

Energy and CO₂ Intensity Reduction Policies in China: Targets and Implementation

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Abstract

China announced it would decrease CO₂ emission intensity per GDP by 17% by 2015 compared to 2010 levels in its 12th Five Year Plan (FYP12: 2011-2015). This paper assesses the implementation plan of the CO₂ intensity target in the FYP12 by comparing it with the implementation of China's energy intensity reduction policy during the 11th Five Year Plan (FYP11: 2006-2010) period. While it is difficult to evaluate China's Cancun Pledge (CO₂ intensity target for 2020), it can be generally agreed that the successful achievement of the CO₂ intensity target in the FYP12 will be crucial for meeting the Cancun Pledge.

To ensure the implementation of the target, the Chinese government applied a Target Responsibility System (TRS) to the FYP12 CO₂ intensity target. National targets are distributed to local governments and enterprises as mandatory targets and the TRS makes it clear which government bodies and personnel are responsible for achieving the allocated target. Target achievement status is linked to personnel evaluation, with a possibility of punitive measures. China's distinctive legal and political systems have enabled the introduction of the TRS: the strong command and supervisory authority of the central government over provincial governments, the strong binding force of the National Development Plan, and the party's overall control of personnel affairs.

The TRS played a crucial role in achieving energy intensity targets in the FYP11 period, but there were a number of issues observed, such as the unreasonable allocation of targets to some provinces, illegal forced power cuts by local governments as last-minute methods for achieving their targets, and uncertainty over the credibility of target achievement results. Based on some of the problematic issues observed, China's government has introduced various measures such as a more reasonable (perhaps scientifically based) target allocation process, an Energy Forecast and Early-Warning System and Fixed Asset Conservation Measures.

Key words: 12th Five Year Plan, Closure of Small Plants and Outdated Capacity Program, CO₂ Intensity Reduction Policy, energy-saving policy, Target Responsibility System, Top-10,000 program

1. Introduction

China is the largest CO₂ emitter in the world today, accounting for nearly 9 Gt CO₂ in 2010 (Olivier *et al.*, 2011). The Chinese economy is expected to grow further in coming decades, and thus China's contribution to CO₂ emissions reduction is crucial to climate change mitigation. In recent years, China has put "significant" effort into minimizing its increase in CO₂ emissions while meeting its rapidly increasing energy demand and maintaining a rate of energy self-sufficiency. At the 16th Conference of the Parties (COP16) to the United Nations Framework Convention on Climate Change (UNFCCC) in Cancun, Mexico, China made a pledge to reduce its CO₂ emission intensity per unit GDP by 40%-45% by

2020 compared to 2005 levels (hereafter, its mid-term target). To achieve the Cancun target, China set a target of reducing its CO₂ emissions intensity by 17% by 2015 compared to 2010 levels (hereafter, the 2015 CO₂ intensity target) in its 12th Five Year Plan (hereafter, the FYP12 CO₂ intensity target). To achieve the CO₂ intensity target, the State Council announced in December 2012 a document (State Council Document No.41) providing concrete measures by 2015. These are to achieve an energy conservation capacity of 300 million tons of coal equivalent (tce); to reach a ratio of non-fossil energy consumption to primary energy consumption of 11.4%; to reduce energy intensity per unit GDP by 16%; to expand its forests by 12.5 million hectares; to increase forest coverage to 21.66%, and to increase forest stock

volume by 600 million m³. In particular, State Council Document No.41 positioned the energy intensity target (16% reduction of energy intensity per unit GDP between 2010 and 2015, established by State Council Document No.26 in 2011) as one of the key measures for achieving the CO₂ target.

To ensure implementation of the CO₂ intensity target, FYP12 introduced a Target Responsibility System (TRS) which was adopted in State Council Document No.29. Under the TRS, national targets are fragmented and allotted to local governments and enterprises as mandatory targets with measures to reward or punish the personnel in charge (limited to government-owned enterprises). A scheme similar to the TRS was previously adopted as an energy-saving policy in the 11th Five Year Plan (hereafter, the FYP11) and was carried over into the FYP12.

Therefore, careful design and implementation of energy-saving policies as well as monitoring, reporting and verification (MRV) of policy impacts will be crucial for achieving the target. With regard to the design of energy-saving policies, the allocation of CO₂ and energy intensity targets to provinces and lower levels of local governments through the TRS will become important.

Many studies have emphasized that MRV is the key to effective implementation of Chinese energy and CO₂ policies, and recommendations have been made regarding effective MRV implementation (*e.g.*, Teng *et al.*, 2009; IGES, 2009; Bellevrat, 2012). However, only a few studies have critically assessed the TRS from the perspective of a legal and political framework (Jin *et al.*, 2011; Tamura, 2012). To date, there has not yet been any in-depth assessment of the TRS regarding implementation of energy and CO₂ policies.

The objective of this paper is to discuss China's energy and CO₂ intensity targets in the FYP12 and to review implementation of the TRS in the FYP11 for the allocation of energy intensity reduction targets in order to obtain insights into policy recommendations for the FYP12 and the 13th Five Year Plan (hereafter, the FYP13) (2016-2020) for effective achievement of the 2020 CO₂ emissions reduction target.

The questions this study aimed to answer are defined as follows:

- How does the literature evaluate the CO₂ intensity target in the FYP12 in the context of the Cancun Pledge?
- How is the TRS legally and politically authorised?
- What are the measures in the TRS that drive local governments toward achieving policy targets?
- What issues were observed for the TRS with regard to achieving the energy intensity target in the FYP11?
- What are potential options for improvement of the TRS in the FYP12 and beyond, to achieve the 2020 CO₂ intensity target?

The structure of this paper is as follows. Section 2 describes the ambitiousness of the CO₂ intensity target in the FYP12 and the importance of energy intensity reduction in the context of climate change mitigation.

Section 3 analyses the implementation challenges regarding energy and climate policies in China by investigating how the national energy intensity target was achieved in the FYP11. Section 4 describes some issues observed regarding the energy intensity TRS in the FYP11. Finally, conclusions and recommendations are drawn in Section 5.

2. CO₂ Intensity Reduction Targets in the FYP12 in the Context of China's Climate Change Mitigation Efforts toward 2020

The CO₂ intensity target in the FYP12 was developed in the context of achieving the 2020 CO₂ intensity target enshrined in the Cancun Pledge. It has been suggested that the energy intensity target of the FYP12 has also been set by working backwards from the 40% CO₂ intensity reduction in 2020 compared to the 2005 level (Feng & Yuan, 2011).

It is internationally welcomed that China, the largest CO₂ emitting country in the world, has committed itself to quantitative emissions reduction targets. However, evaluating China's Cancun Pledge on CO₂ intensity targets is difficult. With regard to the level of ambition, in-depth analyses seem to agree that the target is by no means an easy one to achieve (Stern & Jotzo, 2010; Carraro & Tavoni, 2010). The argument that the 2020 CO₂ intensity target is no different from business-as-usual (BAU) seems to be based on BAU projections from the International Energy Agency (IEA) or the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE), but these BAU projections already incorporate significant investments in low-carbon technologies (Carraro & Tavoni, 2010) that can hardly be considered BAU.

Nonetheless, China may surpass the Cancun Pledge if the proposed policy measures prove to be effective. An assessment by Climate Action Tracker (CAT) (2011) concluded that China will exceed the 2020 target if 'it continues its efforts on energy savings and non-fossil energy and economic growth continues to be as high as predicted.' Li (2012) also conducted calculations based on the currently discussed 'mid-long term roadmap' and concluded that all the proposed measures up to 2020 may reduce CO₂ intensity by 18.8% during the FYP12 period and 47.5% by 2020 compared to the 2005 level if they are all implemented effectively.

The successful achievement of the FYP12 CO₂ intensity target will likely be crucial if China is to meet the 2020 CO₂ intensity target of the Cancun Pledge. The level of required effort up to 2020 is estimated based on the historic emissions dataset and assumptions on future GDP growth rates. However, there are questions over the accuracy of the statistical data on historic emissions and there is a wide range of estimates on future GDP growth rates. The reduction in CO₂ intensity during the FYP11 period was 15.3% based on the statistics from IEA, indicating that the required CO₂ intensity reduction in the FYP13 period would be as high as 15%-22% even if the

FYP12 target were achieved. According to the emissions data from the National Bureau of Statistics (NBS), however, CO₂ intensity was reduced by 21% in the FYP11 period. Assuming that the FYP12 target is achieved, the required CO₂ intensity reduction in the FYP13 period would still be a high 8%-16%. In addition, the expected slower GDP growth in the FYP13 period compared to the FYP12 period may make CO₂ intensity reduction even more difficult. Energy consumption generally does not increase as fast as GDP, so higher GDP growth rates are more desirable for achieving larger reductions in energy and CO₂ intensity, although they may lead to increases in the absolute amount of energy consumption and CO₂ emissions (CAT, 2011).

From the perspective of meeting the 2°C target through global burden sharing, the Chinese 2020 CO₂ intensity target is rated by CAT as ‘inadequate,’ indicating that China’s proposed emissions target is above the emissions range that would enable it to meet the 2°C target (CAT, 2012). The GHG emissions level under the Cancun Pledge is projected to be around 11-13 GtCO₂e/yr, depending on GDP growth assumptions, whereas a ‘sufficient’ effort would require the 2020 emissions to be kept below 11 GtCO₂e/yr. The emissions ranges of the four evaluation categories used in the CAT are based on the modelling results from a number of studies that have calculated country-specific emissions pathways under various global effort-sharing principles. However, these referenced studies were published in 2009 and 2010; they may not have reflected the faster-than-expected GDP growth observed in the last several years. The considerable impact of GDP growth assumptions on the projection of CO₂ emissions has also been discussed in, e.g., Asuka *et al.* (2011) and Jiang (2011). Moreover, CAT only evaluates the ambition level of pledges, but not the policy measures taken to achieve the pledged targets. As described above, China may not only meet its Cancun pledge but go beyond it (CAT, 2012; Li, 2012).

To summarize this section, while there are divergent views on the ambition level and feasibility of China’s 2020 CO₂ intensity target enshrined in the Cancun Pledge, it can be generally agreed that the 17% CO₂ intensity reduction target for the FYP12 is in any case a minimum requirement that China must achieve in order to meet the Cancun Pledge. Therefore, it is most important for China effectively to implement key policy measures that would lead to significant CO₂ emissions reductions up to 2020. In particular, the effective implementation of energy saving measures will be crucial, as this will account for a large part of the expected CO₂ emissions reduction.

3. Analysis of the Implementation of Energy Intensity Reduction Policy During the FYP11 Period

This section analyses the implementation of energy intensity reduction policy during the FYP11 period, from the planning stages to the end results.

3.1 Description and institutional background of the TRS

The TRS was established through State Council Document No. 29 in 2006 to allocate nine mandatory national targets set in the legally binding FYP11 to all local governments. The national targets are first translated into provincial targets, then further subdivided and redistributed by provincial governments to their respective lower branches. The central government places particular emphasis on energy-saving and reducing emissions of major pollutants, and both of these policies have been combined into a single policy that was adopted starting in 2007 with State Council Document No. 15 issued on 23 May 2007. Achievement of the energy-saving and emissions reductions targets, in particular, not only affects personnel evaluation by the local government officials in charge, but failure to achieve mandated targets can also result in punitive measures.

There are three main reasons for adopting the TRS method to ensure policy implementation: (1) the strong command and supervisory authority of the central government over provincial governments, (2) the strong binding force of the national five year plans, and (3) the overall control over personnel affairs by the Communist Party of China (CPC).

3.1.1 Strong command and supervisory authority of the central government over provincial governments

There is no regional or local autonomy law in China. Hence, there is no legislation that defines the division of administrative responsibilities between central and local governments or the role of central government in local matters. Further, provincial governments are positioned as administrative bodies complying with the unified command and supervision of the State Council, and a clear command and supervision relationship is established between the central and regional governments (Constitution of the People’s Republic of China and Article 55 of the Organization Law for Local People’s Congresses and Local People’s Governments).

3.1.2 Strong binding force of the national FYP

The National Five Year Plan (FYP) is legally and strongly binding for local governments and they are obligated to comply with the targets allocated by the state council. China’s Constitution gives the State Council the authority to draw up the FYP for national economic and social development and to implement it (Article 89, Clause 5). Regarding implementation of the plan, the State Council has the authority to adopt administrative measures, enact administrative rules and regulations, and issue decisions and orders (Constitution, Article 89, Clause 1; Legislative Law, Article 56, Clause 2).

The local governments are responsible for implementing the National FYP (Article 59, Clause 5 of the Organization Law). Moreover, higher branches of government can reprimand local government heads for refusing to carry out their orders (Ordinance on Dealing

with Administrative Body Public Servants [State Council Order], Article 19, Clauses 34-36: reprimands, warnings, demotions, suspensions, dismissals).

3.1.3 Overall control of personnel affairs by the Communist Party of China

Public servant personnel affairs in China, in particular personnel at the managerial level (*e.g.*, province heads, mayors, bureau directors, section heads, etc.), are uniformly controlled by the CPC. In other words, authority to punish (except for removal from office) administrative heads lies with the higher branches of government, but the CPC also has *de facto* authority to appoint, promote and transfer personnel to other posts (*e.g.*, from an administrative body to a legislative body) after completion of term of office. For example, provincial heads are supposedly elected by regional people's congresses, but the authority to recommend individuals for these posts lies with the provincial party committees and requires the approval of senior officials (members of the Central Committee of the CPC) (see Rules for Selecting Senior Party Officials, Article 8 and subsequent articles). The same process applies to the selection of central government leaders when there is a leadership changeover.

3.2 Target setting process

3.2.1 Further subdivision of the mandatory energy intensity targets

The decision-making process to determine energy intensity targets at the local government level can be explained as follows. Based on State Council Document No. 29 granting the state the authority to set targets for local governments, the National Development and Reform Commission (NDRC) draws up reduction plans for the various provincial governments. As shown in Table 1, the energy-saving targets are differentiated among local governments; for example, there is a more than 2.5-fold difference between the lowest and highest

targets.

The target figures can be roughly divided into those self-reported by provincial governments and those calculated by the central government's policy-making departments. If the targets declared by provincial governments are higher than the nationwide averages, they are allowed to stand as regional targets. If, on the other hand, the targets declared are lower than the nationwide averages, or no targets have been declared to begin with, targets are worked out in consultation with the local governments based on regional development levels, industrial structure, total energy consumption, per capita energy consumption, energy self-sufficiency and so forth and decided upon after the NDRC obtains the approval of the State Council.

There is some flexibility, however, in target setting, taking into consideration the wishes of local governments, economic conditions, and other factors.

3.2.2 Responsibility of provincial governments for achieving the energy intensity target

Provincial governments are responsible for the implementation of energy policies and further distribution of the targets to lower branches of local government (*e.g.*, city or prefectural government or administrative region), and energy-consuming enterprises within their jurisdictions (State Council Document No. 29).

To clarify responsibility with regard to energy saving activities for enterprises, energy-consuming enterprises are required to submit a pledge to provincial governments. In the case of state-run enterprises that are included in the "Top-1000 energy-consuming enterprises program" (hereafter the Top-1000 Program), they do not submit their pledges to provincial governments, but to the NDRC. Management and supervision of these enterprises are carried out by the provincial governments based on authorisation from the State Council (Fig. 1).

The Top-1000 program has aimed to achieve energy-

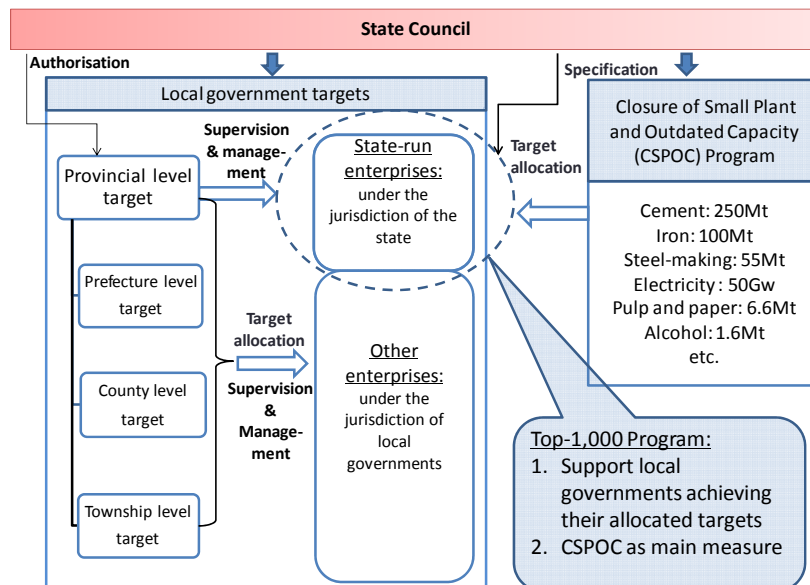


Fig. 1 Schematic of the target allocation process and the TRS for the Top-1000 program with the Closure of Small Plants and Outdated Capacity (CSPOC) program.

saving of 100 million tce, and has targeted the 998 largest energy-consuming enterprises across nine sectors with annual energy consumption of larger than 180,000 tce. The 998 enterprises together accounted, in 2006, for one-third of China's total energy use and almost half of its industrial energy use, and thus the Top-1000 program was considered to be a key measure for achieving the national energy intensity target in the FYP11 (for details, see, *e.g.*, Taylor *et al.*, 2010 and Price *et al.*, 2011).

Many enterprises in the Top-1000 program are required to achieve their allocated targets not only by the provincial government in which they are located, but also by the central government under the Closure of small plants and outdated capacity program (hereafter, the CSPOC program – also known as the “adjusting industrial organizations policy” in China) that includes fourteen high energy-consumption industries such as electric power and steel making. It is estimated that the closures will save 118 million tce (State Council Decision No.15). Also, management and supervision of the CSPOC program is carried out by provincial governments.

Provincial governments are also responsible for establishing a statistical system to track progress of energy saving efforts in their jurisdictions and reporting the statistics regularly to the central government (State Council Document No. 29). Technical standards for developing a statistical system and evaluation rules for target achievement are detailed in State Council Document No.36 promulgated in 2007.

3.3 Measures for ensuring effective policy implementation

For effective implementation of energy-saving policy, provincial governments are responsible for creating a personnel evaluation system that links the status of target achievement with both rewarding and punitive measures which have previously been introduced in central and provincial governments.

The officials in charge of energy policy implementation in either the government (this includes chiefs and vice-chiefs of provinces, cities, prefectures, districts and counties) or governing agencies (*e.g.*, local development councils and environment bureaus) can lose their eligibility status for commendation, such as year-end awards or group or personal honorary titles, if they fail to meet their energy-saving targets, notwithstanding their high overall evaluation scores (the so-called One-Vote Veto System). This also applies to the heads of state-run enterprises and local government companies in the Top-1000 program. In addition, false reporting of statistics may lead to dismissal of the responsible personnel from their offices.

Additionally, local governments with a poor record may be penalised by having restrictions placed on investment projects or regional infrastructural support projects. Applications for approval of business plans may be refused (in the case of applications where the central government holds approval authority) for investment projects in the area under jurisdiction or applications for

environmental assessments (Article 16 of the Environmental Assessment Act). Furthermore, central government support for regional infrastructure projects may be cut back (State Council Document No.29). China has a system for evaluating whether investment projects (including foreign investment) match the country's industrial policy. This permit approval system is based on State Council Document No.29 and the “Interim Procedures for the Examination and Approval of Enterprise Investment Projects” order of the NDRC, which is not a system under the law, but reviews items to be adjudicated from the viewpoint of securing the right of corporations to make decisions, and redistributes adjudication authority between the central and local governments. Such penalties affect regional economic growth considerably and therefore have a strong impact on the political career prospects of local government leaders.

3.4 Provincial energy intensity results at the end of the FYP11

Table 1 presents the provincial energy intensity targets and results for the FYP11 period. National statistics show that the national energy intensity declined by 19.1% (NBS, 2011) slightly short of the target, with all regions except Xinjiang meeting their targets. The announcement from the NBS about the top ten provinces that surpassed their allocated targets indicates that the Chinese government places importance on how much the provinces exceed their respective targets. At the time, many other provinces barely achieved their respective targets; 10 out of 41 provinces and cities exceeded their targets by less than 0.1%-points.

A number of important factors affected the national energy intensity reduction result. Most provinces and cities were found to achieve their energy intensity target mainly because the economic growth under the 11th FYP was far higher than expected (Teng, 2012); energy consumption did not increase as fast as economic growth, thus leading to lower-than-expected energy intensity. On the other hand, revision of the GDP and energy consumption data for the base year, *i.e.*, 2005, led to the country as a whole falling short of the national target, although almost all provinces achieved their respective targets (Teng, 2012). Moreover, it is also indicated that the economic stimulus plan implemented in 2008-2009 following the global economic crisis has impeded energy saving efforts (Ma, 2011).

3.5 Issues regarding the local energy intensity target allocation and the TRS in the FYP11

Although the Chinese government claims that the implementation of energy intensity reduction policy measures was successful, in the authors' view there were three major issues with regard to the TRS in the FYP11. The first issue related to the provincial target allocation. The provincial targets were more or less based on the equal-numbers principle, which failed to reflect disparities among provinces such as their levels of economic and social development, economic structure and techno-

Table 1 Energy intensity targets in the 11th and 12th Five Year Plans and the results for the 11th Five Year Plan. Numbers in bold represent provincial targets higher than the national target values.

Province/ region	11 th FYP (2006-2010)			12 th FYP (2011-2015)	
	2005 Intensity (tce/10,000RMB)	2010 Target vs.2005 (%)	Actual reduction (%)	2015 Target vs.2010 (%)	2015 Target vs.2005 (%)
National target	1.22	-20	-19.1	-16	-32
Beijing	0.8	-20	-26.59	-17	-39.1
Tianjin	1.11	-20	-21	-18	-35.2
Hebei	1.96	-20	-20.11	-17	-33.7
Shanxi	2.95	-22 (originally -25)	-22.66	-16	-35
Neimenggu	2.48	-22 (originally -25)	-22.62	-15	-34.2
Liaoning	1.83	-20	-20.01	-17	-33.6
Jilin	1.65	-22 (originally -30)	-22.04	-16	-34.5
Heilongjiang	1.46	-20	-20.79	-16	-33.5
Shanghai	0.88	-20	-20	-18	-34.4
Jiangsu	0.92	-20	-20.45	-18	-34.8
Zhejiang	0.9	-20	-20.01	-18	-34.4
Anhui	1.21	-20	-20.36	-16	-33.1
Fujian	0.94	-16	-16.45	-16	-29.8
Jiangxi	1.06	-20	-20.04	-16	-32.8
Shandong	1.28	-22	-22.09	-17	-35.3
Henan	1.38	-20	-20.12	-16	-32.9
Hubei	1.51	-20	-21.67	-16	-34.2
Hunan	1.4	-20	-20.43	-16	-33.2
Guangdong	0.79	-16	-16.42	-18	-31.5
Guangxi	1.22	-15	-15.22	-15	-27.9
Hainan	0.92	-12	-12.14	-10	-20.9
Chongqing	1.42	-20	-20.95	-16	-33.6
Sichuan	1.53	-20	-20.31	-16	-33.1
Guizhou	3.25	-20	-20.16	-15	-32.1
Yunnan	1.73	-17	-17.41	-15	-29.8
Xizang	1.45	-12	-12	-10	-20.8
Shaanxi	1.48	-20	-20.25	-16	-33
Gansu	2.26	-20	-20.26	-15	-32.2
Qinghai	3.07	-17	-17.04	-10	-25.3
Ningxia	4.14	-20	-20.09	-15	-32.1
Xinjiang	2.11	-20	-8.91	-10	-18

Source: State Council Document No.94 (2006),NBS (2011),State Council Document No.26 (2011)

logical performance (Teng, 2012). In addition, because neither the NDRC nor provinces realized the potential impacts of such targets, the NDRC did not object to extremely ambitious targets proposed by the provinces at the start of the FYP11 (Feng & Yuan, 2011). As seen in Table 1, there are three provinces (Shanxi, Neimenggu and Jilin) that readjusted their initial targets during the FYP11. For these provinces, mid-period evaluations in 2008 indicated that the original targets were too ambitious to achieve. Nevertheless, the adjusted targets were still higher than 20% (Feng & Yuan, 2011). The unreasonable target allocation described above may have put some local governments with unfeasible targets under extreme pressure under the TRS. Xie Zhenhua, the Deputy Director-General of the NDRC admitted that the individual targets assigned to provincial governments in the FYP11 may not have weighed relevant local con-

ditions adequately in September 2010 (China Net, 2011). In other words, it is necessary to improve the target allocation process so as to prevent excessively ambitious targets (Feng & Yuan, 2011).

The second issue concerns the last-minute measures taken by some provinces to achieve their energy intensity targets. According to domestic news reports, in 2010, the final year of the FYP11, there were many cases of local authorities taking illegal last-minute measures such as cutting off power to meet energy saving targets (Power. IN-EN.com, 2012). Such incidents were a result of unreasonable target allocation and an increase in energy consumption due to the economic stimulus plan of 2008-2009. These last-minute measures caused major social problems that the CPC's internet newspaper People's Daily set up a site inviting readers to report such incidents, and by the end of 2010, more than 1,000 mes-

sages related to this matter had been received (People's Daily Online, 2010). To resolve the problem, the State Council issued an emergency decision forbidding illegal and unwarranted power interruptions for the purpose of meeting the energy policy targets. This demonstrates that local government leaders are under strong pressure to meet their targets. Responding to public anger over the measures, Zhang Ping, the Chair of the NDRC made a public apology on March 6, 2011, admitting that the institution had made errors due to a lack of experience (Feng & Yuan, 2011).

The third issue concerns the credibility of target achievement. The National Audit Office (NAO) conducted audit investigations on the reporting of energy conservation and emissions reduction between 2007 and 2009 for power, steel and cement companies in 20 provinces. The finding showed that, as of the end of 2009, eight power generation companies (total 492.5 megawatt capacity), 121 steel companies (total 23.479 million tonnes iron production capacity), and 54 cement companies (total 9.1555 million tonnes cement production capacity) made overstatements on the shutdown of small and inefficient facilities under the CSPOC program (NAO, 2011). Considering that the audit investigations were conducted in only 20 provinces, there are probably many more companies that violated the reporting regulations across the country. Not only do uncertainties about the credibility of the target achievement remain, these audit results also indicate that the TRS may not be functioning as it is expected to be.

Although the TRS played a crucially important role in meeting the energy intensity target of the FYP11, there were some shortcomings within the implementation of the TRS during the FYP11. In order to make implementation of the TRS more efficient and smooth, it will be

important to make it more predictable in the beginning stages and give it an effective monitoring mechanism.

In addition, the TRS is a top-down regulatory mechanism and exclusively focused on the most energy intensive and traditional sectors. As some have argued, the same policy framework to reduce energy intensity that was adopted in virtually all the provinces, such as the CSPOC program, did not fully take into account the differences among provinces, so they may not always have been cost-effective (Teng, 2012). Therefore, it seems that a more flexible mechanism needs to be introduced to complement the TRS, such as creating a market for energy-saving target certificates among local governments.

4. Framework for Executing Energy and CO₂ Intensity Targets in the FYP12

4.1 Target setting process

Compared to the FYP11, some improvements have been made in the implementation of the TRS in the FYP12. Firstly, for TRS target allocation during the term of each FYP, a three-stage process is used to allocate provincial-level targets (Feng & Yuan, 2011). Provincial governments initially submit their proposed target to the central government and the NDRC responds with an adjusted target. This adjustment routine is then repeated. Finally, the provinces submit a third figure, which is examined and approved by the National People's Congress (NPC) before being announced as part of official provincial tasks. This process has been improved for the FYP12 so that there is increased coordination between the central and local government compared with the TRS process in the FYP11, and also intervention by the NPC in the target allocation process (Fig. 2).

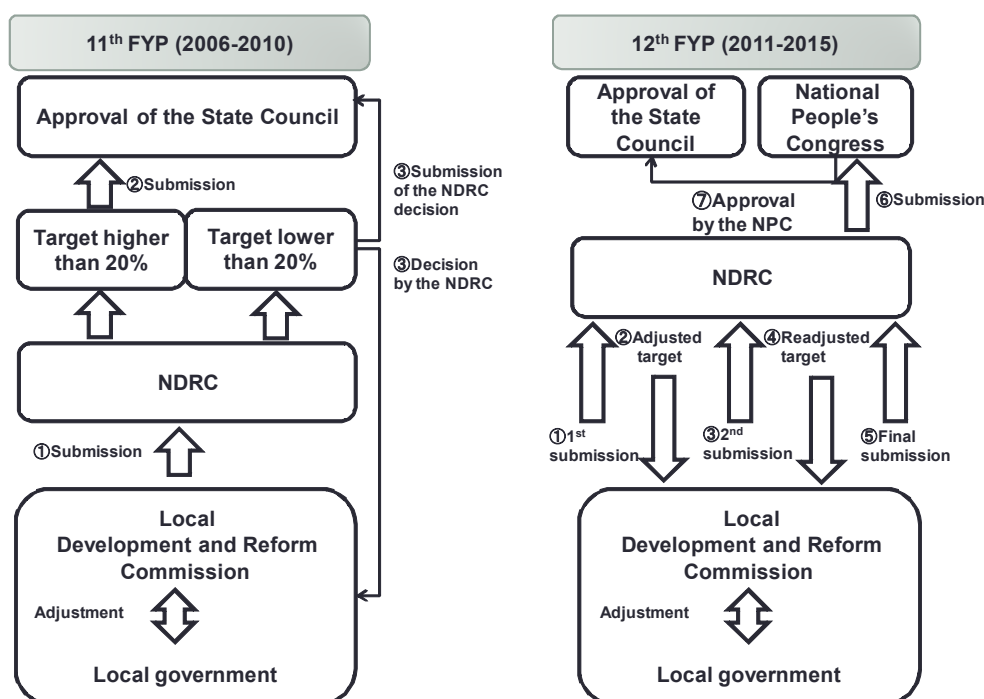


Fig. 2 Changes in the provincial target setting process between the 11th and 12th Five Year Plans.

The methods of target setting have also been improved. The Chinese government is trying to use a more scientific methodology to achieve an equitable distribution of targets. In recent years, many groups have evaluated their experience in the 11th FYP and conducted analyses for a more reasonable allocation of provincial targets in the 12th FYP. At the provincial level, local Development and Reform Commissions (DRCs) and Economic and Trade Commissions (ETCs) have been working with local universities to recommend specific targets and their own methodology and criteria (Ohshita *et al.*, 2011). The US Lawrence Berkeley National Laboratory (LBNL), in cooperation with China's Energy Research Institute (ERI), has also developed a sector-based target allocation methodology, which takes into account provincial circumstances (*e.g.*, GDP, population, economic structure and industrial energy intensity).

Table 1 shows the provincial energy intensity targets in the FYP12. While an overall goal to cut energy-intensity (energy consumed per unit of GDP) by 16% was set for the nation, provincial targets have been adjusted up or down to suit local conditions. Provinces are indicated for classification into four groups for target differentiation: coastal developed, developed, central and western (Teng, 2012), while five different target values are observed (Table 1).

An LBNL study (Ohshita & Price, 2011) compared the draft provincial targets of the Chinese government with the allocation results of three scenarios that they investigated in Ohshita *et al.* (2011). The results indicate that the draft official targets are a mix of three scenarios. It is also mentioned that the draft official targets have a tighter range of targets than the three scenarios. These results suggest that the draft official targets are a compromise between political negotiations and the consideration of differences in energy and economic circumstances among provinces.

It should, however, be noted that the Chinese government has not disclosed the energy intensity reduction at the national level when the provincial targets are added up. A recent study (Guan *et al.*, 2012) shows that there is a 1.4 gigatonne CO₂ emissions gap between the emissions data from the NBS and the sum of emissions data from the statistical departments at provincial and county levels. Such a large uncertainty in official energy and emissions data raises major concerns as to whether the achievement of provincial targets would lead to the achievement of national targets.

4.2 Measures for ensuring system implementation

Another improvement under the FYP12 is that the TRS will be strengthened to meet the energy and CO₂ intensity targets. There are several differences compared to the TRS in the FYP11. The new TRS for the control of total energy consumption is implemented in a way that ensures whole-process monitoring. The energy control TRS has been expected to play an important role in providing predictability of the energy-saving TRS administration.

Its new role will be enabled through the Energy Forecast and Early-Warning System (hereafter, Early-Warning System) and Provisional Measures on the Assessment and Examination of Energy Conservation of Fixed Asset Investment Projects (hereafter, Fixed Asset Conservation Measures). The Early-Warning System aims to grasp every region's energy consumption in a timely manner and then demand that each local government take prompt action to remediate over-consumption (State Council No.26). The Fixed Asset Conservation Measures issued in September 2010 (Administrative Rule of NDRC, 2010) require entities considering an investment in fixed assets to perform an energy conservation assessment prior to applying for project approval (Grobowski *et al.*, 2010). The energy conservation assessment is allowed to be made more stringent in provinces and other lower branch governments where energy conservation is projected by the Early-Warning System to be more difficult.

The third improvement is that the "Top 10,000 Energy-Consuming Enterprises Program" (hereafter the Top-10,000 Program) was implemented from 2012, aiming to promote an effect framework for achieving the 2015 energy intensity targets. The Top-10,000 Program maintains a similar framework to the previous Top-1000 program as described above, but there are some differences. Firstly, the target entities have been expanded to more than 15,950, covering a wide range of sectors, such as the manufacturing industry and transportation as well as service and commercial sectors (hotels, restaurants, department stores, universities). Secondly, the project has established an energy-saving target of 250 million tce, 2.5 times larger than that of the Top-1000 program. Moreover, most cheap, quick energy-saving measures such as the CSPOC program have exhausted their potential over the last five years, and there is now less leeway for shutting down out-dated facilities (Feng & Yuan, 2011), so enterprises need to improve their energy-saving technologies, energy management skills, etc., further. This is expected to promote an energy efficient market. In fact, the Chinese government has been considering the introduction of a national carbon credit market or national energy-saving credit market to provide incentives to various stakeholders (State Council Document No.41).

The final improvement noted is that the Chinese government has been considering introducing the Total Energy Consumption Control Program that was planned in State Council Document No. 26 in 2011. This was mentioned in the Report on the Work of the Government delivered by Premier Wen Jiabao at the Fifth Session of the Eleventh National People's Congress on March 5, 2012. In this program, an energy consumption cap of about 4.1 billion tce has been introduced through the TRS. If it becomes established, it will mean that China will create an energy-saving certificate market under the new TRS system.

5. Conclusions and Recommendations

Irrespective of its level of ambition, China's CO₂ intensity target for 2020 is widely considered to be challenging. Meeting the target and putting the country on track to achieve a 2°C target requires not only ambitious targets but also effective implementation of carefully designed policies. As mentioned, China's distinctive legal and political system enables the TRS to be introduced to local governments. To ensure effective implementation, the TRS makes it clear which bodies and individuals are responsible for taking measures. Measures such as linking the status of target achievement with a personnel evaluation system, and taking punitive measures if targets are not reached are designed to ensure that the system is implemented. The reasons for adopting these methods to ensure policy implementation are that the central government has strong command and supervisory authority over provincial governments; the national FYP has a powerful binding force; and the party exerts overall control over personnel affairs.

The TRS played a crucial role in achieving the energy intensity targets in the FYP11 period, but there were a number of issues observed, such as the unreasonable allocation of targets to some provinces, illegal forced power cuts by local governments as last-minute methods for achieving their targets, and uncertainty over the credibility of target achievement results.

Based on some of the issues observed regarding the overly regulatory TRS, the Chinese government has introduced a more reasonable target-setting process and methods with the Early-Warning System and the Fixed Asset Conservation Measures. In addition, for improving the TRS, the Chinese government is considering introducing a national carbon credit market or a national energy-saving certificate market to provide incentives to various stakeholders.

For achieving the FYP12 energy-saving and CO₂ intensity targets to contribute to the mid-term target, how to establish a proper MRV is the common challenge in China. To overcome this challenge, not only must the infrastructure for measuring various data of enterprises be improved, but data quality and information disclosure must also be enhanced. There is a basic problem that the local government cannot get statistical energy data from large state enterprises because they are not under local government control (Wang, 2012). As a way to solve this problem, it will be necessary to establish a unified nationwide statistical system and improve local governments' legal status.

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