, finance, and capacity-building support for NAMAs. The BAP therefore broadens participation in GHG mitigation from previous agreements, while maintaining important distinctions between developed and developing countries. A policy framework that maintains this distinction and recognizes actions in both developing and developed countries will be an essential part of achieving a global climate agreement.

The phrase "measurable, reportable, and verifiable" was critical to the agreement of the BAP, and the way in which the concept of MRV is reflected in the post-2012 agreement will have significant implications for the effectiveness of that agreement for stakeholders in both developing and developed countries (Ellis and Larsen, 2008). This paper will highlight current measurement, reporting and verification structures in China, which currently support the measurement of progress towards the fulfillment of China's plans and programs, that might be applicable in a post-2012 structure for MRV. It will not, however, make any specific proposals for negotiators; it only seeks to inform international discussion on how MRV could be applied in practice, and therefore what provisions might be required in a UNFCCC climate agreement.

Although the BAP does not precisely define Nationally Appropriate Mitigation Actions (NAMAs), the term suggests that NAMAs will derive from national policies instituted domestically. Submissions from Parties to the UNFCCC suggest that these NAMAs should integrate two goals: changing a country's economic development path to be more sustainable and contributing to greenhouse gas (GHG) mitigation. Other submissions suggest that NAMAs should respect the development right of developing countries and should be guided by their existing development plans or strategies (Winkler, 2008). NAMAs can achieve the goal of GHG mitigation through policies and measures that have either a direct or an indirect impact on emissions reduction. International support in finance, technology and capacity building could enhance the effectiveness of NAMAs if configured correctly.

Given the country-specific nature of these NAMAs, it is instructive to look at the way relevant policies are shaped and implemented today. In the remainder of this report we will look in detail at the case of China.

TABLE 1.. MRV Metrics and Mechanisms in China's Five-Year Plan

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
Five-Year Plan	National comprehensive planning document	Qualitative evaluation of policy implementation	Annual work report by premier and by each ministry	Monitored and verified by standing committee of National People's Congress	New targets set every five years

Measurement, Reporting and Verification in China

The national climate change goals for China are outlined both in China's Five-Year Plan framework and in its specific climate change policy – the National Climate Change Program (National Development and Reform Committee, 2007c), released in June 2007. As detailed below, both the national program itself and the various sector-specific programs within it have metrics associated with them, as well as reporting and in some cases verification procedures. The extent to which all of these provisions have been implemented differs, as many of these reporting and other systems are new, and are therefore largely untested.

In general, our review of China's mitigation policies and measures finds that China has programs with targets attached that have supportive policies and measures and that these policies and measures are diverse in terms of their mitigation impact. Further our review finds that not all policies have stated metrics associated with them, in cases where they do exist, the set of metrics are both quantitative and qualitative in nature, and are both outcomes-based and process-based.

In many cases, China has provisions for reporting; however, these differ greatly by policy and program. In addition to reporting, China also has verification procedures, some of which involve cross-checking data, but most of which involve spot-check inspection systems. As these systems were introduced recently in most cases it is not yet possible to test the quality of the systems or the data they produce. Furthermore, it should be noted that some policy review and data collection processes are centralized, others are decentralized, leading to a very diverse MRV system for climate related policies and measures.

SECTION II: A FRAMEWORK FOR CLIMATE CHANGE POLICIES IN CHINA

China's Five-Year Plans are a series of comprehensive national planning documents that guide economic and social development. A Five-Year Plan is approved by the National People's Congress and provides general guidance for development by setting integrated goals for all government organizations every five years. Under the general Five-Year Plan, different sectors also prepare sectoral Five-Year Plans, including those for renewable energy development and sector-specific energy conservation plans. In 2006, the National People's Congress approved its 11th Five-Year Plan for the years 2006 through 2010 (Government of China, 2006).

In June 2007, the National Development and Reform Committee (NDRC) published China's National Climate Change Program (CNCCP) (National Development and Reform Committee, 2007c). This was the first time the Chinese government had synthesized its climate strategies at the national level. In October 2008, the government of China published a white paper on climate change (Government of China, 2008). China's national-level mitigation actions can be identified from the Five-Year Plans the CNCCP and the white paper. Under the terms of the BAP, these mitigation actions could be considered "nationally appropriate" since they are identified by the Chinese government, take into account the priorities of the host country, with a focus on development, and offer significant mitigation benefits.

Figure 1 and Table 1 illustrates how policy set in the Five-Year Plan is translated into specific programs at the national, provincial and local level. While these goals may be quite specific in terms of a percentage target for reforestation or energy intensity or an immunization rate, the Five-Year Plan does not set out detailed implementation measures. Rather, the goals are set by the National People's Congress, which approves the Plan, and then it is up to the State Council and the Ministries to formulate the actual programs for implementation.

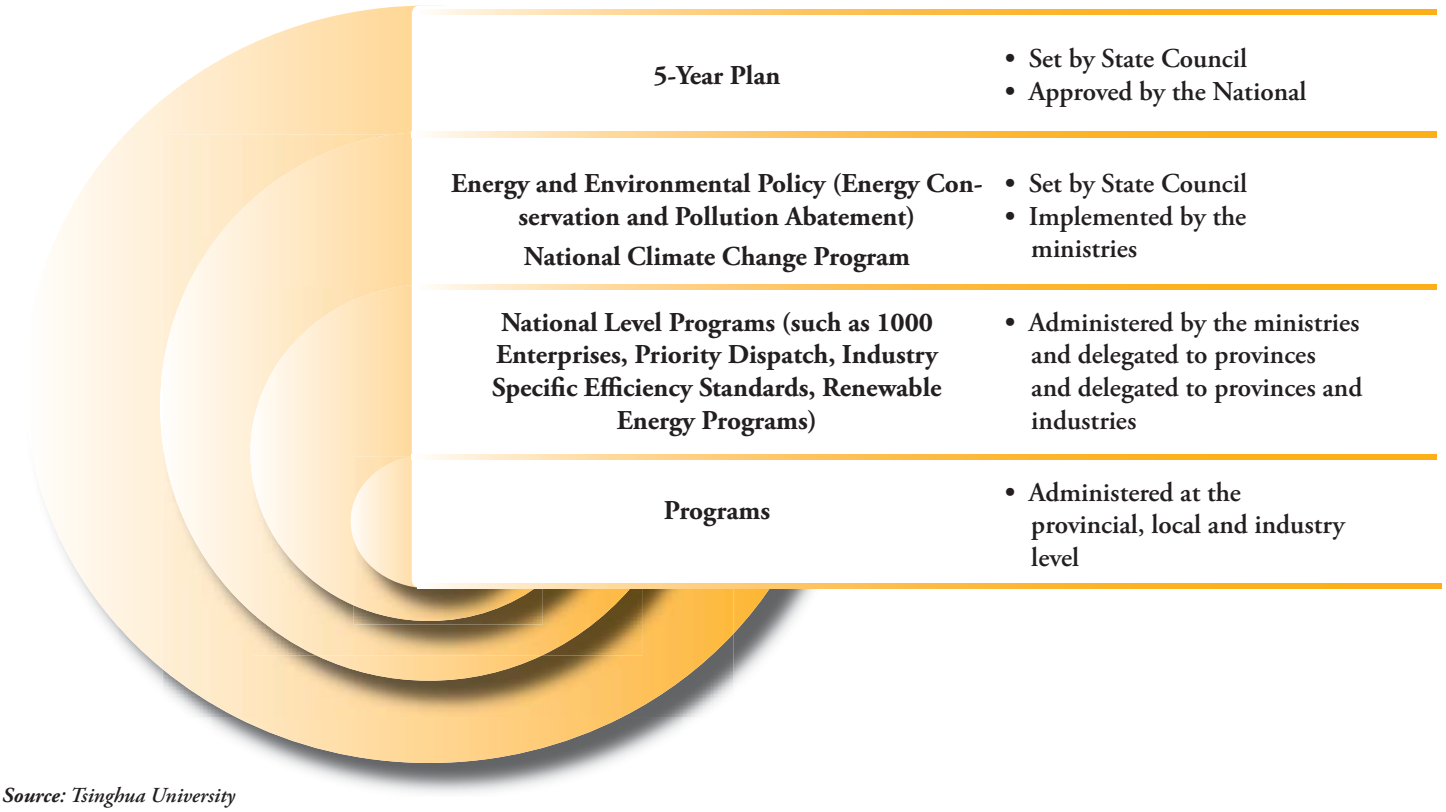
TABLE 2. Major Climate-Related Targets in the 11th Five-Year Plan

	Indicators	Status In 2005	Target for 2010	Achievement in 2008[1]
Economic Structure	Share of service industry's contribution to GDP	40.3%	43.3%	40.1%
	Urbanization rate	43%	47%	45.7%
	R&D as a percentage of GDP	1.3%	2%	1.52%
Emission Related	Energy intensity (energy consumption per unit of GDP)		20% reduction from 2005 levels	10.08%
	Rate of comprehensive use of solid industrial waste	55.8%	60%	
	Forest coverage as a percent of total land cover	18.2%	20%	

[1]Data in year 2008 come from annual statistics communiqué published by NBS and annual "Report of the work of government" delivered by Premier Minister. Data for forest coverage and waste recycle rate are not available from these sources.

Source: Government of China, 2006

FIGURE 1: Hierarchy of Plans and Supportive NAMAs in



Source: Tsinghua University

Roles and Responsibilities of Government Bodies in Climate Change Policy in China

The State Council heads China's executive branch and is led by Premier Wen Jiabao, with Vice Premiers and State Councilors each overseeing several ministries. The State Council has its own offices, which manage both the development of the Five-Year Plan and of various more specific plans, especially when these plans are cross-cutting. In considering MRV opportunities, this paper focuses on two such plans issued by the State Council: the Energy and Environmental Policy and the National Climate Change Program. Both assign specific programs and targets to multiple ministries. The Energy and Environment Policy has a somewhat higher status in Chinese policy-making because energy conservation and pollution abatement have been set as national policies—the highest level at which a target can be designated.

Ministries are subsequently assigned programs to implement. These are then implemented directly or delegated either to the provinces or to national-level state enterprises. The "1000 Enterprise Program," for example, focuses specifically on reducing energy consumption in the one thousand largest national-level state enterprises, accounting for roughly one-third of Chinese energy consumption. Thus, the NDRC assigns targets directly to the companies and assigns teams to inspect the enterprises.

The NDRC also administers a number of programs that help promote energy intensity improvements, for example specific measures for industry, buildings, etc. Provinces receive instructions and targets for energy conservation under these programs. By carrying out these instructions they contribute to achieving both their specific sectoral targets and the overall provincial energy intensity goal. Provinces also assign targets to the cities and counties in their jurisdiction, and to individual companies. Most provinces have copied the "1000 Enterprises" model for the larger firms under their supervision.

The Energy Efficiency and Pollution Abatement Program goals have been assigned to the NDRC and the Ministry of Environmental Protection (MEP). All other ministries have been tasked with setting sectoral energy intensity targets, which are coordinated by the NDRC. The NDRC also plays a major role in implementing targets under the CNCCP, but a much larger number of ministries are involved.

In addition to the NDRC and MEP, the Ministry of Foreign Affairs continues to have an important role in international negotiations; the State Forestry Administration is responsible for the reforestation goals; the Ministry of Science and Technology, the Chinese Academy of Sciences and the State Meteorological Administration are responsible for climate science, and the first two are also responsible for technology development; agriculture and the various resource ministries, as well as the Ministry of Civil Affairs all have a role in adaptation; and the Ministry of House and Urban Construction and the Ministry of Communications are responsible for the building and transportation sectors. This list is not exhaustive but illustrates the number of players involved in China's climate change policy review.

QUANTITATIVE TARGETS IN NATIONAL MITIGATION POLICIES

National policy on energy conservation and climate change plays an important role in overall national strategy. The 11th Five-Year Plan sets 22 quantitative targets in four categories: economic growth, economic structure, environment and resources, and public services. These are quantifiable national development or economic growth metrics; examples of these targets are shown in Table 2.

In June 2007, the government of China published China's National Climate Change Program (CNCCP). Below are listed the CNCCP's major quantified objectives related to climate to be achieved by 2010, including the ambitious target of reducing the nation's energy intensity by 20 percent:

- ***Reduce national energy intensity (energy consumption per unit of GDP) by 20 percent from 2005 levels and decrease emissions of the main pollutants by 10 percent from 2005 levels.*** The energy intensity per unit of GDP was 1.22tce/10,000 RMB in 2005 and China's goal is to reduce it to less than 1tce/10,000 RMB by 2010 (National Development and Reform Committee, 2007b). This energy saving target is a core target in several national Five-Year Plans and the CNCCP. In addition to setting reduction targets, a package of supportive policies and measures was also introduced and implemented to achieve this goal. The details of how the government will measure, report and verify these targets will be discussed later in this section, and are outlined in Figure 2.
- ***Increase the use of alternative energy to 10 percent of primary energy consumption by 2010.*** China plans to achieve this target by developing renewable energy (including large-scale hydropower), boosting the construction of renewable power plants (wind, biomass and solar), and accelerating the development and utilization of biogas and biofuel (National Development and Reform Committee, 2007a).

The NDRC issued its Medium- and Long-Term Development Plan for Renewable Energy in September 2007. The Plan establishes targets for the development of various sources of renewable energy up to 2020, calling for the percentage of renewable energy to rise to 10 percent of total energy consumption by 2010 and 15 percent by 2020. An investment of RMB 2 trillion into renewable energy development in China before 2020 is envisaged to reach this goal. In addition, the plan establishes that the government will adopt a variety of measures to stimulate the development and use of renewable energy. These include a wind power concession program, feed-in tariffs, green electricity voluntary markets and preferential financial and tax policies, including funds to subsidize the development of renewable energy sources (National Development and Reform Committee, 2007a).

TABLE 3 Energy Intensities and Targets for Major Industrial Products

	Year 2000	Year 2005	Year 2010 Targets
Thermal Power (gce/kWh)	392	370	355
Steel (kgce/t)	784	700	685
Aluminum (tce/t)	9.923	9.595	9.471
Cement (kgce/t)	181	159	148
Ethylene (kgce/t)	848	700	650
Railway transportation (tce/Mt*km)	10.41	9.65	9.4

Source: National Development and Reform Committee, 2004

For example, to increase the attractiveness of wind energy projects in China, the Value Added Tax (VAT) for wind generation equipment has been lowered from 17 percent to 8.5 percent, and income tax for wind projects has been cut from 33 percent to 15 percent.

- ***Keep N2O emissions in 2010 stable relative to 2005 levels.*** The government aims to control GHG emissions generated through industrial processes by implementing efficiency policies in various sectors, including metallurgy, building materials and the chemical industry, as well as developing a recycling economy, increasing resource efficiency and strengthening control of N2O emissions (National Development and Reform Committee, 2007c).
- ***Increase Forest cover to 20 percent of total land cover by 2010.*** China aims to continue key afforestration projects, converting cropland on steep slopes into forest, grassland, and natural forest protected areas, and improving basic farmland to increase forest cover from 18.2 percent in 2005 to 20 percent by 2010 (National Development and Reform Committee, 2007c).

Not all targets in the 11th Five-Year Plan are listed in the CNCCP because not all policies and measures contributing to sustainable development have an impact on climate change. In the following section, we select the 20 percent energy intensity reduction target as a case study to explore how a domestic framework for implementation can offer an example of how China could construct measurable, reportable and verifiable national policies.

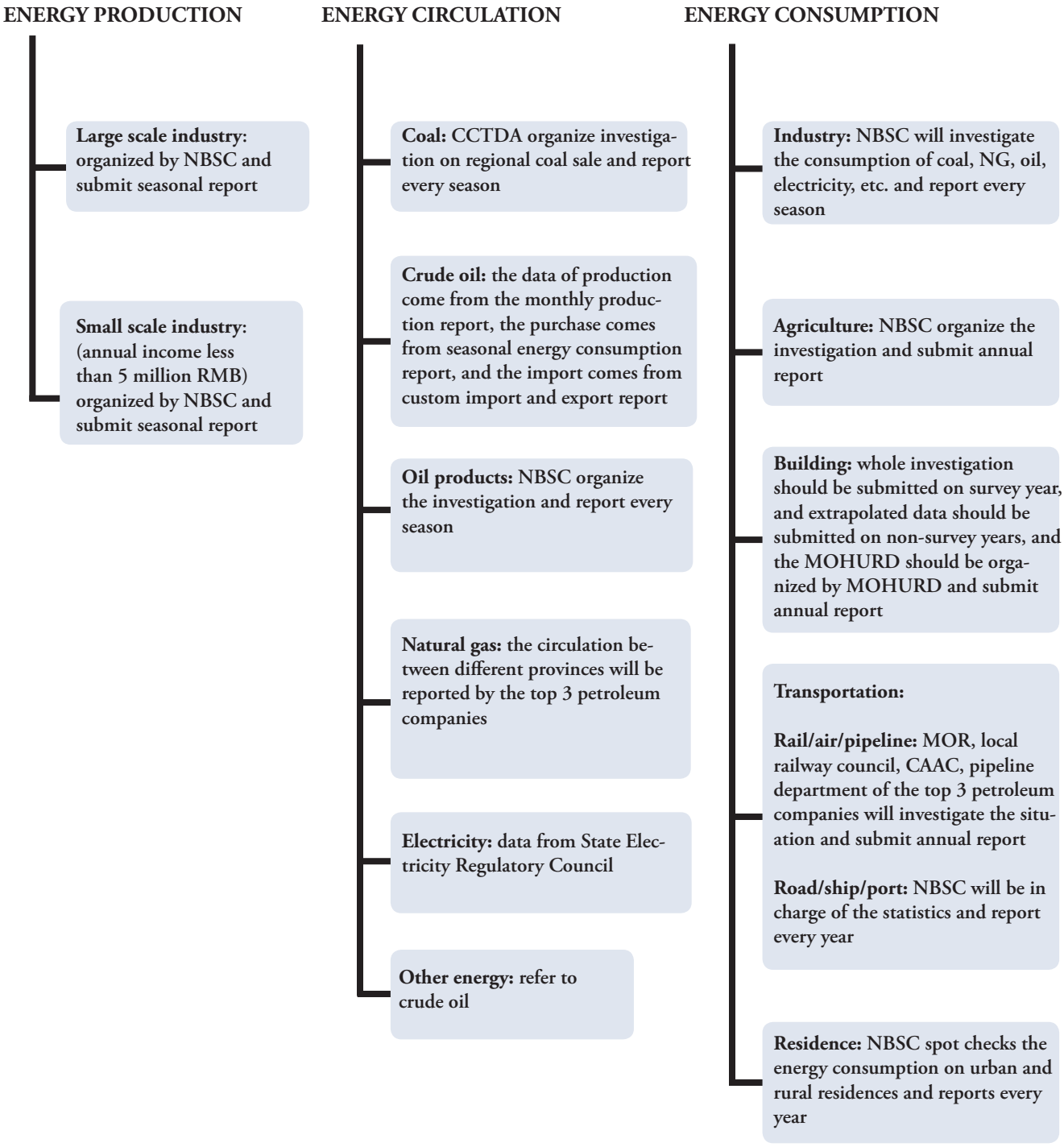
Gathering and assessing Energy Data in China

The main metric used is energy intensity of GDP, which is measured through an energy accounting system. The State Council to the NDRC and the National Bureau of Statistics (NBS) jointly set the standards and implemented a comprehensive system to review performance towards its goals. NBS collects the data and the NDRC leads a verification and inspection process. The NDRC has allocated energy conservation targets to every province, autonomous region and municipality. The regional governments have further allocated targets to cities, counties and key energy-intensive enterprises. All levels of government then report through their Statistics Departments. The Provincial and National levels of the NDRC then inspect enterprises to ensure compliance.

The energy accounting system covers three areas: energy production; energy circulation (transmission and distribution) among different provinces; and energy consumption. The system is intended to collect energy data from specific sectors as needed to calculate the energy intensity of GDP as accurately as possible. Figure 2 demonstrates the primary data and end use sectors covered by this process.

Several specific sectoral plans have been developed under the Five-Year Plan including the forestry sector. Quantitative targets are also identified in these sectoral plans. For example, Table 3 shows the energy intensities and targets for major industry sectors as specified in the energy development plan.

FIGURE 2. Data Sources for Measuring Energy Intensity of GDP



NBS = National Bureau of Statistics of China;

CCTDA = China Coal Trade & Development Association;

MOHURD = Ministry of Housing and Urban-Rural Development;

CAAC = Civil Aviation Administration of China;

MOR = Ministry of Railway

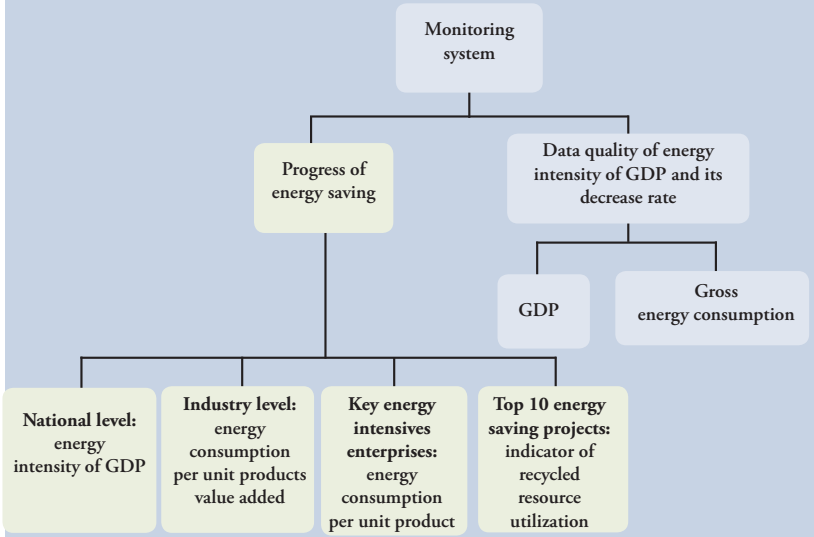
Source: Tsinghua University

The procedure for reporting the data identified in Figure 2 is depicted in Figure 3:

- First, the provincial government submits a self-assessment report to the State Council and the NDRC by the end of March, based on data from the energy accounting system.
- Second, the NDRC and other related departments, such as the National Bureau of Statistics and the State-Owned Assets Supervision and Administration Commission (SASAC) verify and assess the implementation of energy conservation in the local government. Based on an on-site assessment and spot checks, the NDRC drafts an examination report and submits it to the State Council by the end of May each year.
- Third, the State Council examines and approves the examination report and returns it to the NDRC.
- Finally, the NDRC reports the energy savings to the general public

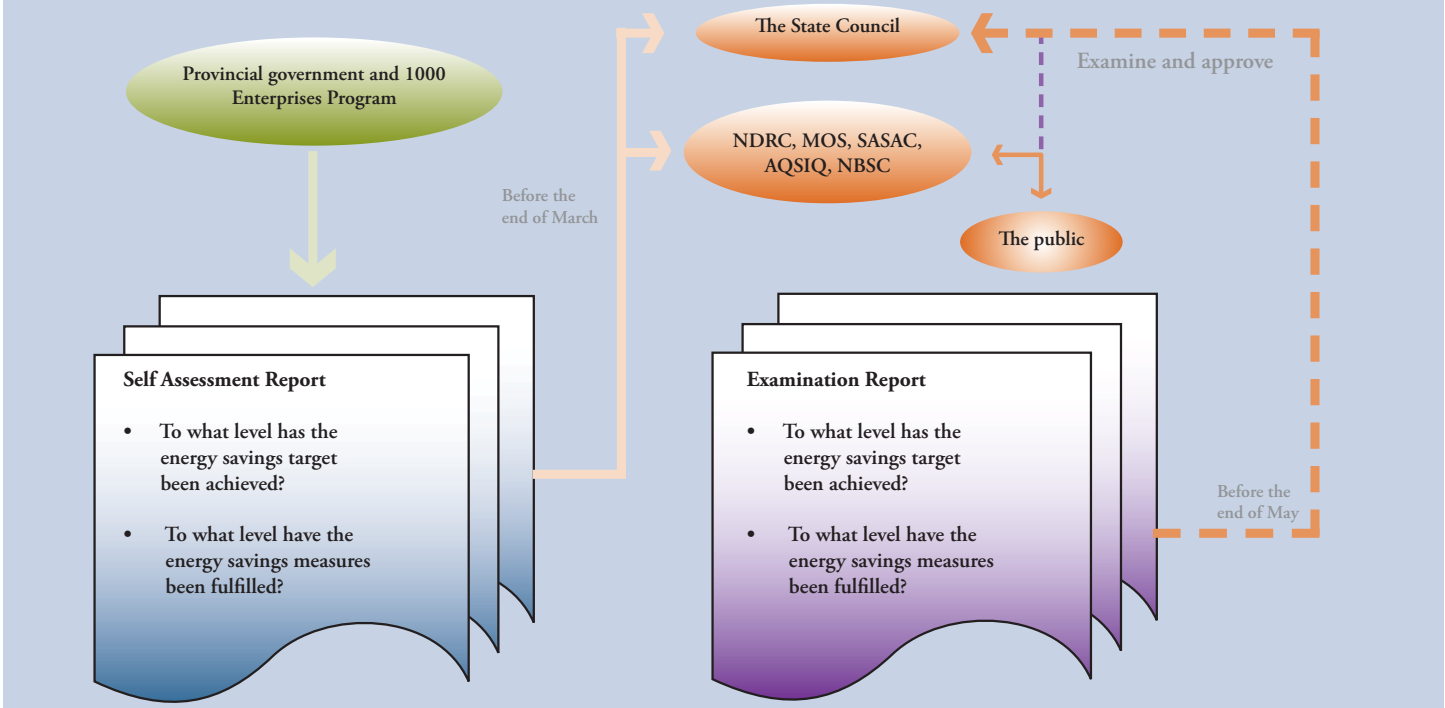
The Central government assesses and verifies the progress of provincial governments in achieving their energy conservation targets (see Figure 4). A government-approved assessment team conducts an on-site assessment, spot checks for more than 10 percent of key enterprises annually, and submits an assessment report, which includes ten indicators (see Figure 5). The first indicator is the reduction rate of energy intensity per unit of GDP. The other nine are qualitative indicators that evaluate the implementation of energy conservation measures.

FIGURE 4. Verification System for Energy Intensity Data



Source: Tsinghua University

FIGURE 3. Examination and Reporting System for Energy Intensity of GDP



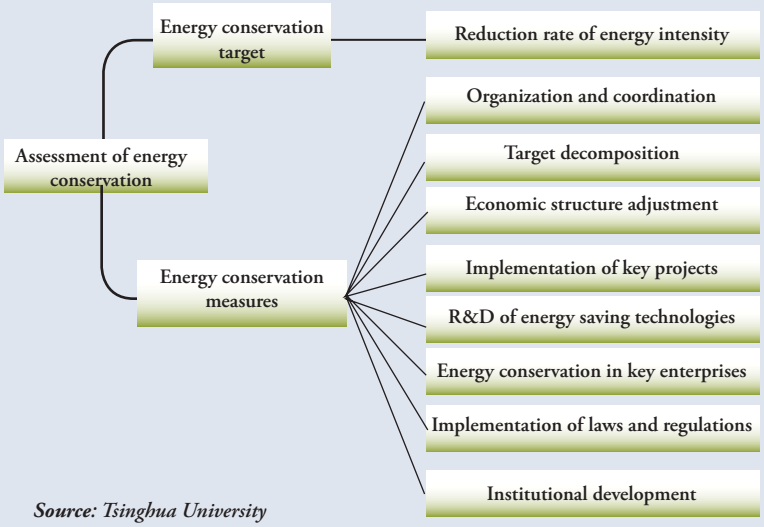
MOS: ministry of supervision
SASAC: State-owned Assets Supervision and Administration Commission of the State Council
AQSIQ: General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

Source: Tsinghua University

QUALITATIVE CLIMATE CHANGE POLICIES IN CHINA

China's mitigation actions do not consist solely of quantified targets, but also include a set of supportive policies and measures, as summarized in Table 4. These are designed to provide an enabling environment suitable to achieving the targets. The outcome of these supportive policies and measures may be difficult to quantify. For example, the CNCCP has identified the enhancement of research and development, of institutional management and of public awareness as important mitigation policies and measures. In contrast to quantified targets, these policies and measures may only have indirect mitigation benefits. On the other hand, some of these measures, such as fuel tax regimes, may have significant impacts on energy consumption and related emissions long-term, so should therefore be considered important.

FIGURE 5. Evaluation System for Energy Conservation Target



Source: Tsinghua University

TABLE 4. Summary of MRV Metrics and Mechanisms for Other National Mitigation Policies

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
GDP Restructuring	National	Share of GDP represented by the service sector	NBS publishes a yearly statistics bulletin	Internal data quality assurance system within NBS	5 year goal, annual progress reports
Technology Development	National	Share of GDP represented by R&D spending	NBS, MOST and MOF jointly publish a yearly statistics bulletin	NBS and MOST collect enterprise-level data separately	5 year goal, annual progress reports
Energy Intensity	National, with targets given to each province, locality and State-owned enterprise	Energy used (MTCE/ Unit GDP)	Calculated by NBS and published in a semi-annual statistics bulletin	Collected from multiple sources to ensure cross-checking	Five year goal. Many data are tabulated monthly. Provinces are required to report semi-annually
Renewable Energy	National, with targets given to provinces and power generation companies	Renewable energy portfolio standard (specified percentage of renewable in total output)	Energy Bureau aggregates data from NBS, various ministries and industrial associations	Internal data quality assurance system within various ministries and cross-checking	Goals to year 2010 and 2020, calculated annually
Waste Recycling	National, industrial sector	Percentage of industrial solid waste recycled	Calculated by Ministry of Environment Protection and published in a yearly bulletin	Internal data quality assurance system within MEP	Five year goal from 2006 to 2010
Forest Cover	National	Percentage of total landmass planted in trees	State Forestry Administration conducts national forest resource inventory	Remote sensing and ground-truthing	Five year and longer-term goals

MOST = Ministry of Science and Technology, NBS = National Bureau of Statistics
MOEP = Ministry of Environment Protection, SFA = State Forestry Administration
MOF = Ministry of Finance

TABLE 5. Summary of MRV Metrics and Mechanisms for Energy Efficiency

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
Efficiency Standards	Multiple industries and consumer products	Energy use per physical unit of output	Industrial processors and product manufacturers report the energy efficiency of their products and processes when asking for approval and registration	Energy saving verified by Energy Conservation Technology Service Center at national and local level	
Efficiency Labeling	Multiple Products	Energy use during product operation	All products in a given product category must be tested for energy efficiency and labeled accordingly, with test results reported to National Institute of Standardization (NIS)	Test results verified by Energy Labeling Management Center under NIS	New products will be added accordingly

Energy Legislation

The Chinese Renewable Energy Law, enacted in January 2006, provides a comprehensive renewable policy framework at the national level. The law covers a variety of areas including resource investigation, renewable energy planning, grid connection for renewable generation projects, fiscal and taxation measures, technology research and development, and also education and public awareness.

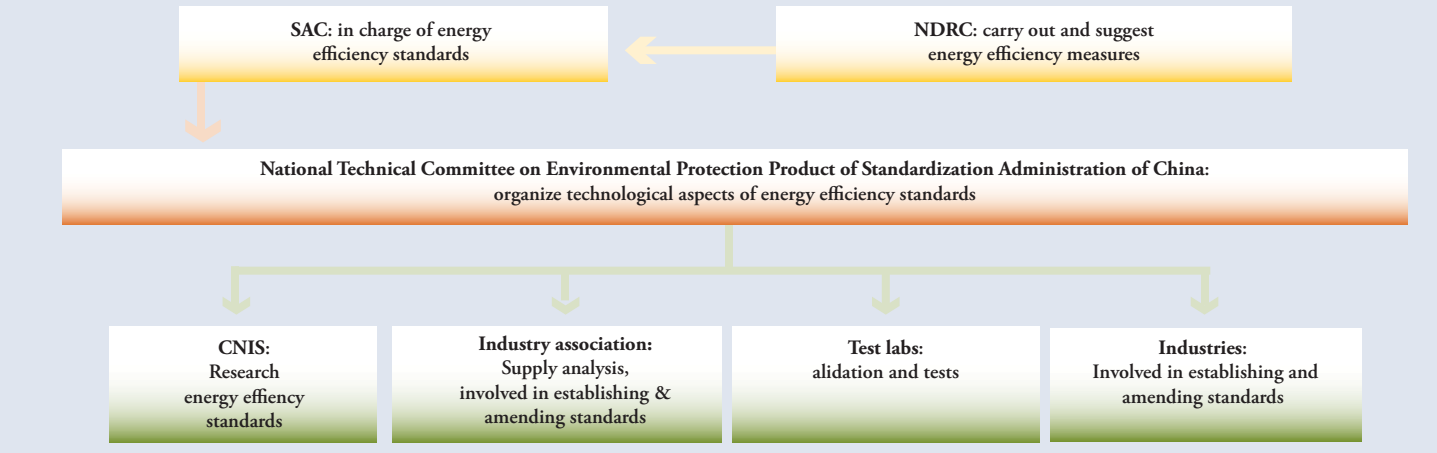
The Energy Conservation Law of China was enacted in 1998. This focused primarily on energy conservation in the industrial sector and lacked incentives and compliance mechanisms. In June 2007, an amendment was drafted and submitted to the People's Congress for approval. It extended the scope from the industrial sector to the residential and transportation sectors, established a framework for energy saving regulations and standards, provided a set of incentive policies ranging from tax reductions to subsidies, identified the central and local government as the focal point to take responsibility for implementation and also strengthened the compliance articles in the law.

The Circular Economy Law was enacted by the Chinese government in 2004. The Circular Economy Law aims to improve productivity, reduce costs and achieve economic, social and environmental targets as well as to realize the "reduce, reuse and recycle" principle from production to distribution and consumption. In January 2009 the Circular Economy Promotion Law was enacted to better specify how attain the aims of the Circular Economy. This law has seven chapters with 59 articles and adopts a key supervisory role over energy- and resource-intensive enterprises.

China is in the process of developing a more comprehensive system of energy legislation. A new Energy Law is now undergoing stakeholder consultation, and further legislation on electricity, coal and oil is under development.

The Energy Law itself is only a framework to guide the activity of government agencies and enterprises. The efficient enforcement of laws depends on detailed incentive policies, regulations, and standards. For example, there are more than 300 regulations in the process of being formulated for the Circular Economy Promotion Law. After the enactment of the Energy Conservation Law, the General Administration of Quality Supervision, Inspection and Quarantine and National Standards Administration Commission was appointed to develop and update regulations and standards related to energy conservation. Some major national standards are listed in the next section; most were enacted in June 2008.

FIGURE 6. The Organization and Management of China's Energy Efficiency Standards



SAC: National Standardization Administration Committee of China
NDRC: National Development and Reform Committee
CNIS: China National Institute of Standardization

Source: Tsinghua University

Regulations and Standards

Energy Efficiency Standards

Energy efficiency standards and the energy efficiency labeling system are two important measures aimed at enhancing the efficiency of electric appliances. In the 1980s, China formulated its first set of energy efficiency standards, which included nine types of appliances. The energy standards system currently includes 23 types of products, including appliances, lighting elements and general industrial equipment. The breakdown of responsibilities or setting energy efficiency standards is laid out in Figure 6.

Comprehensive information on the 23 product categories is publicly available. All of the products that enter the market must achieve the relevant standard. This is verified by the State Administration for Industry & Commerce.

Energy Efficiency Labeling

The energy efficiency labeling system was established in 2004 with the goal of providing energy saving information to consumers. The aim of this measure is to help consumers save energy, encourage manufacturers to improve the energy efficiency of their products, and to encourage distributors to select products with high energy efficiency. For example, as of March 2005, TV sets and air conditioners with an energy efficiency rank lower than 5 cannot enter into the market. This measure plays an active role in promoting energy saving on a large scale.

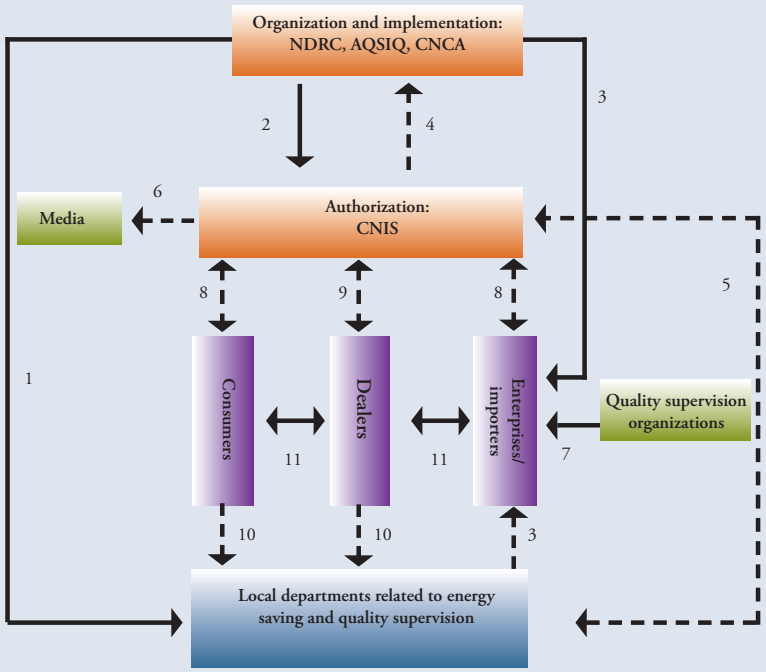
The energy efficiency label includes (1) product specifications and type; (2) energy efficiency grade; (3) estimated energy consumption of the product; (4) number of the applicable national energy efficiency standard. To determine the energy efficiency grade of the product the manufacturer or importer may either use its own testing capacity or a testing institution accredited by the State.

There are two kinds of labels in the energy efficiency labeling system. One is the Energy Conservation Certification, and the other is the China Energy Label (see Figure 7). The Energy Conservation Certification is awarded to equipment that meets specific energy efficiency standards or technology criteria. There is no information about the product's energy efficiency on the label. In contrast, the China Energy Label is an information label that provides consumers with information about the product's energy efficiency.

The China Energy Label is mandatory on all relevant consumer products. A manufacturer or importer is responsible for the accuracy of the information on the energy efficiency label it uses and cannot forge or imitate any energy efficiency label. The AQSIQ (Administration of Quality Supervision, Inspection and Quarantine) and the NDRC must, in accordance with their respective duties, inspect the products listed in the "Catalogue" and verify the information on energy efficiency labels, as shown in Figure 8.

FIGURE 7. The China Energy Label

FIGURE 8. Organization System of Energy Efficiency Label



1. organization
2. authorization
3. supervision
4. suggestion
5. information sharing
6. bulletin
7. check
8. record and ratify
9. lodge a complaint & query;
10. lodge a complaint & report;
11. social supervision

AQSIQ: General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

CNCA: Certification and Accreditation Administration of the People's Republic of China

CNIS: China National Institute of Standardization

***Source:** Tsinghua University*

Incentive Policies

The Chinese economic system is a combination of central planning and market mechanisms, including targeted taxes. Taxes are not only an important source of fiscal revenue in China, but can also be used as a tool to guide consumer and investor behavior. As shown in Figure 9, China's tax system currently employs seven different categories of taxes, including turnover taxes such as value-added taxes (VATs) and consumption taxes.

Value-added taxes have been used to encourage renewable and energy conservation projects in China. For example, to increase the attractiveness of wind energy projects in China, the VAT for wind generation equipment has been lowered from 17 percent to 8.5 percent and income tax for wind projects has been cut from 33 percent to 15 percent. Consumption taxes are also being employed to drive conservation. In December 2008, the Chinese government announced plans for a fuel tax, which will be collected beginning in 2009. The fuel tax has been debated for more than a decade. It will start at 1 RMB per liter of petrol and the revenue generated will replace road tolls as a funding source for highway maintenance and construction. This policy has obvious GHG benefits through reducing energy consumption and related emissions. Research shows that a fuel tax of 2.4 RMB per liter of petrol would be expected to reduce fuel demand by 10 percent in 2010 (Jiang, 2008).

The Chinese government also uses subsidies as an incentive for energy conservation. For example, the Ministry of Finance (MoF) provides a 30-50 percent subsidy for citizens who purchase energy-saving lamps. NDRC plans to promote the purchase of 150 million energy saving lamps from 2006 to 2010, and is also working with the Global Environment Facility (GEF) and UNDP to develop a plan for phasing out incandescent lamps.

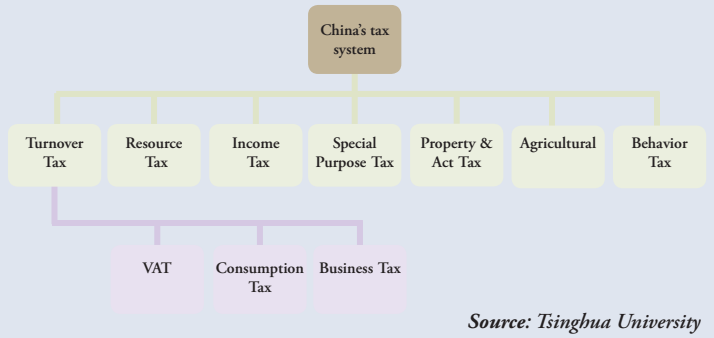
Institutional Arrangements

The Chinese government set up a special institution to address climate change in 1990 and established the National Coordination Committee on Climate Change (NCCCC) in 1998. In 2007, the National Leading Group to Address Climate Change, headed by the Chinese premier, was established to formulate important strategies, policies and measures related to climate change and to address major problems in this regard. The number of member agencies of the National Leading Group increased from 18 to 20 in 2008.

The National Development and Reform Commission (NDRC) have been charged with undertaking the general work on climate change, and the office of the National Leading Group was placed in the NDRC. Within the NDRC, a dedicated department has been established for organizing and coordinating work on climate change throughout the country. The Experts Committee on Climate Change has been set up to improve scientific decision-making on climate change, and has done a great deal of work in supporting government decision-making and promoting international cooperation and nongovernmental activities.

In contrast with target-oriented policies and measures, the results of these institutional reforms can be difficult to measure quantitatively or even qualitatively. A better way to evaluate such policies and measures might be through a decentralized self-reporting mechanism.

FIGURE 9. China's Tax System



Source: Tsinghua University

Table 6. Summary of MRV Metrics and Mechanisms for Incentive Policies

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
Tax policy	National	Increased cost of fossil fuels (examples: fuel tax and VAT rebate change)	National Tax Bureau	Tax bureau has tax receipts	Change becomes permanent
Tax incentives	National	Tax breaks for renewable investments	National Tax Bureau for amount of tax, NDRC for actual investments	NDRC reports on new renewable power	Annual reports

SECTION III: A REVIEW OF POLICY IMPLEMENTATION AND MEASUREMENT STRUCTURES ACROSS SECTORS

INDUSTRIAL SECTOR

The industrial sector accounts for about 70 percent of China's total energy consumption. Energy conservation in key industrial sectors is primarily implemented through energy conservation projects based on agreements negotiated between enterprises and the government. The Top Ten Energy Conservation Projects are the key measures to ensure that the target of 20 percent energy intensity reduction is met (National Development and Reform Committee, 2006). Six of these projects are in the industrial sector: Coal-fired industrial boiler (kiln) retrofit projects, district cogeneration projects, residual heat and pressure utilization projects, petroleum saving and substituting projects, motor system energy saving projects, and energy system optimization projects. Policies and measures to support these key projects include regulations and standards, a preferential tax regime, subsidies and low-interest loans.

The Thousand Enterprise Program

Under China's Thousand Enterprise program specific energy saving targets are negotiated between the government and major energy-consuming enterprises, with commitments and time schedules to achieve these commitments. The major goals of the Thousand Enterprise program are to significantly improve energy efficiency, reduce unit energy consumption for all major products, employ either an international best practice or sectoral best practice benchmark, improve the energy efficiency of each sector and achieve energy savings of approximately 100 million tons of coal equivalent during the 11th Five-Year Plan period. All participating enterprises have a signed contract with the central and provincial governments to commit to achieving their energy savings target (Price and Wang, 2007).

According to the Thousand Enterprise program's action plan, the enterprises involved should establish an energy conservation department and a reporting system for internal energy utilization. The enterprises must also conduct an energy audit and submit the audit report to local and central governments for assessment and verification. The enterprises must report their achievements from the previous year to the local government by January of each year, and the provincial government must verify these achievements and report to the central government before March. The enterprises must also report their quarterly fuel consumption to the National Bureau of Statistics (NBS) via a web-based reporting system. Enterprise data are considered confidential and provided only to NDRC. The local government is responsible for verifying the achievement of energy conservation targets through spot checks and energy audits by third parties.

NDRC has a system to evaluate the results of the 1000 enterprises program. The systems measures the level of effort in energy conservation activities and these are scored according to the following table which awards a score based on the reduction achieved. Enterprises with a score of more than 60 will be regarded as getting a "Pass" grade (see Table 7 for results).

Additionally, the system used to evaluate provincial governments takes into account the energy-saving performance of key enterprises. This provides a strong incentive to local officials to ensure that enterprises achieve their targets.

In mid-2008, NDRC published the 2007 assessment results of the 1000 enterprises program. The report showed that 90% of key enterprises achieved their energy conservation target, indicating an estimated energy conservation equivalent of about 38 million tons of coal in 2007 (National Development and Reform Committee, 2008).

TABLE 7. Evaluation system for 1000 enterprises program

Energy conservation target (40)	100% achieved: 40; 90% achieved: 35; 80% achieved: 30; 70% achieved 25; 60% achieved: 20; 50% achieved: 0
Energy conservation measures (60)	Energy conservation leading group: 3 Energy conservation management department: 2
	Decomposition of target to unit and person 3 Assessment of energy conservation target 3 Reward and punishment system 4
	Energy efficiency performance in 1000 enterprises: 10 for top 10% and 5 for top 50%. Energy conservation R&D fund 4 Annual energy conservation plan 4 Closure of backward equipment 7 Retirement of outdated equipment
	Implementation of local regulation 2 Implementation of energy consumption norm 4 Norm management for energy consuming equipments 2 Implementation of energy conservation design 2
	Energy audit and monitoring system 2 Energy statistics manger and account 3 Energy monitoring appliance 3 Energy conservation training 2

Source: Tsinghua University

Program to Close Small Enterprises

Closing small thermal power plants is part of the national energy saving and pollution reduction effort to meet the national target of 20 percent reduction in energy intensity by 2010. This program, which operates in parallel with plans to build larger, more efficient plants, is officially called "The Program of Large Substituting for Small." In order to promote the robust development of China's power industry, NDRC has required the closure of small-scale thermal power units with high energy consumption and poor pollution control, and delegated this task to provincial governments and the power and grid companies.

This program is intended to close most of the existing small units, which currently produce approximately 114 GW of power; the program is expected to decommission about 50 percent of inefficient small units by 2010. These include:

1. all conventional thermal power generating units of below 50 MW;
2. all conventional thermal power generating units of 100 MW and below that have been operating for over 20 years;
3. all conventional thermal power generating units of 200 MW and below that have reached the end of their design lives;
4. all coal fired generating units with a net heat rate at least 10% higher than the 2005 provincial average or at least 15% higher than the 2005 national average ;
5. all generating units that fail to meet environmental standards;
6. all generating units not complying with laws and regulations.

In 2007, China shut down 553 small thermal power generators under the program, with a total capacity of 14.38 million kilowatts and an average age of 28 years (State Electricity Regulatory Committee and National Development and Reform Committee, 2008). Large thermal power generators exceeding 50,000 kilowatts will be used to replace the lost capacity.

Implementation of this program is headed by NDRC at the national level and is supported by other government agencies, such as the State Electricity Regulatory Commission (SERC) and the Ministry of Environmental Protection (MEP). At the local level, the leading group is composed of the local development and reform commission (DRC) and other government agencies and local utility companies.

It is relatively easy to measure the number and installed capacity of small size generation units that are closed. Moreover, this program creates a link between decisions to decommission inefficient small size units and permission to build newer and larger power generation projects. The decommissioning of inefficient small size units is the key criterion for eligibility for a new substituting power project to be included in the national power development plan, which is the basis for central government approval of projects. For example, a power company has to decommission 840MW of inefficient small size units to make it eligible to procure a new project of two 600MW super critical units approved by the NDRC.

Local governments/companies are in charge of implementing the program in their area and will be held accountable by higher level governments/companies for failure to accomplish the mission assigned. Provincial governments and major electricity companies were required to submit detailed implementation plans to NDRC before the end of March 2007 covering post-decommissioning issues such as reemployment and financial compensation. The total capacity of small thermal power plants shut down is reported to NDRC by local governments.

NDRC or a relevant organization commissioned by NDRC verifies report figures. Supervisory organizations, such as the electricity regulatory commission, are assigned by the central government to conduct verification and registration of each inefficient small size unit decommissioned. A list of decommissioned units is published online for public monitoring to ensure that these units are truly and permanently decommissioned.

There are similar programs in other industrial sectors. Some major substitution and closure programs to phase out inefficient equipment in key sectors are listed in Table 8.

TABLE 8. Closure Programs in Key Sectors

Closure Program	Total Capacity of Closed Facilities
Closure of small-scale thermal power units	50GW
Closure of blast furnaces under 300 m^2	100 million tons
Closure of small-scale steel-making capacity	55 million tons
Closure of small-scale coking plants	80 million tons
Closure of calcium carbide facilities under 6300 kVA	2 million tons
Closure of small-scale clinker production capacity	250 million tons

Source: National Development and Reform Committee, 2004

Energy Conservation Power Generation Dispatch (ECPGD) Program

The Energy Conservation Power Generation Dispatch Program began in December 2007 with pilot projects in the provinces of Guizhou, Jiangsu, Sichuan, Henan and Guangdong. Detailed implementation measures and working plans are still under development based on these pilots.

The ECPGD Program (State Council, 2008) is complementary to the Program Closing Small Enterprises and focuses on prioritizing power generation from existing renewable, nuclear, efficient and clean coal power plants over other more carbon-intensive power plants. It is a major reform to the current pattern of power generation dispatch in China, intended to create a market mechanism by substituting the current even load power generation scheduling rule with an energy efficiency-based rule that favors low-carbon energy.

The table of priority categories of generating units is the foundation of ECPGD and is established by the provincial development and reform commission. It is adjusted according to the operating situation of generating units. The priority categories are as follows: (1) wind power, solar power, oceanic power and hydro power; (2) adjustable hydro, biomass, geothermal power and solid waste-fired units; (3) nuclear power; (4) coal-fired cogeneration units and units with comprehensive use of resources, including those using residual heat, residual gas, residual pressure, coal gangue, coal bed/coalmine methane, etc; (5) natural gas and coal gasification-based; (6) other coal-fired generating units, including cogeneration without heat load; (7) oil and oil product-based generating units.

Within each category, units are ranked according to their energy efficiency. Units with the same energy efficiency are further ranked according to their emission levels and water usage. Units are scheduled for generation only when all units in higher priority categories and ranks are operating at full capacity.

Local development and reform commissions organize the collection and management of load forecasting and load management and provide this information to industry, grid companies and power generation companies. The priority list for load management and dispatch is based on the information collected on individual plants and the load forecasts. There is no official estimate for energy-saving and emissions reduction resulting from the implementation of ECPGD, but it is likely to make the single greatest contribution to energy conservation in the electricity sector.

TABLE 9. Summary of MRV Metrics and Mechanisms for Industrial Sectors

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
The Thousand Enterprise Program	National, targeted at 1000 largest enterprises	Energy Intensity per unit output	Enterprise to local DRC to NDRC	NDRC verification teams	5 year program with annual targets; progress reports twice a year
Individual Industrial Sector Targets	Set by Sector	Energy Intensity per unit physical output or value added	Industrial association to NBS/NDRC	Aggregated data from individual companies	Annual and 5 year reporting
Program to Close Small Enterprises	National	Percent of total land forested	State Forestry Administration	Energy Bureau of NDRC conducts on-site verification	5 year targets, annual progress reports
Energy Conservation Power Generation Dispatch	Currently piloted in five provinces, but planned to be national within the electric power system	Currently a compliance metric, but no energy metric	Power plant performance determined by NDRC at local levels, which then sets the dispatch priority	Local technical bureaus verify efficiency and performance	
Coal-fired industrial boiler (kiln) retrofit projects	Coal-fired industrial boilers nation-wide	Average efficiency and energy saving of industrial coal-fired boilers	Energy saving reported by enterprises to government	Energy saving projects verified by third parties	2010 Goal
District cogeneration projects	District heating, especially in northern China	Share of cogeneration in district heating and cogeneration capacity	Energy saving reported by enterprises to government	Energy saving projects verified by third parties	2010 Goal
Residual heat and pressure utilization projects	Iron and steel, construction material and other industries with saving potential	Energy saving from residual heat and pressure utilization	Energy saving reported by enterprises to government	Energy saving projects verified by the third parties	2010 Goal
Petroleum saving and substituting projects	Metal, construction material and other industries with saving potential	Quantity of petroleum saved and substituted	Energy saving reported by enterprises to government	Energy saving projects verified by third parties	2010 Goal
Motor system energy saving projects	Major electricity consuming sectors	Motor efficiency improvement and electricity saving	Energy saving reported by enterprises to government	Energy saving projects verified by the third parties	2010 Goal
Energy system optimization projects	Refinery, chemical, iron, and steel industries	Energy improvement per unit product and quantity of energy saving	Energy saving reported by enterprises to government	Energy saving projects verified by the third parties	2010 Goal

TABLE 10. Summary of MRV Metrics and Mechanisms for the Building Sector

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
Energy Efficiency in Buildings	National	Adherence to standards	Building contractors report to local government and building owner in project acceptance report	Local quality supervision institution verifies	

RESIDENTIAL SECTOR

Energy saving in buildings requires efficient use of energy during the construction and operation of buildings, as well as efficient use of heating, air conditioning, lighting, electrical equipment, and hot water supply. About 2 billion m2 of new buildings are constructed every year in China (Newspaper on International Finance, 2005). Currently, buildings account for almost 28 percent of China's total energy consumption – up from just 10 percent in 1978. This share could rise to 35-40 percent as living standards improve and workplaces develop. Under such a scenario, the residential sector could surpass other energy-intensive sectors, such as industry and transportation, to become the nation's largest energy-consuming sector.

The mitigation policies and measures in the residential sector mainly consist of regulations and standards for building design, market mechanisms such as promoting the installation of heating meters in old buildings, and subsidies for energy-saving appliances in buildings.

Building Energy Conservation Project

The Building Energy Conservation Project has three dimensions:

1. Energy conservation in new buildings;
2. Energy-saving renovation in existing buildings;
3. Renewable energy use in buildings.

Both public buildings and residential buildings have corresponding energy saving design standards. Policies on design standards, assessment and methodologies for examination have been implemented so as to: strengthen the operation and management of energy-consuming equipment for buildings; optimize the thermal engineering performance of the surrounding structures of buildings; improve the work efficiency of heating, cooling, lighting, ventilation, water supply, drainage and pump systems; promote the use of renewable energy; and reduce energy consumption of buildings while guaranteeing their essential functions and ensuring sufficient indoor heating.

The government has also established the following indicators of energy conservation and efficiency in buildings (see Table 10):

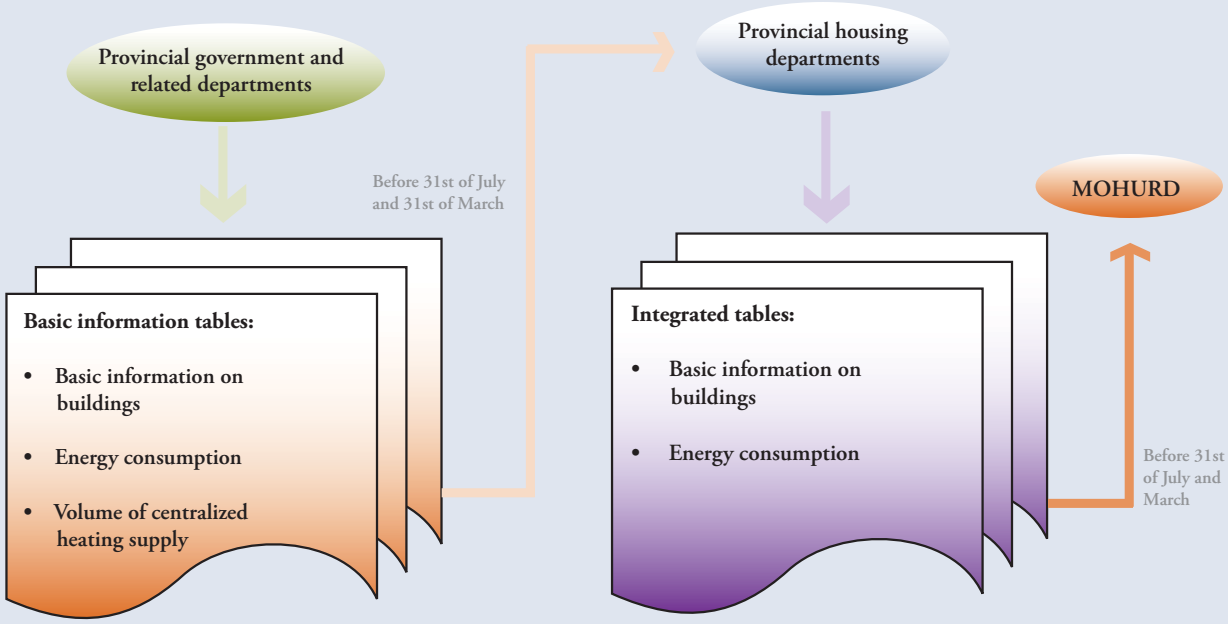
- For new buildings, a 50 percent energy saving target has been set, with the target increased to 65 percent in Beijing, Tianjin, Shanghai and Chongqing.
- In the northern, southern and transition regions, the share of new energy-conserving wall and roof materials should increase from 40 percent to 60 percent, and the share of new heat-preserving and thermal insulation materials used in energy conservation programs in buildings should increase from 35 percent to 55 percent in 2010.
- For public buildings, the indoor air temperature cannot be higher than 20oC in the winter, and cannot be lower than 26oC in the summer.

The government has established different monitoring and compliance processes for different buildings, depending on whether they are residential or pubic, and in accordance with their different design standards and energy conservation indicators.

For residential buildings, the Ministry of Housing and Urban-Rural Development (MOHURD) established the "Energy consumption statistical reporting mechanism of residential buildings" in 2007 to provide a comprehensive picture of residential energy consumption. This mechanism has been implemented in 23 cities, such as Beijing, Shanghai, Chongqing and Harbin, and will be extended throughout the country.

Information in this reporting system is organized in three different accounting tables: a basic information table, an energy consumption table, and a centralized heating supply table. Provincial governments direct the collection of this data, and report these tables to the Provincial housing department, which submits the integrated tables to MOHURD. Figure 10 illustrates how the reporting mechanism works.

FIGURE 10. Reporting Mechanism for Energy Consumption in Residential Buildings



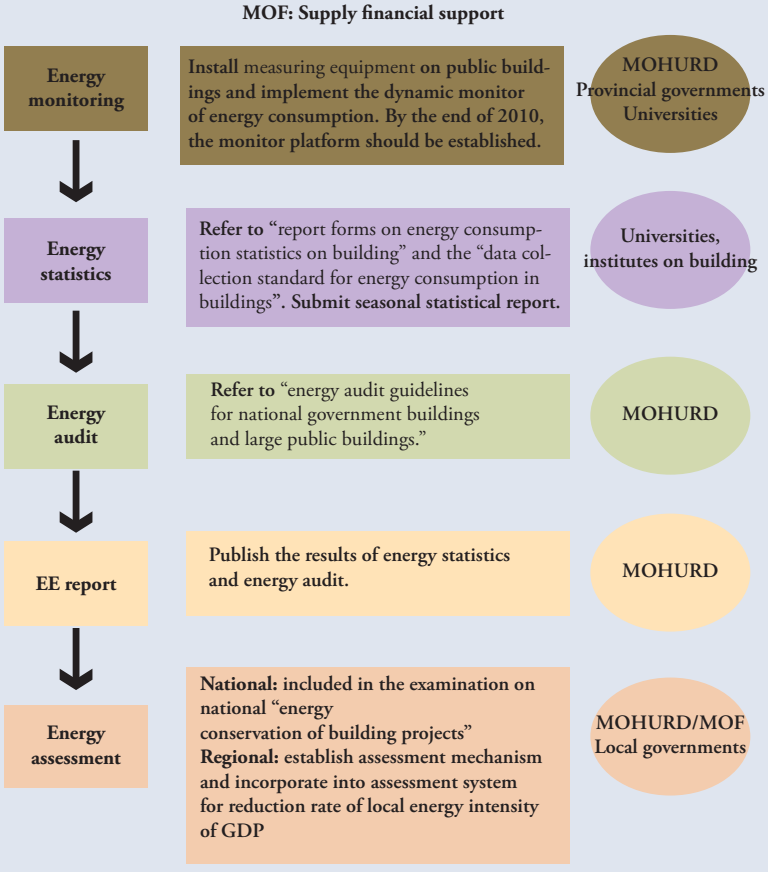
MOHURD: Ministry of Housing and Urban-Rural Development of the People's Republic of China
MOF: Ministry of Finance
EE: energy efficiency

Source: Tsinghua University

Ultimately, the construction administrative department of the State Council receives the information collected by the reporting mechanism and uses it to supervise residential energy conservation at the national level. At the local level, however, the construction administrative department of local governments at the county level or above administers the energy conservation program for residential buildings within its jurisdiction. To help in this effort, MOHURD has established criteria for evaluating the quality of energy conservation projects in new buildings to make sure they meet conservation targets.

To ensure energy conservation in national government buildings and large public buildings, the government formulated a comprehensive energy conservation monitoring system with several elements, including a system for measuring building energy consumption (see figure 11), energy consumption statistics and accounting, an energy audit, an energy efficiency report and an energy efficiency assessment. Figure 10 illustrates this system.

FIGURE 11. Monitoring System for Energy Savings in National Government Buildings and Large Public Buildings



Source: Tsinghua University

TRANSPORTATION SECTOR

Transport presents a significant challenge because many current Chinese transport needs have not yet been met. There is a need to develop additional public transportation services in ways that minimize carbon intensity. Thus, comprehensive policy planning that is aimed at reducing future rather than current emissions will actually have the greatest impact over time. This includes vehicle and fuel standards, as well as the development of mass transit and inter-city rapid transit. These needs fit well with a MRV structure that can take into account the diversity of actions and policies needed.

The transport sector has recently become one of the primary energy consumers in China. It accounted for 7.5 percent of total energy consumption in 2006 and this will continue to increase to meet growing demand. The transportation sector is also responsible for a significant contribution to China's GHG emissions.

To promote energy efficiency in the transport sector, national and local governments are implementing a wide range of policies and measures including industrial strategies and supporting initiatives. The government also implements economic policies conducive to energy conservation such as a policy of tax reduction for the production and consumption of compact cars. In 2009, the government began collecting a fuel tax on petrol consumption, which was the first energy tax to be collected in China. Mandatory entry permits for clean energy vehicles have also been introduced to improve the investment environment, regulate the vehicle market and encourage manufacturers to invest in research and development. Some voluntary actions, such as the "drive one day less a month" program have been implemented to improve public awareness of climate change.

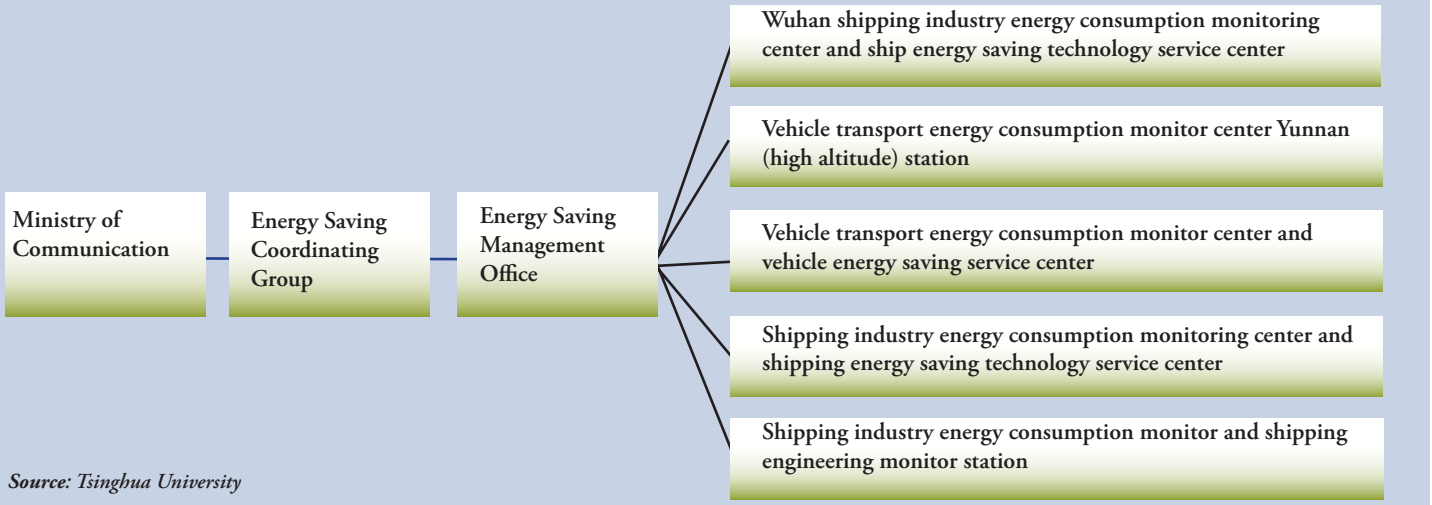
After China's Energy Conservation Law came into effect in 2007, the Ministry of Communication (MoC) established an energy saving coordination group and energy management office to take responsibility for energy saving policy decisions and management in the transportation sector, the functioning of which is illustrated in Fig. 12. The MoC also set up several monitoring and service centers responsible for monitoring, auditing and promoting energy-saving technologies.

Fuel Consumption Limitation Standard for Motor Vehicles

Vehicle fuel economy standards have proven to be one of the most effective tools for controlling oil demand and GHG emissions from the transportation sector in many countries around the world. In 2000, China established its first national fuel efficiency standard, which was designed to reduce oil consumption and to encourage foreign automakers to introduce more fuel-efficient vehicle technologies into the Chinese market.

The first national standard for vehicle fuel efficiency was enacted in July 2005. This new standard was implemented in two stages: stage 1, which aimed to improve fuel efficiency by 10 percent, took effect on July 1, 2005. Stage 2 took effect on January 1, 2008 with the goal of improving fuel efficiency by an additional 10 percent. A standard has been developed to set different fuel efficiency levels for different types of vehicles to be sold in China. The vehicle companies are asked to provide detailed information for fuel efficiency verification reports. Every vehicle sold must be tested to confirm that its fuel consumption meets specifications for that model.

FIGURE 12. Organization Structure for MRV in the Transportation Sector



Source: Tsinghua University

The General Administration of Quality Supervision, Inspection and Quarantine is responsible for implementing and monitoring the fuel efficiency standard. At the national level, responsibility for planning and checking is assigned to the State Council Standardization Administration Department and other State Council departments. At provincial level, this responsibility is assigned to provincial or autonomous regional or municipality standardization administration departments.

Railway System Development

Rail is the most commonly used mode of long-distance transportation in China. The Ministry of Railways is responsible for the construction and operation of the rail system. Compared with other long-distance transportation modes, such as highway and aviation systems, rail is less carbon-intensive in terms of emissions per person kilometers. In the 11th Five-Year plan of railway construction, the Chinese government allocated about 1.25 trillion RMB to expand its railway system, with the goal of growing from 78,000 km in 2007 to 85,000 km in 2010 and 100,000 km in 2020. In December 2008, the State Council announced an economic stimulus package with a 2 trillion RMB investment plan. As a result of increased investment, the country's railway network is expected to expand further to 100,000 km in 2010 and 120,000 km in 2020. The Ministry of Railways is also paying greater attention to the development of a high-speed railway system that can compete with direct flights in the long distance transportation market. China Railway High-speed (CRH) has been utilized in several intercity rail system expansions in China. The goal is to extend the high-speed system to a length of 12,000 km with an average speed higher than 200km/h.

Mass Transit System in Major Cities

The economic growth that China has achieved in recent decades has been accompanied by extensive urbanization and associated transportation challenges. In 2005, the State Council issued a decree to give priority to urban public transport. This decree requires local governments to improve public transportation infrastructure, optimize operations, guarantee priority use of roads for public transportation, and implement reforms to further promote public transportation. Compared with other public transport modes, Bus Rapid Transit (BRT) is one of the more attractive solutions for developing countries as it has a low investment requirement (about 4 million $/km) and lower energy use and carbon emissions. At least 10 Chinese cities are actively planning or expanding BRT systems with varying approaches. The first BRT line in Beijing began operation in Dec 2005 with a length of about 16 km. The average passenger rate is about 90,000 people per day, with a peak of more than 200,000 people per day. Compared with railway planning, urban transportation planning is more decentralized within local authorities. Most of the major Chinese cities have an urban transportation plan for the 11th Five-Year period. These and other initiatives are summarized in Table 11. For example, the municipal government of Beijing published its urban transportation plan in 2010. The major goal is to increase the share of public transportation to 40 percent from 28 percent by the end of 2010.

TABLE 11. Summary of MRV Metrics and Mechanisms for the Transportation Sector

NAMA	Scope	Metric	Reporting Mechanism	Verification Mechanism	Time Frame
Vehicle Efficiency Standards	National, auto sector	Km/liter	Through agricultural bureaus to the central ministry	Both pre- and post-manufacture	Based on introduction of new models
Fuel tax	National, vehicle sector	Absolute price increase to fuel	Set by central tax authorities, who also report revenues	Tax authority audits of local fuel tax revenues	Annual revenue reporting
Mass Transit development	Local authorities	Share of public transit in overall transportation system, km for BRT, metro and other public transit systems	Local municipal government	Annual report to People's Congress at city level	Annual reporting
Intercity rail	National, rail sector	Km of new track and investment in new rail infrastructure	Ministry of Railways	National ministry collects data from localities	Annual reporting

SECTION IV: LINKING MRV ON THE GROUND TO THE GLOBAL CLIMATE AGREEMENT

As outlined above, in Section II the Chinese government has laid out a national climate strategy. The climate change policies and measures identified are development-focused and are diverse in terms of type and scope. A review of these policies and measures could provide important insights into a possible MRV system under the post-2012 climate regime.

Nationally Appropriate Mitigation Actions

A wide range of polices have been undertaken by the Chinese government, which could be classified as a NAMA in the future, depending on the UNFCCC negotiations.

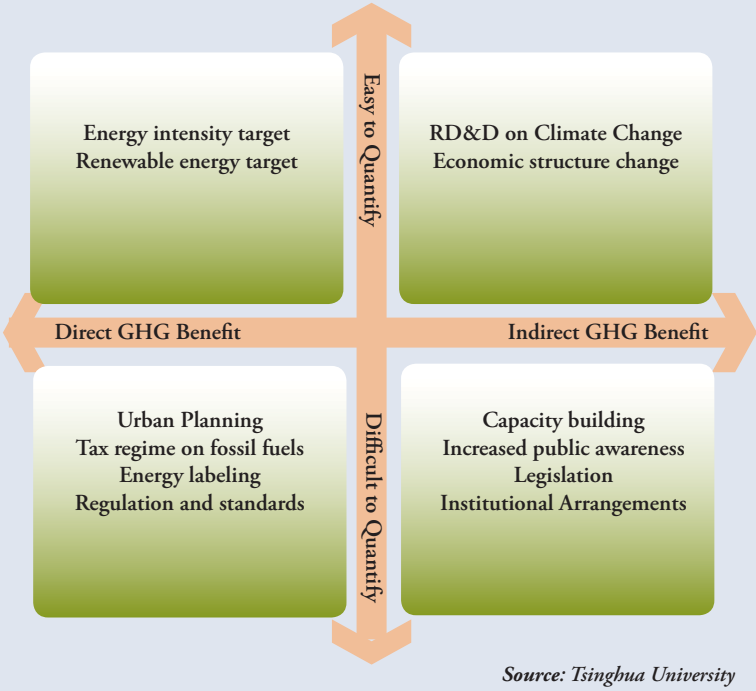
In theory, under a post-2012 climate agreement, NAMAs could be either defined through an agreed list or could emerge from broad national mitigation strategies or low-carbon development programs / plans, as has been proposed by some UNFCCC delegations such as the European Union (McMahon et al, 2009). As aforementioned, China's broad strategy is reflected in the Five Year Plan and China's National Climate Change Program, as well as other programs. The broad strategy approach seems to encourage the development of a diversity of policies and measures, as evidenced by the range of possible NAMAs and metrics found in China and reflected in this paper, and summarized in Figure 13.

Given that the identification of NAMAs is likely to be a country-driven process (Ellis et al., 2007), some important questions remain: Is it reasonable to ask developing countries to choose which of their policies and measures could be submitted as NAMAs in order to garner external support? Or would countries simply submit all of their NAMAs, among which donors would decide which they chose to support, although this could encourage cherry-picking? Does this mean that MRV of actions would also be nationally determined, and if so, how would progress be demonstrated? Through national inventories or low-carbon development plans? Would there be specific financial and technical support for the MRV process itself? All of these questions remain to be answered through international negotiations.

Measurement

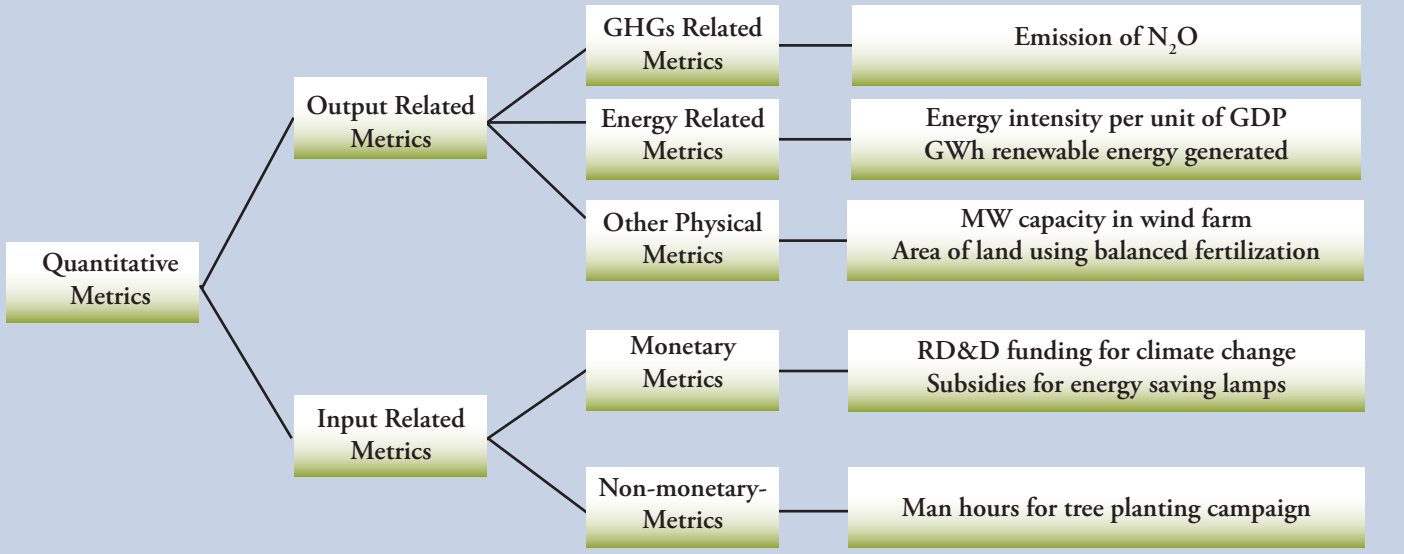
Measurement is central to MRV and metrics are the starting point of measurement. A wide range of metrics have been adopted by the Chinese government across sectors, and some are development focused while other are GHG specific, some are out-put focused, other are in-put focused eg GHG reduction, energy saving, acres of reforestation, Research and development funding and so on as shown in Figure 14.

FIGURE 13. Classification of Policies and Measures based on Ease of Quantification and GHGs Benefit



Source: Tsinghua University

FIGURE 14. Structure for Different Quantitative Indicators



Source: Tsinghua University

Metrics that are output related measure the result of the mitigation action either directly in GHG emissions or indirectly in terms of energy saving or changing in production or consumption.

Energy-related metrics or other physical metrics can be used as proxies to estimate emissions (i.e. tCO2e) which can't be measured directly. These metrics can be translated to emission reduction metrics if methodologies are available. There needs to be standardization of the methodologies employed .This will require building capacity around the methodologies themselves, as well as for the monitoring, reporting and verification process itself.

Input related metrics may be necessary when the outcomes are hard to measure accurately. In such cases the mitigation actions themselves reflect the key parameter to be monitored as shown in Figure 14. For example, a tax on fossil fuels may contribute to reducing GHG emissions, but the exact amount of emission reduction is hard to separate from the price effect and increased energy efficiency. In that case, the level of fossil fuel tax may be a more appropriate metric for such mitigation actions.

Some metrics lend themselves well to quantification and others less so as Figure 13 demonstrates. China currently employs a diverse set of metrics. There are advantages and disadvantages to employing a diverse set of metrics. The advantage is that these programs can be developed, adapted and integrated into the nation's overall development program. By using measures directly related to energy or transportation, for example, it is easier to relate these efforts to both greenhouse gas mitigation and to overall economic development goals. Using measures directly related to energy and transportation also allows countries to measure progress and outcomes using targets and quotas, for example, and these might better suit their institutional strengths. At the same time it enables countries to avoid a situation where an underdeveloped methodology leaves them without an appropriate tool to report their efforts on carbon mitigation to the international community. Use of proxy GHG metrics or qualitative metrics is therefore an important first step.

Generally, GHG measurement requires a complex methodologies and accounting systems, and in many developing countries, including China, these systems are not fully developed. However there is a wide range of international experience to build on, including systems such as the Greenhouse Gas Protocol developed under the auspices of the World Business Council for Sustainable Development and the World Resources Institute. China has pilot programs to improve GHG accounting in some industries but these are not comprehensive or across all sectors.

Many of China's metrics are direct measurements. But there is the additional issue of progress over time, or policies or measures, or NAMAs that a well-designed MRV system can also address, and which we try to address by looking at qualitative as well as immediately quantifiable measures.

The disadvantages of diverse metrics include the bureaucratic effort required to collate and synthesize data at the national level, and the complexity of creating a system at the international level that suits all participating countries. These disadvantages will become more acute when it comes to linking NAMAs to international support from developed country donors. This will require some forward thinking. These are, however, issues that might be dealt with given time and the building of trust among countries under a post-2012 climate agreement.

Reporting and Verification

There are already domestic reporting processes for various mitigation policies and measures in China across different levels and sectors. Most of the mitigation actions reviewed in this paper are unilateral actions supported through domestic resources without international provisions in terms of financial and technological support. A few have small levels of international support. Some reporting and verification processes are decentralized and not integrated at the national level while others have been aggregated at different levels. For example, reporting and verification of energy intensity targets is implemented from the enterprise level all the way to the national level. Developing countries like China could improve reporting and verification processes by integrating them at the national level to monitor mitigation actions in different sectors. For most qualitative measures, for which there is no formal domestic procedure for reporting and verification, a national or international registry of NAMAs, which has been proposed by several Parties within the UNFCCC, could be developed to recognize and assess these measures at the national or international level. This could provide a starting point for design of reporting and verification procedures.

Important issues regarding what MRV structures should be created at the international level remain undecided.
In terms of measurement, some questions include: should a system be established that is based on outcomes or based on performance-related metrics? How can the international system support national measurement processes for GHG emissions?

On the reporting side these questions include: should unilateral mitigation actions be reported to the international community? If yes, how should this be carried out? How should the outcome of enhanced mitigation actions that are supported by international finance and technology be reported? And how might the support itself be reported?

With regard to verification, the international community will need to consider how international verification processes might compliment national systems and how incentives can be configured to encourage verification across all sectors in all countries?

In terms of institutional structures, some questions include: how should the linkage between these actions and capacity-building support be established? Will a registry-type approach, which is being considered under the UNFCCC and describes a system for 'registering' NAMAs in a central reporting system, be enough and how will this be linked to support structures?

CONCLUSION

Major developing countries such as China have adopted mitigation efforts to control their GHG emissions and contribute to global efforts to deal with climate change. Some of these mitigation policies and measures have been reported and verified through domestic processes. These mitigation efforts could be recognized by the international community and supported by a process of MRV under a post-2012 climate agreement. This could enhance the range and scale of actions through the provision of financial, technological and capacity-building support from developed parties. Agreement on the definitions of terms such as "Nationally Appropriate Mitigation Actions," "measurable," "reportable," and "verifiable" will be an important part of the consensus-building process. This report is intended to help clarify these definitional issues.

This report also suggests other conclusions. First, an MRV framework should cover "mitigation actions," not just the emissions reductions resulting from these actions. Not all individual mitigation actions will result in direct and measurable emissions reduction. A uniform guideline for NAMAs may be helpful for developing countries to frame their mitigation actions, but it is not necessary for them to strictly follow these guidelines.

Second, most NAMAs are undertaken within the context of sustainable development policies and measures and their level and scope may differ significantly as a result of varying national circumstances and development paths. Any guideline for NAMAs should allow different types of goals, initiatives, instruments and policy tools for developing countries. In particular, NAMAs should reflect the specific development priorities of each country.

Finally, the reporting and verification process for mitigation actions could be bolstered to give a more comprehensive picture of what actions have been taken and what outcomes have resulted, through for example low-carbon development plans or inventories. Such structures could provide better information to decision makers in developing countries and could also avoid possible double counting of mitigation actions.

Success depends on the ability of the international community to create the right environment for mitigation to take place. The Bali Action Plan provides the starting point. The challenge now is to translate this into concrete outcomes at the UNFCCC meeting in Copenhagen in December 2009.

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