Internal Ex-Post Evaluation for Grant Aid Project

conducted by Bhutan Office: February 2025

Country Name	**The Project for Improvement of Medical Equipment at the National and Regional Referral Hospitals**
Kingdom of Bhutan	

I. Project Outline

Background	In Bhutan, health indicators had improved in the last decade and mortality from communicable diseases decreased significantly. On the other hand, non-communicable diseases had been increasing year by year and become the main causes of death. However, the government was not able to secure a sufficient budget and had difficulty in the development of the equipment necessary for testing and diagnosis. In addition, advanced diagnostic imaging equipment was only available at the national hospital in the capital city, Thimphu, so patients in rural areas had to travel through mountainous regions to see a doctor, causing physical and economic difficulties.					
Objectives of the Project	This project aimed to strengthen the diagnostic imaging capacity of the national referral hospital (Jigme Dorji Wangchuck National Referral Hospital (JDWNRH)) in the capital city, Thimphu, Eastern Regional Referral Hospital (ERRH), Mongar and Central Regional Referral Hospital (CRRH), Gelephu, in Bhutan and to improve access to the health services for local residents by procuring the medical equipment for image diagnosis, thereby contributing to the alleviation of the disparity in the health services between urban and rural areas.					
Contents of the Project	1. Project Site: Thimphu City, Mongar Dzongkhag (District), and Sarpang Dzongkhag (District, including Gelephu City). 2. Japanese side: (i) Provision of grant necessary for the procurement of medical equipment for image diagnosis; 64-slice Computed Tomography (CT) (1), 16-slice CT (2), General digital X-ray apparatus (1), digital mammography (1), spirometer (1), and electrocardiogram (ECG) Holter system (1)[1] (ii) Technical Assistance (soft component of the grant aid) to JDWNRH for image diagnosis and cardiac CT scans with the procured 64-slice CT. 3. Bhutanese side: Preparation of the CT room and the mammography room at JDWNRH, preparation of the CT room at MERRH, etc.					
Project Period	E/N Date	March 3, 2017	Completion Date (ex-ante)	August 2018	Completion Date (actual)	October 2018 (Completion date of soft component)
	G/A Date	March 27, 2017				
Project Cost	E/N Grant Limit / G/A Grant Limit: 551 million yen, Actual Grant Amount: 537 million yen					
Executing Agency	Department of Medical Services under Ministry of Health (MOH)[2]					
Contracted Agencies	Main Contractors: Marubeni Protechs Corporation Main Consultant: International Techno Center Co., Ltd.					

II. Result of the Evaluation

< Special Perspectives Considered in the Ex-Post Evaluation >

[Use of supplementary information]

・In addition to the qualitative effects stated in the ex-ante evaluation sheet, the continuation status of the objective of the soft-component plan, "Image diagnosis and cardiac CT scans with the procured 64-slice CT are performed appropriately" is confirmed as the effects of the soft-component (Supplementary Information 1) and "Increase of the number of mammography examinations in JDWNRH" (Supplementary Information 2), and "Increase of the number of digital X-ray examination in CRRH, Gelephu" (Supplementary Information 3) are also used to confirm the effects of the procured equipment.

1 Relevance/Coherence

[Relevance]

<Consistency with the Development Policy of Bhutan at the Time of Ex-Ante Evaluation >

The project was consistent with the 11th Five Year Plan (2013-2018), the national plan of Bhutan at the time of ex-ante evaluation, which aimed to achieve further improvement of the health services and improved access to the health services for the rural population through strengthening diagnostic capacities of the referral hospitals.

<Consistency with the Development Needs of Bhutan at the Time of Ex-Ante Evaluation >

The project was consistent with the Bhutanese development needs of improvement of the health services, especially for those rural populations in mountainous regions at the time of ex-ante evaluation as described in "Background" above.

<Appropriateness of Project Design/Approach>

The project design/approach was highly appropriate. Some of the equipment served to provide benefits to vulnerable people, particularly those who lived in regional areas. Those people in rural area when they were in a serious condition, had no other way to travel a long way to Thimphu to receive medical services such as a CT scan. With the equipment installed in ERRH, Mongar and CRRH, Gelephu by the project, they have now received the same level of services without travelling a long way to Thimphu. In addition, both hospitals (in Gelephu and Mongar) are government hospitals and are located in the accessible area from neighboring Dzongkhags (districts) which serve all people in an equal manner. Medical disparities particularly for vulnerable people in rural areas were largely reduced.

<Evaluation Result>

In light of the above, the relevance of the project is ③[3]

[Coherence]

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

[1] A one-year warranty and a four-year Comprehensive Maintenance Contract (CMC) was included for adequate maintenance of the radiological equipment.

[2] The project was implemented in collaboration with the target hospitals (JDWNRH, MERRH, and GCRRH).

[3] ④：very high, ③：high, ②：moderately low, ①：low

The Project was consistent with Japan's Country Assistance Policy for the Kingdom of Bhutan (2015) at the time of ex-ante evaluation, which set forth "narrowing economic and social disparity between urban and rural areas" under one of the priority areas of "Sustainable Economic Growth".

<Collaboration/Coordination with JICA's other interventions>

The collaboration/coordination between the project and Japanese grant aid projects known as "The Project for Replacement of Ambulances" Phase 1 (2011) and Phase 2 (2015) was planned at the time of ex-ante evaluation and was implemented beyond the plan. The positive effect(s) expected were confirmed at the time of ex-post evaluation. With a total of 55 ambulances procured for primary medical facilities in rural areas, all residents can now be transported in an emergency within 30 minutes and access to core hospitals has greatly improved. However, there were cases in which treatment was too late because of a lack of proper treatment at the referral hospital during a life-threatening emergency. Under such circumstances, diagnostic imaging equipment placed in the two regional referral hospitals procured under this project has served well for patients to receive the prompt treatment based on appropriate diagnosis. There are more patients that are referred to the regional hospitals rather than Thimphu only and there is an increased use of ambulances in the allotted regions. For instance, the number of CT examinations in both ERRH, Mongar and CRRH, Gelephu was increased.

<Cooperation with other institutions/ Coordination with international framework>

Any cooperation/coordination with donor agencies, Non-Governmental Organizations, and other institutions was not clearly planned at the time of ex-ante evaluation or during the project period.

<Evaluation Result>

In light of the above, the coherence of the project is ③.

[Evaluation Result of Relevance/Coherence]

In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Effectiveness>

The project objective to strengthen the diagnostic imaging capacity of the national referral hospitals (JDWNRH, ERRH, Mongar and CRRH, Gelephu) and to improve access to health services for local residents by procuring the medical equipment for image diagnosis was mostly achieved as planned. The number of days for which use of CT is suspended at JDWNRH decreased achieving the target beyond the plan in which the achievement rate was 114.3% (Indicator 1).[4] The number of CT examinations for JDWNRH increased, achieving the target (2021) beyond the plan in which the achievement rate was 113.5% (Indicator 2). In case of ERRH, Mongar, the achievement rate was 85.5% (Indicator 3) in which the degree of achievement is categorized as mostly achieved as planned and for CRRH, Gelephu by 48.3%, as not achieved (Indicator 4)[5].

As for the qualitative effects, it was confirmed by the study that the improvement of access to health services for local residents has enabled early diagnosis and treatment. According to ERRH, Mongar, the referral system was improved, so that the patients timely could reach the hospital, and that the disease was diagnosed at an early stage, thus they were directed to the appropriate medical services. There was a case in which two patients who had a stroke and hemorrhage were rescued by timely interventions. If there was no CT in the hospital, it could not be the case since the patient should have been transferred to Thimphu by spending a whole day. JDWNRH as well as CRRH, Gelephu also commented that early detection was helpful especially for diseases, such as trauma, stroke cases, emergency bowel obstruction, thyroid and hemorrhage since they require timely interventions. According to JDWNRH, the image diagnosis and cardiac CT scans with the procured 64-slice CT have been performed appropriately using the skills and knowledge developed through trainings provided under the soft-component of the project (Supplementary Information 1). It was also commented by JDWNRH, the number of mammography examinations has increased with the procured equipment. In the initial phase of the project, the number of mammography was done for 111 patients in 2018 and it scaled up to 389 in 2022. With the help of mammography, JDWNRH could increase its diagnostic services (Supplementary Information 2). CRRH, Gelephu commented that the number of digital X-ray examination has increased since it is convenient, and the image is clear. (Supplementary Information 3). The number of digital X-rays were 6,468 in 2019 and 3,408 in 2020. The number gradually increased to 6,766 in 2021 and 7,920 in 2022, contributing to achieving the early detection and diagnoses for locals in Gelephu.

Most of the procured equipments has been in proper condition and has been properly utilized as originally intended except the spirometer and ECG Holter System at ERRH, Mongar, which are not in frequent use. According to the ERRH, Mongar, the spirometer is used only when the trained nurse is assigned for short duration. For optimal utilization, ERRH, Mongar suggests that it should be better to shift the equipment to the hospital where there is a trained nurse constantly assigned. CT in JDWNRH and CRRH, Gelephu, were not in use for some time due to the problems of injectors, etc., but they have been repaired and returned to the normal operation.

<Impact>

The project has contributed to the alleviation of disparity in the health services between urban and rural areas in Bhutan. The project has helped to alleviate the burden of patients in rural areas by reducing waiting time and/or travel time for CT examinations as well as by saving their expenditure for travelling to Thimphu. The health worker in ERRH, Mongar shared that patient used to travel 3 days journey from Samdrup Jongkhar to Thimphu to get medical diagnoses and treatment, but now with the services available in Mongar and Gelephu it has reduced the travel to only 4 hours to Gelephu and a day to Mongar where the patient has a choice to get services and timely diagnoses from the two referral hospitals. CRRH, Gelephu and ERRH, Mongar have gained momentum in referral system.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ③.

Quantitative Effects

[4] Drastic increase of number of days for which use of CT is suspended at JDWNRH in 2022 (Indicator 1) is due to the fact that the CT at JDWNRH could not be used for 61 days intermittently when the breakdown of CT equipment occurred. The reason of the time required for such a long period was to procure replacement parts and dispatch engineers from Singapore due to reduced air traffic caused by the effect of COVID-19. This incident also explains the slight decrease in the number of CT examinations for JDWNRH in 2022 (indicator 2). Since April 2022, when equipment repairs were completed, the CT has been operating smoothly until the end of CMC period.

[5] The reason for Indicator 4 not being achieved is that Gelephu was regarded as a high-risk area because of its proximity to the Indian broader and more stringent restrictions were imposed during lockdown.

Indicators	Baseline 2015 Baseline year	Target 2021 3 years after Completion	Actual 2019 1 year after Completion	Actual 2020 2 years after Completion	Actual 2021 3 years after Completion	Degree of Achievement (%)2021 Target year	Actual Ex-post Evaluation 2022	Source
Indicator 1: Number of days for which use of CT is suspended in JDWNRH (days/year)	16	2	0	0	0	114.3%	61	Report by CMC Consultant
Indicator 2: Number of CT examinations in JDWNRH (cases/year)	3,782	5,000	8,057	5,611	5,676	113.5%	4,824	Report by CMC Consultant
Indicator 3: Number of CT examinations in ERRH, Mongar(cases/year)	0	1,500	821	1,029	1,283	85.5%	1,413	Report by CMC Consultant
Indicator 4: Number of CT examinations in CRRH, Gelephu (cases/year)	0	1,500	267	576	724	48.3%	1,353	Report by CMC Consultant

Source：JICA documents, interviews with JDWNRH, MERRH and GCRRH

3 Efficiency

Although the project cost was within the plan (the ratio against the plan: 97%), the project period exceeded the plan (the ratio against the plan: 111%). The excess of the project period is due to that it took more time for transportation of equipment. Outputs were produced as planned.

	Project Cost (Japanese side only, yen)	Project Period (months)
Plan (ex-ante)	551 million yen	18 months
Actual	537 million yen	20 months
Ratio (%)	97%	111%

In light of the above, the efficiency of the project is ③.

4 Sustainability

< Institutional/Organizational Aspect>

In January 2023, the Department of Medical Services has been separated from the Ministry of Health as a new department under the National Medical Services (NMS). The Department of Bio Medical Engineering (DBME) of the NMS assumes overall responsibility for the management of medical equipment in all medical facilities including three hospitals targeted by the project. The personnel in charge of operation and maintenance (O&M) of medical equipment are Bio Medical Engineers (BME) and Bio Medical Technicians (BMT). Those engineers and technicians are assigned to DBME, JDWNRH[6], ERRH, Mongar, and CRRH, Gelephu to maintain and manage medical equipment at the sub facilities in their respective regions. In case of malfunctions in medical equipment, those engineers and technicians check the conditions and repair the equipment. If it is difficult for them to repair the sophisticated equipment, they request DBME to dispatch a technician, a specialist. There is no significant organizational changes in the past five years for three hospitals. It was confirmed by the study that a sufficient number of staff are assigned to all three hospitals.

<Technical Aspect>

It was identified by the study that those staff engaged in O&M at all three hospitals have basic skills in O&M, but no sufficient skills to deal with sophisticated equipment, such as CT. With this regard, it is highly necessary to provide CMC for such equipment. It was also confirmed that manuals provided by the project, such as digital X-rays, helped to improve the knowledge about the operation of equipment. In case of ERRH, Mongar and CRRH, Gelephu, staff in charge of O&M of equipment did receive the training of basic skills of O&M from DBME. The O&M of equipment provided by the project was under the five-years cycle of CMC with local agents.

<Financial Aspect>

It is likely that the necessary budget for the proper O&M of the procured equipment will be secured. According to the Chief Biomedical Engineer of NMS, there is a plan to continue CMC with local agents by utilizing the funds from the Ministry of Finance.

<Environmental and Social Aspect>

No issue with environmental and social aspects has been observed and it has not been necessary to take any countermeasures.

<Current Status of Operation and Maintenance>

The maintenance of equipments is mostly covered by a local agent which provides the preventive measures biannually as planned and follows a Standard Operation Procedure. Daily check-ups are sufficiently managed by staff in charge at each hospital keeping low temperature and warm-up before using the CT on a daily basis.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the technical aspect of the implementing agency. Therefore, the sustainability of the project effects is ③.

5 Summary of the Evaluation

The project mostly achieved the project objectives as planned to strengthen the diagnostic imaging capacity of JDWNRH, ERRH,Mongar, and CRRH, Gelephu in Bhutan and to improve access to the health services for local residents by procuring the medical equipment for image

[6]In JDWNRH, there are also assistant medical engineering technicians who are not certified but have learned to maintain and repair equipment in the field and have more than 10 years of work experience.

diagnosis. As a result, the disparity in the health services between urban and rural areas has been reduced

Sustainability is high. Though there are slight problems in the technical aspect, no issues in the institutional/organizational aspects and financial aspect. Efficiency is also high.

Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

Recommendations to Implementing Agency:

1. In terms of the sustainability of the equipment, proper maintenance and operation procedures should be maintained. To enhance their skills for technical staff, the National Medical Services and DBME could provide training occasionally for the health officials with the support from local suppliers. In this respect, it is recommended that DBME should use JICA-trained technicians as trainers to provide technical guidance to other staff members.

2. The daily monitoring and timely maintenance of the provided equipment are sufficiently managed by the staff in charge at each hospital. This practice should be continued, as it is crucial to detect faults in the early stages and maintain the equipment in a good condition.

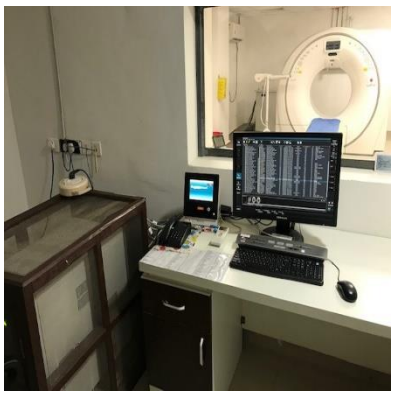
3. In terms of Spirometer and ECG Holter System, JICA would like to recommend the Ministry of Health and National Medical Services to consider relocation of the Equipment from ERRH, Mongar to JDWNRH or any health facilities where it is required and can have an optimum utilization of the equipment.

Lessons Learned for JICA:

1. With regards to the Spirometer and ECG Holter System, these machines are not fully used because a trained nurse who has the skill to use the equipment was transferred to other hospitals. For this reason, it is important to consider the number of medical staff who are capable to handle the equipment when confirming equipment at the planning stage. In addition, the development of users' manuals for the equipment can be considered at the project planning.

2. CMC is important for any procurement of precision machinery including medical equipment. This is because repairs of advanced medical equipment must be made by the manufacturers and the medical equipment in all three hospitals in Bhutan could maintain the good condition with CMC, although it was unfortunate some period was affected by lockdown caused by the COVID-19. Hence it is crucial that JICA continue to have CMC for any procurement of medical equipment.

3. Although major faults of the equipment need to be handled by engineers of manufacturers, capacity building for biomedical engineers and technicians in Bhutan is also crucial. With the daily check-up and early detection of the faults of equipment by biomedical engineers and technicians in each hospital, MOH could utilize the equipment sustainably during the monitoring period. To reduce the number of days on suspension of medical equipment, making standard manuals for monitoring and training in all hospitals are required. In addition, training for capacity development based on the manual is also necessary for maintenance of medical equipment.



Set of CT (16 slice) equipment being used in Mongar Regional Referral Hospital

General digital X-ray apparatus in Gelephu Central Regional Referral Hospital.