Internal Ex-Post Evaluation for Technical Cooperation Project

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Country Name	The Project for Japan-China Cooperation Center for Meteorological Disasters
People's Republic of China	

I. Project Outline

Background	China is afflicted by frequent meteorological disasters such as floods, droughts, typhoons and cold weather. In particular, floods along the Yangtze River caused large amount of damage every year. Furthermore, climatic change and weather phenomena in China was a cause of droughts, floods and localized heavy rains in East Asia including Japan. In order to explore the mechanism of heavy rains along the Yangtze River, the meteorological observation network had to be developed in the Tibet Plateau and in the upstream area of the Yangtze River. However, there were only two automated observation stations and eleven manual observation stations in Tibet, causing the low accuracy and reliability of weather forecasts and meteorological disaster predictions, e.g. deviations in the obtained data. Also, disaster prediction was difficult due to lack of modern comprehensive system such as Global Positioning System (GPS) and observation apparatuses for Planetary Boundary Layer (PBL) [1].		
Objectives of the Project	1. Overall Goal: Meteorological disaster is reduced in East Asia including China and Japan 2. Project Purpose: The operational weather forecasting system of China is strengthened through the development of numerical weather prediction models[2] importing the data obtained by the quantitatively and qualitatively improved observation systems in the Tibet Plateau and its eastern surrounding area. 3. Assumed steps for achieving the project goals[3]: This project develops the meteorological observation system and numerical weather prediction models, and thereby improves accuracy and reliability of weather forecasts and meteorological disaster predictions. Then, it aims to reduce disaster along the Yangtze River[4].		
Activities of the project	1. Project site: The City of Beijing, Sichuan Province (Chengdu), Yunnan Province (Kunming), Tibet Autonomous Region (Lhasa) 2. Main activities: Development and operational testing of observation systems and the satellite-using system; integration of the new system to the existing system; testing of online data input and transfer; planning and implementation of observation plans; joint analytical research, development of numerical weather prediction models, integration of those models to the operational numerical weather forecast; etc. 3. Inputs (to carry out above activities) Japanese Side 1) Experts: 15 persons (Short-term) 2) Trainees received: 12 persons 3) Equipment: Observation and analytical equipment, vehicles, etc. Chinese Side 1. Staff allocated: 95 persons 2. Land and facilities: Project office (Beijing, Chengdu, Lhasa, Kunming) 3. Local cost		
Project Period	December 2005 to June 2009	Project Cost	539 million yen
Implementing Agency	Chinese Academy of Meteorological Sciences (CAMS), China Meteorological Administration (CMA), etc.		
Cooperation Agency in Japan	University of Tokyo, Japan Weather Association (JWA)		
Related Projects (if any)	Japan's cooperation: GEWEX Asian Monsoon Experiment (GAME) (Japan-China joint research under the special program of joint research of Ministry of Education, Culture, Sports, Science and Technology,1994-2000) * GEWEX: Global Energy and Water Cycle Experiment		

[1] The layer of the atmosphere that is directly influenced by its contact with a planetary surface.

[2] Defined procedures, or more concretely, calculation programs, to compute changes of conditions of atmosphere and oceans based on physical equations.

[3] Reviewed at the time of the ex-post evaluation.

[4] This project originally intended to bring about another outcome, formulation of disaster prevention plans based on studies on water circulation mechanism in east Asia. However, given the project purpose that is to improve the operational forecasting system, this evaluation consistently focused on contributions to disaster reduction along the Yangtze River as the overall goal.

II. Result of the Evaluation

1 Relevance

This project has been highly relevant with China's development policy "enhancement of accuracy and timeliness of forecasts through development of meteorological operations" as set in the 10th (2001-2005) and 11th (2006-2010) Five-year Plan Outlines for the National Economic and Social Development, development needs "accuracy and reliability of weather forecasts and meteorological disaster predictions through developing a special meteorological observation network in the Tibet Plateau and surrounding areas", as well as Japan's ODA policy, the China Economic Cooperation Plan (2001), at the time of both ex-ante evaluation and project completion. Therefore, relevance of this project is high.

2 Effectiveness/Impact

This project achieved its project purpose, "strengthening the operational weather forecasting system of China through development of numerical weather prediction models". Under this project, various kinds of observation equipment were installed in total 35 locations, which enabled acquisition and transmission of meteorological observation data, such as water vapor data using GPS and ground temperature, humidity, wind direction, wind speed and precipitation using Automated Weather Stations (AWSs). Numerical weather prediction models importing such observation data were developed by the time of project completion. The models have become utilized for weather forecasting and meteorological disaster predictions at the operational level by inputting observed data.

At the time of ex-post evaluation, data acquisition and transmission are operating normally, except at one GPS station where operation stopped due to breakdown of the equipment, and another two observation points where data transmission partly fails due to a power supply problem. Repair of the broken equipment is planned using budget on the Chinese side. The numerical weather prediction models have been continuously used at the operational level. As a result, for example, the level of heavy rain forecast for downstream areas in the east of the Tibet Plateau has been enhanced. The operational data communication network of China Meteorological Administration (CMA) covers all meteorological stations that transmit all data, including those that became obtained as a result of this project, to regional meteorological administration offices for weather and disaster forecasting. Also, there are cases where the techniques introduced under the project have been further improved and thus attained higher accuracy and reliability (e.g. application of the land surface-satellite remote control assimilation technique in the operational sections. This system is planned to be a subject of further research and development). On the other hand, application to flood predictions has not been realized yet because river flow data have not been provided by the water control section.

The overall goal "reduction of meteorological disaster in East Asia including China and Japan" is twofold. First, concrete information on reduction of disaster along the Yangtze River was not available though the implementing agency provided positive comments on the contribution of the project. Second, as to reduction of meteorological disaster in East Asia, contribution of this project to meteorological research in that area was confirmed: the implementing agency has provided observed data to respective institutions in accordance with the regulations of the Asia Monsoon Year (AMY) Project. As a result, more than 50 scientific research institutions have used the provided data, and related research papers have been published in journals with international impact.

Therefore, effectiveness/ impact of the project is fair.

Achievement of project purpose and overall goal

Aim	Indicators	Results
(Project Purpose) The operational weather forecasting system of China is strengthened through the development of numerical weather prediction models importing the data obtained by the quantitatively and qualitatively improved observation systems in the Tibet Plateau and its eastern surrounding area	The following data for 2 years are acquired: hourly GPS data from around 80% of the new GPS stations (for calculation of accumulated amount of water vapor); and hourly data on ground temperature, humidity, wind direction, wind speed and precipitation from AWSs (5 stations).	(Project completion) 24 new GPS stations and 7 new AWSs were established and the designated data were acquired. (Ex-post evaluation) 21 GPS stations and 7 AWSs operate normally. Data acquisition and transmission is good. GPS stations that are not operating normally: Gerze (equipment was broken), Dingqing (data transmission partly fails due to power supply problem) and Lhunze (ditto).
	The following data are acquired for around 80% of warm periods from the 3 new PBL stations: per 10-minute data of vertical distribution of wind direction and wind speed; and timely data of vertical distribution of temperature and land surface flux data. The following satellite products (about 5 day average) for 2 years are acquired: atmospheric vertical structure; spatial distribution of precipitation; and soil moisture distribution.	(Project completion) PBL observation system was installed in 3 new stations and a new wind profiler (to observe vertical distribution of wind and moisture) was installed in 1 new station. Data acquisition started at all of them. (Ex-post evaluation) All of the above-mentioned 4 stations operate normally, though some sensors are broken down (repair is planned next year). Data acquisition and transmission is mostly normal.
	Reproducibility of heavy rain on the numerical weather prediction models developed under this project: to be improved to the extent that can be provided for flood prediction.	(Project completion) Improvement of accuracy of meteorological predictions at the operational level using the models developed was demonstrated. (Ex-post evaluation) The level of heavy rain forecast for downstream areas in the east of the Tibet Plateau has been enhanced. Simulation studies were conducted on flood

		models, but the results have not been applied yet.
	Progress of development of the advanced meteorological observation network such as with GPS and PBL at the operational level.	(Project completion) Regular observations started. (Ex-post evaluation) Regular observations are carried out with mostly good conditions.
	Progress of development and utilization of numerical weather prediction models with data assimilation at the operational level.	(Project completion) Application of data assimilation techniques to numerical weather predictions was widely disseminated through training. (Ex-post evaluation) The techniques are applied at Sichuan, Yunnan and Hubei meteorological administration offices.
(Overall goal) Meteorological disaster is reduced in East Asia including China and Japan	Verification examples of flood prediction and meteorological disaster reduction in China and in East Asia based on meteorological prediction information.	(Ex-post Evaluation) Damage was reduced through enhanced accuracy of forecasts.

Sources：Terminal Evaluation Report and responses to the questionnaire by the implementing agency.

3 Efficiency

While the inputs were mostly appropriate for producing the outputs of the project, and the project period was within the plan (ratio against the plan: 100%), the project cost was higher than the plan (ratio against the plan: 150%) due to the review of the items of the equipment to be provided and the field of expert to be dispatched. Therefore, efficiency of the project is fair.

4 Sustainability

In the policy aspect, the 12th Five-year Plan Outlines for the National Economic and Social Development (2011-2016) that articulates “development of the systems of surveillance, early warnings and information release of meteorological disasters”. As the Government of China has emphasized the development of the observation network and operation system for the Tibet Plateau area, sufficient backups have been established to keep this project effective. Institutionally, management responsibility of the AWSs and GPS stations developed under this project was transferred from Chinese Academy of Meteorological Sciences (CAMS) under CMA and provincial meteorological research institutions to the operational observation system of CMA in 2009. The operation of those stations are managed and funded by CMA in an integrated manner based on the regulation for its operation system, and no problems have been observed. The technical capacity of the implementing agency is considered to be appropriate as activities such as operation and maintenance of each observation equipment as well as data analysis/prediction has been carried out (see “2 Effectiveness/ Impact”). Capacity building activities are also carried out following recent technological innovation. No problems are found in the financial aspect, either, as the operation and maintenance cost for the system developed under this project have been borne by CMA as part of the budget for its operational observation system.

From these findings, it is considered that the project has no problem in the policy background as well as institutional, technical and financial aspects of the implementing agency; therefore, sustainability of effects of the project is high.

5 Summary of the Evaluation

This project has achieved the project purpose of “strengthening the operational weather forecasting system of China through development of numerical weather prediction models”. Meteorological observation data became acquired and transmitted in the Tibet Plateau and upstream area of the Yangtze River, and such data were imported to the numerical prediction models. Through utilization of the models for weather forecasting and meteorological disaster prediction at the operational level, accuracy of weather forecasting has been improved. Although concrete information was not available to verify the achievement of the overall goal, it is pointed out that the enhanced forecasting accuracy has reduced damage caused by disasters. As for sustainability, no problem has been found as the institutional set-ups and necessary cost have been properly secured given the importance of the observation system in the concerned area. For efficiency, the project cost exceeded the plan.

In the light of above, This project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing agency:

The equipment provided under this project have been well maintained and effectively utilized. Although some equipment had troubles, the Chinese side has made necessary budgetary arrangement and maintenance. The information on outcomes of the project has been shared with respective local meteorological offices and presented at international research groups through research papers. The implementing agency is expected to continue extending such outcomes and maintaining the equipment so that the project could play its role for long term.

Lessons learned for JICA

In the planning stage of a project that requires high level of expertise, inputs of materials and equipment should be examined from expert (technical) point of view, and inputs of experts should be based on a more detailed personnel assignment plan so that the project could be completed within the planned period and cost.

Wind profiler radar Yunnan Dali

Automatic weather observation