



International Organization for Standardization

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1 Objectives and organization of the case study

In recent years, ISO has developed a methodology to assess the economic benefits of standards on organizations. This methodology is generic and can also be used to describe and measure non-economic benefits generated by standards. Based on ISO 26000:2010, *Guidance on social responsibility*, we define “non-economic benefits of standards” generally as benefits for the society and the environment that are achieved in full or in part through the implementation of standards by an organization. The benefits are those which affect the society or the environment in which the organization exists or is part of.

This project aims at applying the ISO methodology to assess the non-economic benefits, which include social and environmental benefits of standards in the Shenzhen Meteorological Service Center. However in the course of this assessment, it became clear that the impacts generated by standards are mainly social and not environmental. Therefore, in the following text “non-economic benefits” refers to “social benefits”.

This case study can provide an example and a reference for the assessment of non-economic benefits of standards. Additionally, once quantitative results of non-economic benefits of standards are obtained through this project, more enterprises and other institutions may recognize the importance of standards and devote more resources in the future to the development and use of standards.

We have organized the assessment in the following steps:

1. We have chosen the meteorological service and the lightning protection services as the assessment samples from the meteorological service center. These two services form the scope of the assessment
2. We analyze the value chain of these two services

3. We gather information and collect data by interviewing the management and technical personnel of the meteorological service center
4. We identify and select key value drivers and assess those business functions which are most deeply affected by standards
5. We determine operational indicators, and assess the impacts of standards on the respective activities
6. Finally, we quantify the non-economic benefits resulting from the use of standards

Time frame of this assessment project

The pilot project to assess the non-economic benefits of standards in the meteorological service center was carried out from June to August 2013 and the report was completed in August 2013. The project has been supported by ISO, commissioned by the State Administration for Standardization of China (SAC) and implemented by the Shenzhen Institute of Standards and Technology (SIST). What was very important for the success of the project was that management, technical and other staff of the Shenzhen meteorological service center provided strong support during the project. The project stages are shown in **Table 1**.

Time	Project content
May 2013	Launch and selection of the pilot organization
	Collection of basic data and information
	Translation of guide/forms
June-July 2013	Selection and analysis of the standards related to the value chain
	Definition of evaluating parameters/indicators
	Tentative summary of findings
August 2013	Adjustment/improvement
	Discussion with the ISO project advisor and modification, improvement. Completion of the report

Table 1 – Progress of the project

2 Introduction to the selected organization

The Shenzhen Meteorological Service Center (SMSC) was established in 2003 (it also carries the designation “Lightning Protection Center of Shenzhen”) and is located in the Futian District of the city of Shenzhen. Affiliated with the Shenzhen Meteorological Bureau, SMSC has set up technical service points for lightning protection in the two districts of Longgang and Baoan.

As an important support unit of the Shenzhen public meteorological services, SMSC, which relies on a large network and platforms of the Shenzhen Meteorological Bureau, focuses on meteorological disaster prevention, disaster reduction and issues related to climate change. Moreover, SMSC orients its services towards the idea of “people first, nature best” and devotes many resources to the development of the public weather and meteorological information services, thereby contributing to the quality of life in Shenzhen. SMSC primarily carries out public meteorological information services, meteorological television and advertising services, industrial meteorological safeguards and technical services for lightning protection.

In recent years, the business of SMSC has strengthened continuously through the implementation of a standardization strategy. Currently the center has a staff of 80, including 11 senior engineers, 15 engineers, of whom 2 have PhDs, 4 have master degrees and 63 have undergraduate degrees.

3 Attitude of the Shenzhen Meteorological Service Center towards standardization

Management and personnel of SMSC pay high attention to standardization. They use standards in their work and participate in standards development activities. In August 2010, the State Administration for Standardization of China (SAC) officially approved SMSC as China's first standardization pilot unit in the field of meteorological services. The current situation of standardization in SMSC is as follows:

1. In line with the characteristics of the meteorological services in Shenzhen, SMSC has established the first complete standards system for meteorological services (see **Figure 1**). The system has a reasonable and comprehensive structure which covers the complete process of meteorological decision-making, meteorological services to the public, professional and specialized meteorological services (e.g. for the industry) as well as services regarding lightning protection and others.
2. It has established an innovative and effective model and mechanisms for standardization of meteorological services, which has changed traditional approaches to the work inside the organization. At the same time, SMSC has strengthened the active cooperation with enterprises, research institutes and key customers.
3. SMSC has participated in standards development work, which includes the development of two national standards, seven industry-sector standards and seven local standards. It has also been engaged in the training of standardization experts. Moreover, the center takes part in writing many technical standards for lightning protection in Shenzhen, such as *Lightning monitoring method*, *Operational specification for the safety of lightning protection in oil tanks and oil stations*, *Technical specification for*

investigation of the thunder disaster accident and others. In addition, the center has set standards on lightning protection in Shenzhen, such as *Conditions of lightning protection technology of traffic monitoring systems in Shenzhen*, *Safety requirements and test specifications of Lightning protection – Part 1 : General principles*, *Implementation rules for the lightning protection detection in key sites*, *Standards system for lightning protection in Shenzhen*, *Operational regulation of Shenzhen SPD testing laboratory*. Through the establishment and promotion of lightning protection standards, the management and operations of the lightning protection industry in Shenzhen now uses standards to a higher degree.

4. SMSC has implemented 78 laws and regulations and uses more than 44 national standards of China, around 11 industry-sector standards and 83 internal standards developed by SMSC itself, and has reached a 100% implementation rate of these standards.
5. Through regular training in standardization, the awareness of standardization among staff member has significantly increased.

SMSC obtained the first certification in national meteorology from the China Meteorological Administration (CMA) in 2005, and, in 2006, was also certified against the ISO 9001 quality management system. In this study, we will review the impacts of standards that have been developed on a consensus-basis by standards organizations (so-called “external standards”) which is a core part of the “ISO Methodology”. In addition, and due to their relevance for the operations of SMSC, we will also review the impacts of internal standards, which are standards

that have not been developed through standards organizations, but by SMSC itself to support its operations.

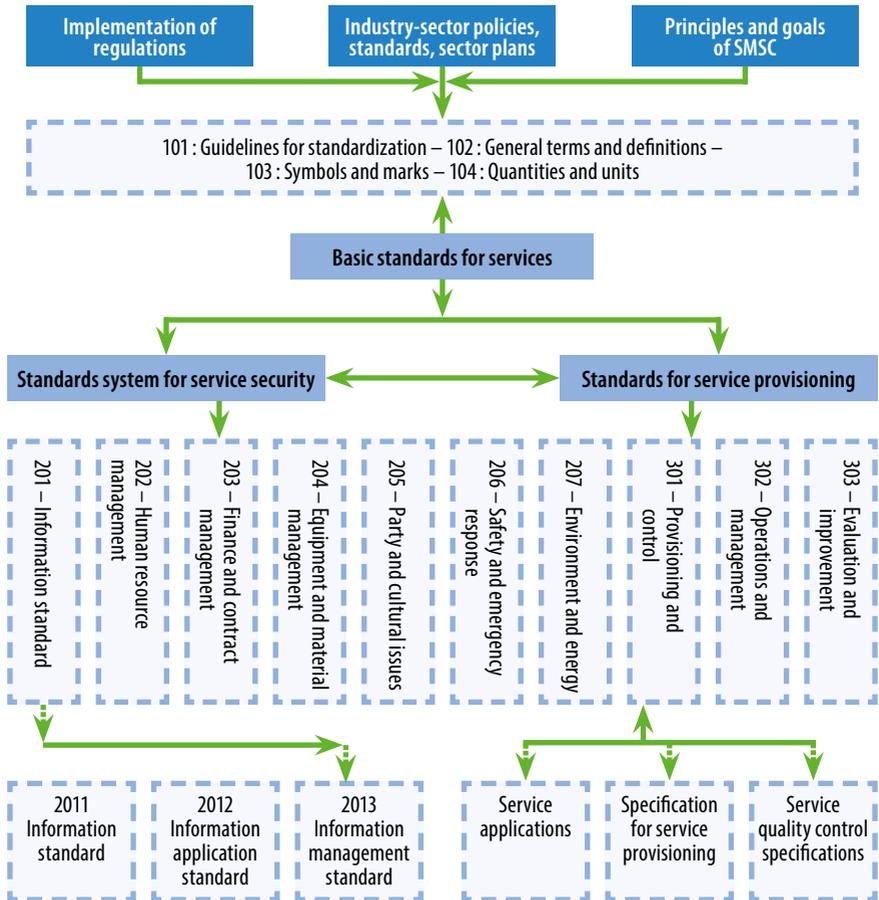


Figure 1 – Structure of the standard system of the Shenzhen Meteorological Service

4 Analysis of the value chain

The value chain is an analytical tool for the study of enterprises and their competitive positioning that has been developed by Michael Porter, a professor from Harvard Business School. It is a framework for grouping related activities in enterprises in order to understand the basic processes that underlie value creation. Porter believes that the study of the value chain of an enterprise, including its value-added links, can help to identify the sources of competitive advantage. It should be noted that the original model of an enterprise value chain developed by Porter has been designed on the basis of manufacturing enterprises.

The primary business of SMSC consists of providing meteorological and lightning protection services. Through an analysis of relevant business processes and operations, the value chain of meteorological and lightning protection services can be identified as shown below.

4.1 The value chain of the meteorological services

Based on an analysis and interviews with management and professional staff in SMSC, the following primary and support activities of SMSC were identified.

- **Primary activities:** Demand recognition, information collection, information generation, information provisioning and dissemination, user feedback and others.
- **Support activities:** Administration and management (including human resources, party and cultural issues, finance and contracts, information management), safety and emergency management, equipment and supplies management, environmental and energy management and others. The value chain of the meteorological service is shown in **Figure 2**.

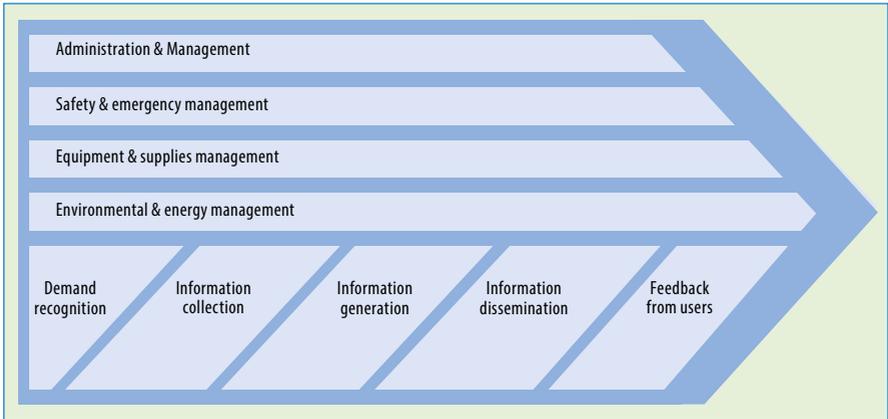


Figure 2 – The value chain of the meteorological services of SMSC

4.2 The value chain of the lightning protection services

Based on an analysis and interviews in SMSC of the lightning protection services' value chain, we came to the following conclusion :

- **Primary activities:** Business acceptance, business processing and report preparation which includes review of documentation, designs of plans, on-site inspection, drafting of reports and report delivery.
- **Support activities:** Administration and management (including human resource management, party and cultural issues, finance and contracts, information management), safety and emergency management, equipment and supply management. The value chain of the lightning protection services is shown in **Figure 3**.

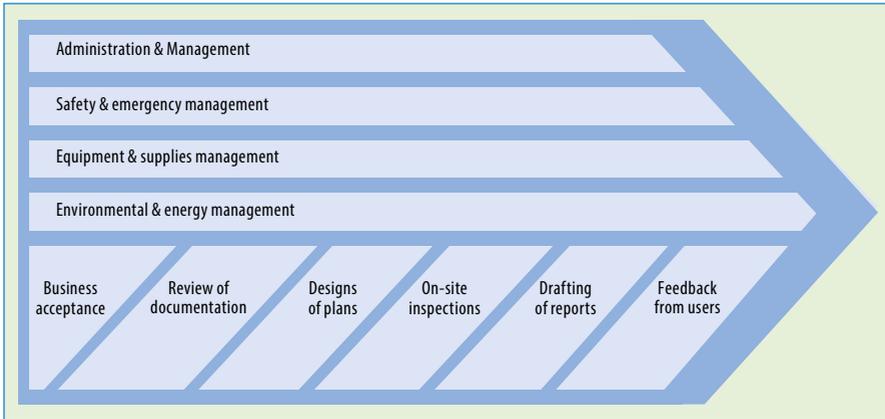


Figure 3 – The value chain of the lightning protection services of SMSC

4.3 Key value drivers

The ISO methodology defines value drivers as key organizational capabilities which constitute competitive advantages of an organization. As a not-for-profit organization affiliated to the Shenzhen Meteorological Bureau, SMSC is a provider of fundamental social welfare services which take the form of:

- providing meteorological services in different forms and channels by addressing different user groups (both the general public and governmental agencies as well as industry sectors), to protect lives, ensure safety of property and reduce or mitigate impacts from disasters
- contributing to sustainable development of the society

For SMSC, the process of realizing social services consists in ensuring service quality and expected service levels, in improving weather forecasting accuracy and timeliness, meeting the needs of all societal groups, expanding the coverage of meteorological services, increas-

ing public satisfaction with the services as well as protecting human lives and the safety of property.

Through interviews with several senior managers, the key value drivers of SMSC have been determined as listed in **Table 2**.

Type of service	Key value drivers	Description
Public meteorological services & lightning protection services	Increase in the standardization of services	By regulating the industry's terminology and unifying industry symbols and marks, SMSC can raise public understanding of meteorological information, contribute to streamlining the market of the meteorological industry, promote a healthy and orderly development of society, establish a good reputation for SMSC and enhance public confidence in meteorological services.
	Increase in the efficiency of services	The implementation of standards can systematize communication channels for the verification and release of information, improve service efficiency and timeliness of information release and help expand the coverage of public services.
	Increase in service quality for the public	The center conducted lightning protection inspection for relevant products in accordance with inspection standards to ensure that products meet the requirements of international or national standards, improve service quality, raise public trust, safeguard the lives of citizens and the safety of property.
	Increase in public satisfaction	Improving public trust and satisfaction by providing services of high quality, supported by standardization work.
	Reduction of accident rate	Ensuring security of lightning protection of products; reducing the occurrence of lightning disasters by equipping lightning protection devices with high-quality detection technology.
Meteorological services for industry sectors	Reduction of damage to property	Improvement of the timeliness and accuracy of information provided by the meteorological services will reduce damage to industry equipment and facilities from disasters and will thus reduce loss of property and conserve resources.

Table 2 – Key value drivers of the meteorological service center

5 Scope of the assessment

The assessment scope is limited to the business functions which show clear impacts of standards and to activities closely related to the key value drivers of the organization. Based on SMSC's value chain, the business functions which show a significant impact of standards and contribute significantly to the generation of social benefits have been chosen as assessment targets and are shown in **Table 3**.

Type of service	Scope
Meteorological services	Information generation and provisioning
Lightning protection services	On-site inspection of devices

Table 3 – Assessment scope of SMSC

5.1 Information generation and provisioning

The generation and provisioning of meteorological information includes the two aspects of information generation and information dissemination. Information generation mainly includes collecting meteorological data, observing satellite cloud images, focusing on Doppler weather radar and automatic weather stations, as well as predicting the weather through consultations of expert groups using meteorological analysis methods. According to different user needs, forecast results are designed for different products and distributed through a variety of channels.

SMSC is committed to providing timely, accurate and effective meteorological information, guiding the public in their travel decisions, ensuring public safety as well as providing basic inputs into governmental regulations. This process of information generation plays a fundamental role in the meteorological service center and provides basic information for different organizations and groups in the society.

5.2 On-site inspection and testing of lightning protection devices

On-site testing mainly includes the following activities: a) testing of lightning protection devices in new buildings; b) conducting risk assessments for potential lightning disasters; c) periodic testing of lightning protection devices and acceptance testing of projects that use lightning protection devices. The main purpose of lightning protection testing is to determine the functionality of current lightning protection devices to make sure lightning arresters work as intended. For this reason, on-site inspections of lightning protection devices are an important activity for public safety and constitute a key contribution of the meteorological services towards social benefits.

To undertake this activity, the following standards are used (a more comprehensive list of important standards can be found in **Table 4**):

- GB/T 21431-2008, *Technical specifications for inspection of lightning protection systems in buildings*
- SZJG 28.1-2009, *Safety requirements and test specification of lightning protection – Part 1: General principles*

These standards contain technical requirements for the inspection of lightning protection devices to ensure compliance with national and international standards, to guarantee the testing quality of these devices with a view to effectively protecting buildings and ensuring public safety.

6 Standards used in the SMSC value chain

After identifying the business functions in the scope of the assessment of SMSC, we selected key standards used in these business functions through questionnaire surveys and interviews with staff in SMSC (see **Table 4**).

As mentioned earlier (see section 3 of this report), a significant number of internal standards are used in the meteorological services. These internal standards are designed to meet demands of a diverse group of users of the meteorological services, to help standardize the business processes of the meteorological services, as well as improve service efficiency and service levels in providing meteorological information. These very specific standards play an important role in the business operations of SMSC (Note: All standards for which the reference number starts with "Q/" are company internal standards).

Type of business	Business function	Activity	Standard reference number	Titles of the standards
Public meteorological services	Information generation and provision	Service standardization	GB/T 22164-2008	Public meteorological service – Weather graphic symbols
			GB/T 27962-2011	Graphical symbols for meteorological disaster warning signal icon
		Public information services	Q/SZQX 301201-2012	Service specification for public meteorological information
			Q/SZQX 301202-2012	Specification for the provision of meteorological information for the telephone Hotline "12121"
			Q/SZQX 301203-2012	Specifications for the dissemination of meteorological information through SMS
			Q/SZQX 301212-2012	Radio station broadcasts live meteorological information attachment requirements
Q/SZQX 301211-2012	Meteorological channel real-time information spot operating procedures			

Type of business	Business function	Activity	Standard reference number	Titles of the standards
Industry meteorological services	Information generation and provision	Industry information services	Q/SZQX 301302-2012	Meteorological service specification for power supply
			Q/SZQX 301305-2012	Meteorological service specification for transport
			Q/SZQX 301306-2012	Meteorological service specification for ports
			Q/SZQX 301307-2012	Meteorological service specification for construction safety
			Q/SZQX 301301-2012	Service specification for professional special meteorological information
Lightning protection services	On-site inspection and testing	Lightning protection design and testing	GB/T 21431-2008	Technical specifications for inspection of lightning protection devices in buildings
			GB 50057-2010	Code for design protection of structures against lightning
			SZJG 28.1-2009	Safety requirements and test specification for lightning protection – Part 1 : General principles
			SZJG 28.2-2011	Safety requirements and test specification for lightning protection – Part 2 : Schools
			GB 50601-2010	Code for construction and quality acceptance for lightning protection engineering of structures
			GB/T 21714-2008	Protection against lightning

Table 4 – Standards used in key business functions

7 Selection of operational indicators to measure the impacts of standards

The key standards contributing to social benefits have been identified through questionnaires and staff interviews (see **Table 5**). Interviews confirmed that in order to streamline the market of the meteorological industry, unify the industry terminology, unify the weather symbols and marks, overcome barriers to public understanding of meteorological information, and create a good reputation for SMSC, all meteorological departments need to comply with the Chinese national standards GB/T 22164-2008, *Public meteorological services – Weather graphic symbols*, and GB/T 27962-2011, *Graphical symbols for meteorological disaster warning signal icon*. Additionally, in order to meet growing public demand for meteorological services, business procedures have been standardized in order to improve the efficiency and level of service and a series of SMSC-internal standards have been developed, as shown in **Table 5**.

As a result of interviews with department supervisors in SMSC and follow-up research, the operational indicators in **Table 5** have been selected to measure the impacts of the standards.

Business function	Type of service	Operational indicators	Standards used in the service	Definition of the indicators
On-site inspection	Lightning protection services	Service coverage rate	GB/T 21431	Improvement of inspection capability of lightning protection devices and public recognition of these inspections, enhancing the service coverage through the use of standards
		Accident rate	GB/T 21431	Organization and implementation of testing standards for lightning protection devices to make the inspection of lightning protection devices for buildings more scientific, safer and reliable, which increases public trust and reduces lightning accidents
Information production and providing	Public meteorological services	Public recognition	GB/T 22164 GB/T 27962	Streamlining within the industry, and increase in public recognition and in the accuracy of public understanding of meteorological information through the use of unified terminology and classification and regulation of meteorological symbols and marks
		Public benefit range	Q/SZQX 301201	Increase in benefits due to public meteorological services as a consequence of the use of standards raising the efficiency of services
		Public satisfaction	Q/SZQX 302105	Timely and efficient meteorological services, through managing the service according to standards, increases public satisfaction
	Meteorological services for the industry	Contribution rate of service	Q/SZQX 301301	Reduced loss of property due to natural disasters through generation of industry-oriented meteorological forecasts in accordance with the standard

Table 5 – Operational indicators to determine social benefits of standards

8 Quantitative and qualitative evaluation of non-economic benefits of standards

8.1 Impacts of standards

Through interviews with supervisors of SMSC’s key business functions, and detailed studies of the standards system of the meteorological services, we identified the most important standards to evaluate their social benefits. This includes both external and internal standards the impacts of which will be analyzed separately to avoid confusion and double-counting their impacts.

8.1.1 Impacts of external standards on SMSC

The impacts of external standards on SMSC are mainly reflected by the indicators “public knowledge and recognition” of the meteorological service, the “scope of the service coverage” and “accident rate” that can be related to lightning protection services as well as the control of respective devices (see **Table 6** for details).

Business functions	Operational indicators	Description of the impacts of standards
Information making and providing	Public knowledge and recognition	In the absence of standards, weather graphic symbols and disaster warning signal icons, which are basic means in communicating weather information, had many different designs and representations and symbols were used differently all over China. Following the release of GB/T 22164 and GB/T 27962, the relevant departments of the meteorological industry have all followed the weather symbols defined in GB/T 22164. This standard defines the graphic representation and method of application, and contributes to a common understanding of weather information by the public.

Business functions	Operational indicators	Description of the impacts of standards
On-site inspection	Scope of service coverage	<p>Before the introduction of standards, companies had no choice other than to rely on the experience of working staff in deciding whether a product inspection method and technology were reliable or not. In addition, there were always doubts about the effectiveness of the inspection technology for lightning protection devices. After its use, the standard GB/T 21431 gained a wide recognition and strong authority in China.</p> <p>The standard stipulates detailed technical requirements and inspection methods for lightning protection devices in buildings. It is the basic reference for tests and can ensure companies of the reliability of lightning protection devices. This has increased the number of tested lightning protection devices, resulting in an expansion of the service coverage.</p>
	Accident rate	<p>Before the use of standards, lightning protection products were of mixed quality. GB/T 21431 has gained wide recognition and strong authority, helping companies to better understand a product's current status on the basis of an inspection. Through this standard, the majority of technical staff have access to rules and regulations to be followed when testing, which has resulted in an upgrading of many testing facilities. As a consequence, the accident rate through lightning disasters reduced and the safety of public lives and property increased.</p>

Table 6 – Impacts of external standards on SMSC

8.1.2 Impacts of internal standards on SMSC

The impacts of internal standards on the meteorological service center are mainly reflected in the number of users of the service, public satisfaction with respect to the meteorological service, and in the contribution rate of the meteorological service industry. See

Table 7 for details.

Business functions	Types of service	Operational indicators	Description of the impacts of standards
Information making and providing	Public meteorological service	Number of users (Service audience)	In the absence of standards, the processing of meteorological information required frequent communication and exchange between related personnel making progress quite slow. By using standards, the organization defined unified requirements for the generation and dissemination of public meteorological information thus guaranteeing service quality as well as efficiency. This greatly increased the volume of available meteorological information resulting in a wider user base of the services.
		Public satisfaction	Before the introduction of standards, SMSC had no specific rules to follow for the quality management and assessment of meteorological information, which hindered the improvement of service quality. By using standards, SMSC improved the level, quality, and timeliness of its service thereby increasing public satisfaction.
	Industry meteorological service	Service contribution rate	In the absence of standards, efficiency of the meteorological services was low, failing to provide timely and accurate meteorological information. After introducing standards, SMSC improved the quality, accuracy and timeliness of weather forecasts, thus providing reliable services for disaster prevention and mitigation. Forewarning of upcoming major weather disasters, enables companies, organizations and households to take precautionary measures and reduce likely damage to property and loss of resources.

Table 7 – Impacts of internal standards on SMSC

8.2 Quantification of the non-economic benefits of standards

8.2.1 External standards

Through interviews with supervisors of key business functions in the meteorological service center, we understood that the business functions the most affected by external standards were: information generation, provision of meteorological services, and on-site inspection of lightning protection devices. Key standards used are GB/T 22164 and GB/T 27962 and, for the lightning protection service, GB/T 21431. In the following we have tried to quantify the social impacts of these standards.

Public knowledge and recognition of the meteorological services

Through interviews with supervisors and the analysis of satisfaction survey reports undertaken by SMSC, we found that public knowledge and recognition of the meteorological warning information before the introduction of these standards (before 2011) was around 33 %. After using standards (since 2011) it increased to around 35 %. In line with SMSC-staff input, we concluded that public recognition of meteorological warning information increased by 2 % as a consequence of the standards which introduced unified regulations on weather symbols and warning signal icons for meteorological disasters (see **Table 8** for details).

Operational indicator	2009	2010	2011	2012
Public knowledge and recognition	33.2 %	33.2 %	35.2 %	35.4 %
	Before the use of standards		After the use of standards	

Table 8 – Public knowledge and recognition of meteorological warning information

Service coverage through inspections of lightning protection services

Through interviews with supervisors in SMSC and in reviewing the benefits summary of the lightning protection technology services, we gained understanding of the lightning protection service's coverage.

Figure 4 shows that the number of inspections of lightning protection facilities in 2009 and 2010 remained around 3200 before using the standard. After using the standard, the organization completed a total of 3588 lightning protection facility inspections in 2011, an increase of around 10% over 2010. In 2012 the number of inspections increased by 580 over 2011, raising the coverage by 16%. So, the service coverage increased at least 10% per year through providing lightning protection inspection services.

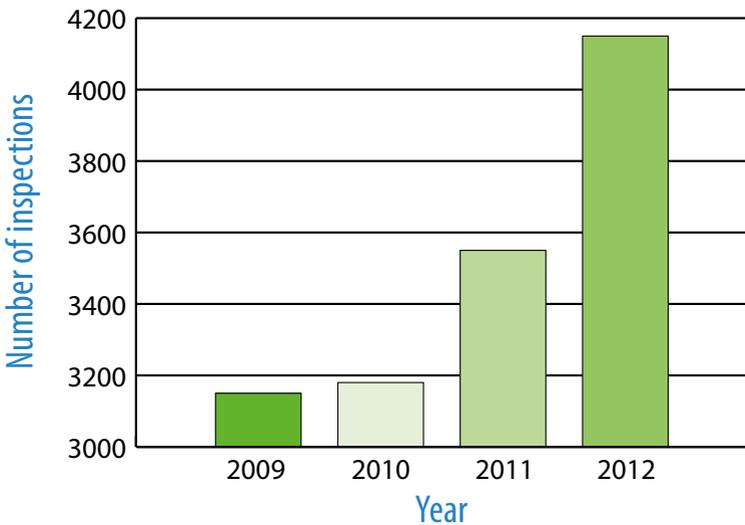


Figure 4 – Inspection volume of lightning protection devices

Accident rate

Being able to follow rules and laws during the inspection process of lightning protection devices based on the unified regulations in GB/T 21431 resulted in higher reliability and safety of these devices. It also improved public trust in lightning protection device inspections and resulted in a reduction of the accident rate. The number of accidents due to lightning disasters was 13 in 2010, 38% less than in 2009, when they were at 21. After introduction of the standard, only six accidents occurred in 2011 and 2012, 53% less than in 2010. Based on the interviews with staff of SMCS, the key reason is seen in the use of the standard (for details see **Figure 5**).

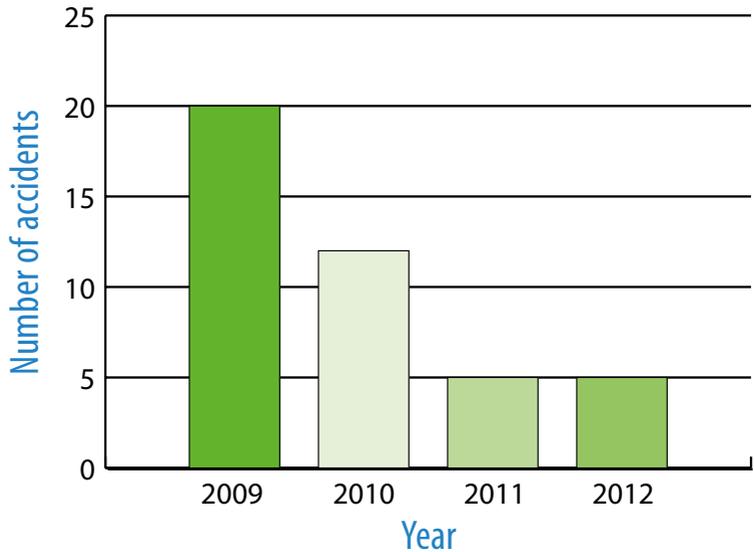


Figure 5 – Number of accidents due to lightning protection disasters

8.2.2 Internal standards

As mentioned earlier, the impacts of internal standards on key business functions in the meteorological service center are mainly

reflected in public meteorological services and industry meteorological services. On the basis of research and interviews with supervisors in the meteorological service center, we were able to quantify the social impacts of standards of internal standards which SMSC has been using since 2012.

Number of users of the meteorological service

The organization improved service efficiency and expanded its customer base through unified standards for its services in providing public meteorological information.

We can interpret the number of users having subscribed to the SMS weather information service, which includes weather warnings, as a proxy for the total number of users of the service. As shown in **Table 9**, before the use of standards the amount of weather warnings sent as SMS messages in 2011 increased by 5 % over 2010. After introducing standards in 2012, this amount increased in 2012 by another 7 % over 2011. This means that the total number of users of the service increased by 2 % after the introduction of internal standards in the public meteorological service.

Year	# of SMS sent with weather warnings (in billions)	# of users of the SMS weather information service (in millions)
2012	0.9	2.5
2011	0.84	2.09
2010	0.8	2.03

Table 9 – Number of users of public meteorological information

Level of public satisfaction

SMSC has been able to effectively improve the quality and levels of its service, and promote public service satisfaction through evaluating and managing meteorological service information forecasts to see whether they were accurate or not, whether they met public require-

ments and whether information was released in a timely manner. Through interviews with supervisors in the meteorological service center and on the basis of an analysis of relevant data, it was found that public satisfaction in 2012 had reached 96.1 %, an increase of 0.4 % over 2011 (see **Table 10** for details)..

Operational indicator	2009	2010	2011	2012
Public satisfaction	94.1 %	94.4 %	95.7 %	96.1 %

Table 10 – Survey data related to public satisfaction

Service contribution rate (example study: Xili reservoir)

Through standards, the quality of the meteorological services has improved. Specifying the processes for generating meteorological information has enhanced the timeliness and accuracy of weather information deliver , thereby reducing the loss of property, accidents and casualties caused by weather-related disasters.

Following a suggestion by the management of SMSC, we chose the Xili reservoir to conduct a sample assessment and calculate benefits generated by the meteorological services: The Xili reservoir prepares annual water supply operation plans on the basis of long-term weather forecasts by the meteorological service center. It develops a specific water diversion program on the basis of recent weather forecasts and the actual rainfall in the region. These plans are aimed at significantly reducing water wastage. From a field research report of the Xili reservoir, we learnt that the water runoff of the reservoir was about 40 million cubic meters in 2012, of which 50 % was used to contribute to the capacity of the water reservoir. This was possible on the basis of rainfall forecasts provided by the meteorological service center. Given that the cost of water transport from the Dongjiang river to the Xili reservoir is about 0.7 RMB per cubic meter, the monetary

value of 20 million cubic meters water (i.e. 50% of the total runoff) can be calculated as follows:

$$20 \text{ million} \times 0.7 = 14 \text{ million RMB}$$

The total water value of the Xili reservoir in 2012 was 400 million cubic meters. The benefit for the Xili reservoir derived from applying the meteorological information from the SMSC was 14 million RMB, which amounts to a contribution rate of 3.5% by the meteorological services.

9 Evaluation of the results

We can summarize the main conclusions from our study as follows: For the meteorological service center, standards have the most significant impact in the areas of information generation and information provisioning as well as in on-site inspection services to ensure lightning protection devices function as intended. The impact of external standards is mainly reflected in on-site inspections by the lightning protection services of the meteorological service center, achieving social benefits of 16%. The impact of internal standards is also mainly reflected in information generation and amounts to 3.5% of social benefits. Compared with internal standards, external standards have a higher degree of contribution in terms of social benefits through the lightning protection services. External standards play therefore a vital role for key business functions of the meteorological service center. Every step of the on-site inspection relies on the standard. In fact, standards are needed throughout the entire process of the business functions of the lightning protection service.

10 Conclusions

10.1 Standardization is a pillar in enhancing organizational competitiveness

With the rapid development of the Chinese economy, of science and technology, the public has higher requirements for the quality of meteorological services. The State Council of China issued a document Several opinions of the State Council regarding accelerating the development of meteorological services, requiring further development and higher quality of the meteorological services in order to serve the national economy and the socio-economic development. Through participation in standardization, the meteorological service center was able to improve its service quality and innovate some of its services. Further participation in standards development would enable the center to innovate its operations and services and, at the same time, raise the level of internal company standardization. System certification would also help to achieve a closer integration of standardization in the weather services.

10.2 Recommendations towards a further improvement of the assessment method

In order to improve studies on non-economic benefits (social and environmental) of standards, we need more in-depth research and improvements of the evaluation method.

The concept of the “value chain” constitutes the basic framework for the economic and social/environmental benefits assessment. However, the biggest challenge in using the method is to distinguish between the impacts of standards and impacts of other factors. It is very important to be familiar with the business activities of the organization that is subject to an assessment and the key business

functions. When undertaking an evaluation of the non-economic (social and environmental) benefits of standards, one must aim at understanding the situation of an organization and try to refine the evaluation indicators so that they become operable and sufficiently precise in order to reach the the most valid evaluation results.

Annex 1 : Project participants

In addition to the individuals listed at the beginning of this report, the following have participated in the project:

- **Project members – Standardization Administration of the People’s Republic of China (SAC)**
 - Mr. Li Dongfang, Standardization Officer, Department of International Cooperation
- **Project members – Market Supervision Administration of Shenzhen Municipality (MSA)**
 - Mr. Tan Jianjun, Division Director, Standardization Division
 - Mr. Cheng Shengtao, Principal Staff Member, Standardization Division
- **Project members – Shenzhen Meteorological Service Center (SMSC)**
 - Mr. Liu Dunxun, Senior Engineer, Department of lightning protection service
 - Mr. Luo Hongyan, Engineer, Department of lightning protection service
 - Mr. Yang Yuexin, Engineer, Department of lightning protection service
 - Ms. Yang Lin, Engineer, Department of lightning protection service
- **Project members – Shenzhen Institute of Standards and Technology (SIST):**
 - Mr. Lu Hongfeng, Director-in-Chief
 - Mr. Wang Ke, Deputy Director, Standardization Application Research Centre