

Republic of Moldova

FY2021 Ex-Post Evaluation Report of Japanese ODA Loan

“The Project for Improvement of Medical Care Service”

External Evaluator: Hisae Takahashi, Global Group 21 Japan, Inc.

## **0. Summary**

The Project was implemented with aims to improve and streamline the medical care and public health service by introducing new medical and laboratory equipment into tertiary and secondary hospitals<sup>1</sup> and other facilities in Moldova, thereby contributing to the improvement of the medical care service for the citizens.

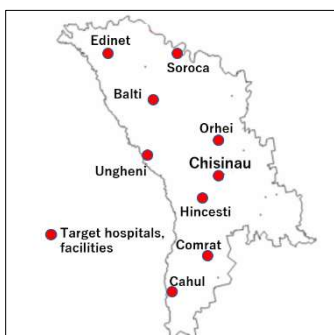
Its purpose is in line with Moldova’s development policy and development needs at the time of appraisal and ex-post evaluation. It was also confirmed that the Project was in line with the international framework at the time of appraisal in terms of the consistency with the Japan’s aid policy; synergy effect and coordination with the Technical Cooperation Project conducted by the Japan International Cooperation Agency (JICA), and with the assistance by other development partner organizations; and the Sustainable Development Goals (SDGs). Therefore, its relevance and coherence are high. The Project costs exceeded the plan, and the Project period largely exceeded the plan due to the delay of the facility renovation for installation of the equipment and other reasons. Therefore, efficiency of the Project is moderately low. Approximately 70% of the set targets for the number of treatments and tests were generally achieved in the target facilities. Medical services using the procured equipment have contributed to provide early diagnosis, timely treatment, reduced patient burden, and also quality of medical care services with comfort for healthcare workers. Improvements in the quality of testing at the Centers of Public Health (CSPs) have also been reported. The impact in terms of contribution to improved medical care services across the country and to the recovery of patients with novel coronavirus infection (COVID-19) was also confirmed. Therefore, effectiveness and impacts of the Project are high. No issues have been observed in the policy/system, institutional/organizational, and technical aspects of the operation and maintenance of the Project. However, some minor issues have been observed in the financial aspect and the current status of operation and maintenance. Therefore, sustainability of the project effects is moderately low.

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

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<sup>1</sup> Health services in Moldova are broadly divided into primary level (outpatient only), secondary level with hospitalization, and core tertiary level.

## 1. Project Description



Project Locations



X-ray Procured for the Mother and Child Institute

### 1.1 Background

After the Republic of Moldova (Moldova) became independent from the former Soviet Union in 1991, the financial condition of the health sector was under the financial pressure because the government was obliged to cover all medical cost and also because an excessive number of hospitals were established, thus it became necessary to reform the system of medical services. Under such situation, thanks to the sector reform conducted through cooperation of the World Bank (WB), the number of hospitals was reduced by approximately 80% from 335 (1998) to 73 (2012), and the medical expenditure was reduced by 40% (1991-1998)<sup>2</sup>. Meanwhile, in Moldova, medical and relevant expenditure accounted for 11.7% (2010)<sup>3</sup> against Gross Domestic Product, which had already reached the level of advanced countries, and transition of the disease structure was in progress toward that of advanced countries centring on non-communicable diseases. Also, rapid aging of the society was foreseen in the future due to the demographic changes. Therefore, it was needed to integrate and concentrate hospitals in order to further improve efficiency of medical services mainly of secondary and tertiary care and to improve the medical quality of those core hospitals. Concerning the latter, the urgent issue was updating deteriorated equipment as well as procurement of new equipment, given that the medical personnel had already acquired a certain level of medical technology. Against this backdrop, the Government of Moldova requested a Finance and Investment Cooperation to procure medical and laboratory equipment in the core hospitals in the capital city of Chisinau and the other facilities to Japan in 2012, and a loan agreement for the Project was signed in 2013.

### 1.2 Project Outline

The objective of this Project is to improve and streamline the medical care and public health service by introducing new medical and laboratory equipment into tertiary and secondary hospitals and other facilities in Moldova, thereby contributing to the improvement of the medical

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<sup>2</sup> Source: Ex-ante evaluation

<sup>3</sup> Source: World Development Indicators

care service for the citizens.

Loan Approved Amount/ Disbursed Amount	5,926 million yen/5,698 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	June 2013/June 2013	
Terms and Conditions	Interest Rate	0.1% (except for consulting services) 0.01% (Consulting service)
	Repayment Period (Grace Period)	30 years 10 years)
	Conditions for Procurement	Tied (Special Terms for Economic Partnership (STEP))
Borrower/Executing Agency	The Government of the Republic of Moldova/Ministry of Health	
Project Completion	July 2018	
Target Area	City of Chisinau and others	
Main Contractors (Over 1 billion yen)	- Kanematsu Corporation (Japan) - Marubeni Protechs Corporation (Japan)	
Main Consultant(s) (Over 100 million yen)	- Fujita Planning Co., Ltd. (Japan)	
Related Studies	- Feasibility Study (2009)	
Related Projects	<p>[Technical Cooperation]</p> <ul style="list-style-type: none"> <li>- The Project for Improving Medical Device Management (2015-2017)</li> <li>- Country-focused Training on Improving the Oncological Services for Cancer Patients (2020-2023)</li> </ul> <p>[Grant Aid]</p> <ul style="list-style-type: none"> <li>- The Project for Improvement of Medical Equipment for Mother and Child Republican Hospital (1998)</li> <li>- The Project for Improvement of Maternal and Child Health Care System in the Second Level Hospitals (2000)</li> </ul> <p>[WB]</p> <ul style="list-style-type: none"> <li>- Health Services and Social Assistance Project (2007-2013)</li> </ul> <p>[European Union]</p> <ul style="list-style-type: none"> <li>- An assistance to the Regional Public Health Centers (2008-2012)</li> <li>- Sector Policy Support Programme Health (2009-2013)</li> <li>- Co-financing of the construction of the Republican Clinical Hospital's surgery block</li> </ul> <p>[Swiss Agency for Development and Cooperation]</p> <ul style="list-style-type: none"> <li>- Procurement of medical equipment to the Mother and Child Institute</li> </ul>	

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hisae Takahashi, Global Group 21 Japan, Inc.

## 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October, 2021–November, 2022

Duration of the Field Study: February-March and August, 2022 (conducted by the local assistant)

## 2.3 Constraints during the Evaluation Study

Due to the global pandemic of COVID-19, the external evaluator did not travel to Moldova, but conducted interviews with the executing agency, the field inspection of the equipment at the target facilities of the Project, and interviews with the medical staffs and others through the local assistants. The collected information and data were carefully examined, and evaluation analysis and judgment were conducted by the evaluator. In addition, acceptance of refugees in Moldova due to the Russian invasion of Ukraine in February 2022 increased the workload of the executing agency, the Ministry of Health (MoH), and medical staff at target facilities, making it difficult to spend time answering questionnaires and conducting interviews during site visits, which in turn placed certain constraints on information collection.

## 3. Results of the Evaluation (Overall Rating: B<sup>4</sup>)

### 3.1 Relevance/Coherence (Rating: ③<sup>5</sup>)

#### 3.1.1. Relevance (Rating: ③)

##### 3.1.1.1 Consistency with the Development Plan of Moldova

At the time of the appraisal of the Project, Moldova's development policy, The *Moldova 2020* (2012), stated on the health sector that improving the efficiency of the health system would contribute to increase productivity, promote social inclusion and reduce poverty, and that the health of the population would affect economic development and social prosperity<sup>6</sup>. The sector plan at the time, the *National Health Policy 2007-2021* (2007), set 13 goals, including health promotion and disease prevention, strengthening the health of infants, young and elderly people, overcoming non-communicable chronic diseases and others. The *Healthcare System Development Strategy 2008-2017* was presented as an implementation policy to achieve its goals and to assess progress on nine indicators, including population and basic health indicators, equitable access to medical services, financial sources for medical care, etc. Furthermore, to incorporate the above policy and strategy into an action plan for sector reform, the *Policy Roadmap for Moldova (2011)*, which showed plans for the functional reorganization, consolidation, and development of general and specialized hospitals in the capital city, was developed.

<sup>4</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>5</sup> ④: Very High, ③: High, ②: Moderately Low, ①: Low

<sup>6</sup> Source: *Moldova 2020, National Development Strategy: 7 solutions for economic growth and poverty reduction*

At the time of the ex-post evaluation, the *Moldova 2030* (2018)<sup>7</sup> was formulated, stating reduction of morbidity of non-communicable diseases in the health sector and setting goals to reduce mortality from cardiovascular diseases by 13% and to reduce the infant mortality rate to 8.6 per 1,000. The *National Health Policy 2014-2020* (2013), which is the sector plan at the time of the ex-post evaluation, aims to improve the health of the population and reduce inequalities, with key areas such as health system governance, securing financial sources for medicines and medical equipment and the provision of medical services and public health. In addition, the 10 CSPs were established to strengthen laboratory networks and management at the regional level to enhance responses to public health emergencies in line with the policy<sup>8</sup>.

As mentioned above, at both times of the appraisal and ex-post evaluation, the purpose of the Project is in line with the Government's development policy for the country.

### 3.1.1.2 Consistency with the Development Needs of Moldova

At the time of the appraisal of the Project, the country was shifting to a disease structure centred on non-communicable diseases, and the aging of the population was expected to continue rapidly due to demographic changes, making it a challenge to improve the level of medical care at the core hospitals. On the other hand, the development of medical facilities and equipment has stalled due to a lack of funds and many facilities have no choice but to use the equipment which come from more than 20 years old after installation. In addition, there were concerns about the risks posed to health by pesticide residues in the country, where there are many agricultural workers, and also there was a need to strengthen the testing systems required to identify health risks from hazardous environmental substances from industrialisation and to formulate countermeasures. The National Centers of Public Health (CNSP) and CSPs, which played this role, also had aging equipment, and it was a challenge to improve the equipment and strengthen activities using them. The target hospitals equipped with equipment under the Project were positioned as the top referral hospitals in each field in Moldova and were therefore high priority targets for support in the country, where improving core hospitals was an issue.

At the time of the ex-post evaluation, equipment utilization is very high except for some equipment, and core hospitals in all sectors have a strong need for regularly updating equipment to provide necessary healthcare services efficiently. In addition, many items of outdated equipment are still used in the CNSP and CSPs, thus the need for updating equipment continues to be high, as the types and methods of examination are constantly evolving, and new normative documents and standards are emerging<sup>9</sup>.

Based on the above, at the time of planning and ex-post evaluation, the development needs to

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<sup>7</sup> Source: *National Development Strategy (2018)*

<sup>8</sup> Source: Questionnaire answers

<sup>9</sup> Source: Questionnaire answers

enhance medical and laboratory equipment remains high, thus the Project was in line with this need.

### 3.1.2 Coherence (Rating: ③)

#### 3.1.2.1 Consistency with Japan's ODA Policy

At the time of the appraisal, the *Rolling Plan for the Republic of Moldova* (2012) had positioned the social sector as the priority area for assistance and Japan was working on improvement of medical care services as one of the priority issues. As the implementation of the Project was in line with this policy, the Project was found to be consistent with Japan's ODA policy.

#### 3.1.2.2 Internal Coherence

Prior to the implementation of the Project, JICA procured medical equipment through conducting "The Project for Improvement of Medical Equipment for Mother and Child Republican Hospital" (1998)<sup>10</sup> and "The Project for Improvement of Maternal and Child Health Care System in the Second Level Hospitals" (2000) under its grant aid program<sup>11</sup>. Although the relevance of the two projects is limited to the Institute of Mother and Child (MCI), the MCI states that its experience in implementing equipment procurement and the provision of Japanese equipment enabled the smooth implementation of the Project and led to the request to the Japanese Government for cooperation. In addition, with the aim of improving equipment maintenance and management capacity and clinical skills in the target hospitals and facilities, support was planned through Technical Cooperation Project and "The Project for Improving Medical Device Management (PIMDM)" (2015-2017) was implemented. Through the implementation of the Project, Departments/Sections of Biomedical Engineering (D/SBME) were newly established in the target hospitals. According to the medical staffs at the target hospitals, the establishment of the D/SBMEs has significantly improved their capacity to manage medical equipment, and they are able to carry out maintenance of medical equipment in-house at the time of ex-post evaluation, whereas previously this was outsourced. The implementation of both projects, which supported the procurement of equipment (ODA loan) and the strengthening of equipment maintenance and management capacity (Technical Cooperation Project), contributed to the situation where equipment procured under the Project has been utilized and operated under appropriate maintenance and management.

#### 3.1.2.3 External Coherence

A surgical block was constructed at the target facility, the Republican Clinical Hospital (RCH),

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<sup>10</sup> Procurement of mother and child medical care equipment to the hospital, which was predecessor of the project's target hospital, the MCI.

<sup>11</sup> Procurement of mother and child healthcare equipment to the eleven second level hospitals across the country.

with support from the WB and others, and the Project was planned to take charge of the procurement of equipment. Interviews with the RCH indicated that the provision of medical services using the equipment procured in top-quality facilities built with the support of the WB has led to providing efficient service to patients. In addition, the EU, Austria, and others also supported the procurement of medical equipment in other target facilities. Therefore, coordination was made during the detailed design, such as excluding some equipment planned in the Project to avoid duplication. Although no consistency with international frameworks was pointed out in the documents as of the appraisal or by the executing agency, the Project was implemented with the goal of strengthening and increasing the efficiency of the medical service system and contributing to the improvement of medical services in Moldova. It is therefore consistent with “SDG Goal 3: Ensure healthy lives and promote well-being for all at all ages.”

As mentioned above, implementation of the Project is in line with Moldova’s development policy and development needs, and there are no issues with the Project plan and approach. It was also confirmed that the Project is in line with Japan’s ODA policy, synergizes with JICA’s Grant Aid and Technical Cooperation projects, and is in line with the cooperation and coordination with the WB, EU, other assistance, and international frameworks. Therefore, its relevance and coherence are high.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

In the Project, medical and laboratory equipment were procured, and consultancy services were conducted at the five core hospitals in each sector, the CNSP and CSPs. The planned and actual outputs of this Project are shown in Table1.

Table 1 Planned and Actual Output<sup>12</sup>

Target hospitals/facilities	Plan	Actual
RCH <sup>Note1</sup>	Operation microscope, C-arm with angiography, Equipment for neurosurgical operation theater	Deleted: Equipment for neurosurgical operation theater, C-arm with angiography Added: Equipment for operation theater and ICU
MCI <sup>Note2</sup>	Computed Tomography (CT), Anesthesia machine, X-ray mammography, Surgical endoscope, Endoscopic electrocautery	Deleted: CT, Anesthesia machine, Endoscopic electrocautery Added: Equipment and others for Central Sterile Supply Department (CSSD), operation theater and pathological prosecution room
Emergency Medicine Institute (EMI) <sup>Note3</sup>	CT, MRI, Angiography, Surgical endoscope	Added: CSSD equipment, mobile X-ray, Neuronavigation System
Oncologic Institute (OI) <sup>Note4</sup>	CT, MRI, Surgical endoscope, FISH Hybridizator, Anesthesia machine	Deleted: MRI, Surgical endoscope Added: CT (1), Ambulance, Genetic analyzer, Otolaryngology
Municipal Clinical Hospital "Sf. Treime" (ST) <sup>Note5</sup>	CT, MRI, Angiography	Deleted: MRI Added: Equipment relating to operation theater, ICU and laboratory, and for CSSD
All target hospitals	Infusion pumps, monitors, etc.	As planned
CNSP, CSPs <sup>Note6</sup>	Liquid Chromatography, Genetic analyzer, Safety cabinet	As planned
Consulting services	Support for bidding works, briefing sessions and evaluation; Support for contract negotiations; Supervision of equipment delivery and installation; Coordination and implementation of training; Support for inspection after installation of equipment; Support for development of maintenance and management plans; Support for PSR and PCR preparation; Technical advice and coordination support for overall project operation	As planned

Source: Ex-ante evaluation, documents provided by JICA and the Project consultant, questionnaire answers

Note 1: The RCH is the top referral hospital in Moldova providing advanced surgical care and main speciality area is treatment of cardiovascular disease.

Note 2: The MCI took over the management of the Republican Clinical Hospital for Children and provides the whole set of medical care from pregnancy and childbirth to pediatric care as a core hospital in the country.

<sup>12</sup> In this Project, 89 types of equipment were procured for the RCH, 63 for the MCI, 24 for the EMI, 62 for the OI, 44 for the ST, 52 for the National Central Public Health Centre and 23 for the Regional Public Health Centre. Due to the wide variety of equipment types and quantities, this ex-post evaluation focused on understanding the major equipment types and those that are highly relevant to the effectiveness.



Note 3: The EMI specializes in emergency medical care that requires advanced treatment and in the treatment of cerebrovascular diseases and surgery under the microscope, and is the only hospital that can deal with multiple trauma and severe burn injury in Moldova.

Note 4: The OI is the top referral hospitals in the field of inspection, diagnosis and treatment of cancer, and public research facilities in the field of oncology.

Note 5: The ST is the largest municipal hospital in the capital. It is offering medical service in multiple specialized departments and receiving the patients referred from all over the country.

Note 6: The CNSP is responsible for policy formulation and implementation. The CSPs are in charge of activities for health promotion through the examination. In 2017, they were integrated in the National Agency for Public Health.

During the detailed design, some changes were made to the equipment to be procured. The reasons for the changes were, as described below,<sup>13</sup> mainly to adjust to the priorities in each target facility and to avoid duplication of support from other donors, and thus the changes were taken as appropriate. No changes were made to the major equipment after the detailed design.

[Reasons for changes in procured equipment]

1) RCH

The type of equipment to be procured has changed based on coordination with the project supported by Austria. Moreover, under the changes, the hospital covered the cost of locally available furniture, appliances, personal computers, etc.

2) OI

The clinical effects and priorities for equipment were reviewed in the hospital, and equipment was re-selected for deletion and addition.

3) EMI

Equipment for sterilization section was added to provide a higher level of sterilization of the surgical instruments procured under the Project.

4) MCI

CT was added considering the clinical effect. Moreover, equipment that could be procured with the budget of the MoH was excluded from the scope, while genetic diagnostic equipment and otoscopes were added instead.

5) ST

Equipment to be deleted or added was selected based on a review of the clinical effects and priorities in the hospital.

6) CNSP and CSPs

Since additional equipment was procured with the support of EU, duplicate equipment was excluded from the Project.

In addition to the changes mentioned above, the facilities for installing three types of equipment

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<sup>13</sup> Source: Detailed design survey report and questionnaire answers

were also changed. A neuronavigator<sup>14</sup> and electroencephalograph (EGG) were shifted from the RCH to the Institute of Neurology and Neurosurgery, which was not the target facility of the Project, to increase the utilization rate of the equipment. Furthermore, in the OI, the endoscope washers/disinfectors were shifted to the RCH, MCI, EMI and ST since the facilities where it was initially planned to install the equipment could not be established due to budget shortfalls, thus it was not expected to fully utilize the equipment.

The consulting service was also implemented as planned. Equipment-specific trainings on Operation and Maintenance(O&M) were provided for some items of equipment in “Coordination and implementation of training” in addition to operational explanations at the time of installation. Equipment and duration were as follows: CT, MRI and pediatric laparoscopy training (1 week each), angiography equipment training (3 weeks), real-time PCR equipment training (3 days), training for liquid chromatography and gas chromatography (4 days each), and all were conducted at the target facilities in Chisinau. Interviews with each facility indicated that the training content was appropriate and effective in the O&M of the equipment, although some respondents mentioned that it would have been more effective if the training had been conducted again a few months after the equipment had been in use. In the “Technical advice and coordination support for overall Project operation,” support for the overall implementation and operation was mainly provided. Given the very limited manpower of the MoH, the fact that this was the first ODA loan project in Moldova, and the relatively large monetary scale of the Project, the coordination support provided by the consultant team of Japan, which included liaison with the JICA France office that had jurisdiction over the Project at the time and support for the preparation of documents for the payment, etc, was effective in ensuring the smooth implementation of the Project.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total cost of the Project was planned to be 6,651 million yen (ODA loan: 5,926 million yen). The actual project cost was 7,451 million yen (112% of the plan), slightly exceeding the plan. As shown in Table 2, while the cost covered by the Japanese portion was within the plan, the one covered by the Moldovan side exceeded the plan significantly because the scale of the facility renovation required for the installation of precision equipment was larger than planned and took longer time. The increase in the amount for the construction of the facility was an unavoidable response, as it was necessary to install the equipment in the proper place.

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<sup>14</sup> Imaging equipment to show the three-dimensional location of lesions and surrounding brain tissue during neurosurgery.

Table 2 Planned and Actual Project Costs

(Unit: million yen)

	Plan			Actual		
	Total	ODA loan	Moldovan funds	Total	ODA loan	Moldovan funds
Equipment procurement, installation	5,348	5,3408	0	5,575	5,575	0
Facility construction, renovation	332	0	332	1,729	0	1,729
Consulting service	128	128	0	124	124	0
Price escalation	227	227	0	0	0	0
Contingency	280	223	57	0	0	0
Interest during construction	12	0	12	16	0	16
Commitment charge	11	0	11	8	0	8
Administration cost	313	0	313	0	0	0
Taxes	0	0	0	0	0	0
<b>Total</b>	<b>6,651</b>	<b>5,926</b>	<b>725</b>	<b>7,451</b>	<b>5,698</b>	<b>1,753</b>

Source: Documents provided by JICA and questionnaire answers

Exchange rate: 1 lei = 6.37 yen (As of the appraisal in December 2012), 1 lei = 6.64 yen (Actual: average rate during the project implementation period)

### 3.2.2.2 Project Period

The Project period<sup>15</sup> was planned to be 29 months, from June 2013 to October 2015, as opposed to an actual 60 months, from June 2013 to May 2018, which significantly exceeded the plan (207% of the plan). Procurement of equipment was completed in March 2016, however, delays occurred as the relevant facilities could not be renovated as planned due to budgetary shortfalls on the Moldovan side<sup>16</sup>. Specifically, the renovation works of the Colon Cancer Screening Center at the OI were delayed, and the handover took place in December 2017. Moreover, the equipment remained underutilized due to the absence of doctors who could use the equipment; thus the Project was completed in May 2018 when this equipment was partially put into operation. It should be noted that at the stage of the Project formulation, it was confirmed with the MoH and the Ministry of Finance that the budget for facility development at each hospital had been secured, and no problems were identified. On the other hand, as already mentioned (refer to the Project costs), the renovation of the facilities required for the installation of equipment was more serious and extensive than planned, leading to budget shortfalls<sup>17</sup>. In addition to budget shortfalls, the replacement of the director of the target hospital, which delayed the decision-making on the facility renovation due to the deployment of substitute personnel, also contributed to the slow progress of the Project. Furthermore, in Moldova, single-company tenders are not approved, which has led to delays in the renovation works including the sterilization section due

<sup>15</sup> The Project period is defined as the month the loan agreement is signed to the month the equipment is put into operation.

<sup>16</sup> Source: Questionnaire answers from the Project consultant

<sup>17</sup> Source: Document provided by JICA, questionnaire answers from the Project consultant

to unsuccessful tenders caused by insufficient number of bidders<sup>18</sup>.

In light of the above, the Project cost slightly exceeded the plan and the Project period significantly exceeded the plan. Therefore, efficiency of the Project is moderately low.

### 3.3 Effectiveness and Impacts<sup>19</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The purpose of the Project is to strengthen and improve the efficiency of medical services and the testing systems by introducing the equipment to the target facilities, and the indicators listed in Table 3 had been set. On the other hand, in 2019, after the Project completion, the MoH submitted the change of the operation and effect indicators for the following reasons<sup>20</sup>: 1) Equipment planned to be procured at the time of appraisal was excluded as a result of the detailed design, 2) The indicators were not appropriate due to lack of uniformity in counting the number of cases treated by endoscopy, 3) There are restrictions on the high cost services (e.g. catheterization for cardiovascular diseases) covered by the National Health Insurance, and the number of treatments that can be carried out at each facility depends on these restrictions, and 4) A part of the roles related to the indicators of the CNSP and CSPs transferred to the other organization due to the reform. In the ex-post evaluation, the achievement of the indicators set at the time of the appraisal is confirmed. Meanwhile, for indicators which have not achieved the target, alternative indicators were confirmed as a reference, if the reason for indicators not reaching targets corresponds to one of the reasons for change listed above, or more appropriate indicators were proposed. The analysis also took into account the actual results for 2019 and 2021, since it was assumed that the data would be affected due to movement restrictions in the country and the impact on normal operations associated with the response to COVID-19 in 2020 (two years after Project completion) when the target values were to be confirmed.

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<sup>18</sup> Source: Questionnaire answers from the Project consultant

<sup>19</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.

<sup>20</sup> JICA responded that it was difficult to change the indicators after the Project was completed since those changes needed to be discussed and agreed upon when events occur during Project implementation, but they would be used as a reference when conducting the ex-post evaluation.

Table 3 Operation and Effect Indicators of the Project

	Baseline value	Target value	Actual value				
	2011		2017	2018	2019	2020	2021
		2 Years After Completion		Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
<b>① Average number of days of hospitalization for patients with endoscope interventions</b>							
MCI	5.4	4.0	4.0	4.0	4.0	<b>4.0</b>	4.0
EMI	4.0	3.5	3.6	3.8	3.8	<b>3.5</b>	3.5
OI <sup>Note1</sup>	-	3.5	-				
ST	5.2	4.0	3.8	3.6	3.4	<b>3.0</b>	2.8
<b>② Number of patients with ischemic heart disease treated by endovascular interventions</b>							
EMI <sup>Note2</sup>	0	1,000			-		
<i>(Alternative indicator) Number of patients with cerebro-vascular diseases and peripheral vascular diseases treated by endovascular interventions</i>	0	350	40	310	370	255	<b>370</b>
ST	0	500	112	182	233	279	<b>789</b>
<b>③ Number of CT tests</b>							
MCI	0	2,500	1,288	1,288	1,709	1,513	<b>2,485</b>
EMI	7,434	10,000	7,353	10,022	10,197	<b>9,814</b>	16,378
OI <sup>Note3</sup>	453	4,500	-				
ST	766	2,000	2,932	3,565	3,703	<b>3,767</b>	6,029
<b>④ Number of MRI tests</b>							
MCI <sup>Note3</sup>	0	2,000	-				
EMI	0	2,000	2,143	1,004	<b>1,842</b>	1,039	<b>1,961</b>
ST <sup>Note3</sup>	0	2,000	-				
<b>⑤ Number of angiography tests</b>							
RCH <sup>Note3</sup>	400	1,000	-				
EMI	0	1,200	203	N.A	N.A	N.A	N.A
ST	0	750	566	800	830	<b>717</b>	906
<b>⑥ Number of endoscopic interventions</b>							
MCI	4,500	6,800	395	3,701	3,756	2,695	3,557
<i>(Alternative indicator) Number of the interventional endoscopies including: Laparoscopies, Hysteroscopies, Bronchoscopies, Gastroscopies</i>	429	1,100	395	3,712	3,862	<b>2,744</b>	3,779
EMI	2,333	5,800	3,959	5,328	3,653	2,217	3,110
OI	8,011	10,000	810	1,713	1,932	971	986
<i>(Alternative indicator) Number of mammography and colonoscopy screening investigation</i>	N.A.	5,800	4,824	5,668	6,301	<b>4,619</b>	5,555
ST	1,054	4,000	1,757	6,528	6,956	<b>6,052</b>	7,388
<b>⑦ Number of microscopic interventions</b>							
RCH	0	150	3,005	2,525	3,050	<b>1,624</b>	2,776
<b>⑧ Number of tests at the CNSP and CSPs</b>							
Bacteriological tests	296,269	330,000	248,540	226,396	198,796	116,715	130,755

Serological tests	273,437	305,000	106,984	67,808	12,298	7,813	44,030
Parasitological tests	332,817	380,000	280,126	209,047	191,666	148,876	155,222
Sanitary bacteriological tests	412,606	470,000	253,147	159,193	147,442	126,099	164,690
Sanitary hygienic tests	368,778	420,000	197,277	139,155	148,417	134,416	158,828
Molecular biological tests	5,791	6,900	10,997	7,814	7,681	<b>236,342</b>	247,403
Radiological tests	3,593	4,100	1,626	6,503	9,150	<b>7,405</b>	7,969
<i>(Alternative indicator) Number of implemented methods</i>	60	54	—	—	—	—	<b>183</b>
<i>(Alternative indicator) Number of implemented parameter</i>	130	140	—	—	—	—	—

Source: Documents provided by JICA, questionnaire answers

Note1: As oncology patients have complex systemic diseases and receive multilateral treatment, this indicator is not appropriate for the OI and is therefore excluded from the evaluation.

Note 2: The EMI is not subcontracted by the National Health Insurance for the delivery of treatment service for the cardiac patients and treatment is not provided to these patients, therefore this indicator is excluded.

Note 3: The planned equipment (CT, MRI, angiography equipment) was deleted during detailed design and therefore excluded from the evaluation.

In Table 3, indicators that achieved the target are shown in boldface<sup>21</sup>. More than 70% of the operation and effect indicators set for the target facilities (number of treatments and tests) have generally achieved the target values<sup>22</sup>, thus it can be said that the equipment procured has contributed to an increase in the number of tests and the improvement of medical care services in the target hospitals. The achievement of each indicator is as follows.

① Average number of days of hospitalization for patients with endoscope interventions

The performance of the three hospitals other than the OI has met the target.

② Number of patients with ischemic heart disease treated by endovascular interventions

The actual performance achieved about 60% of the target value in 2020, but the number of cases performed exceeded the target by 2021 at the ST. The number of patients with cerebrovascular diseases and peripheral vascular diseases treated by endovascular interventions was set as an alternative indicator, since the EMI does not provide treatment for cardiac patients as the National Health Insurance is not applied. The target values were proposed by the MoH as highly feasible figures, hence it is difficult to analyze the exact status of achievement as the validity cannot be ascertained. The EMI did not have angiography equipment and the treatment itself was not provided at the time of the appraisal, however, procurement of equipment has made examinations possible. The situation was that a certain number of treatments were identified at the time of the ex-post evaluation, meaning that the

<sup>21</sup> As the response to COVID-19 is likely to have affected the usual number of treatments and tests in 2020, indicators whose performance in 2020 was below the target were also checked for performance in 2019 or 2021.

<sup>22</sup> Of the eight indicators (number of treatments and tests) set, six indicators have basically met their targets: ① Average number of days of hospitalization for patients with endoscope intervention, ② Number of patients with ischemic heart disease treated by endovascular interventions, ③ Number of CT tests, ④ Number of MRI tests, ⑤ Number of angiography tests and ⑦ Number of microscopic interventions.

hospital is contributing to the improvement of healthcare services of this hospital.

③Number of CT tests

Although the performance of the MCI was slightly below the target, the number of tests performed at the EMI and ST exceeded the target.

④Number of MRI tests

At the MCI, the only hospital where MRI was installed, the number of tests was limited in 2018 due to a temporary breakdown and in 2020 due to COVID-19, but those in 2019 and 2021 both almost achieved the target.

⑤Number of angiography tests

Target number of the tests was achieved at the ST. The achievement of the EMI could not be confirmed because information was not provided due to the reason that ⑤Number of angiography tests is included in the alternative indicator for indicator ② (see below).

⑥Number of endoscopic interventions

Targets were achieved at the ST. In the EMI, the achievement in 2020 was about 60%, however, since it was almost achieved in 2018 and there was an increase in 2021, this may have been the result of temporary equipment breakdowns and COVID-19. The data for the MCI and OI were lower than the target values because the baseline values included all endoscopic treatments, whereas the actual figures are limited to the number of treatments using the equipment procured by the Project. The alternative indicators, “*Number of the interventional endoscopies including: Laparoscopies, Hysteroscopies, Bronchoscopies, Gastroscopies*” (MCI) and “*Number of mammography and colonoscopy screening investigation*” (OI), were submitted by the MCI and OI as the scope of the indicators was not clear. “*Number of the interventional endoscopies including Laparoscopies, Hysteroscopies, Bronchoscopies, Gastroscopes*” performed at the MCI significantly exceeded the target. Although the OI only achieved 80% in 2020 when it was affected by COVID-19, the target was almost achieved in 2021, thus sufficient outcomes are considered to have been achieved.

⑦Number of microscopic interventions

The number of interventions performed at the targeted RCH significantly exceeded the target.

⑧Number of tests at the CNSP and CSPs

Out of the seven types of tests, the numbers of tests, except for two types (molecular biology and radiology), were below the target. The above two types of tests increased because the studies for viral hepatitis and SARS-CoV-2 were carried out with the support of the World

Health Organization (WHO)<sup>23</sup>. The number of tests was below target due to the consolidation of public health-related organizations, with the tasks related to food hygiene as well being transferred to the newly created National Food Safety Agency, which is responsible for related tasks. At the time of the ex-post evaluation, the CNSP and CSPs mainly carried out laboratory services on hygiene inspections of some food products, environmental hygiene inspections and commissioned research<sup>24</sup>. The CNSP suggested as alternative indicators, the number of test methods and measurable parameters made possible by the procurement of examination equipment. Information on all 10 CSPs was not available, however, according to the officials at the CNSP, approximately 183 test methods have been introduced after the Project was implemented. In addition, according to medical staffs<sup>25</sup> at the two CSPs where site visits were conducted, the numbers of test methods or parameters that can be measured have not increased by the procurement of the equipment, but the newly installed equipment has contributed to improve the accuracy and efficiency of the examinations (see qualitative effects for details).

### 3.3.1.2 Qualitative Effects (Other Effects)

Thanks to the implementation of the Project, the qualitative effects were confirmed in the targeted facilities through use of the procured equipment, such as the provision of advanced medical services, early diagnosis and timely treatment, reduced patient burden and contribution to quality health services. According to the target hospitals, modern and sophisticated medical equipment such as CT, angiography equipment, radiography equipment and endoscopes enable early diagnosis and timely provision of treatment. For example, the mammography has many more qualitative images, helping identification of anatomical structures and microcalcifications, differential diagnosis of malignant and benign mammary glands and early detection of breast cancer. The introduction of X-ray has also enabled high-resolution examinations and reduced patient burden (irradiation dose). Furthermore, medical staffs commented that the updating and upgrading of medical equipment contributes to providing quality medical care services comfortably for not only patients, but also medical workers. Despite the limited number of responses, when patients were interviewed at the ST, they were all satisfied with the high standard of medical services they received at the hospital and indicated that the medical services at the target facility had improved compared with how they were before<sup>26</sup>.

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<sup>23</sup> Source: Questionnaire answers

<sup>24</sup> Source: Questionnaire answers

<sup>25</sup> Site visits to the CSPs in Hincesti and Orhei were conducted in August 2022 by the local assistant.

<sup>26</sup> The three respondents were each patient who had received medical services using equipment procured by the Project (“stenting vessels surgery”, “endoscopy medical services” and “thrombus extraction performed by angiography”).



The CNSP and CSPs are also able to implement tests more quickly and accurately by using the procured examination equipment. For example, it was reported that the use of a vortex mixer<sup>27</sup> minimised the impact of human error, and that the installation of a thermostatic bath<sup>28</sup> significantly reduced the melting time of culture media used in the laboratory and improved the efficiency of the staff's working hours.



(Photo: left) CT



(Photo: center) Mammography



(Photo: right) Vortex mixer

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### (1) Improvement of health care services in Moldova

The Project was assumed to contribute to the improvement of medical care services for people in Moldova by strengthening and improving the efficiency of the medical care service supply system in the target facilities, and to clarify the division of roles among hospitals.

The targeted facilities are the top referral hospitals in each field in Moldova, thus it can be said that the improvements in the medical services of these hospitals have an impact on the country's overall medical care services. The latest equipment provided by the Project contributed to the development of a system whereby patients not only from the region, but also from all parts of the country, can receive advanced medical services. In addition, the numbers of sophisticated equipment and the range of medical services have increased, enabling early diagnosis and the provision of high accuracy and treatment strategies, resulting in reduced complications and mortality. Moreover, the equipment procured complies with the standards required in the EU, and the use of modernised equipment also helps to reduce the workload and burden on medical staffs. The installation of advanced examination equipment at the CNSP and CSPs has also enabled tests to be conducted in line with EU standards, improved the accuracy of tests and significantly extended the nomenclature<sup>29</sup> of laboratory examination<sup>30</sup>.

<sup>27</sup> Experimental apparatus for stirring the contents of a test tube by swirling the bottom of the tube at high speed.

<sup>28</sup> Artificially created environments that facilitate the growth of cells and micro-organisms.

<sup>29</sup> Nomenclature is a rule on how to name chemical and other substances, enabling systematic naming that captures the unique characteristics of a thing and allows phylogenetic taxonomic recognition.

<sup>30</sup> Questionnaire answers

## (2) Clarification of the division of roles among hospitals

Although sufficient responses could not be obtained from the executing agency and target facilities, according to the ST, the number of referrals (referral and transport) to other hospitals has decreased and, conversely, the number of referrals from other hospitals to the ST has increased, as the ST has expanded the range and improved the quality of medical services. It can be said that the increased range of treatments that can be performed, and improved medical care services, have increased the number of cases that can be handled within the hospital.

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

This Project was classified as Category B on the *JICA Guidelines for Environmental and Social Considerations* (April 2010), as it had minimal undesirable effects on the environment. Medical waste is regularly monitored at each facility in accordance with an environmental monitoring mechanism under the supervision of local authorities. Moreover, it has been confirmed that no negative impacts have occurred till now because of the implementation of the Project<sup>31</sup>.

#### 2) Resettlement and Land Acquisition

The Project involved the installation of equipment on an existing site, and no land acquisition or resettlement was planned. It was confirmed through the documents provided by JICA and questionnaire answers that neither resettlement nor land acquisition had occurred.

#### 3) Gender Equality and Marginalized People

No specific and direct initiatives from the perspectives of gender and marginalized people were articulated at the time of the appraisal, and no relevant impact occurred during the implementation and after the completion of the Project<sup>32</sup>.

#### 4) Social Systems and Norms, Human Well-being and Human Rights

The establishment of Departments of Biomedical Engineering through the Technical Cooperation, with the installation of medical equipment in the Project, has increased the understanding of the importance of medical equipment management at the medical facilities in Moldova and influenced important changes to the national decree on medical equipment (No. 102). The decree specifies the introduction of regular laboratory inspections of medical equipment, which had not previously been conducted.<sup>33</sup>

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<sup>31</sup> Questionnaire answers

<sup>32</sup> Questionnaire answers

<sup>33</sup> Documents provided by JICA, questionnaire answers

## 5) Unintended Positive/Negative Impacts

### Contribution to COVID-19 countermeasures

Equipment such as ventilators, patient monitors and diagnostic imaging equipment (mobile X-ray) procured under the Project was used in responding to COVID-19 at the target facilities. The use of this equipment to diagnose lung conditions and initiate necessary treatment in a timely manner has contributed significantly to reducing causal complications of patients. The ST, which was designated as a hospital to respond to COVID-19, had an extraordinary flow of patients in critical condition in need of respiratory therapy at the time and they were able to save more lives with this equipment.



Photo: Patient monitor (front) and Ventilator (left back) (ST)

### Provision of medical services to displaced people from Ukraine

All the target facilities have constantly received displaced patients from Ukraine, especially many elderly people, women, and children. The OI, which has assigned 10 staffs and provides medical services for Ukrainians, has seen more than 300 displaced Ukrainians as patients, who received various tests, treatments, and operations. At the MCI, 57 displaced persons were treated and examined when the site visit was conducted. Other target facilities have similarly received many displaced people from Ukraine and reported that mainly X-rays, anesthesia, endoscopes, ventilators, analyzers, patient monitors, infusion pumps, etc., were utilized and contributed to the examinations and treatments.

From the above, it can be said that the Project has generally increased the number of tests and treatments required as planned and contributed to the improvement of medical care services in the target facilities. The provision of advanced healthcare services also contributes to reducing the burden on patients and enhances the comfort of medical staffs in providing quality medical care services, and it is also reported that the accuracy and efficiency of testing capabilities in the CNSP/CSPs have been improved. Patients are also highly satisfied with the services, and the target facilities are the top referral hospitals in each area, thus the improvement of medical care services in those facilities has an impact on the improvement of medical care services in Moldova as a whole. The equipment was also used as essential equipment to respond to COVID-19 and provide medical services to displaced people from Ukraine, confirming the impact of the equipment in contributing to large numbers of patients. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ②)

#### 3.4.1 Policy and System

The National Agency for Public Health (NAPH) was established by MoH Order No. 184 (March 2016). With the establishment of the NAPH, the CNSP and CSPs were integrated into the NAPH, and in 2017, their major functions were also handed over to the NAPH. While testing for food hygiene and HIV testing has been transferred to newly established organizations and hospitals, other testing and food testing commissioned by other organizations continues to be conducted and equipment is operated and maintained by the NAPH and CSPs.

#### 3.4.2 Institutional/Organizational Aspect

Prior to the implementation of the Project, though the equipment was operated and maintained by each facility, many hospitals contracted with private equipment maintenance companies and received regular maintenance services for advanced equipment including CT and MRI. After the implementation of the Project, the D/SBMEs have been established in each facility through the implementation of the PIMDM and have maintained and managed the equipment, thus not outsourcing it to external parties. In the CNSP and CSPs, maintenance and management were still outsourced at the time of the ex-post evaluation.

The number of the O&M staff at each target facility is shown in Table 5. The number of staff involved in the O&M has increased at each facility due to the increase in equipment and the internalization of maintenance and management tasks, however staff shortages were reported at several facilities. For example, additional Biomedical Engineers (BMEs)<sup>34</sup> assigned in the D/SBMEs are needed as they sometimes have too much work maintaining medical equipment according to the manuals, which was not done in the past. Moreover, engineers are not assigned in the CSPs after their integration into the NAPH, thus the need for such a position was mentioned by the CSPs visited.

Table 5 Number of the O&M Staff at Each Target Facility

	As of the appraisal <sup>Note1</sup>	As of the ex-post evaluation			Insufficiency of the staff number
		Total	Engineers and others	BME	
RCH	2	11	4	7	Yes
MCI	9 (5)	14	4	10	
EMI	5 (1)	19	9	10	
OI	3	12	7	5	Yes
ST	1	11	3	7	
NAPH	2 - 3	3	-	3	Yes
Each CSP	2 - 3	-	-	-	Yes

Source: Documents provided by JICA, questionnaire answers

Note 1: Numbers in brackets indicate BMEs.

<sup>34</sup> Specialized and required to complete the Biomedical Engineer course at the Technical University of Moldova.

Each facility has a system whereby if problems of maintenance arise that cannot be dealt with in the hospital, they contact their own supplier to request repairs or action. In the NAPH, engineers conduct the maintenance of simple equipment, while the maintenance of precision equipment is outsourced to contracted external suppliers, as in the system in place as of the appraisal.

### 3.4.3 Technical Aspect

- Technical capacity required for the O&M

At CSPs where engineers are not assigned and maintenance of equipment is outsourced, a lack of staff with appropriate technical skills was reported as an issue. No problems were reported in the hospitals regarding the technical skills on medical staffs and BMEs required for the O&M of the equipment. At the OI, there is equipment that is not being used according to its intended purpose due to the absence of doctors who can perform bone marrow transplants utilizing stem cell freezing equipment. At the time of the appraisal, there was a doctor who received training in Romania and Germany, and was able to utilise the equipment, but he passed away and there were no doctors available thereafter, and the equipment has remained in operation as a refrigeration facility ever since. According to the OI, it is planned that hematologists and doctors undergoing short-term training will be able to perform bone marrow transplants<sup>35</sup>.

- Contribution through the trainings in the Project and the support from the Technical Cooperation

The target facilities had opportunities for participating in the O&M and clinical trainings through equipment-specific training under the Project and support from the Technical Cooperation, PIMDM. In addition, D/SBMEs have also been established, hence equipment maintenance, which was outsourced before the Project, can currently be conducted internally. The D/SBMEs established in each target facility operate in line with MoH Order No. 262 *Regarding the establishment of D/SBMEs within pilot institutions* (2016). Medical equipment procured under the Project is also maintained in accordance with manufacturers' recommendations, which has also improved confidence in the quality of the equipment for medical staffs using the equipment. According to the medical staffs in the target facilities, the presence of BMEs in the Department contributes to the prompt resolution of medical equipment faults, the proper planning of maintenance procedures and the securing of necessary budget, and is essential for the sustainable and effective use of equipment, including the implementation of preventive maintenance and management<sup>36</sup>. In each target facility, it would have been difficult to properly maintain and manage the procured equipment internally without the establishment of D/SBMEs responsible for maintenance and management, thus the PIMDM has made a significant contribution.

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<sup>35</sup> Documents provide by JICA, questionnaire answers

<sup>36</sup> Source: PCR, questionnaire answers, hearing to the Project consultant

- Use of manuals and availability of spare parts, etc.

In all target facilities, maintenance manuals for procured equipment are used on site as required. At the OI, it was confirmed that the manuals that do not contain detailed information including structural drawings and electronic schematics necessary for maintenance are also maintained by using information sources on the web. Spare parts and consumables are available, though parts for some items of equipment (endoscopes and others) that are very expensive and time-consuming to obtain were identified as challenges. In addition, maintenance services in the CNSP and CSPs are contracted through a tender process, which means that it takes time to make repairs and obtain parts. Therefore, it is explained that a certain warranty and repair period should be provided when procurement is contracted.

#### 3.4.4 Financial Aspect

Each facility has allocated budget for the O&M of equipment. Financial resources of hospitals are budgeted approximately 85% by the MoH, 5% by medical fees (payment for medical services), and others<sup>37</sup>. Although there were no income and expenditure problems in the two hospitals where the information could be confirmed (see Table 6), half of the target facilities reported budget shortfalls (see Table 7). There are many consumables and spare parts for medical equipment which require expensive parts and repairs, thus possible maintenance is carried out within budgetary limits in hospitals where budgets are insufficient (the NAPH outsources maintenance within its budget). The cases have shown that the facilities with insufficient budgets are unable to conduct adequate repair work on medical equipment. It is reported that cost of maintenance and management of endoscopes, which are used frequently, is particularly expensive.

Table 6 Income and Expenditure of the Target Hospitals

(Unit: million Moldovan Lei)

	2019			2020		
	Income	Expenditure	Balance	Income	Expenditure	Balance
RCH	530	477	53	583	556	27
ST	209	205	4	292	302	-10 <sup>Note</sup>

Source: Questionnaire answer

Note: The ST experienced a deficit in 2020 due to the impact of COVID-19 but returned to normal profitability in 2021.

Table 7 The O&M Cost of each Target Hospital

(Unit: million Moldovan Lei)

	2017	2018	2019	2020	Insufficiency of budget
RCH	3,760	5,864	6,179	8,307	
MCI	10,345	2,694	N/A	N/A	N/A
EMI	2,522	3,510	5,767	3,908	
OI	4,812	5,583	1,410	4,726	

<sup>37</sup> Based on information from the RCH, as detailed financial information, including budget breakdown, was only available from the RCH.

ST	506	1,900	1,456	2,536	Yes
NAPH	581	393			Yes

Source: Documents provided by JICA, questionnaire answers

### 3.4.5 Environmental and Social Aspect

No negative environmental and social impacts were assumed at the time of appraisal, and it has been confirmed by the executing agency that there are no possible negative environmental and social impacts in the future.

### 3.4.6 Preventative Measures to Risks

- Communication among stakeholders

It was pointed out that close coordination was required since the MoH was not familiar with the procedures specific to ODA loan, etc. as this was the first ODA loan project in Moldova, and since the detailed design which was conducted as Technical Cooperation for ODA loan and procurement of consulting services for implementation of the Project would proceed simultaneously<sup>38</sup>. Although the Project was the first ODA loan project in Moldova, it proceeded relatively smoothly in fact, as the MoH had extensive experience in implementing EU-supported projects and the support for logistics and coordination tasks among the stakeholders were provided through the consulting service. In addition, the same consulting company was responsible for detailed design and consultancy support, therefore there were no obstacles or problems with handover or coordination systems<sup>39</sup>.

- Securing basic infrastructure for equipment installation

When procuring equipment, it was a prerequisite that the necessary buildings for installation and use of equipment, as well as electricity, water and medical gas supplies, are secured. Therefore, it was pointed out as of the appraisal to keep the following points in mind: to examine the consistency of the equipment and the underlying infrastructure, and to ensure that any necessary renovation would be carried out in advance. As described in Efficiency (2) Project Inputs ② Project Period, as the main reasons for delay, the OI reported cases where the construction of facilities necessary for the installation and use of some equipment was not completed and the equipment was transferred to other facilities at the time of completion, resulting in only partial utilization of some equipment. In the other hospitals, the basic infrastructure was developed as planned and equipment was procured and put to use without any problems.

### 3.4.7 Status of Operation and Maintenance

The maintenance status of the equipment procured under the Project is generally good, both in

<sup>38</sup> Source: Documents provided by JICA

<sup>39</sup> Source: Questionnaire answers and hearing to the Project consultant

terms of utilization and maintenance<sup>40</sup>. Maintenance of equipment is also carried out in accordance with the plan, and records were also confirmed during the site visit. On the other hand, cases were reported where frequently used items of equipment such as endoscopes and ventilators were difficult to repair or required new purchases due to the high cost of parts and maintenance. As challenges, it was pointed out that some equipment had to be sent abroad for repair as there were no agents in Moldova, budgets were not available, and the equipment could not be used during the long repair periods.

Table 8 Major Equipment which is Damaged and Planned Response

Hospital	Equipment	Current condition	Plan for response
RCH	Anesthesia machine	Using a working anesthesia machine.	Needed spare will be procured this year.
	ESR iSED analyzer <sup>41</sup>	No difficulties thanks to using alternate analysis methods.	The devices will be replaced this year.
MCI	Ophthalmic microsurgical system	Given the fact that operations of this type are planned and not urgent, there are no serious cases or difficulties in providing medical services due to absence of this equipment.	As there are no agents in Moldova, making it necessary to obtain from Romania, additional costs are required for engineer's travel, work and the necessary spare parts.
	Endoscope	There are some malfunctions in some part of the equipment due to intensive use. Thus, due to the limited frequency of use, the number of patients treated per day is limited.	The defect has not been removed as it can only be repaired at repair laboratories in Germany and the parts are costly.
EMI	Video colonoscope	One of the two devices is non-functional due to a damaged part (by intensive use), thus only the other one is in use.	Maintenance is carried out annually, but depending on the complexity of the fault, repairs take time.
	X-ray C-arm	One of the two devices is non-functional.	Currently in the process of contracting repair services.
OI	Video colonoscope	It has reduced the number of interventions and increased waiting times.	The repair cost is expensive, at around 50% of the equipment cost. It is planned to procure new devices.
	Ventilator	Damages of magnet valve and using other devices.	The repair cost is economically inefficient, thus there is no plan to repair it.
	Ventilator	Deterioration due to intensive use and using other devices.	Requires the intervention of an authorized company. Maintenance is planned in 2023.

<sup>40</sup> Source: Questionnaire answer and site visit conducted by the local assistant

<sup>41</sup> Equipment for analyzing abnormalities in blood components and the degree of inflammation by ESR (erythrocyte sedimentation rate).



	Digital mammogram	The other mammography unit is in use.	As spare parts are very expensive, it is planned to purchase them through another project's budget.
	Stem cell freezing unit	Not in use due to the absence of a facility for installation and a capable doctor	See 3.4.3 Technical Aspect
ST	Pulmonary ventilator	Damage of several parts	In the process of repair
	Infusion pump	Disconnection due to cable deterioration	In the process of repair
	Blood gas analyzer	Damage to interaction with the sensors	In the process of repair
NAPH	Rotary evaporator	Malfunction of pump	It is included in procurement plan of medical equipment for 2022
	Alpha, Beta and Gamma Counting Spectrometry	Failure of the detector	Not yet responded as the agent is not located in the country.

Source: Questionnaire answers and confirmation during the site visits

As mentioned above, no issues have been observed in the policy/system, institutional/organizational, and technical aspects. However, some minor issues have been observed in the financial aspect including the current status of O&M and they are not expected to be resolved. Therefore, sustainability of the project effects is moderately low.

#### 4. Conclusion, Lessons Learned and Recommendations

##### 4.1 Conclusion

The Project was implemented with aims to improve and streamline the medical care and public health service by introducing new medical and laboratory equipment into tertiary and secondary hospitals and other facilities in Moldova, thereby contributing to the improvement of the medical care service for the citizens.

Its purpose is in line with Moldova's development policy and development needs at the time of appraisal and ex-post evaluation. It was also confirmed that the Project was in line with the international framework at the time of appraisal in terms of the consistency with the Japan's aid policy; synergy effect and coordination with the Technical Cooperation Project conducted by the JICA, and with the assistance by other development partner organizations; and the SDGs. Therefore, its relevance and coherence are high. The Project costs exceeded the plan, and the Project period largely exceeded the plan due to the delay of the facility renovation for installation of the equipment and other reasons. Therefore, efficiency of the Project is moderately low. Approximately 70% of the set targets for the number of treatments and tests were generally achieved in the target facilities. Medical services using the procured equipment have contributed

to provide early diagnosis, timely treatment, reduced patient burden, and also quality of medical care services with comfort for healthcare workers. Improvements in the quality of testing at the CSPs have also been reported. The impact in terms of contribution to improved medical care services across the country and to the recovery of patients with COVID-19 was also confirmed. Therefore, effectiveness and impacts of the Project are high. No issues have been observed in the policy/system, institutional/organizational, and technical aspects of the operation and maintenance of the Project. However, some minor issues have been observed in the financial aspect and the current status of operation and maintenance. Therefore, sustainability of the Project effects is moderately low.

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

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

- Re-examine the maintenance plans for the frequently used equipment

Equipment is generally in good condition and has been mostly utilized without problems, however, some frequently used items of equipment, such as endoscopes and mammography, are expensive to maintain and are a burden on hospitals. Although preventive maintenance of the equipment is conducted by the D/SBMEs, maintenance costs can be higher if the equipment is used more frequently than expected. Moreover, if it takes time to order the necessary parts or repairs, the equipment will not be available during that time. In addition to general preventive maintenance and maintenance plans, the D/SBMEs at each hospital should consider additional costs and replacement cycles of parts required for the frequently used equipment to further enhance the effective use of equipment.

- Responses to the shortage of BME numbers

Several target facilities reported shortages of the staff to ensure proper O&M of equipment. The number of staff at each facility has increased with the increase in equipment, but there is overwork, particularly due to a shortage of engineers and BMEs. The target facilities that are understaffed should notify the MoH with a clear indication of the number of understaffed staff, their overtime hours and workload, and the MoH should consider and respond to necessary increases to reduce the burden on BMEs and support the appropriate maintenance and use of appropriate equipment.

### 4.2.2 Recommendations to JICA

None

## 4.3 Lessons Learned

### Ensure the preconditions of procurement needed for the proper use of equipment

In this Project, it was planned to prepare the necessary facilities for installation on the

Moldovan side. The Project was delayed because the facilities could not be constructed due to a lack of budget as there was a demand to renovate the facilities beyond the estimation at the implementation stage, although this had been fully examined at the time of the appraisal. In addition, it was confirmed that there is equipment which has not been properly used at the time of the ex-post evaluation because the installation facility was not prepared. For this equipment, the absence of doctors who could handle the equipment was another factor why the equipment was not being used properly. When procuring precision equipment, the conditions under which the equipment will be fully utilized should be clarified in advance, and Project stakeholders should provide monitoring support from the Project formation stage to ensure that the conditions are met; and it is desirable to install the equipment only after the conditions for installation (securing the installation site and assigning several doctors who can utilize the equipment) are met, to prevent equipment from being unused.

## **5. Non-Score Criteria**

### 5.1. Performance

#### 5.1.1 Objective Perspective

- Smooth implementation of Project through support (consulting services) for overall operations

This Project was Moldova's first ODA loan project. In addition, since the executing agency, the MoH, had limited staff, extensive support was provided by the consultancy team as part of the consultancy services, including liaison with the JICA France office and assistance for preparing the payment documents. Generous follow-up, including a support for the preparation of procedurally necessary documents to be submitted to JICA, liaison and coordination work and payment-related documents, also enabled proper communication between the MoH and the Japanese side, which is considered to have contributed to the smooth progress of the Project.

#### 5.1.2 Subjective Perspectives (retrospective)

(1) Detailed analysis (contribution to the healthcare sector through synergies with the related cooperation projects) policy

Prior to implementation of the Project, Japan has implemented support for the development of maternal and child health care and medical equipment (see 3.1.2.2 Internal Coherence) through grant aid projects, medical and health-related task-specific training, etc. in the healthcare in Moldova. The Project was implemented as the first ODA loan project in Moldova for further expanding their impact of those activities in healthcare sector. Furthermore, around the same time as the Project, the PIMDM for the appropriate O&M of medical equipment and the establishment of a management system was implemented as the Technical Cooperation Project, and the linkages have continued even after the Project was completed and are contributing to the improvement of medical and public health services in the country. In this part, the complementary and synergistic

effects of these series of supports on the effectiveness and impact as well as sustainability of the Project are analyzed from the subjective perspectives. Specifically, the following four points are described: the situation as of the Project formulation; how the Project overcame obstacles and achieved outcomes, including the linkage with the Technical Cooperation Project; who responded and how when unexpected changes in circumstances occurred; and the outcomes achieved as a result<sup>42</sup>.

## (2) Situation at the time of the appraisal of the Project

At the time of the appraisal, in Moldova, the further reform and streamlining of the medical care service delivery system was needed to avoid the increase of medical care expenditure to a sustainable level, while promoting the health sector reform. While basic health indicators were improving, the number of patients with heart disease, brain disease and non-communicable diseases was increasing due to the aging of the population and changing lifestyles, with non-communicable diseases being the main cause of death (2011)<sup>43</sup>. For non-communicable diseases, treatment based on accurate diagnosis using advanced medical equipment is the key to combating these diseases, therefore this was considered a priority issue for health policy. In addition, a large part of this equipment has been used from the Soviet Union era, and more than 80% of the existing medical equipment was obsolete; and the lack of equipment was hindering proper diagnosis and surgical procedures. At that time, medical equipment management was a new concept in Moldova; the D/SBMEs were established in the MoH in 2012, by the department in charge of medicines doubling as the medical equipment department, and several staff were assigned to this department. However, experience of the staff in the maintenance of medical equipment was limited, as the situation was such that pharmaceutical staff were also responsible for equipment maintenance. Thus, the Moldovan side understood that the existing capacity of medical equipment management system was not sufficient, and it would also need to strengthen its capacity to ensure the sustainability of the equipment when procuring new equipment<sup>44</sup>.

## (3) From Grant Aid to the formation of ODA loan Project, and the link with Technical Cooperation Project

In the facilities where medical equipment for mother and child health care was procured through grant aid, it was confirmed that the equipment had been used properly for more than 10

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<sup>42</sup> When conducting this study, it was not possible to conduct the originally planned interviews with officials from the MoH in Moldova because the person in charge of the Project was retired from the MoH, and other Ministry officials were busy with COVID-19 and dealing with displaced persons from Ukraine. For this purpose, an analysis was made based on the sources including the interviews conducted with medical personnel at the target facilities and project consultants for the Grant Aid Project and Technical Cooperation Project, and the content of interviews with JICA officials by JICA's Evaluation Department.

<sup>43</sup> Source: Documents provided by JICA

<sup>44</sup> Source: Hearing to the Project consultant

years, while the durability of the equipment was estimated to be around five years. On the Moldovan side, the experience of using Japanese equipment procured through grant aid has led to an understanding of the high performance of the equipment, thus a request for Japanese equipment was raised. Accordingly, to respond to the strong need for advanced medical equipment, the utilization of the equipment after the implementation of the project, and the reputation and trust in Japanese medical equipment, based on past grant aid experience, led to a request from the Government of Moldova to Japan for the ODA loan Project under STEP in 2012 with the aim of procuring insufficient and new equipment. In fact, medical staffs at the MCI, where medical equipment for maternal and child health care was procured through the grant aid, stated that the success of the grant project (the use and contribution of the equipment at the MCI) led to the implementation of this Project. Subsequently, the Project was implemented by scaling up with the use of the experiences gained from the grant aid project, and as a project to introduce new and advanced medical equipment for tertiary and secondary medical facilities.

The Project was formulated only to procure equipment. On the other hand, at the time, the target hospital outsourced the maintenance of its main equipment, which was expensive and time-consuming. Therefore, the Technical Cooperation Project, PIMDM, was implemented at the same time the equipment was installed under the Project, with the aim of establishing a system for the maintenance and management of medical equipment for the facilities where the equipment was procured. Thanks to the implementation of the PIMDM, D/SBMEs were established in the five target facilities of the Project, and BMEs were assigned accordingly. Their roles and standard operating procedures were prepared by the PIMDM and described in the guidelines and include the introduction of records of cases of repairs and responses to medical equipment, the introduction of planned preventive maintenance and user training, etc., all of which are essential to ensure the sustainability of the equipment procured under the Project. In the D/SBMEs, the devices for testing medical equipment were installed, enabling regular testing of equipment performance, thus the quality of internal equipment maintenance has also improved. Accordingly, after the implementation of the Project, medical equipment maintenance, which had previously been outsourced, was conducted in-house in the target hospitals, and the D/SBMEs and BMEs have become indispensable for the efficient and effective use of equipment. Medical staffs in all target hospitals indicated in interviews that the presence of BMEs has made a significant contribution to the quick resolution of medical equipment failures, the proper planning and implementation of maintenance procedures, and securing of the budget needed to do so.



Photo: BMEs inspecting medical equipment with doctors. (One BME in the front right and two in the back). Source: Website of the target hospital (RCH)

#### (4) Unexpected changes in circumstances and responses

According to the Project consultant and the medical staffs at the target facilities, without the establishment of the D/SBMEs and the presence of BMEs in the department, it would have been difficult to properly operate and maintain the procured equipment. At the time of the ex-post evaluation, BME, which is increasing its importance in each institution, is a position with a short history in Moldova. A department in this field was established at the Technical University of Moldova in the late 2000s, and the first graduates were produced in 2010. At the time of the start of the Project, the number of graduates from the Department was limited to around 100, and the recognition and status of the BME was low, therefore most graduates from the Department were working in other jobs and this situation was a major challenge to securing BMEs.

The MoH, which had a limited number of staff, also specialized in policy-making work, leaving treatment and services to each medical facility, and had limited involvement in services such as maintenance of medical equipment. The medical equipment was managed concurrently by the staff in charge of medicine, but their experience in maintaining medical equipment was also limited due to the structure whereby the department that handled medicines oversaw equipment. In a situation where the importance of maintenance and management was increasing, the recognition was low and recruitment and employment of the necessary personnel did not progress, the experts engaged in the Project and PIMDM requested the participation of the Deputy Minister of the MoH in the training in Japan organized by the PIMDM and conveyed the importance of medical equipment management through his participation in the training. This resulted in the assignment of a BME in charge of medical equipment at the MoH after his return. The placement of personnel with knowledge of medical equipment and its maintenance in key posts in the MoH, where personnel in charge of medicines were only previously available, has helped to share the importance of equipment maintenance and management, and has led to the establishment of a system for the maintenance and management of medical equipment at the five target facilities. This was the starting point for the development of a medical equipment management system<sup>45</sup>.

#### (5) Resulted outcome

In the target medical facilities of the Project, the medical equipment procured has contributed to provide quality medical services. For example, the reduction of “the number of days of hospitalization for patients with endoscope intervention” (the operation and effect indicator set at the time of the appraisal), the provision of early diagnosis and timely treatment using modern and high-performance medical equipment (CT, angiography equipment, X-ray equipment, endoscopes, etc.), and the implementation of high-resolution tests by introducing X-ray equipment all help to reduce the burden on patients. The use of the sophisticated equipment also helped reduce the burden and workload of medical staff.

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<sup>45</sup> Source: Hearing to the Project consultant

The PIMDM, which was implemented at the time of the installation of equipment in the Project, contributed to the efficient and effective use of the equipment, which is one of the synergy effects between the two projects. As noted by the medical staffs in the target facilities, medical equipment is properly maintained (according to manufacturers' recommendations) by D/SBMEs established through PIMDM support, and preventive maintenance and repair work is carried out promptly and regularly after Project completion. Considering the maintenance and management systems in each target facility and the understanding about the maintenance in Moldova at the time of formulation, it would have been difficult to ensure that the medical equipment procured would continue to be used effectively without the activities of the D/SBMEs. According to the MoH and medical staffs in the target hospitals, through the outcomes achieved in the target facilities, there is now a better understanding of the maintenance and management of medical equipment not only in the target facilities, but also in other medical facilities. In response to these changes, the MoH plans to identify and analyze the training needs of technical staffs in charge of medical equipment at medical facilities nationwide with the support of JICA in the future, in order to further strengthen the maintenance of medical equipment in regions as well<sup>46</sup>.

## 5.2 Additionality

None

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<sup>46</sup> From July 2022, JICA has launched a Technical Cooperation project, "Strengthening the Capacity of Medical Equipment Maintenance and Management," which supports the development of medical equipment management guidelines and the establishment of training programs for BMEs.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
<u>Major equipment</u>		
RCH	Operation microscope, C-arm with angiography, Equipment for neurosurgical operation theatre	Deleted: Equipment for neurosurgical operation theater, C-arm with angiography Added: Equipment for operation theater and ICU
MCI	CT, Anesthesia machine, X-ray mammography, Surgical endoscope, Endoscopic electrocautery	Deleted: CT, Anesthesia machine, Endoscopic electrocautery Added: Equipment and others for CSSD, operation theater and pathological prosecution room
EMI	CT, MRI, Angiography, Surgical endoscope	Added: CSSD equipment, mobile X-ray, Neuronavigation System
OI	CT, MRI, surgical endoscope, FISH Hybridizator, Anesthesia machine	Deleted: MRI, Surgical endoscope Added: CT (1), Ambulance, Genetic analyzer, Oscope
ST	CT, MRI, Angiography	Deleted: MRI Added: Equipment relating to operation theater, ICU and laboratory, and for CSSD
All target hospitals	Infusion pumps, monitors, etc.	As planned
CNSP and CSPs	Liquid Chromatography, Genetic analyzer, Safety Cabinet	As planned
<u>Consulting services</u>	1) Support for bidding works, briefing sessions and evaluation 2) Support for contract negotiations 3) Supervision of equipment delivery and installation 4) Coordination and implementation of training 5) Support for inspection after installation of equipment 6) Support for development of maintenance and management plans 7) Support for PSR and PCR preparation 8) Technical advice and coordination support for overall project operation	As planned
2. Project Period	June 2013-October 2015 (29 months)	June 2013-May 2018 (60 months)
3. Project Cost		
Amount Paid in Foreign Currency	5,907 million yen	5,722 million yen
Amount Paid in Local Currency	744 million yen (116 million Moldovan Lei)	1,729 million yen (260 million Moldovan Lei)
Total	6,651 million yen	7,451 million yen
ODA Loan Portion	5,907 million yen	5,698 million yen
Exchange Rate	1 Moldovan Lei = 6.37 yen (As of December 2012)	1 Moldovan Lei = 6.64 yen ((Average rate: June 2013-May 2018)
4. Final Disbursement	July 2018	