

The Republic of Nicaragua

Ex-Post Evaluation of Japanese ODA Grant Aid Project

“Project of General Hospital Construction in the Department of Boaco”

External Evaluator: Jun Totsukawa, Sano Planning Co, Ltd

0. Summary

This project aims to enable Boaco general hospital to properly function as a core hospital and thereby improve its medical services for citizens in the department of Boaco and its neighbouring departments by re-constructing the hospital and providing it with relevant equipment. This objective has been highly relevant with the country’s development plan, development needs, as well as Japan’s ODA policy. On the other hand, although the project was implemented as planned, both the project cost and the project period slightly exceeded the plan, therefore efficiency of the project is fair. Based on the data collected in this ex-post evaluation study, all the indicators for effectiveness, including the number of outpatients and inpatients, or the number of surgical operations, show dramatic increases and there appeared some impacts such as the improvement of patient services or the motivations of the hospital staff. Judging from these findings, effectiveness and impacts of this project are high. Sustainability of this project is also high as there is no major concern either in its operation and maintenance system working in collaboration with the Ministry of Health or in its handling of technical and financial aspects, which thereby guarantees its sustainability into the future.

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

1. Project Description



Project Location



Boaco General Hospital

1.1 Background

As of 2004, the level of medical system of Nicaragua lagged behind the neighbouring countries such as Honduras or Costa Rica, as was seen in its infant mortality rate (32 out of 1,000 births) and the maternal mortality rate (120 out of 100,000) compared with Honduras (32/1000, 100/100,000) and Costa Rica (9/1000, 29/100,000). Thus, a further improvement on medical health sector was needed.

Under such a circumstance, the government of Nicaragua, partitioning the whole nation into 17 health administrative regions and establishing a local public health centre in each region as an affiliate of the Ministry of Health, initiated a medical health reform plan which aims to provide fair and efficient medical care services to its citizens. At the same time, in the national policy on medical health, it planned to modernize the country's 32 regional centre hospitals. Under such backgrounds, the Ministry of Health of Nicaragua, the executing agency of this project, designated seven hospitals as those needing urgent refurbishment, and chose Boaco general hospital as the one with the highest priority. All the hospitals suffered from acute dilapidation, but Boaco general hospital had many functional problems because its facilities were those which were originally storage facilities and were temporarily transformed into the hospital facilities, and as a result, the hospital was facing difficulties in providing patients with sufficient and safe medical services. The government of Nicaragua requested a grant aid for the implementation of the hospital refurbishment plan with the construction of facilities and provision of medical equipment in order to modernize the hospital function to the government of Japan, which already had various cooperation records to the government of Nicaragua, such as grant-aid for construction of medical facilities, such as Granada hospital construction plan (150 beds, total surface area of 7,500 m² ; completed in 1998), and for provision of medical facilities and equipment, as well as technical cooperation for "Project for Strengthening of the Local System of Integral Health Care of Granada" (2000 – 2004).

1.2 Project Outline

The objective of this project is to enable Boaco general hospital to properly function as a core hospital and thereby improve its medical services for citizens in the department of Boaco and its neighbouring departments by re-constructing the hospital and providing it with relevant equipment.

Grant Limit / Actual Grant Amount	1,412 million yen Detailed design: 94 million yen Main: 1,318 million yen / 1412 million yen Detailed design: 94 million yen
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	Main: 1,318 million yen
Exchange of Notes Date (/Grant Agreement Date)	Detailed design : January 2006, Main : May 2006
Implementing Agency	The Ministry of Health, Republic of Nicaragua
Project Completion Date	October, 2008
Main Contractor(s)	Hazama Corporation
Main Consultant(s)	Nihon Sekkei, Inc. / Fujita Planning Co., Ltd.
Basic Design Study Period	April 2005 - September 2005
Related Projects (if any)	The Project for Construction of Granada General Hospital (1996-1998) The Project for Strengthening of the Local System of Integrated Health Care (SILAIS) of Granada (2000 - 2004)

2. Outline of the Evaluation Study

2.1 External Evaluator

Jun Totsukawa, Sano Planning Co, Ltd

2.2 Duration of Evaluation Study

Duration of the Study: November 2011 – August 2012

Duration of the Field Study: 29 February 2012 – 22 March 2012, 9 June 2012 – 28 June 2012

2.3 Constraints during the Evaluation Study (if any)

None in particular.

3. Results of the Evaluation (Overall Rating: A¹)

3.1 Relevance (Rating: ③²)

3.1.1 Relevance with the Development Plan of Nicaragua

(At the time of the project planning)

Nicaragua drew up "National Healthcare Plan (2004 - 2015)" with the objective of provision of

¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ③: High, ② Fair, ① Low

qualitatively and quantitatively sufficient medical services, and further made "National Healthcare 5-year plan (2005 - 2009)" as a mid-term project toward the objective. This 5-year plan includes improvements on access to health-care services and on quality of medical services through the amelioration of the referral hospitals in the condition of dilapidation or of inability to provide sufficient services in seven departments (Boaco, León, Chinandega, Ocotal, San Carlos, Puerto Cabezas, Managua). Among the seven departments, the Boaco General Hospital is mentioned in the 5-year plan as one of the hospitals in the most urgent needs of reconstruction partly because the hospital is considered to be able to make an important contribution for national health-care improvement as a centre-hospital in Boaco and its neighbouring departments, in which poverty rates are high, and partly because the functional problems of Boaco hospital are strikingly obvious, as is mentioned below in the section on "Relevance with the Development Needs".

(At the time of the ex-post evaluation study)

The above-mentioned "National Healthcare Plan (2004 - 2015)" remains as the pivotal policy for the Health sector of Nicaragua. At the time of this ex-post evaluation study, the reconstructed Boaco General Hospital is providing higher quality medical services than before and thereby is making a clear contribution to the objectives set in the National Healthcare Plan. The on-going "National Healthcare 5-year plan (2011 - 2015)" aims for sufficient medical facilities in all the levels of medical services to provide the same healthcare services to its citizens, thus its basic policy remains unaltered from the time of the planning of this project.³

3.1.2 Relevance with the Development Needs of Nicaragua

(1) Development needs at the time of project planning

Boaco General Hospital is a referral hospital of the primary medical facilities (seven health centres and 27 healthcare posts) and is a national referral medical facility covering its own department and the Eastern region. Its functionality as a referral hospital was considered to be substantially important because it can be most easily accessed from the Eastern region in which the use of referral hospitals are relatively difficult. However, despite such an importance, the hospital was devastated by the hurricane "Juana" in 1988, and the medical services were continued using the facilities converted from storage facilities and offices of the energy public corporation into hospital use as a temporary solution. Such a situation has been causing various problems in safety and sanitary issues, calling for an immediate improvement.⁴ It is in this context that Boaco General Hospital was chosen by the Ministry of Health as the first priority hospital to be reconstructed among the seven hospitals in urgent needs.

³ There is a one year time lag between the end of the previous plan and the start of the on-going "National Healthcare Plan (2011 - 2015)". However, the core policies remain unchanged. One point which may worth being mentioned is its emphasis on community-based healthcare activities featuring the placement of healthcare promoters in the communities.

⁴ In addition to the scarce surface areas of the buildings, there were various problems, such as the crossing of the lines of flows of patients and visitors due to the structural characteristics of the buildings.

(2) Development needs at the time of the ex-post evaluation study

The reconstructed hospital is sufficiently playing its functional role as a referral hospital covering the department of Boaco and its neighbouring departments, providing medical services to a large number of patients. Incoming patients are not only from the department of Boaco, but a large number of patients also come from the neighbouring departments of Matagalpa and the Autonomous Region of North Atlantic and the Autonomous Region of South, within which the hospital is recognized as the most equipped, highest-quality medical service providing hospital. And thanks to the better facilities, the hospital newly opened urological section and paediatric surgery section, and thereby meets the regions' needs.

As above, this project has been highly relevant with the country's development plan in terms of the regions' needs for medical services at the time of the project planning and remains relevant even now as of this ex-post evaluation study.

3.1.3 Relevance with Japan's ODA Policy

Japan's Country Assistance Program to Nicaragua (October 2002) raises "Healthcare and medical services" as one of the most important assistance areas, among which it says "In consideration of Nicaragua's difficult social welfare status, Japan promotes its cooperation to Nicaragua, placing emphasis on the provision of social infrastructures and equipment in healthcare and medical services and enhancement of maintenance management abilities, for the objective of welfare improvement of Nicaragua. In this respect, this project is consistent with Japan's ODA policy to Nicaragua.

Thus, this project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness⁵ (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The project has substantially raised the achievement level of each indicator set at the time of the project planning, and thus is considered to have attained the quantitative effects.

⁵ Sub-rating for Effectiveness is to be put with consideration of Impact.

Table 1 Evolution of the status of achievement of quantitative effects⁶

Items	2004 (Before the project)	2011
Increase of referred patients from lower tier hospitals (primary healthcare facilities)	2,602/year*	3,879/year
Increase of the number of outpatients (specialized sector, emergency)	20,519/year	56,957/year
Increase of the number of inpatients	22,953 person-day/year	44,482 person-day/year
Increase in the number of surgeries	3,262/year	4,222/year

Note: Since the incumbent president of the hospital told us that the numbers in 2004 when the project was planned are not comparable with the current numbers and thus are not suitable for comparison purpose due to the differing definitions of the two, we took the numbers of 2007, which are comparable with the current numbers.

The numbers of inpatients and outpatients of Boaco General Hospital are drastically increasing with the good reputation as a well-equipped hospital. Moreover, as it has been equipped with new surgery rooms and its related equipment and has received newly appointed surgeons, the number of surgeries is rising. The addition of urological section and paediatric surgery section to the existing sections can be raised as a contributing factor to the increase of the patients.

The urological section started its operation in August 2009, while the paediatric surgery section in January 2010. Since there is no other hospital in the department of Boaco and its neighbouring departments which have a urological section, the reputation of Boaco General Hospital is even high.

3.2.2 Qualitative Effects

Currently, Boaco General Hospital is expanding the education of doctors and nurses. In 2011, it received eight medical interns, 37 supporting operation doctors, 155 nurse interns, 29 supporting nurses⁷. Thus, "Implementation of practical training activities", one of the qualitative effects this project expected, is considered to be steadily carried out. Namely, before the reconstruction the hospital were receiving nurse interns only, but the new facilities enabled to receive various kinds of interns. Especially the programme of medical interns started in 2011 should be especially mentioned as it raised the status of the hospital (Usually, medical -interns are appointed only to hospitals in medium or large cities)

In essence, the renewed facilities eventually caused various positive effects such as training activities or enhancement of staff capacity building.

Within-hospital trainings are usually done on regular basis for the hospital staff and interns with some doctors serving as trainers before the opening hours of the hospital. In addition to this, group studies among interns or lectures by visiting personnel from the Ministry of Health are

⁶ "To increase" was set as the target of this project, and any concrete absolute number was not set as targets.

⁷ The supporting nurses are staff whose task is to support the nurses, while nurse interns are undergraduate students of nurse schools.

being done when necessary.

Table 2 The number of interns at Boaco General Hospital

	Before the project	After the project		
	2004	2009	2010	2011
Medical interns	0	0	0	8
Nurse interns	12	32	53	155
Supporting operation doctors	0	16	16	37
Supporting nurses	0	59	22	29

Source: Documents of Boaco General Hospital

On the other hand, as to the status of disposal of medical waste, which was instructed by the soft-component program, it is so far being implemented in compliance with the disposal method the soft-component instructed. However, the degree of compliance varies across the sectors within the hospital. To address such a situation, "Hospital patrol team" composed by the hospital's president, the vice-president and others, is undertaking weekly check-ups. In an observation without preliminary notice by the ex-post evaluation study team, we have witnessed that injection needles, hazardous waste and ordinary wastes are collected into disposal boxes, red-plastic bags, and black-plastic bags respectively, thus the disposal method is largely in compliance with the method instructed. The following table shows the result of the concerned persons' self-evaluation conducted as "beneficiary survey" under this ex-post evaluation study.

Table 3 Situation of waste disposal (Self-evaluation by Boaco Hospital personnel)

	1) Always follow the rule	2) Mostly follow the rule	3) Sometimes fail to follow the rule	4) Follow the rule in less than half of the cases	5) Mostly fail to follow the rule	6) Do not know	7) Others	Total
Doctors	11	4	0	0	0	0	0	15
Nurses, Assistants	13	17	5	0	3	0	0	38
Total	24	21	5	0	3	0	0	53
Percentage	45.3	39.6	9.4	0	5.7	0	0	100

Source: Beneficiary survey

3.3 Impact

3.3.1 Intended Impacts

This project yielded the impacts mentioned below. To study the status of the impacts, we

conducted a beneficiary survey to patients, doctors, and nurses.⁸

(1) Improvement of patients services (in terms of "hard" infrastructure)

All the facilities, including the waiting spaces and the consultation rooms, the hospitalization buildings, are clean and spacious and receive high reputation from outpatients as well as inpatients. As in the following table, the beneficiary survey shows that all the respondents answered that the hospital improved in both aspects. (For further information, the result of the survey to the doctors, nurses and assistants is also given below).

Table 4 Recognition on cleanliness of the new hospital

	1)	2)	3)	4)	5)	6)	7)	Total
	Became very clean	Became clean	Not changed much (It has been clean since before the project.)	Not changed much (It is still not clean.)	It has worsened (It became unclean.)	Do not know	Others	
Patients	40	8	1	0	1	0	0	50
Doctors	14	1	0	0	0	0	0	15
Nurses, Assistants	19	16	5	0	0	0	0	40
Total	73	25	6	0	1	0	0	105
Percentage	69.5	23.8	5.7	0	1.0	0	0	100

Source: Beneficiary survey

Table 5 Image about the spaces of the new hospital

	1)	2)	3)	4)	5)	6)	7)	Total
	Became very spacious	Became spacious	Not changed much (It has been spacious since before.)	Not changed much (It has been small since before.)	It has worsened (It became less spacious.)	Do not know	Others	
Patients	49	1	0	0	0	0	0	50
Doctors	15	0	0	0	0	0	0	15
Nurses, Assistants	21	18	0	1	0	0	0	40
Total	85	19	0	1	0	0	0	105
Percentage	81.0	18.1	0	1.0	0	0	0	100

Source: Beneficiary survey

⁸ The beneficiary survey was done by a face-to-face questionnaires survey to the doctors (15 persons), nurses and assistants (40 persons) who have been working since the old hospital before the reconstruction, and outpatients (50 persons) who have been treated at the old hospital.

(2) Improvement of patients services (in terms of "soft" infrastructure)

The results of the beneficiary survey reveal that a large majority of patients recognize that the services by doctors and nurses are also improving in addition to the factors related to the hard infrastructure. In addition to the trend of answers below, many favorable statements are heard, such as "Procedural time for hospitalization has been shortened.", "Waiting time has been shortened.", "The number of staff has increased."

Table 6 Changes in medical services by doctors

	1)	2)	3)	4)	5)	6)	7)	Total
	Became very good	Became good	Not changed much (It has been good since before.)	Not changed much (It has been bad since before.)	It worsened	Do not know	Others	
Patients	27	11	11	1	0	0	0	50
Doctors	10	5	0	0	0	0	0	15
Total	37	16	11	1	0	0	0	65
Percentage	56.9	24.6	16.9	1.5	0	0	0	100

Note: In the questionnaires to patients, we asked the respondents what they feel about changes, such as "Change in the quality of medical services - I could receive simple treatments before, but now receive treatments using various medical equipment and doctors' services got better.". We asked doctors to answer as self-evaluation about changes in medical services attributable to the renewal of the hospital.

Source: Beneficiary survey

Table 7 Changes in medical services by nurses

	1)	2)	3)	4)	5)	6)	7)	Total
	Became very good	Became good	Not changed much (It has been good since before.)	Not changed much (It has been bad since before.)	It worsened	Do not know	Others	
Patients	22	12	14	2	0	0	0	50
Doctors	9	2	3	0	0	0	0	14
Nurses, Assistants	15	15	7	2	1	0	0	40
Total	46	29	24	4	1	0	0	104
Percentage	44.2	27.9	23.1	3.8	1.0	0	0	100

Note 1: One special field doctor did not answer.

Note 2: In the questionnaires to patients, we asked the respondents what they feel about changes, such as "Change in the quality of medical services - I could receive simple treatments before, but now receive treatments using various medical equipment and doctors' services got better.". We asked the questions to doctors as supervisors and to nurses and assistants as self-evaluation.

Source: Beneficiary survey

(3) Improvement of motivation

The new facilities and equipment contributed to the improvement of the motivation of doctors and nurses and other staff. Opinions such as "I can work with positive minds because of the clean and spacious workplace.", "A mindset of keeping the new hospital clean causes positive effects not only to the good maintenance of the facilities but also to the equipment management and the waste disposal.", are heard. Some doctors answered that the new medical treatment, which has been enabled by the use of new equipment such as defibrillator or laparoscopy, contributed not only to the practical improvement of medical services but also to the motivation of the doctors.

Table 8 Change in motivation of respondents themselves

	1) (Motivation) has increased much	2) Has increased	3) Not changed much (It has been high since before.)	4) Not changed much (It has been low since before.)	5) It has decreased.	6) Do not know	7) Others	Total
Doctors	14	1	0	0	0	0	0	15
Nurses and assistants	19	16	3	1	1	0	0	40
Total	33	17	3	1	1	0	0	55
Percentage	60.0	30.9	5.5	1.8	1.8	0	0	100

Note: We asked the question "How has the workplace environment of the new hospital changed the motivation of your own.

Source: Beneficiary survey

3.3.2 Other Impacts

(1) Impacts on the natural environment

In the waste water disposal system, the neutralization tank which processes the medical examination waste water, is currently out of order and thus not working. On the other hand, as to the infectious waste water and the domestic waste water, the sterilization tanks and septic tanks are working, and thus they are properly disposed. Currently, the maintenance management staffs of the hospital dilute the medical examination waste water by manually adding water into the tank, and pour the waste into the septic tanks for the final treatment. It will be required to implement a test of waste water and a change of pumps. It is not clear at this moment if the treatment by the dilution is sufficient enough (if the extent of the dilution is enough) because a test of the quality of the liquid is not being done.

As to the sterilization tanks, CEMED (Medical Equipment Maintenance Centre: Centro de Mantenimiento de Equipos Médicos), an executing agency of the Ministry of Health, whose mission is the maintenance of medical equipment, attempted a repair but eventually found that the replacement of the pump by the new one is necessary and is considering its procurement.

(2) Other impacts

The old hospital facilities were not dismantled and are being utilized as general clinics and maternal clinics. It is located 5 to 10 minutes drive from the city of Boaco. The wider options of medical services from the clinics with easy access and the reconstructed Boaco General Hospital are appreciated by citizens.

In light of the above, this project largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

【Hospital buildings】 : It is designed with structures, wards, and rooms in the following table. Although there was a slight change such as in connecting corridors, the basic facility contents were constructed as per the original plan.

Table 9 Facility contents of this project

Ward	Functional sector	Composition of rooms
Central and outpatient ward	Outpatient (Specialized medical treatment sector)	Internal department, Surgical department, Orthopedic surgery department, Obstetrics and gynecology department, Paediatrics / Newly born babies Emergency medical treatment, Triage
	Outpatient (emergency medical treatment sector)	
	Examination sector	Radiology/Blood/Biochemical/Bacteriological examinations
	Childbirth sector Surgery sector	Delivery related rooms, Newly born babies rooms Surgery related rooms
Medical treatment ward	Medical treatment sector (111 beds)	Internal department, Surgical department, Orthopedic surgery department, Obstetrics and gynecology department, Paediatrics / Newly born babies, Room with additional charges, Special care units
Management ward	Office and administration sector	Office, Training room, Library, Pharmacy
Service ward	Service sector	Kitchen/ dining hall, Cleaning room
Machinery ward	Energy supply sector	Electricity room, Self-generation room, Water tank room, Pump room
Connecting corridors		
Structure: Steel reinforced concrete construction, One-story		

Currently, all the facilities are fully utilized. The specification of the facilities have almost no problems, but only the limited number and space of storage facilities for documents, drugs, and other stuff is pointed out. It is impossible to secure further spaces because the storage facilities already utilize even the spaces up to the ceiling to maximize its capacity. Thus, the hospital is making a request of construction of new storage facilities within the hospital site to the Ministry

of Health.⁹

In terms of the frequencies of use, in addition to the medical ward and the administration ward, the service ward is always in operation to serve meals and cleanings for inpatients and hospital staff, thus the facilities are fully utilized at their maximum.

【Equipment】 : Equipment are installed as per the table below.

The equipment was procured after a careful checking of the conditions of the existing equipment and thus the necessity of the replacement by the new ones, thereby almost all the equipment was fully in use. Two pieces of equipment, the fetus heartbeat detector and the transfusion pumps, are in repair or applied for repair. On the other hand, only one piece of equipment, the nebulizers, is utilized with a low frequency. This is because the nebulizers procured in this project are not designed for infusion of medical agents and thus not compatible with the other existing nebulizers.

Table 10 Main medical equipment procured in this project

Classification	Name of equipment
Radiology	X-rays apparatus, Mobile X-rays apparatus, Ultrasonic diagnostic equipment, Kits for accessories of X-rays, X-ray film developers, X film illuminator (large)
Examination	Electrocardiograph
Examination	Microscope, Refrigerator, Dry heat sterilizers, Vertical pressure steam sterilization autoclave, Pipette shaking apparatus, Horizontal shaking apparatus, Electronic balance, Constant temperature water tank, Centrifuge, Freezer, Distilled water manufacturing equipment, Stirrer, Blood cool box, Hematocrit centrifuge
Material chamber	High-pressure steam sterilization equipment (A), High-pressure steam sterilization equipment (B)
Surgery	Operating table, Patient monitoring system, Washing equipment (for three persons), Washing equipment (for two persons), Instrument kits for cesarean section, Minor surgery instrument kits, Electric cautery, Surgery light (Ceiling) , Surgery light (Mobile), Anesthesia apparatus, Surgery instrument set, Instrument set tracheotomy, Mayo stand
Newly born babies	Beds for newly born babies, Light therapy equipment, Incubator
Common to all sectors	Shaukasuten (small), Tabletop steam sterilizer, Defibrillation equipment, Scales for newborns, Infant warmer, Oxygen box, Treatment table for a newborn, Examination table, Laryngoscope (For newborn), Fetal heart detector, Screening units, Cryosurgical instrument, Pulse Oximeter, Resuscitator (For adults), Resuscitator (For children), Resuscitator (For newborn), Aspirator (small), Aspirator (large), Height weight scale, Transfusion pump, Syringe pump, Beds (For adults and children), Orthopedic bed (for adults), Delivery table, Stretcher, Treatment bed, Round car, Emergency cart, Screen, Stethoscope (for adults), Stethoscope (for children), Stethoscope (for newborn), Oxygen flowmeter, Shelf, Examination Lamps, Instrument table, Bed head units, Over bed table, Nebulizer, Ear glasses, Infusion stand, Cast cutting saw, Wheelchairs, Sphygmomanometer (for adults), Sphygmomanometer (for newborns), Cast forceps

⁹ The lessons learned from Granada General Hospital (A grant aid project in 1996-1998) were reflected in the construction of the facilities. 1) Installation of drugs storage facilities, 2) Expansion of rooms for newly born babies, 3) other specification of finish (such as the adoption of durable washing face bowl).

Classification	Name of equipment
Maintenance	Tools for electronics, Multimeter
Furniture, etc.	Chairs for the doctor, Desks for doctors, Round chairs, Benches, Desks for training, Chairs for training, Drug shelf, Bed for duty

【Difference between the plan and the final】

The total surface area became 5,529.8 m² mainly due to the reduction of the surface area of the connecting corridors. (210.1 m² down from the original plan)

The installation of rooms with additional charges was cancelled because of a change in the medical service system of Nicaragua. The corresponding rooms are instead used as sleeping rooms for newly born babies and expectant mothers. There is no change for medical equipment from the original plan.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned and the actual project costs are as per Table 11. The actual costs slightly exceeded the plan.

Table 11 The planned and the actual project costs

	Japanese side			Nicaraguan side	Project total Japan and Nicaragua
	Detailed design	Main components	Total		
Plan	94 million yen	1,318 million yen	1,412 million yen	61 million yen	1,473 million yen
Actual	94 million yen	1,318 million yen	1,412 million yen (100% of the planned)	88 million yen (144% of the planned)	1,500 million yen (<u>101.8% of the planned</u>)

Source : JICA documents and Boaco Hospital documents

The Japanese side was to be in charge of the construction of the main building and the procurement of equipment and furniture, while the Nicaraguan government was to be in charge of a) the creation and the levelling of ground, b) the installation of drainage system, c) the installation of water supply system, d) the installation of electricity and telephone lines, e) the road pavement, f) the installation of walls, g) the procurement of ordinary furniture and fixtures, h) the cost of the hospital relocation, i) the cost of construction work for some parts of facilities.

【Difference between the plan and the actual】

Because the first tender of the project failed due to the sharp increase of the construction materials, the detailed design was revised with re-tender, and thereby the cost sharing between Japan and Nicaragua was revised. As a result of the revision, Nicaragua bore the expenses for a hospital morgue, ambulance parking, guard offices, and outer channel construction, and thus the

costs borne by Nicaragua increased in comparison with the original plan. Nicaragua also implemented the originally planned tasks.

3.4.2.2 Project Period

The project period was longer than the planned one as shown in Table 12. The part of the project on the side of Nicaragua was also terminated within the same project period.

Table 12 The planned and the actual project period

	Plan	Actual
Detailed design and tender support	7 months	10 months : 142% of the planned (March 2006 – January 2007)
Construction and construction management	15 months	19 months : 126% of the planned (April 2007 – October 2008)
Total period	Total: 22 months	Total: 29 months : 131% of the planned

Source : JICA documents

【Difference between the plan and the actual】

The failure of the first tender is considered to be the major reason of the prolonged period for the detailed design and tender support.

The period for the construction became longer than planned because of several reasons such as, a delay in the procurement of basic construction materials and equipment, a strike of delivery companies, the longer-than-expected period for securing enough workers.

In light of the above, both the project cost and the project period slightly exceeded the plan, therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

Boaco General Hospital employed 90 more workers than at the time of the planning. Consequently, the number of the staff reaches 308 at the time of this ex-post evaluation study. Out of these staff, currently 8 full-time employees (engineers) (including one staff employed in 2012) belong to the Operation and Maintenance section, which is to be compared with 1 full-time employee at the time of the planning. Thus, a sufficient number of staff is assigned to the operation and maintenance. It can also be said that the continuous service by five engineers who received soft-component trainings is reinforcing the system.

As mentioned above, the number of staff of the hospital has been gradually increased. However, facing an even increasing number of outpatients and inpatients, the hospital is making a request for further increase of the workforce to the Ministry of Health. As to the fiscal year 2012, the

employment of nine new staff (three doctors, six for the management section (among which one for operation and maintenance)) was approved. The hospital considers that the number of doctors has reached a sufficient level, while there is still a shortage in nurses, and thus it needs to be solved.

As to the maintenance of special medical equipment, the system of regular preventive maintenance and repairs is established.¹⁰

(For reference)

In comparison with some other hospitals, it is found that Boaco hospital has the largest number of staff for the operation and maintenance despite its smallest size, which indicates how well equipped Boaco hospital's operation and maintenance section. Precisely speaking, Matagalpa hospital in the table is a regional hospital and thus even larger than department hospitals.

Table 13 Comparison with some other hospitals

	Boaco	Granada	Matagalpa
Number of beds	116	159	335
Total number of staff	308	450*	800*
Number of staff for operation and maintenance	8	7	5

Note: The number of staff of Granada and Matagalpa are rough numbers at the time of hearing by the ex-post evaluation team.
Source: Boaco Hospital documents and the hearings by the ex-post evaluation team

3.5.2 Technical Aspects of Operation and Maintenance

The staff of the operation and maintenance section is composed mostly by workers with more than five years of experience with the chief engineer having the longest experience. For the staff who has less experience or needs refresh trainings, trainings at the national technology institute or the Nicaragua-German experts training centre¹¹ are available. In 2011, an engineer in charge of electrical facilities received a training of medical equipment course. Judging from the practical experience they earned in their workplace and the training they received when needed, the technical aspects of operation and maintenance are considered to be largely at fully sustainable level.

On the other hand, the system of repairs by CEMED of special medical equipment is well established and in work. So far, the incinerator, the emergency electricity system, and the generator were repaired by CEMED. CEMED also performs regular maintenance of the important and expensive equipment (Equipment in X-ray department, High pressure sterilizer,

¹⁰ CEMED is in charge of the repairs of the expensive and technically complicated equipment, such as X-rays apparatus, Ultrasonic diagnostic equipment, pressure steam sterilizer, and of the large-sized refrigerators and washing machines. Upon request, it can also repair inexpensive facilities. (see Table 14)

¹¹ The formal name of each institute is Instituto Nacional Tecnológico (INATEC) and Centro de Capacitación Profesional Nicaragüense Alemán (CECNA).

etc.) as “preventive maintenance”.

Table 14 Records of preventive maintenance and repairs by CEMED (2009 – 2011)

	Preventive maintenance	Repairs	
		Record	Repaired equipment/parts
Emergency electricity generator	Yes	Yes	Change of battery terminal and others
Pressure steam sterilization autoclave	Yes	-	-
X-rays apparatus	Yes	-	-
Clothes dryer	Yes	Yes	Repair of motor axis and others
Incinerator	- (Non applicable)	Yes	Repair of within-furnace combustion appliance and others
Emergency electricity system	- (Non applicable)	Yes	Connection to X-ray apparatus

Source: Boaco hospital documents

As described above, based on the assumption that the hospital alone cannot deal with all the repairs, the hospital established the role sharing with CEMED and by so doing has managed well the operation and maintenance system. Thus, technical sustainability is considered to be largely secured.

3.5.3 Financial Aspects of Operation and Maintenance

Boaco hospital, a national hospital under the direct control of the Ministry of Health, is financially supported fully by the Ministry of Health. Its budget has increased year by year as is shown in Table 15.

Only a few years being passed since its reconstruction, there was no large-scale reparation so far. However, some reparation such as a change of floor of the kitchen, or additional installation of air-conditioners, was carried out according to the operation and maintenance plan made by the hospital.

Moreover, the Ministry of Health recognizes an increasing number of patients and is showing its intension to positively deal with the hospital’s requests for increase of the staff and the budget.

Given the above, it can be concluded that the financial sustainability for operation and maintenance is so far high.

Table 15 Budget of Boaco General Hospital (Córdoba)

	2004	2009	2010	2011	2012
Ministry of Health	11,868,000	38,856,000	42,930,000	48,591,000	56,575,000
Others	838,000	0	0	0	0
Total	12,706,000	38,856,000	42,930,000	48,591,000	56,575,000

Source: Boaco hospital documents

Table 16 Expenditure for Operation and Maintenance by Boaco General Hospital (Córdoba)

	2007	2008	2009	2010	2011
Facilities	0	1,800	16,500	756,087	565,610
Medical equipment	9,027	74,720	46,944	23,466	235,911

Source: Boaco hospital documents

3.5.4 Situation of operation and maintenance management

Regarding the method for operation and maintenance management, recordings of the status of the facilities and equipment on regular basis are being done using the equipment inventory account book and the maintenance account book guided and made by the soft-component program. In the inspection by this study team, it was confirmed that the tracking record of the status and the repairs is readily available from the account book, and thus it is largely being implemented well.

The other facilities and equipment are utilized without any problem. Also, defects in the washing machine and an anticorrosive painting of the delivery beds in the service section, which were pointed out in the ex-post status-quo study in 2010, were already duly dealt with. Re-painting of the walls of the inpatient ward and a construction of new storage facility are scheduled in 2012.

As mentioned above, most equipment is duly utilized, but the equipment currently out of order are:

- ① Fetus heartbeat detectors (3 out of order, 1 in operation)
- ② Transfusion pumps (1 out of order, 1 in operation)
- ③ Neutralization tank pump

Out of these equipment, ① and ② needs replacement of parts, but the parts are not available in Nicaragua. Thus, a budget for its purchase needs to be secured. For ③ Neutralization tank pump, replacement by a pump available in Nicaragua is being considered.

If we raise a potential problem, it is the following issue. Medical equipment is mainly imported from abroad. Thus, depending on the sorts of defects, it might be necessary to directly purchase from agents or from abroad. Since CEMED is exclusively serving the maintenance of all the medical equipment in Nicaragua nationwide, whether it can readily respond to requests of repairs or of purchase of parts from various hospitals depends on the importance and the substitutability of the equipment and the priority in the budget of CEMED. Under such circumstances, it is possible that the priority by CEMED is low for a case such as the one of fetus heartbeat detectors, in which one detector is still in operation.

In light of the above, no major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aims to enable Boaco general hospital to properly function as a core hospital and thereby improve its medical services for citizens in the department of Boaco and its neighbouring departments by re-constructing the hospital and providing it with relevant equipment. This objective has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy. On the other hand, although the project was implemented as planned, both the project cost and the project period slightly exceeded the plan, therefore efficiency of the project is fair. Based on the data collected in this ex-post evaluation study, all the indicators for effectiveness, including the number of outpatients and inpatients, or the number of surgical operations, show dramatic increases and there appeared some impacts such as the improvement of patient services or the motivations of the hospital staff. Judging from these findings, effectiveness and impacts of this project are high. Sustainability of this project is also high as there is no major concern either in its operation and maintenance system working in collaboration with the Ministry of Health or in its handling of technical and financial aspects, which thereby guarantees its sustainability into the future.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Because the neutralization tank is not in operation, the PH of the examination waste water may not be properly managed. It is required that examination of waste water from the hospital done, and then proper chemical administration be implemented as a temporary solution. In the middle term, it is needed to purchase replacement pumps and regain the previous system of stable PH management.

4.2.2 Recommendations to JICA

None in particular.

4.3 Lessons Learned

One of the most important factors which contributed to this project's sustainability is the initiative on the staff's mind-set change led by the president and the high ranking personnel of the management section. In short, it is "Hospital patrol". It is worth mentioning that the president's regular visits to each section for checking and discussion/consultation instead of unilateral messages by letters urged the staff's proper disposal of medical wastes and proper handling of facilities and equipment, and eventually yielded positive changes. We can learn from this, in addition to the importance of the leadership, regular visits by the organization's upper echelon are very effective to enhance sustainability.