

FY2021 Simplified Ex-Post Evaluation Report of Japanese Grant Aid Project

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Duration of the Study: April 2022–February 2023

Duration of the Field Study: 28 August 2022–10 September 2022

Country Name  
Morocco

**The Project for Construction of Shellfish Aquaculture Technology Research Center**



Panoramic view of the project facility (source: Evaluator)

Mussels farmed in this project (source: Evaluator)

**I. Project Outline**

Background	<p>In 2009, the Moroccan government formulated a fisheries strategy (Plan Halieutis) with the aim of developing the fishery sector and ensure the stability of fishery resources. The plan positions aquaculture as one of the drivers of growth in the seafood sector and sets an ultimate policy target of 200,000 tons of aquaculture production, including fish (shellfish estimated at 110,000 tons), by 2020. To achieve this goal, the government has established the Aquaculture Promotion Organization (ANDA) and encouraged private companies to enter the aquaculture industry. However, along with the difficulty in collecting natural seedlings for shellfish aquaculture, aquaculture technology, including the production of artificial seedlings, remains underdeveloped, and only a few private companies import and cultivate oyster seedlings from overseas.</p>		
Project Objectives	<p>This project aims to improve the research and development capabilities of the National Institute of Fisheries (INRH) in aquaculture technology, including seedling production, by constructing an aquaculture technology research center for shellfish and equipping it with the necessary equipment for aquaculture technology research on the coast of Amsa Bay, Tetouan Province, thereby contributing to the establishment of shellfish aquaculture technology, including seedling production in the country.</p>		
Project Contents	<ol style="list-style-type: none"> <li>1. Project Site: Amsa Bay coast, Tetouan Province, Tangier Tetouan District (population: 2.47 million)</li> <li>2. Japanese side: 1.2 billion yen 1) Contents of civil engineering work, procurement equipment and so on, Facilities: Administration Building (567 m<sup>2</sup>), Breeding and Research Building (951.50 m<sup>2</sup>), Elevated Water Tank Tower (78.50 m<sup>2</sup>), Electrical Room Building (64.68 m<sup>2</sup>), Seawater Intake Facility (Intake Pipe Distance 372 m), Other Facilities (69.79 m<sup>2</sup>), Equipment: Breeding research equipment (44 items, including breeding tanks and so on), marine aquaculture testing equipment (60 items, including lantern nets, current meters and so on), experimental research equipment (64 items, including microscopes, spectrophotometers, and so on), feed culture equipment (122 items) and so on.</li> <li>2) Contents of Consulting Services/Capacity Building Program (Soft Component) Detailed design, bidding assistance, construction supervision, guidance on epidemic prevention and hygiene management in the facility for researchers and so on, guidance on phytoplankton storage, cultivation, and proliferation.</li> <li>3. Moroccan side: 0.03 billion yen</li> </ol>		
Implementation Schedule	E/N Date	June 16, 2016	Completion Date November 25, 2018 (completion of facility construction and equipment delivery)
Implementation Schedule	G/A Date	June 16, 2016	
Project Cost	E/N Grant Limit / G/A Grant Limit: 1.2 billion yen, Actual Grant Amount: 1.2 billion yen		
Executing Agency	Institut National de Recherche Halieutique (INRH) Main Contractor: Iwata Chizaki Inc.		
Contracted Agencies	Main Consultant: OAFIC Co. Ltd.		

## II. Result of the Evaluation

### Summary

This project was carried out to improve the research and development capabilities of the National Institute of Fisheries (INRH) in aquaculture technology, including seedling production, by constructing an aquaculture technology research center for shellfish and equipping it with the necessary equipment for aquaculture technology research on the coast of Amsa Bay, Tetouan Province, thereby contributing to the establishment of shellfish aquaculture technology, including seedling production in the country.

The relevance and coherence of this project are high. The project is consistent with the Moroccan government's *Fisheries Strategy (2010–2020)* and with the needs of shellfish farming. Furthermore, the project is also consistent with the agriculture and fisheries industries that are emphasized in the *Japan's Country Assistance Policy for the Kingdom of Morocco (May, 2012)*. It complements Japan's existing fishery assistance to the INRH, the executing agency, and is consistent with the SDGs (Goal 14). In addition, although aquaculture technology has not yet been commercialized and marketed, this project has improved the research and development capabilities of shellfish aquaculture technology, increased the interest of aquaculture researchers in the INRH and shellfish aquaculture, and contributed to research and education on aquaculture. The implementation of this project has not caused any particular environmental issues. Therefore, the project's effectiveness and impacts are high. However, although the project cost was within the plan, the project period exceeded the plan due to the time required for domestic procedures on the Moroccan side. Therefore, the efficiency of the project is moderately low. No issues were identified in the policy/system, institutional/organizational, and financial aspects. However, some minor issues were observed in the current operation and maintenance, which are not expected to be improved/resolved. Therefore, sustainability of the project effects is moderately low.

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

<b>Overall Rating<sup>1</sup></b>	<b>B (Satisfactory)</b>	<b>Relevance &amp; Coherence</b>	③ <sup>2</sup>	<b>Effectiveness &amp; Impacts</b>	③	<b>Efficiency</b>	②	<b>Sustainability</b>	②
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<Special Perspectives Considered in the Ex-Post Evaluation/Constraints of the Ex-post Evaluation>

The target value is set for FY2022, six years after the project completion (assumed to be completed in 2016), but the actual project completion (2018) is roughly two years later than the assumed year and during the ex-post evaluation, the ex-post evaluation takes place less than four years after the project completion. Although the evaluation will be conducted before six years have passed since the project's completion as originally envisioned, the initial target indicators will be used because no special adjustments are necessary in the target indicators related to effectiveness (cumulative number of established shellfish farming technologies (papers and research reports)).

### 1 Relevance/Coherence

<Relevance>

- Consistency with the Development Policy of Morocco at the Time of Ex-Ante Evaluation

The *Fisheries Strategy (2010–2020)* suggests the production and distribution of seedlings, development and dissemination of aquaculture technology, and development of legal systems on the aquaculture industry. This project is expected to significantly contribute to the technical aspects of 'production and distribution of seedlings' and 'development and dissemination of aquaculture technology.' This project was consistent with Morocco's development policy.

- Consistency with the Development Needs of Morocco at the Time of Ex-Ante Evaluation

In Morocco, the promotion of offshore fisheries and the development of fisheries infrastructure since the 1970s substantially developed the country's fisheries industry; however, the country's catch has plateaued since the 1990s. Consequently, the aquaculture industry has been positioned as a driver of growth in the fisheries sector. Regarding fish, although sea bass farming was successful, domestic procurement of oysters, clams, and other natural juvenile shellfish was difficult for shellfish cultivation. The production technology for artificial seedlings for mussels was not developed, particularly, all oyster seedlings were imported from foreign countries, such as France. Regarding imported seedlings, the occurrence of diseases and the stable supply have become issues that have hindered the development of shellfish cultivation. Thus, the Moroccan government had to ensure a stable supply of artificial seedlings of shellfish (especially bivalves). In light of the above, the purpose of this project was consistent with the development needs.

- Appropriateness of Project Design/Approach\*

Since the importance of detailed planning design according to the needs of users was pointed out from the post-evaluation of similar projects in the past, it was confirmed that JICA experts actually provided appropriate advice on the preparation of this project, such as conducting preparatory surveys and coordinating with the INRH (INRH expressed its gratitude for this). Thus, it was determined that the business plan was appropriate.

<Coherence>

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

*Japan's Country Assistance Policy to the Kingdom of Morocco (May 2012)* places agriculture and fishery development issues under the priority area of 'strengthening economic competitiveness and sustainable economic growth.' In addition, the *JICA Country Analytical Paper of the Kingdom of Morocco* identifies the 'stability and high added value in the agricultural and fisheries industries' as a priority issue, and this project was in line with the assistance policies of Japan and JICA. In light of the above, the project objectives were consistent with Japan's development cooperation policy.

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

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

- Internal Coherence

Although no direct relationship was found between past projects in the fisheries and aquaculture sectors, such as the JICA grant aid "The Project for Construction of the Central Research Institute of the National Institute of Fisheries (2007-2009)," there was indirect cooperation, such as exchanges of opinions with the INRH between "Fisheries Industry Promotion Experts" and "Aquaculture Promotion Experts." It can be said that these past projects are consistent in the sense that they are contributing to raising the level of research with a view to demonstration and commercialization in the fisheries sector.

- External Coherence

This project received no intervention (assistance) from other donors. Nonetheless, the Ministry of Fisheries, the INRH's supervisory body, is primarily responsible for donor coordination, preventing an overlap in fishery sector projects funded by other donors. Furthermore, shellfish aquaculture research conducted by this project is consistent with the SDGs (Goal 14: Life below water) because it prevents mussel overfishing in the Mediterranean Sea and contributes to marine ecosystem preservation.

<Evaluation Result>

In light of the above, the relevance and coherence of the project are high.<sup>3</sup>

## 2 Effectiveness/Impacts<sup>4</sup>

<Effectiveness>

As quantitative indicators, this project listed the "(1) cumulative number of established shellfish aquaculture technologies (papers and research reports), (2) cumulative number of commissioned research projects on shellfish cultivation, (3) cumulative number of species studied in shellfish aquaculture, and (4) cumulative annual number of days of facility use related to intermediate breeding" and "growing interest in the INRH and shellfish aquaculture in aquaculture industry circle" as a qualitative indicator.

The field survey revealed that the number of papers was 21 (bulletins and domestic journals) and three (international journals) (at the time of ex-post evaluation, the same hereinafter) against the target value of 10 (six years after the project completion). There were two commissioned studies against four goals. Three species were studied against four targets. The cumulative annual number of days of facility use related to intermediate breeding was roughly 100 days compared to the target of 120 days. Resultantly, the effect indicators were largely achieved, and academic contributions were obtained through joint research with Tetouan University and the acceptance of graduate students. Considering that the project has not yet reached six years of completion during the ex-post evaluation, it is judged that the project is expected to achieve its target if the achievement rate is between 60%–70%, as it is four years after completion (4/6 years ≈ approx. 67%) as of 2022.

In addition, the executives of the Amsa Fisheries Union (union president and former union president) and M'diq Fisheries Union (deputy union president and secretary general) (four people in total, all men) expressed the opinion that the establishment of this project increased interest in the INRH and shellfish farming. Moreover, interviews with eight professors of the Faculty of Biology at Tetouan University, which have exchange with the project, showed that graduate students were conducting research and interning in this project, and an average of four master's theses are written jointly with the INRH per year, and that of during the ex-post evaluation, the interns (two master's students, all women) have acquired aquaculture techniques and research knowledge from watering and caring for seedlings. It was confirmed that there was a growing academic interest in shellfish cultivation. The soft components were generally highly evaluated by the participants (INRH staff), but there was an opinion that continuous support was necessary for the accumulation of organizational knowledge and the realization of effects

<Impacts>

- Intended Impacts

The impact envisaged during the planning was "to contribute to the establishment of shellfish farming technology, including seedling production in Morocco." More than 200 fish farms were established as a result of INRH initiatives, and attempts are being made to commercialize INRH research results. It was temporarily suspended due to the influence of the economic lockdown (2020–2021) caused by COVID-19. Nonetheless, it is expected to materialize in the future. Field surveys have also shown that attempts have been made to commercialize mussels, such as culturing mussels at fish farms near the INRH. In addition, by accepting interns primarily from Tetouan University (an average of four interns per year), the INRH has become a human resource development center in the field of marine biology.

- Other Positive and Negative Impacts

In terms of environmental and social considerations, this project is classified as Category B under the *Japan International Cooperation Agency Environmental and Social Consideration Guidelines* (promulgated in April 2010). Since the INRH leased public marine land owned by the (then) Ministry of Equipment, Transport, Logistics, and Water, there was no land acquisition or relocation. The Environmental Impact Assessment (EIA) report was approved in 2016. No problem was identified with the scenery because the facilities are unified in white and light blue to match the surrounding landscape. In addition, based on the current situation survey (including a diving survey), it was confirmed that appropriate monitoring measures were taken for air quality, water quality, and noise during construction, and for water quality after the facility went into operation (one year). Although quantitative water quality surveys were not conducted by INRH at the time of ex-post evaluation, no particular problems were reported in terms of noise, vibration, and odor as a result of the current situation survey and interviews with nearby residents during the ex-post evaluation; thus, no significant environmental and social impacts were observed. No negative impact on gender and other issues was found, and more than half of the researchers at the Shellfish Research Institute were women.

<sup>3</sup> Relevance: ③, Coherence:②

<sup>4</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.

### <Evaluation Result>

This project has improved the research and development capabilities of shellfish aquaculture technology, increased interest of aquaculture researchers INRH and shellfish aquaculture, and contributed to research and education on aquaculture although aquaculture technology has not yet been commercialized and marketed. No particular problems have been confirmed in the surrounding environment due to the implementation of this project. Therefore, the effectiveness and impacts of the project are high.

### Quantitative Effects

Indicators	Baseline 2014 Baseline Year	Target 2022 6 Years after Completion	Actual 2019 1 Year after Completion	Actual 2020 2 Years after Completion	Actual 2021 3 Years after Completion	Actual 2022 3 Years after Completion
Indicator 1 Cumulative number of established shellfish aquaculture technologies (papers and research reports)	0	10	0	NA	NA	24
Indicator 2 Cumulative number of commissioned research projects on shellfish aquaculture	0	4	0	NA	NA	2
Indicator 3 Cumulative number of species studied in shellfish aquaculture	0	3	0	NA	NA	3
Indicator 4 Cumulative annual number of days of facility use related to intermediate breeding	0	120	0	NA	NA	100

Source: Baseline values and target values are from pre- and post-evaluation tables, and actual values are answers to questionnaires.

Note: In 2020–2021, normal business operations were suspended due to lockdowns caused by COVID-19; hence, no effect indicators were obtained.

### 3 Efficiency

The output of this project was generally in line with the plan (as described in the Contents of the Project of "I. Project Overview").

Although minor changes were made in the layout of the facility, none of the changes would affect the project effect.

The total project cost was planned to be 1,230 million yen (1,200 million yen for the Japanese side and 30 million yen for the Moroccan side). Of this, the actual amount of cooperation by the Japanese side was 1,183 million yen compared to the planned amount of 1,200 million yen (99% of the plan), which was almost as planned. Morocco's actual expenses were 30 million yen compared to the planned 30 million yen.

The actual project period was 41 months (178% of the plan) compared to the planned 23 months, exceeding the plan. It took time from the consulting contract in July 2015 to the bidding in February 2017 for construction permits and other procedures on the Moroccan side, but the construction was completed in July 2018. The soft component of the project took slightly longer than originally planned as it was implemented over a two-month period starting in September due to vacation in August, but there was no impact on efficiency.

<Evaluation Result> Although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is moderately low.

### 4 Sustainability

#### • Policy and System

No problems were found in terms of policy and system. The INRH has three levels of organization: headquarters (Casablanca), regional centers or specialized centers (Nador, Tangier, M'diq and so on.), and stations, laboratories and research support service (Amsa and so on). Of the functions of the INRH headquarters, budget execution is delegated to the M'diq Specialized Center. However, decisions on the budget exceeding 300 million MAD are referred to INRH headquarters. Day-to-day operations have been delegated to the M'diq Specialized Center.

In addition, the Ministry of Fisheries, which is the supervisory body of INRH, continues to place importance on the development, dissemination, and commercialization of shellfish aquaculture technology, and it is highly likely that the effects of this project will continue.

#### • Institutional/Organizational Aspect

No problems were found in terms of institutional/organizational aspect. The center consists of one director, four researchers, one office manager, one electrician, one secretary, one staff member in charge of general affairs, one treasurer, one driver, five security guards, and four cleaners. In addition, engineers from M'diq's research center are also available to support INRH in Amsa as needed. Although there are some changes in the number of employees from the original plan, there is no hindrance to the operation of the organization. In addition, academic exchanges are conducted on a daily basis, with graduate students from Tetouan University choosing INRH (Amsa) as their internship site and INRH researchers serving as thesis advisors.

#### • Technical Aspect

The operational techniques are well established, and operation manuals are also maintained. In addition, efforts are being made to educate

staff by conducting on-the-job training. In this way, operational techniques are well equipped, but maintenance and repair techniques (programming skills required for system maintenance) are not fully developed in some areas. It has also been pointed out that the Japanese side (manufacturer) cannot respond quickly to failures that occur outside the warranty period because there is no distributor in Morocco.

- Financial Aspect

No special problems were identified. Although INRH is an independent administrative agency, it is currently operated with government subsidies (roughly 170–180 million MAD per year). The Independent Accounting Division also sells research results but earns only a small amount of profit. Meanwhile, the INRH M'diq Specialized Center has secured sufficient funds to conduct research, inclusive of maintenance, repair, and utility expenses, within its budget. Budgets for academic and basic research fields are also a concern in Morocco, but the INRH is actively applying for funds for externally commissioned research and scientific research to secure funds and maintain the level of research.

Operating expenses for this project (under the jurisdiction of the M'diq Specialized Center)

Unit: Million MAD

	2019	2020	2021
Operating expenses	1. 401	1. 609	1. 368
Of which: Utility bills	0.511	0.350	0.350
Of which: Facility maintenance and repair costs	0.502	0.670	0.670
INRH Budget (overall)	n.a.	170.5	182.5

Source: INRH, Moroccan Ministry of Finance

Note: Labor costs are not included.

- Environmental and Social Aspect

No environmental or landscape problems have occurred.

As described in the Impact section, no special agreement with JICA has been made to conduct a water quality survey during the operation of this project after one year of provision, and thus no survey has been conducted.

- Preventative Measures to Risks

To date, there have been no outbreaks of potentially hazardous shellfish diseases. Even if such a situation were to occur, the problem can be solved by cooperating with neighboring fisheries associations (Amsa and M'diq) and procuring seeds from centers nationwide where INRH has research stations.

- Current Status of Operation and Maintenance

Some issues remain. The rationale for this is as follows.

(1) Seawater filtration pump malfunction: Due to "dry operation" that occurred during normal operation, the pump was not operating normally when there was no seawater, so the filtration pump was replaced in November 2020.<sup>5</sup> At the time of the ex-post evaluation, the automatic operation function is malfunctioning, so the pump must be manually operated and stopped. Consequently, personnel who would not be required if the automatic control function were functioning must be assigned for a period of time to check the operation status. This problem was not reported during the defect inspection (2019), because the problem was not yet detected. In addition, JICA conducted a field survey (monitoring) in February 2022, but no issues were pointed out at that time. To accurately grasp the situation, prompt confirmation of the facts and technical scrutiny are crucial.

The impact on facility operations is severe, and repairs are required immediately. The reason is because a stable supply of high-quality seawater must be secure for the research activities of shellfish cultivation, and its failure can disrupt the center's operation. Due to the current issue, when the water level in the filtration system is extremely low, the function that can be switched on and off automatically cannot be used, and personnel must be assigned to manually switch it on and off. The average seawater intake time is approximately 3 hours, during which the motor's operational status must be inspected.<sup>6</sup>

(2) Damage to aquarium nets: Similar or the same type of nets cannot be procured in Morocco and must be imported from Japan, which is problematic from a sustainability standpoint. However, Morocco's self-help efforts is reflected in the fact that it has responded to this issue by using local materials and ingenuity to create more reinforced aquarium nets. Moreover, considering that there is no local distributor in Morocco, the support from the Japanese manufacturer is insufficient.

(3) Inability to use some experimental machines: Precision instruments, such as spectrofluorometers, cannot be used (lack of availability of reagents for important analysis: pigments, proteins, carbohydrates, and so on). Although there are some local distributors in Morocco, the service for obtaining reagents and conducting manipulations is readily not available or difficult to obtain, and the Japanese manufacturer do not provide sufficient support.

<Evaluation Result>

On the basis of the above, no problems with the policy/system, institutional/organizational, and financial aspects were identified. However, some minor issues were observed in the current status of operation and maintenance, which are not expected to be improved/resolved. Therefore, the sustainability of the project effects is moderately low.

<sup>5</sup> This malfunction may be due to the damaged equipment (impeller and casing) inside the pump caused by dry operation (interview with INRH Amsa Director), but the details have not been confirmed.

<sup>6</sup> Results of the interview with INRH Amsa.

### III. Recommendations and Lessons Learned

- Recommendations to Executing Agency

Due to a malfunction of the seawater filter pump (it does not stop automatically when there is no seawater), as described in the section on sustainability, the motor must be manually switched on and off. Therefore, the executing agency must proactively identify the problem in co-operation with related organisations and encourage the manufacturer to investigate the cause of the pump malfunction (provide on-site or remote support) and repair or replace the pump immediately. This will contribute to enhancing the project's sustainability.

If the investigation reveals that the malfunction is caused by human error, the executing agency must retrain the operation technique.

- Recommendations to JICA

The malfunction described above had already occurred in 2020, immediately following the procurement, prompting the manufacturer to replace the entire motor, and the same malfunction was confirmed again during the ex-post evaluation. Given that JICA could have detected the problem in advance if it had been appropriately monitoring during that time, in the future, to promptly detect any malfunctions that may occur even if the executing agency does not proactively raise issues, JICA must take the necessary steps, such as enhancing its on-site and online monitoring system and supporting the measures outlined in the section titled Recommendations to Executing Agency. This is expected to contribute to the achievement of sustainability of this project.

Furthermore, to increase the effectiveness and impacts envisioned in this project, technical support must be provided for the commercialisation of aquaculture technology.

- Lessons Learned

Regular dialogues with the local fisheries union have taken place since the project's inception, resulting in a greater awareness of the research facility. Specifically, in selecting the site, three sites were listed as candidates during the preparation stage, but when finally deciding on this site, various opinions were exchanged, such as whether there would be any impact on fisheries and whether there would be any hindrance to the scenery, as a basis for the selection. In addition, co-operation with local fisheries associations and divers (chartering of boats and diving) is essential for mussel farm management, which was established for marketability experiments in daily research activities, and these co-operative efforts have led to the promotion of understanding.

### IV. Non-Score Criteria

- Performance

Regarding epidemic prevention and sanitation management plans and feed research plans, the soft components on facility operation and research activities in shellfish aquaculture were provided to approximately 20 INRH staff (administrative and research staff), thereby improving the technical level in Morocco. The teaching materials and curriculum used in this project are stored in INRH. Participants who received guidance in the soft components are engaged in facility management and research activities at INRH headquarters and throughout the country, and have contributed to the enhancement of the research and technical level of shellfish aquaculture in Morocco beyond the scope of this project.

- Additionality

In addition to advancing academic research, educating graduate students, and organizing international research conferences, the project has contributed to the development of shellfish aquaculture technology. Specifically, the promotion of research on shellfish aquaculture, the contribution of international journals, and the implementation of commissioned research contributed to the promotion of academic research. In terms of the education of graduate students, the project played a role by regularly accepting graduate students, mainly from nearby Tetouan University, and assigning project-affiliated researchers as master's and doctoral dissertation advisors. In addition, the research results of this project were presented at international research conferences, and it can be said that they have significantly advanced marine biology research.



Shellfish Seedling Experiment Facility (Nursery) (source: Evaluator)



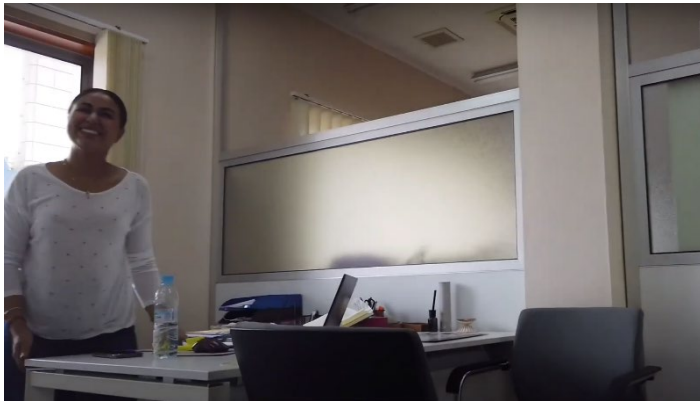
Shellfish Seedling Experiment Facility (Filtration)  
(source: Evaluator)



Shellfish Seedling Experiment Facility (breeding) (source: Evaluator)



Shellfish Seedling Experiment Facility (Refrigeration)  
(source: Evaluator)



Researcher's waiting room (source: Evaluator)



Main entrance of the facility built under the project  
(source: Evaluator)