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Report No: ICR00004359

IMPLEMENTATION COMPLETION AND RESULTS REPORT

(IBRD 75830)

ON A

LOAN

IN THE AMOUNT OF US\$30 MILLION

TO THE

Argentine Republic

FOR A

ARGENTINA MINING ENVIRONMENTAL RESTORATION PROJECT (P110462)

December 27, 2017

Environment & Natural Resources Global Practice
Latin America And Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective: Nov 24, 2017)

Currency Unit = AR\$

AR\$3.015= US\$1 (at appraisal)

AR\$17.47= US\$ 1 (at
completion)

US\$ = SDR 1

FISCAL YEAR

July 1 - June 30

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ABBREVIATIONS AND ACRONYMS

ARN	National Regulatory Authority
CNEA	National Atomic Energy Commission
COCALIN	Qualification Committee of Laboratories and Nuclear Facilities
CPS	Country Partnership Strategy
DIA	Environmental Impact Declaration
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FM	Financial Management
FY	Fiscal Year
GIS	Geographic Information System
GoA	Government of Argentina
GP	Environmental Management Unit (CNEA)
IAEA	International Atomic Energy Agency
LA	Loan Agreement
MTR	Mid-Term Review
PAD	Project Appraisal Document
PDO	Project Development Objective
PIP	Project Implementation Plan
PPF	Project Preparation Facility
SIGA	Environmental Management and Information System

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P110462	ARGENTINA MINING ENVIRONMENTAL RESTORATION PROJECT (P110462)
Country	Financing Instrument
Argentina	Specific Investment Loan
Original EA Category	Revised EA Category
Full Assessment (A)	Full Assessment (A)

Organizations

Borrower	Implementing Agency
Argentine Republic	National Atomic Energy Commission

Project Development Objective (PDO)

Original PDO

The development objectives of the project are to: (a) strengthen Government of Argentina's capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments in accordance with international good practice; and (b) reduce potential economic and health damages associated with a closed uranium mining site in Malargue, Mendoza.

PDO as stated in the legal agreement

The objectives of the Project are: (a) to strengthen the Borrower's capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments, in accordance with international good practice; and (b) to reduce potential economic and health damages associated with the Malargüe Site.

**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
World Bank Financing			
IBRD-75830	30,000,000	30,000,000	29,663,347
Total	30,000,000	30,000,000	29,663,347
Non-World Bank Financing			
Borrower	4,250,000	0	0
Total	4,250,000	0	0
Total Project Cost	34,250,000	30,000,000	29,663,347

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
31-Jul-2008	28-Apr-2010	03-Dec-2012	30-Nov-2013	27-Jun-2017

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
25-Jul-2013	7.49	Change in Results Framework Change in Loan Closing Date(s)
28-Aug-2015	19.96	Change in Loan Closing Date(s)
24-Nov-2015	23.06	Change in Results Framework Change in Loan Closing Date(s)
26-Sep-2016	24.55	Change in Loan Closing Date(s)

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Modest



RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	18-Dec-2008	Satisfactory	Satisfactory	0
02	19-Jun-2009	Unsatisfactory	Unsatisfactory	0
03	19-Dec-2009	Unsatisfactory	Unsatisfactory	0
04	17-May-2010	Moderately Satisfactory	Moderately Satisfactory	0
05	21-Feb-2011	Moderately Satisfactory	Moderately Satisfactory	2.97
06	08-Jan-2012	Moderately Unsatisfactory	Moderately Unsatisfactory	2.97
07	19-Jun-2012	Moderately Satisfactory	Moderately Satisfactory	2.97
08	01-Jan-2013	Moderately Satisfactory	Moderately Satisfactory	4.45
09	09-Jul-2013	Moderately Satisfactory	Moderately Satisfactory	7.57
10	10-Mar-2014	Moderately Satisfactory	Moderately Satisfactory	9.85
11	26-Oct-2014	Moderately Unsatisfactory	Moderately Satisfactory	13.51
12	26-Feb-2015	Moderately Satisfactory	Moderately Satisfactory	16.64
13	20-Aug-2015	Moderately Satisfactory	Moderately Unsatisfactory	20.04
14	05-Nov-2015	Moderately Satisfactory	Moderately Satisfactory	23.14
15	08-Jul-2016	Moderately Satisfactory	Moderately Unsatisfactory	24.62
16	11-Feb-2017	Satisfactory	Satisfactory	27.91
17	28-Jun-2017	Satisfactory	Moderately Satisfactory	27.91

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Energy and Extractives	100
Mining	57
Public Administration - Energy and Extractives	43



Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Environment and Natural Resource Management	0
Environmental Health and Pollution Management	81
Air quality management	27
Water Pollution	27
Soil Pollution	27
Environmental policies and institutions	20

ADM STAFF

Role	At Approval	At ICR
Regional Vice President:	Pamela Cox	Jorge Familiar Calderon
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. The Argentine mining sector represents an important component of the country's private sector investment and was booming at the time of appraisal due to high commodity prices, competitive exchange rates, sector liberalization, streamlining of federal and provincial administrative procedures, and relatively "virgin" mining sites where valuable deposits could be found. In 2006, the mining sector employed 170,000 workers and produced minerals worth US\$ 3.45 billion. The country has a rich endowment of uranium ores and, even though it was not producing the mineral at the time, in the past there had been up to ten different uranium mines.
2. Since mining was a relatively new industry in Argentina, it had little experience with mine closure and clean-up. Years of lax environmental enforcement and management practices in the uranium extraction industry had resulted in undesirable environmental legacies consisting of the accumulation of harmful solid and liquid wastes associated with uranium mining and processing, and the generation of waste tailings and low-grade ore containing low levels of radioactivity.¹ The National Atomic Energy Commission (CNEA) had inventoried eight closed uranium mining and milling sites across the country that had residual low-level radioactive wastes, which raised environmental concerns about long-term public health and use of natural resources. These concerns included: (a) contaminated ground and surface waters, including potable water supplies, (b) elevated incidence of lung and other cancers, and (c) restricted land use and loss of access. On one site, moreover, legacy toxic chemicals also required proper disposal.
3. Some of the closed uranium processing sites presented additional concerns because of their location close to dense urban areas (e.g., the city of Cordoba and the Municipality of Malargüe in Mendoza Province) or close to sites designated for tourism activities (e.g., Los Cardones National Park in Salta Province and San Roque lake in Cordoba Province). Furthermore, a high level of anxiety among the local populations concerning the environmental impacts on air, soil, and water quality that could be caused by closed uranium mining and milling sites. In order to reduce both the economic and public health risks associated with these sites, they needed to be properly remediated consistent with internationally accepted good practices.

¹ It should be noted, however, that the legacy issue was not nuclear waste, but large amounts of low-grade tailings with radioactivity levels typically those for commercially viable natural uranium ore. This distinction is very important as Bank policy at the time prohibited any lending for activities related to nuclear energy production, including the processing of uranium for this purpose. Accordingly, a high level internal management decision was required in order for the Bank to proceed with the appraisal and subsequent financing of this project, which was the first of its kind in terms of Bank involvement not only in Latin America but worldwide. The novelty of the project also contributed to the extensive preparation time required. In short, this was the first time either the GoA or the Bank had dealt with the restoration of former uranium mining-related sites, although the Bank did have past and ongoing experience with the environmental remediation of closed mining sites involving other minerals.



4. Even though CNEA had been active in the nuclear energy fuel cycle since the 1950s, it had little experience with mine and processing site closure. The Bank's involvement with the project was expected to provide a major benefit to CNEA and the government in that it would permit access to international expertise and good practice. The Argentine Federal Government (GoA) as well as provincial and municipal authorities and local communities, felt that the Bank's involvement would lend credibility to CNEA's new policy to be more open and inclusive in involving communities in its environmental management activities. Bank assistance was also expected to provide a consistent approach to addressing sector-wide issues, while financing remediation efforts at one site, in Malargüe.
5. The Malargüe site was chosen for the pilot remediation project due to serious local water and agricultural crop contamination concerns and because it was the most advanced in terms of completing the rigorous design, consultation, environmental and social assessment, and international validation processes to comply with the GoA's strict technical standards and the World Bank's lending requirements.² These important preparatory activities were undertaken for the Malargüe site with technical and operational guidance from Bank mining and environmental safeguards specialists and financing from the two Project Preparation Facility (PPF) advances totaling US\$ 800,000, which were subsequently incorporated as part of the loan.
6. At the time of appraisal, the project was intended to contribute to the GoA's higher-level objectives with respect to improving environmental management and governance through increased transparency and a more participatory approach. More specifically the project was expected to build within CNEA the capacity and programs required for a more open and participatory approach to the management of environmental legacies in the form of contaminated former mining-related sites, for which it had a legal responsibility to clean up and manage. The Bank's Country Partnership Strategy for 2010-2012 specifically mentioned the Government's efforts with the to address the "brown" environmental agenda (i.e., pollution reduction), including the remediation of closed uranium mining and milling sites through the present project (see also para. 25 below).

Theory of Change (Results Chain)

7. The graphical representation of the Theory of Change provided in Annex 6-B (page 70), shows that the Project focused on two core areas of remediation and institutional strengthening and capacity building to mitigate environmental risks that helped the country attain the desired outcomes. The first area entails the **Remediation of the Malargüe Site**, which was supported through the following activities: Implementation of civil works for

² One of the alternatives originally considered by the Bank was to invest in remediation in more than one site. However, according to the PAD (para. 22) this alternative was rejected because in order to do so, it would have required that all environmental and social assessments would need to be completed during project preparation. Given the existing capacity at CNEA and the relevant provincial authorities, overall project preparation would have been considerably longer and would have introduced unacceptably long delays in the financing and implementation of the Malargüe works. Consequently, it was decided to remediate the contamination at one site in order the gain first-hand practical and operational experience (Component 1) and to help develop capacity to permit CNEA and the GoA to undertake similar remediation activities, which would also require additional investment resources, and the other contaminated sites (Component 2).



environmental mediation and site restoration. The second area involved **technical assistance and capacity building for Mine Restoration Planning and Institutional Strengthening**, which was supported through the following activities: (i) Provision of technical assistance for identifying environmental risk, establishing baselines, and developing remediation plans for sites other than Malargüe; (ii) delivery of technical assistance for identification of environmental risks and undertaking of environmental studies for 5 additional legacy sites; (iii) Purchase of specialized equipment and development of sample assessment protocols to help CNEA attain full ISO 17025 accreditation for the management system of its laboratories in terms of quality and administrative and technical operations; (iv) Capacity building of CNEA, provincial and municipal agencies through training on environmental monitoring procedures for management and supervision of mining operations and uranium legacy sites; (v) development and implementation of an Environmental Management Information System (SIGA) for site-specific monitoring.

8. Through these activities, the following outputs were achieved: With regards to the **Remediation of the Malargüe Site** (component 1): the civil works for the removal and safe storage of contaminated materials were completed³, and with regards to **Mine Restoration Planning and Institutional Strengthening** (component 2): (i) the remediation plans for other sites were completed; (ii) training and capacity building for CNEA and other agencies was delivered; (iii) CNEA Labs obtained specialized equipment and were ISO 17025 certified; (iv) the environmental quality monitoring system (SIGA) became operational; and a communication strategy was implemented.
9. These outputs have in turn contributed to the attainment of the following **intermediate outcomes**: With regards to Component 1: (i) all the potential health and economic risks associated with the Malargüe site have been addressed through the removal of tailings according to the remediation plan agreed with authorities. With regards to component 2: (i) the environmental risks at Los Gigantes and El Cichcon sites have been identified, the baseline studies have been completed and the remediation plans (with engineering designs) have been completed and consulted/agreed with local authorities; (ii) the environmental risks of five other legacy sites (Tonco-Salta, Picanan-Chubut, La Estela-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza) have been identified and the baseline environmental studies have been completed; (iii) CNEA laboratories were fully equipped and ISO 17025 accredited to monitor water, air, soil, and radiological parameters; and (iv) Government agencies where legacy sites are located have been trained on environmental monitoring procedures for management and supervision of mining operations and uranium legacy sites.
10. The attainment of these intermediate outcomes have in turn led a substantial achievement of the project's desired PDO/Outcomes (please see Section II-B (efficacy) below for an analysis of the fulfillment of outcomes): (i) the strengthening of GoA's capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and relating mining sector investments, in accordance with international good practice; and (ii)

³ The completion of works entailed (i) the removal and encapsulation of uranium tailings which followed the remediation plan agreed with national authorities; (ii) the subsequent sample collection as part of the environmental, physical, and radiological monitoring plan followed by the quality assurance and control procedures in the field and laboratories; (iii) the implementation of a communication strategy with respect to the remediation and site restoration activities at Malargüe to create public awareness and share best practices in the remediation of legacy sites; and (iv) the civil works for the green park.



the reduction of potential economic and health risks associated with a closed uranium milling site in Malargüe, Mendoza, which in turn will lead to the reduction in the potential economic and health damages in the long term. By substantially fulfilling these key outcomes, the project has also contributed to the attainment of the higher level long-term goals (beyond the PDO) which include: (i) reducing environmental risks and safeguarding natural resources” as one of its three broader themes (CPS for FY 2015-2018); (ii) sustainable growth of the mining sector which minimizes the impacts on other key sectors (agriculture, tourism, forestry); (iii) improved GoA’s capacity to undertake environmental planning, remediation and restoration of mining and contaminated sites (not only uranium) in the country.

Project Development Objectives (PDOs)

11. As stated in the Loan Agreement (LA), the PDOs were: (i) to strengthen the Borrower’s capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments, in accordance with international good practice; and (ii) to reduce potential economic and health damages associated with the Malargüe site.⁴

Key Expected Outcomes and Outcome Indicators

12. The key expected project outcomes stated above were achievement of the two objectives (strengthen the Borrower’s capacity to assess and mitigate environmental risks associated with closed uranium mines, etc., and reduce potential economic and health damages associated with the Malargüe site). The outcome indicators at the time of appraisal, as indicated in the PAD and the Results Framework, concerned environmental works (indicators 1 and 2 below) and mine restoration planning and environmental institutional strengthening (indicators 3 and 4). Indicators one and two were directly associated with objective (ii) and indicator three and four with objective (i):

- 1) All potential health and economic risks associated with the Malargüe site reduced to acceptable and verified levels;
- 2) All potential health and economic risks associated with at least four closed uranium sites to be addressed through credible implementation, with stakeholder buy-in, off site-specific remediation⁵ plans;
- 3) Measurable environmental risks reduced to acceptable levels in other sites or mining sector investments,

⁴ There was a slight difference in the way the PDOs were stated in the LA and the Project Appraisal Document. For the first objective, the PAD referred to the “Government of Argentina” instead of the “Borrower” and to “international best practice” instead of “international good practice.” For the second objective, the PAD referred to “associated with a closed uranium milling site in Malargüe, Mendoza” instead of “associated with the Malargüe site.” The statement of the PDOs contained in the LA will be used for this evaluation as the legally binding version of the project objectives and as per ICR guidelines.

⁵ Environmental remediation consists of the removal of pollutants or contaminants from soil, groundwater, sediments, or surface water in order to minimize, reduce and or control the exposure and negative impacts on human health and the environment and restoration of the affected sites in accordance with pertinent government standards and regulations.



particularly as relates to siting, monitoring and compliance, public disclosure, and management plans for future closings; and

- 4) CNEA laboratories receive full ISO 17025 management system accreditation for its quality, administrative, and technical operations.

Components

13. Project components included the following:

14. **Component 1. Remediation of the Malargüe Site.** (Appraisal Cost: US\$ 17.75 million; Actual Cost: US\$ 22.23 million) This site, which was donated by the Province of Mendoza to CNEA, is located at the northern limit of the city of Malargüe (about 353 km south of Mendoza City). An Environmental Impact Assessment (EIA) following the requirements of the applicable national and provincial legislation and detailed engineering plans for the site had been prepared and approved by provincial authorities and the national Nuclear Regulatory Authority (ARN). The technical remediation approach selected for the site was considered to be the most cost-effective alternative consistent with the health and safety standards established in Argentine law, which are more conservative than international standards.⁶ The project would fund remediation works, including the safe disposal of 710,000 tons of tailings and soil structures to prevent groundwater contamination and dust, and measures to abate radiation and radon emissions. Contracting had occurred in conformance with World Bank procedures, civil works had already begun, and, as of May 2008, the required investment was about 30 percent complete. Independent construction supervision conducted by a Bank-hired technical expert had reviewed the design and certified the quality of construction up to the time of appraisal. Planned activities for this component consisted of completion of the remediation works at Malargüe, which involved the removal and safe storage of the contaminated materials at the site. Based on a recommendation of the Environmental Management Plan that had resulted from the EIA, a green park was later added to the component, which increased its overall cost by US\$ 1.2 million. Remediation costs were also re-estimated based on the findings of the Mid-Term Review (MTR) at the time of the first restructuring in July 2013 and resources were also added to Component 1 through reallocation of the entire amount reserved for contingencies at appraisal (US\$ 2.77 million) and part of the resources for both Components 2 and 3 (see below).

15. **Component 2. Mine Restoration Planning and Institutional Strengthening.** (Appraisal Cost: US\$ 11.6 million; Actual Cost: US\$ 9.82 million) This component had three subcomponents:

⁶ More specifically, the standard to be achieved at the site for radiation exposure had been established and specified in ARN regulations as 0.1mSv/yr. The remediation and restoration work was expected to comply with ARN's Basic Standard for Radiation Safety (AR 10.1.1) and with ARN's mandatory standard RQ-86, as well as with the applicable laws of the Province of Mendoza on hazardous waste and nature preservation. These measures were expected to ensure that a critical population group would not be exposed to an annual radiation dose that could lead to increased risk of radiation related illnesses. The standard specified in ARN regulations was established based on the concept of effective dosage and founded on considerations of individual health risk from effective radiation exposure levels.



(i) *Develop remediation options for other sites.* In addition to Malargüe, seven other closed uranium sites had been inventoried⁷. The project would provide technical assistance to study and design remediation options to clean up the additional sites, and support the environmental and social consultation processes required as per international best practice. It would also fund an international advisory group to advise on the approaches being suggested for each site.⁸

(ii) *Strengthen the CNEA Environmental Management Unit (GP).* The GP is CNEA's relatively new Environmental and Waste Management Department. This component would: (a) support its organization, staffing, financial resources, work methodology, providing training as needed in any of these areas; (b) develop and implement an Environmental Management and Information System (SIGA) including a Geographic Information System (GIS) and site-specific monitoring; and (c) develop and implement improved and systematized public consultation and information processes under the responsibility of the newly created Community Relations Unit.

(iii) *Strengthen environmental management in the mining sector.* This subcomponent would fund the promotion of good environmental practices more broadly in the mining sector by strengthening the environmental entities in the two key national agencies involved in the sector, (i.e., the Secretariat of Mining and the Secretariat of Environment) and selected provincial mining and environmental agencies; specific activities would cover a range of technical assistance topics related to environmental risk and risk management, such as: (a) good practice for closings of both uranium mines and other minerals, in such areas as: tailings dumps and tailings dam restoration, land reclamation, and processing liquid and solid waste remediation; this subcomponent could include study tours and elaboration of a best practice manual based on the Malargüe experience; (b) completion of general baseline surveys and site-specific baseline data requirements for on-going monitoring and compliance; handling and treatment of mine tailings and effluents for operating mines; design of monitoring and control mechanisms; and early-warning impact evaluation methodologies and more detailed impact evaluations as part of site-specific risk analysis; and (c) public awareness and communication strategies concerning sustainable mining practices, such as land use management, risk management, community consultation, and public disclosure of data from site remediation monitoring.

16. **Component 3. Project Management.** (Appraisal Cost: US\$ 1.25 million; Actual Cost: US\$ 0.24 million). The project implementation unit of the GP would be responsible for project implementation, reporting, monitoring, and impact evaluation of key interventions.

⁷ In addition to Malargüe (Mendoza), the other sites included: (i) Huemul (Mendoza); (ii) "El Chichón" (Córdoba); (iii) Los Gigantes (Córdoba); (iv) Tonco (Salta); (v) Pichiñán (Chubut); (vi) Los colorados (La Rioja); and (vii) La Estela (San Luis).

⁸ The members of this group were expected to come from Australia, Canada, Europe (Germany, Spain) and the United States.



B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

17. The project's development objectives were not revised during implementation. However, the outcome targets were changed due to the revision of the PDO indicators. The table below reflects the key revisions to the PDO indicators undertaken during the restructurings of July 25, 2013, and of November 24, 2015. For a detailed explanation behind each of these revisions and for the modifications to the intermediate results indicators, please refer to Annex 1-B.



Revised PDO Indicators

Project Outcome Indicator	Revisions during first Project Restructuring (July 2013) <i>(US\$ 7.57 million, or 25.2 percent, of the loan had been disbursed)</i>	Revisions during second Project Restructuring (November 2015). <i>(US\$ 23.14 million, or 77.1 percent, of the loan had been disbursed)</i>
Objective/Outcome 1: <i>Strengthen the Government of Argentina’s capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments, in accordance with international best practice.</i>		
1. All potential health and economic risks associated with at least four closed uranium sites to be addressed through credible implementation, with stakeholder buy-in, of site-specific remediation plans.	Indicator dropped (as the project never intended to undertake financial remediation works in any site other than Malargüe).	
2. Measurable environmental risks reduced to acceptable levels in other sites or mining sector investments, particularly as relates to siting, monitoring and compliance, public disclosure, and management plans for future closings.	Environmental risks in other seven CNEA sites identified, management plans evaluated, disclosed and agreed with stakeholders	Environmental risks of Los Gigantes and El Cichón sites identified: baseline environmental studies completed; remediation plan consulted and agreed with authorities and engineering design completed.
		(New indicator added) 3. Environmental risks of five other legacy sites (Tonco-Salta, Pichiñan-Chubut, La Estela-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza) identified and baseline environmental studies completed.
4. CNEA laboratories receive full ISO 17025 management system accreditation for its quality, administrative and technical operations.	CNEA laboratories where PRAMU analysis (sic) are carried out implement ISO 17025 procedures for its quality, administrative and technical operations, and are accredited by COCALIN	Number of CNEA laboratories accredited ISO 17025 to monitor water, air, soil, and radiological parameters.
	(indicator added) 5. Environmental monitoring procedures for management of mining operations and/or former uranium mining sites have been	Number of governmental agencies, where legacy sites are located, trained on environmental monitoring procedures for management and supervision of



	transferred to government agencies.	mining operations or uranium legacy sites.
Objective/Outcome 2: <i>Reduce potential economic and health damages associated with a closed uranium milling site in Malargüe, Mendoza.</i>		
1. All potential health and economic risks associated with the Malargüe site reduced to acceptable and verified levels.	All potential health and economic risks associated with the Malargüe site to be addressed through the implementation of remediation plans agreed with stakeholders.	Reduced health, environmental, and economic risks associated with the Malargüe site to be addressed through the removal of the tailings according to remediation plan agreed with authorities.

Revised Components

18. The project components were not revised during implementation although at the time of the first project restructuring in July 2013 there was a reduction in size and shift of emphasis in Subcomponent 2.3 (Strengthen Environmental Management in the Mining Sector). This occurred because international and local consultants could not be hired due to local regulations, and ministry policies deterred travel by government officials. Thus, many of the initial estimated project staff and administrative costs were absorbed by CNEA, which also contributed to the reduced project management costs (see para. 20 below).

Other Changes

19. **Closing Date.** The project closing date changed four times through successive Level II restructurings: (i) in July 2013, following the recommendation of the MTR for 21 months from November 30, 2013 to August 30, 2015 on account of an initial effectiveness delay (see Section III B below); (ii) on August 28, 2015 for 3 months from August 30, 2015 until November 27, 2015; (iii) on November 24, 2015 for ten months from November 27, 2015 to September 27, 2016;⁹ and (iv) on September 26, 2016 for nine months from September 27, 2016 to June 27, 2017. Various implementation delays (see the next section) were responsible for these extensions.

20. **Reallocation of Costs.** There was also a reallocation of costs among project components, including from the Category of Contingencies (US\$ 2.77 million) to Component 1 (Remediation at Malargüe site), as indicated in the Table in section III-B below. Total estimated costs for this component increased to US\$ 18.925 million, compared with US\$ 15 million at appraisal, or by 26.2 percent. This increase was reportedly due to a re-estimation of the costs of the remediation activities at Malargüe compared with that at the time of appraisal and due to increasing costs associated with currency devaluation. On the other hand, resources from Component 3: Project Management,

⁹ It should be noted that delays occurred as a result of elections on November 15, 2015 were not known until after December 2015 and, thus, could not have been factored into the November 27th restructuring.



decreased from an estimated US\$ 1.25 million at appraisal, to US\$ 240,000 as a result of project staff and administrative costs absorbed by CNEA.

Rationale for Changes and Their Implication on the Original Theory of Change

21. The first extension was required to offset the 21-month effectiveness delay as well as to guarantee that the ongoing works at Malargüe could be completed and to ensure that all associated environmental and human health risks would be permanently addressed. The second extension for three months, from August 30 to November 27, 2015,¹⁰ was needed in order to provide additional time to progress towards completion of three delayed activities: (i) Malargüe remediation works; (ii) deployment of the Environmental Monitoring System Management Tool (SIGA); and (iii) capacity building for provincial authorities. This extension would also enable the implementation unit to address key issues such as a pending financial audit, allow the Task Team to closely monitor the first state of the client's action plan and to assess its feasibility in order to consider a further extension of the closing date of nine months, which would require the Regional Vice President's approval.
22. The third extension, from November 27, 2015 to September 27, 2016, occurred in response to a formal request from the GoA on October 22, 2015 in order to allow the project to successfully complete remediation of the Malarque site which had suffered implementation delays¹¹, as well as to provide additional time for completion of: (i) the creation of a public (green) space in Malargüe; (ii) final deployment of the SIGA system; and (iii) the institutional strengthening plan for provincial authorities. The fourth extension, from September 27, 2016 to June 27, 2017, was due to the impact of national, provincial, and municipal elections in October and November 2015, which led to significant institutional changes (government took office on December 10, 2015). As a result of the time and administrative processes required for the new government to settle in, there were additional delays in project implementation.¹² None of these extensions had implications for the original theory of change, which remained valid despite the implementation delays and shift in focus of and rationale for the institutional strengthening component described immediately below.
23. The first Restructuring Paper also argued that the situation at the subnational level was very different in that the need for capacity building of provincial agencies were "acute" and, thus, the impact of institutional strengthening activities was expected to be more important. In addition, there has been considerable demand for such support with respect to environmental management, monitoring, laboratory technologies, risk management, among other

¹⁰ As stated in the Project Restructuring Paper dated August 28, 2015, this second extension would bring the total accumulated extension period to 24 months.

¹¹ More specifically, this extension was expected to make it possible to: (i) complete the removal and transportation of contaminated soils to the remediation site; and (ii) build the final layer to close the encapsulation cell.

¹² Between November 2015 and March 2016 no new payments were made from Bank funds to the contractor for the remediation works at Malargüe (encapsulation of contaminated uranium mining tailings). This financial situation has caused delays in the completion of the remediation works and completion of other activities from Component 2.



areas. Thus, under the restructured project, it was proposed that priority would be given to strengthening provincial level capacity for overall environmental management and that the results indicators would be adjusted to reflect this shift in emphasis under Component 2.

24. The theory of change was affected, however, in the following ways after the first restructuring. While the original key project desired outcomes remained the same (as the project objectives were not revised), there were changes in the intermediate outcomes as indicated in the Table above. The initial intermediate outcome for key outcome (i) (i.e., “all potential health and economic risks associated with at least four closed uranium sites addressed through credible implementation...”) was dropped because it was never intended for the project to finance remediation works in any site other than Malargüe and thus this intermediate outcome and its associated indicators had been incorrectly included in the original Results Framework. Similarly the wording of the second intermediate indicator for this outcome was revised to state “environmental risks in seven other CNEA sites identified, management plans evaluated, disclosed and agreed with stakeholders.”¹³ The third intermediate outcome was also clarified and made more specific at the time of the first restructuring by being restated as “CNEA laboratories where PRAMU [i.e., the project] analysis (sic) are carried out implement ISO 17025 procedures for its quality, administrative and technical operations and are accredited by COCALIN.”¹⁴ A new intermediate outcome was also added by the first restructuring to replace the one that had been dropped. It stated: “environmental monitoring procedures for management of mining operations and/or former uranium mining sites have been transferred to government agencies.”¹⁵ As regards the intermediate outcome for key desired outcome (ii) the language was also modified at the time of both the July 2013 and November 2015 restructurings to read, in the former instance, “all potential health and economic risks associated with the Malargüe site to be addressed through the implementation of remediation plans agreed with stakeholders” and “reduced health, environmental, and economic risks associated with the Malargüe site to be addressed through the removal of tailings according to remediation plan agreed with authorities.” The original theory of change and the revised theory of change based on the final restructuring are displayed in Annex 6-B.

¹³ As also indicated in the text Table above, the wording with regard to this intermediate outcome was revised once again at the time of the November 2015 restructuring to “environmental risks of the *Los Gigantes* and *El Cichon* sites identified, baseline environmental studies completed; remediation plans agreed with authorities and engineering design completed,” thereby adding for 2 of the 7 sites the completion of baseline environmental studies completed, remediation plans consulted and agreed with authorities, and engineering design completed. A new indicator was also added at the time of the November 2015 restructuring to the effect that environmental risks of the other five legacy sites were identified and baseline environmental studies completed. These indicators were more specific than the initially revised one with respect to the intermediate outcomes and associated outputs expected to be achieved at the various CNEA sites.

¹⁴ COCALIN refers to the national Qualification Committee of Laboratories and Nuclear Facilities in Argentina. This intermediate outcome was also revised at the time of the November 2015 restructuring to read “number of CNEA laboratories accredited ISO 17025 to monitor air, soil, and water parameters,” again in order to add greater precision to what was actually expected to be achieved.

¹⁵ This intermediate outcome was also further revised by the November 2015 restructuring in order to make its achievement more readily measurable to read “number of governmental agencies where legacy sites are located, trained on environmental monitoring procedures for management and supervision of mining operations or uranium legacy sites.”



II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

25. The project's objectives were relevant at the time of appraisal and remain substantially so today notwithstanding the project's success in remediating environmental contamination at the former Malargüe uranium site. The PDO is consistent with the global environmental agenda. The most recent World Bank Group Country Partnership Strategy (CPS) for FY 2015-2018, issued in August 2014, highlights deteriorating environmental quality as a continuing development challenge in Argentina stating more specifically (para. 13c, pg. 7) that "environmental and natural resources degradation undermine sustainable growth in a resource-based economy, affecting particularly the poor" and that "the total cost of environmental degradation amounts to about 7 to 8 percent of GDP." While not specifically mentioning contamination from closed or active mining/legacy sites, it nonetheless observes that "the economic cost of damage from environmental health problems associated with urban and indoor air pollution, noise, inadequate water supply, and sanitation and hygiene are equivalent to about 3 to 4 percent of GDP." In response, the CPS (para 82, pg. 30) includes "reducing environmental risks and safeguarding natural resources" as one of its three broader themes.¹⁶
26. On the GoA side, in turn, the most recent CPS notes (para. 66, pg. 27) that a "unified environmental strategy" was under discussion with a focus, *inter alia*, on the environmental management of energy, mining, oil, and gas.¹⁷ The project's objectives also remain relevant in the sense that a need remains to carry out similar remediation works at the other seven legacy sites and the experience garnered under the project, as well as the associated capacity building and training activities it provided, will be of direct relevance for these future activities whether supported with international resources or financed with domestic sources alone. The Bank Group's previous CPS covering the 2010-2012 period and issued in May 2009, moreover, specifically referred (para. 53, pg. 16) to the Government's having "embarked on an ambitious program in support of the *brown* environmental agenda (water pollution and solid waste management in particular as well as the remediation of improperly closed uranium mining and milling sites)," with "brown" referring specifically to concerns with pollution reduction and control and improvement in environmental health. The relevance of the project's development objectives, accordingly, is rated **Substantial**.

¹⁶ The other two themes were: (i) employment creation in firms and farms; and (ii) availability of assets for people and households.

¹⁷ The other focal areas of this strategy are: (i) urban issues and solid waste management; (ii) a new federal environmental agreement that updates the role of COFEMA (the Federal Environmental Council) and identifies national priorities; and (iii) the transfer of funds from the federal to provincial governments in the context of the native forests law.



B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

Objective 1: Strengthen the Borrower's capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments, in accordance with international good practice.

27. Achievements in relation to this objective were **Substantial**. At the time of project closing, capacity to assess and mitigate environmental risks associated with uranium mines had been strengthened as evidenced by CNEAs (and provincial governments) ability to identify and act upon identified risks, develop and analyze technical data which was previously inexistent, undertake systematic monitoring of environmental quality at legacy sites. CNEA and provincial governments have been trained to follow IAEA's international best practice on procedures and protocols and standards on monitoring and managing environmental risks associated to uranium mines and legacies.
28. Capacity enhancement were further evidenced through the fulfillment of the following indicators: (i) identifying environmental risks, presenting and consulting remediation alternatives with local governments, and developing environmental baseline studies and engineering designs for Los Gigantes and El Chicon sites (met by 100 percent); (ii) identifying the environmental risks and developing environmental baseline studies at five additional legacy sites (met by 100 percent)¹⁸; (iii) CNEA laboratories at San Rafael; Cordoba; Mendoza; & Ezeiza have been fully equipped and accredited by ISO 17025 and currently have the recognized quality and capacity to monitor water, air, soil and radiological parameters (met by 100 percent)¹⁹; (iv) 12 provincial agencies (where legacy sites are located) have received training on environmental monitoring procedures for management and supervision of mining uranium operations (met by 100 percent).
29. In addition, the following *intermediate indicators* have been met: (i) soil and water samples have been systematically collected as part of the environmental, physical and radiological monitoring plan followed quality assurance and control procedures in the field and in CNEA's laboratories; (ii) mining environmental legacies baseline studies have been undertaken at seven uranium mining sites and monitoring reports on environmental conditions, levels of pollution and radiation, topographical and groundwater analysis have been undertaken; (iii) CNEA laboratories have been fully equipped and have installed capacity to monitor key environmental/radiological parameters on soil and water; (iv) six key training modules (in addition to technical assistance and capacity building workshops) have been delivered²⁰; (v) guidelines, manuals and monitoring protocols and plans developed

¹⁸ The additional sites included Tonco-Salta, Pichiñán-Chubut, La Estelsa-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza

¹⁹ ISO 17025 is the standard for which most labs must hold accreditation in order to be deemed technically competent to meet the requirements for the competence of testing and calibration.

²⁰ Beneficiaries of the workshops and training modules included the Nuclear Regulatory Authority (ARN); the Environmental, Irrigation, Water and Mining Agencies from the Mendoza Province; the Environmental and Public Works Secretariat from the



(particularly manuals on the protocols for environmental quality monitoring, guidelines for quality assurance on the analysis of samples from the laboratories, manuals with protocols for the remediation of legacy sites which are consistent with IAEA standards); and (v) the SIGA was completed and is fully functional at PRAMU sites, providing live environmental and radiological data to decision makers. In addition, the project succeeded in undertaking some important communication campaigns and established a dialogue with local government on tailing remediation. The project also succeeded in placing the remediation of mining legacies in the priority list of local and provincial governments and they were exposed to international best practices to manage, monitor, and control these types of legacies in order to reduce their environmental impact and risk to public health.

30. Even though CNEA was not able to establish the proposed independent advisory panel as initially planned due to contractual regulations of the Ministry of Energy and Mines (initially the Ministry of Planning and Public Works) to which is affiliated, the overall capacity building at CNEA (and key provincial agencies) was not affected since through CNEA's relationship with the IAEA (and through some financing from the Bank), it was able to arrange for its establishment with the participation of international and national experts at no cost to the project. This panel was therefore structured by highly qualified international nuclear experts from the International Atomic Energy Agency (IAEA) and Argentinian experts who agreed to work voluntarily to support the project. The panel travelled and reported on its visit to Malargüe and Los Gigantes, another site requiring remediation. In particular, the panel provided valuable feedback and technical advice on the work at Malargüe and for future remediation works elsewhere. The IAEA has also been involved in training activities and other efforts to strengthen the capacity of the provinces to monitor and remediate the uranium legacy sites in the country.
31. According to an IAEA expert mission report (April 2016) that assessed the project's progress, CNEA has followed and adopted international standards and best practices. The IAEA experts also recognized the overall level of expertise acquired by CNEA specialists not only in the implementation of the remediation plan at Malargüe, but in its ability to characterize, control and identify options to the legacy sites. At the end of the project, CNEA and provincial agencies (where legacies are located) are better prepared to address the environmental challenges from uranium mining legacies and, as evidenced by the works at Malargüe, have the capacity to undertake remediation activities, which in turn can contribute to improving overall public confidence in carrying out its responsibilities.

Objective 2: Reduce potential economic and health damages associated with the Malargüe site.

32. Achievement of this objective is rated **Substantial**. Baseline reports undertaken during project preparation (December 2006) revealed that radon exposure from plumes of the untreated uranium tails could reach as far as 2.5 km (About 70% of the town's population resides within 6 km of the tailings)²¹. These studies also indicate that the

municipality of Malargüe; the environmental, mining agencies of the province and municipality of Cordoba. About 80 staff from these agencies have benefited from the training modules which have been delivered with support of the IAEA on planning and management for the remediation and monitoring of uranium remediation sites.

²¹ Radon is a radioactive, colorless, odorless, tasteless noble gas, occurring formed as part of the normal radioactive decay chain of uranium into lead (Pb), and is considered to be a health hazard due to its radioactivity. Radon concentration is usually measured in the atmosphere in becquerels per cubic meter (Bq/m³), which is an International System derived unit. As a frame



population directly exposed to the site and its plume could be at risk of gamma ray radiation and contamination from Radon 222 inhalation²². The report concluded that the tailings emit Radon and Gamma radiation at levels that if a hypothetical group would be residing permanently at the perimeter of the site, would be exposed to unallowable doses. Likewise, if a hypothetical population group resided permanently at the site’s perimeter it would be exposed to an annual radon dose of 5-6 mSv/year²³. The study also disclosed that that surface and shallow groundwater systems, had traces of uranium contamination from the untreated tailings, and at the NE part of the site have been contaminated by anions and cations leached from the tailings, and the evaporation of this water from the seasonal marsh skirting the tailings caused a buildup of soil salinity and uranium contents. These studies basically concluded that the radioactive residues at Malargüe would pose a radiological risk only to a hypothetical group that would choose to live in proximity or at the site’s perimeter, but not to occasional visitors. On the other hand, in spite of the plume’s reach, the radiological effect on the town’s population was considered low.

33. CNEA latest Technical Environmental Monitoring Reports (2016-17) reveal through multiple samples at Malargüe that the radon, gamma ray and pollution parameters tested for air, water, soil, and households have been contained to below the permissible international (US-EPA) and local levels (see table below) thereby controlling the contamination exposure to the nearby population. In addition, the testing reflected that Radon levels in tested households were below the 400 Bq/m3 norm from the ARN. In addition, the testing done to CNEA workers at the Malargüe site (through semester blood and weekly urine samples) reveal that radiation levels were under the norm²⁴.

Factor	Baseline	At Project Closing	Standards used
Air	Radon emissions from tailings: 6-10 Bq/m2s.	Radon emissions from managed tailings averaged from 0.13-0.29 Bq/m2s not surpassing the 0.74 Bq/M2s limit. Monthly Total suspended particles did not surpass the 150 µg/m3 limit.	0.74 Bq/m2s (US EPA) & 150 µg/m3 limit for TSP under national law.
Water	Phreatic aquifer is contaminated, primarily beneath the tailings. Tailings underlain by permeable (10-3 cm/s) substrate. Ra-226 content in aquifer underneath the tailings: 0.684 Bq/l.	Quality of phreatic aquifer waters improved through the encapsulation of the tailings and natural decontamination of the area to below 0.18 Bq/l.	Ra-226: 0.185 Bq/l (US EPA).
Soil	Soils at the sites are contaminated by Ra-226, with values of 30 – 100 pCi g-1.	Site decontaminated to achieve Ra-226 soil contents not to exceed 5pCi g-1 above background.	Ra-226 in soils of remediated areas: not to exceed 5 pCi g-1 above background.

of reference, typical domestic exposures are about 100 Bq/m3 indoors and 10-20 Bq/m3 outdoors. In the US, radon concentrations are often measured in picocuries per liter (pCi/l), with 1 pCi/l = 37 Bq/m3.

²² Low levels of gamma rays cause a stochastic health risk, which for radiation dose assessment is defined as the probability of cancer induction and genetic damage.

²³ For reference, the maximum allowable dose mandated by ARN (Mandatory Standard RQ-86) is only 0.1 mSv/year.

²⁴ The Basic Norm of Radiological Safety establishes that the highest yearly doses should not exceed 20mSv/year. During 2016 the highest recorded level for one worker was 0.9mSv/year.



Landscape	Landscape adversely affected by the presence of unmanaged tailings and soils impacted by industrial activities.	Landscape restored, by planting autochthonous woody and herbal species following restoration.	-
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34. Independent evaluations from IAEA (April 2016 and October 2017) concluded that the works at Malargüe have been undertaken following IAEA’s safety standards, and a technical inspection carried out by the Bank during the last supervision mission in June 2017 confirmed that 100 percent of the tailings at the Malargüe site had been transported to the remediation site -- i.e., the engineered encapsulation cell -- and that closure of this capsule was fully complete. As a result, the source of contamination and the associated public health risks in the project area have been significantly reduced, as verified through the detailed monitoring program of physical, environmental, and radiological parameters at the site which, by project closing, reveal that pollution/radiation levels have been contained and did not surpass the local (and international) permissible levels and standards²⁵.
35. The project did not carry out a public health baseline (nor periodic sampling of the population during implementation) to determine radiation/pollution exposure levels. Nonetheless, it can be concluded through the radiation parameters monitored on the air, water, soil and through the health samples of CNEA’s workers at the site, that the project has had a decisively positive impact on public health of the Malargüe community by controlling a legacy that for the past 50 years had contaminated land, water, and air in the vicinity of the former milling site. Furthermore, it can also be concluded that the objective which is referred to in the PAD as “potential economic and health damages” should more appropriately be interpreted as “potential economic and health *risks*” (particularly since one of the key indicators refers to: “All potential health and economic risks associated with the Malargüe site reduced to acceptable and verified levels). This is a quality at entry shortcoming, especially since neither baseline nor ex-post project impact data exists with respect to the reduction of economic and health damages due to contamination at the Malargüe site, and thus, it is only possible to assess the project’s results in terms of the elimination/reduction of potential economic and health risks as a result of the remediation of the contaminated site, which are expected in the longer term to lead to reduction in potential economic and health damages.
36. While at time of appraisal economic activities in Malargüe included summer and winter sport tourism, light industries, and the production of highly regarded potato seedlings that supply some of Argentina’s major urban centers (employing about 800 workers and accounting an annual revenue of US\$1.8M), the economic impacts associated to the pollution from uranium milling site were not estimated at appraisal nor monitored during implementation. It could be concluded, nonetheless, that in addition to human health and safety and environmental benefits that would improve the quality of life and the economic benefits to the population of Malargüe, the effective containment and greening of the site would also help the local economy, which is heavily dependent on tourism and on the wide marketability of local potato seedlings. Reducing the perceived dangers of radioactive contamination is likely to bring additional benefits which could also include new employment

²⁵ The contract with the contractor was amended in April 2017 in order to finalize minor works of site clearing and technical closure of the works. Even though there were some implementation delays as observed above, the civil works for the park at Malargüe were completed by the time of project closure.



opportunities and a greater demand for products and services in the area.

37. According to the legal agreement, CNEA will have to continue the environmental monitoring program for 20 years (see also risk to development outcome below). This is the first uranium remediation project that is successfully completed in Argentina and is expected to serve as a model for the remediation of other contaminated sites in the country and elsewhere in Latin America.
38. In spite of the shortcomings of monitoring health and economic impacts associated with the remediation of Malargüe, given the reduced exposure to pollutants and radiation and its associated health and economic benefits, it can be concluded that this objective had been substantially met.

Justification of Overall Efficacy Rating

39. The overall Efficacy Rating is **Substantial** considering that both project objectives were met and accordingly are both rated Substantial.

C. EFFICIENCY

Assessment of Efficiency and Rating

40. Because it was not possible to undertake a cost-benefit approach due to the inability to clearly quantify project benefits, the PAD utilized a comparative least-cost approach to assess the efficiency of the investment in Malargüe. According to this source, the estimated investment cost to achieve the imposed standard of remediation at the time of appraisal was US\$ 16.2 per ton of tailings. Data for other countries indicated an average of about US\$ 16 per ton. Thus, the design for the Malargüe works was considered to be within the range of unit costs for similar projects internationally. The same comparative least-cost approach applied in the PAD is also used in this assessment, although several important adjustments first need to be made (see Annex 4 for additional information).
41. Based on revised remediation costs at the time of the first restructuring in July 2013, the total cost of Component 1 was increased by US\$ 3.925 million. This revised component cost, however, also included US\$ 1.2 million for development of a park at the Malargüe site, which had not initially been included at appraisal. The revised estimated remediation cost was thus increased to US\$ 20.475 million. This also raised the estimated unit remediation cost to roughly US\$ 28.8/ton based on the assumption that the total amount of material to be removed was 710,000 tons and correcting for an initial underestimation contained in the PAD.
42. It is not possible to directly compare the (appraisal or revised) estimated unit remediation costs with the actual remediation costs, however, because the actual quantity of contaminated materials moved and stored from the Malargüe site was measured in cubic meters (m³) rather than tons. According to the project team, the total amount of materials actually moved during project implementation was 801,520 m³, of which 652,910 m³ were safely removed and stored in a sealed enclosure and 148,610 m³ were for soil remediation at the site itself. This



represented a 14.5 percent increase in the actual volume moved during project implementation compared with that first estimated in the contracts (700,000 m³).

43. It is possible to compare, however, the revised estimated remediation costs at the time of the first restructuring divided by the initially estimated volume of materials to be moved according to the contracts, or US\$ 29.25/m³, with the actual remediation costs (US\$ 21.03 million, once the US\$ 1.2 million for the park is deducted from the total actual costs of Component 1) by the actual volume of contaminated materials and soils removed and safely stored. This yields an average unit cost of US\$ 25.95/m³. Thus, the increased actual remediation costs were largely due to the increased volume of material that had to be moved. It also suggests that implementation of the project's remediation component with respect to the use of project resources was efficient. At project completion, the actual remediation costs represented 58.7 percent of total project costs. In addition, actual project management costs were considerably lower than those estimated at appraisal (US\$ 240,000 compared with US\$ 1.25 million). Even though this reduction was partly due to CNEA's inability to hire external consultants, this nevertheless suggests considerable project administrative efficiency.
44. Only a few other Bank projects have sought to remediate contaminated uranium mining sites. However, for purposes of comparison, the ICR for one such operation, the Disaster Hazard Mitigation Project in the Kyrgyz Republic, which had a uranium mining waste isolation and protection component, reported an average cost of US\$25/m³ for the remediation of tailings materials. This is very similar to the actual average unit remediation cost found for the Malargüe site. Nonetheless, these costs may not be directly comparable because, for other such projects there has been a broad range of remediation costs, averaging between less than US\$24 to around US\$225/m³, according to the same source. This very wide range of average costs is attributed to economies of scale in large projects, complexity of the site and location of materials to be remediated, and the varying nature of national regulations. This variability notwithstanding, the average remediation costs for both the Kyrgyz and Argentine projects fall at the lower end of the range.
45. On the other hand, project implementation took much longer than anticipated and the closing date had to be extended four times for a total of 43 months. This was due in part to the 21-month loan effectiveness delay and partly to chronic delays in the receipt of Government project funds. However, there were also indications of inefficiencies on the part of the contractor selected to implement the civil works at the Malargüe site as well as delays in the final deployment of the project's Environmental Monitoring System Management Tool (SIGA). For these reasons, project Efficiency is rated **Modest**.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

46. The relevance of project objectives is rated **Substantial** as it is relevant to the World Bank Group Country Partnership Strategy (CPS) for FY 2015-2018's objective of "reducing environmental risks and safeguarding natural resources." The two objectives are rated Substantial (increased Government ability to assess and mitigation environmental risks associated with legacy uranium mining sites) and **Substantial** (Reduce



potential economic and health damages associated with the Malargüe site), respectively, resulting in an overall Efficacy rating of **Substantial**. However, project efficiency is rated **Modest**, resulting in an overall project outcome rating of **Moderately Satisfactory**.²⁶

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

47. The project did not specifically have a gender dimension. However, about 50% of the consultations done in Cordoba for the remediation of the Chichon and Los Gigantes, as well as the design of the green space in Malargüe included women. Furthermore, by significantly reducing local public health risks, it has likely had a positive impact on some vulnerable women as, in a somewhat similar project in Zambia for example, pregnant women and their unborn children were found to have been more at risk to exposure from pollutants associated with mining activities than other local populations.

Institutional Strengthening

48. As indicated in paras. 21-22 above, the project successfully carried out its proposed institutional strengthening activities and substantial achieved its objective in this regard both in relation to CNEA and at the provincial and local levels. More than 10 agencies at the federal, provincial and local level (including the provincial environmental, mining, water and irrigation, and municipal public works agencies of Mendoza, Malargüe, and Cordoba) benefited from the training modules. With regards to project-sponsored training events, all those planned were implemented since the beginning of the project and June 2017, including exchanges of government authorities from Cordoba with San Rafael, and technical visits from environmental authorities of the five provinces to the Malargüe site. In addition, CNEA organized workshops with the IAEA for government officials. In addition, in spite of the change of focus from building capacity from the federal level to the local/provincial level, the Ministries of Environment and of Mines were also beneficiaries of the technical trainings that were provided under the project. Furthermore, through: (i) the development of the SIGA (and the equipment acquired for monitoring environmental quality); (ii) strengthening of the CNEA laboratories; (iii) the development of baseline studies and remediation action plans, the overall institutional capacity has been strengthened.

²⁶ A split evaluation was not undertaken as the project scope did not change and revisions to the outcome indicators were not substantial to warrant a split rating.



Mobilizing Private Sector Financing NA

Poverty Reduction and Shared Prosperity

49. While explicit linkage to poverty reduction and shared prosperity was not established at appraisal, and the impacts of the project on poor communities has not been established nor monitored during implementation, it is expected that the reduction in radiation and pollution exposure at the Malargüe site has reduced the health risks and burden on the population as a whole, including the very poor which often lack the resources to treat and address any health-related impact. The project has also resulted in improved quality of nearby surface and ground water and sharply reduced the potential contamination risk for local agricultural production.

Other Unintended Outcomes and Impacts NA

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

50. Project preparation began by the Bank and by the Environmental Management Unit (GP) within CNEA in 1998. The GP has administrative and technical coordination sub-units under the supervision of a general coordinator. The GP coordinated the preparation of the project's EIA, the operational manual and Project Implementation Plan (PIP), including the terms of reference and technical specifications in particular concerning the Malargüe works for the first year of implementation. Project preparation was financed by CNEA with the support of two Project Preparation Facilities (PPFs) of US\$ 400,000 each. The two PPFs (approved on 2001 and 2005) facilitated preparation arrangements as follows: (i) the GP unit was established; (ii) key technical studies were undertaken; (iii) basic office equipment was purchased; (iv) the EIA and EMP, and operational manual were prepared; and (v) key safeguard related consultations were undertaken at Malargüe. In addition, the coordination unit established through the PPFs, continued to operate through appraisal and project implementation. During project preparation, the GP had already been applying Bank-approved FM and procurement procedures, through the administration of the PPF funds, reflecting government commitment to the project and minimizing implementation risks. While the implementation of the two PPFs contributed in familiarizing the GP unit at CNEA with certain Bank policies, procedures and documents, nonetheless, there were a number of complications recorded with the implementation of the two facilities. And despite these investments and Bank exposure, CNEA lacked the capacity to undertake a seamless bidding process for the Malargüe remediation leading to substantial delays



in contracting.

51. Also, before appraisal, CNEA has already begun implementation of remediation activities at the Malargüe site, highlighting a key reason for the selection of this location to be covered under the project. Based on this, the Bank team, hired an international expert in 2007 to conduct a technical assessment of the adequacy of the design and implementation of the remediation activities. The assessment confirmed that the proposed remediation plan for the Malargüe site was sound and realistic, and concluded that project remediation activities conducted to date had been executed in accordance with the proposed design. Thus, the proposed objectives set forth during project preparation while ambitious (since this kind of remediation had not been undertaken in the country), had technical realism.
52. A number of lessons from other projects and experiences worldwide were considered during preparation. For instance, in designing the remediation option for Malargüe site, lessons learned were incorporated from past domestic remediation activities of mining sites, drawing on the expanding international experience with respect to environmentally appropriate closure of uranium mines in Canada, (Lake Elliott, Saskatchewan), Germany (the WISMUT restoration program) and the U.S.A (the UMTRA program).
53. Consultation within the framework of project preparation was carried out mainly in relation to the development of the Environmental Assessment, dealing with the objectives and planning of the uranium restitution program. A Project Monitoring Committee was set up in 2001 to (i) provide a forum for information and suggestions, (ii) discuss the design of participatory mechanisms to be applied during project preparation and implementation, and (iii) monitor project activities, mainly with respect to consultation and decision-making processes. The initiative started with the participation of NGOs at a national level (including Greenpeace, Friends of the Earth, and others), as well as institutions directly involved in the project, including ARN. These consultations often raised concerns/criticism and had a negative effect for CNEA causing delays in the project implementation. While ample work was done to have a number of key technical and feasibility studies ready by appraisal, a number of baseline studies (health and economic impacts) that would strengthen the capacity to assess the PDOs were not developed.
54. Among the risks identified at appraisal, few materialized particularly with regards to the Argentina budget constraints. The risk that the project would not be prioritized by GoA (leading to implementation delays), or that the Ministry of Finance would not transfer resources to the project (the only operation under implementation at the time with that problem) were not foreseen.
55. In spite of certain readiness at CNEA, changes in strategic and budgetary priorities at the executive level (Chief Cabinet of Ministers and Ministry of Economy) was identified as the key factor leading to implementation delays (21 months). In spite of communications and insistence from the Bank, GoA deferred the effectiveness signing of the loan from July 31, 2008 (Approval) to April 28, 2010.



56. As highlighted in the Section II-C above, there were initial miscalculations of costs at time of appraisal (particularly for component 1) which compounded with the currency fluctuations after effectiveness, led to a number of amendments to the contract for the remediation works. In addition, a weak and unclear results framework (and M&E system) at appraisal led to two restructurings during implementation.

B. KEY FACTORS DURING IMPLEMENTATION

57. **Delay in Implementation of Remediation Works.** Slower than anticipated implementation of the remediation works at the Malargüe site was due to the following:

- (i) The decision not to prioritize the signing of effectiveness due to economic and political reasons led to delays in launching the bidding process and delays in beginning the remediation works;
- (ii) Due to the technical complexity and initial issues related to the fiscal capacity of the contractor, the remediation works in Malargüe did not begin until January 25, 2012, resulting in slow disbursement rates during the first three years of project implementation. At the time of the Project's MTR (December 2012), disbursement was only 12 percent (or US\$3.6 million);
- (iii) Periodic changes at the national government led to transitional periods that included new administrative procedures and budget limitations, which in turn delayed the approval of the Project's budget. During these episodes, CNEA was able to make only partial payments (through counterpart funds) to contractors in order to maintain a minimum level of activities. This prompted the need for extensions to the closing date;
- (iv) Currency fluctuations and inflation led to an amendment to the contract;
- (v) Continued delays in the provision of project and counterpart funding by the federal government; and
- (vi) Climatic conditions (periodic high winds, rain and snow) which often restricted the time when works could be undertaken.

58. While, at the time of the third extension, it was estimated that seven months would be needed to complete these works, another three months were added as a precautionary measure in the case that any additional climate-related delays occurred. In addition, implementation was slowed due to the strict radiological measures established by the national nuclear regulatory agency (ARN) and the Bank.

59. **Decision to Build a Public Green Space in Malargüe.** As part of the mitigation measures at the legacy site, following the MTR the municipality and CNEA agreed to build a public green space in a non-contaminated area adjacent to the Malargüe site based on a design proposed by local citizens (the EIA suggested the development a public/recreational space). The estimated time required to complete the bidding (valued at US\$1.2M) and construction of the park was seven months and the team took the risk to approve its construction considering the positive social impact that this would represent to the community (reducing local concerns towards the legacy site) and to the local government.

60. Government authorities changed three times, including through a Presidential election (November 2015).



This led to internal procedures which had repercussions and delays (e.g. adding about 10 months without a budget line from the government) in the implementation and affected the flow of project and counterpart funds to CNEA. While this election entailed a change of administration, the technical and administrative project team at CNEA were not affected.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

61. According to the PAD (para. 34, pp. 12-13), a monitoring and evaluation (M&E) system had been designed to assess progress toward the achievement of the PDOs and indicators, and benchmarks had been defined and referred to in the Loan Agreement²⁷. In spite of these measures, due to the poor quality of the Results Framework, a number of the original outcomes indicators did not reflect what the project was actually intending to do and thus were inadequate. For example, the first two original outcome indicators referred to the implementation and results of the implementation of remediation actions at sites other than Malargüe, which were never intended to occur as part of the original project design. Thus, the associated monitoring framework was also inadequate and needed to be revised during the MTR and formalized at the time of the first project restructuring in July 2013 and later in the third restructuring (2015). Thus, there was a clear disconnect between the Results and Monitoring Frameworks included in the PAD and what the project sought to do in its Component 2. This was a M&E design shortcoming. On the other hand, the M&E design included other instruments that enhanced monitoring and supervision such as the formation of a National Steering committee, a Social Fora and the development of the SIGA.

M&E Implementation

²⁷ The M&E system included the following components: (i) CNEA would submit quarterly progress reports to the Bank covering all project activities, including procurement and a financial summary report; (ii) joint CNEA and Bank reviews would be carried out at least on a semi-annual basis starting six months after effectiveness (these reviews would provide detailed analysis of implementation progress toward the PDOs and include an evaluation of financial management and a post-review of procurement activities); (iii) CNEA had established and published a policy committing to regular provision of information and communication of environmental results; an Environmental Information and Management System (SIGA) would be established by the project to provide internal and public reporting on progress toward the project's overall environmental objectives; and (iv) various oversight structures, including a National Steering Committee, an International Advisory Group (IAG), Technical Working Groups, and Social Fora would monitor implementation progress as well, while CNEA's Community Relations Units would disseminate information regularly on project advances.



62. As indicated above, the M&E system was not fully implemented as designed. The project collected data as per agreed protocols to monitor the environmental conditions of the risk associated in the Malargüe area (to public health and workers in the contaminated area) and in the other 7 seven legacy sites. The project collected systematically data on more than 50 parameters including air, water, soil and radiological levels in about more than 50 sites across the 8 sites in five provinces participating in the project. However, there were some shortcomings in its implementation, particularly because CNEA did not submit the quarterly progress reports. Nonetheless, there were other means (missions, joint country portfolio performance reviews, and data produced by the project), which helped to implement in principle the M&E system and which allowed for both, the Bank and the client, to keep abreast of key issues related to project implementation.
63. In addition, the PDO and intermediate results indicators had to be modified twice through project restructurings during implementation (i.e., in July 2013 and November 2015, respectively) in order to clarify the relevance to actual project design and its constituent activities, which remained essentially unchanged from the outset. These changes improved the precision of project management's and Bank efforts to monitor actual implementation progress and likelihood of achieving the project's development outcomes, which likewise did not change during its execution.

M&E Utilization

64. While the quarterly progress reports covering all project activities (including administrative aspects) were not submitted to the Bank as per the Loan Agreement, technical and financial information generated during the life of the project was utilized by the PIU and the Bank in order to assess and report on its progress, including with respect to counterpart funding and associated implementation delays. In addition, Bank utilized different instruments to enhance supervision and monitoring of the project results such technical and supervision missions to review technical, procurement, financial management and safeguards aspects, in order to monitor key aspects of the project. In addition, CNEA shared periodic reports on the advance of works in Malargüe, audit reports, procurement plans, environmental management reports, environmental monitoring reports. This information was used to make decisions with regards to the works of the contractors, plan international biddings, design the works of the park, coordinate consultations with government authorities of San Rafael and Cordoba, and schedule the environmental monitoring program. This monitoring and information was also used for preparation of both the Borrower's and the Bank's Implementation Completion and Results reports.
65. In addition, the project successfully implemented an environmental monitoring system and information system at the Malargüe site, which provides a model for potential similar such systems to be used for other uranium mining remediation activities at the remaining seven legacy sites in the country. While the SIGA was completed and is fully functional, sharing monitoring data on a public website has not yet materialized. CNEA has indicated that this failure was due to "technical reasons," but the underlying reason appears to be that CNEA does not consider it appropriate to share the results of radiological monitoring campaigns with the public since: (a) very few people are trained to properly interpret the raw data on radon radiation levels, which could easily lend to misinterpretations; (b) there is



an embedded institutional culture at CNEA of not sharing data with the public; (c) the CNEA website had reportedly been hacked on multiple occasions and at the time of project closing an updated website was still under construction; and (d) CNEA wants to avoid concerns due to the external criticism of nuclear energy and associated tailings. While the disclosure of such information was not required in the Loan Agreement, CNEA has indicated that once its website is operational it will publish broad parameters from the monitoring campaigns that are easier to interpret by the public. Under the project, moreover, training was provided to provincial and municipal government agencies with respect to environmental monitoring.

Justification of Overall Rating of Quality of M&E

66. The quality of project M&E is rated **Modest**. As described above the initial Results and M&E Frameworks were poorly designed (i.e., they lacked adequate key monitoring indicators for measuring PDO-related outcomes) representing a serious quality at entry shortcoming. Furthermore, quarterly reports were not submitted to the Bank in a timely manner. On the other hand, while the initial design of the project monitoring indicators was clearly inadequate and required restructuring, their quality and relevance improved during the course of implementation. In addition, the indicators (as well as technical and financial data) were ultimately utilized effectively to monitor progress toward the achievement of project outcomes over time, as well as at completion, and an important environmental monitoring system was installed and utilized at the Malargüe site in order to track progress with respect to the reduction of radiological and other contaminants due to project interventions.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

67. **Environmental**. This was a Category A project and the only policy triggered was Environmental Assessment (OP 4.01). At the time of project closing, Bank performance with respect to safeguards was rated **Moderately Satisfactory**. A thorough environmental assessment was prepared during preparation which helped guide the project on critical issues during implementation, and the planned mitigation activities and implementation of safeguards instruments were completed according to Bank policies and procedures. The Bank environmental specialists provided constant supervision and the PIU formed a team of experts and field technicians who implemented a detailed monitoring system at Malargüe, measuring air, water (uranium, heavy metals, etc.), and soil quality as well as radiological parameters such as radiation at the project site as well as in the cities of Malargüe, Cordoba, and other urban areas. The environmental specialist participated in all supervision missions and external technical consultants were hired to complement the team in supervising the civil works and the security and stability of the works. Three aspects reportedly could have been better managed, however: (i) reporting of the monitoring program, as reports were only shared with the Bank one year after the measurements had occurred, which delayed any needed response; (ii) public access to the results of the monitoring plan did not take place because CNEA was reluctant to share radiological information; and (iii) CNEA also informed the Bank very late about the claim from one neighbor who did not want his land to be cleaned by the project, even though CNEA was



eventually able to reach a voluntary settlement with the land owners (see below). Consequently, for the most part OP 4.01 was complied with.

68. With regard to environmental monitoring variables such as radiation, ground-water quality (both in the site and at the regional level), suspended particulate matter, and weather conditions affecting the works (wind speed, snowfall, rainfall), CNEA did a professional job by appointing well-trained technicians to implement systematic measurements. While the reporting of such monitoring data was weak at first, it improved gradually during project implementation. With regards to the management of waste and occupational health and safety issues at the Malargüe site, however, the contractor's performance was below standards leading to minor accidents that were reported with delays.
69. In addition to remediation of the Malargüe site *per se*, cleanup of traces of tailings on two neighboring properties on which wind and overland flow had deposited contaminated material was undertaken during project implementation. On one of these properties (*Cabañas Experimentales*), the owner voluntarily accepted the remediation of the topsoil layer and it was completed by August 2016. For the second property (*Finca Cabus*), CNEA had maintained voluntary rental contracts with the owner for several years and, at the time of appraisal, was seeking to purchase the land. This purchase did not materialize and the owner initially opposed remediation of his land, possibly seeking monetary compensation. During 2016, however, negotiations took place and the parties reached an agreement that allowed for remediation of the property prior to project closing. The Bank team reviewed this agreement and ensured that it was implemented.
70. **Social.** At appraisal, the project did not trigger any of the Bank's social safeguard policies as no involuntary resettlement or significant land acquisition was required. This indeed proved to be the case during implementation even though, as indicated in the previous paragraph, at one point purchase of one neighboring property had been contemplated, but never occurred. In retrospect, perhaps OP 4.12 should have been triggered as a social specialist had to be added to the Bank team in order to deal with this issue during implementation. As also determined at appraisal, however, no indigenous peoples were affected by the project.
71. Overall safeguards performance was adequate since: (a) Being a Category A, it required a full environmental impact assessment under OP 4.01; (b) no involuntary resettlement or land acquisition was required; (c) the Bank's environmental specialist participated in all missions and when needed, external technical consultants and a social specialist were brought on board; and (d) when an issue raised with regards to the remediation of a neighboring lot (Finca Cabus), CNEA and the Bank team properly addressed the issue and the principle of OP 4.12 was applied. Given the heavy emphasis on environmental monitoring undertaken throughout the project by CNEA, the Bank's environmental safeguards were properly applied and supervised.
72. **Procurement.** During implementation, the quality control of the documentation with respect to the acquisition processes, as well as that which sustained the evaluation of bids was not completely efficient. Frequently, when the contracts were submitted for prior no objection, they went back and forth numerous



times before the Bank was finally able to give its no objection. In all likelihood, insufficient articulation between the PIU and various departments within CNEA was responsible for some of the factors that led to these problems. In general, management of the contracts was not without challenges. Delays in payments, and slow performance of the contractor were elements that contributed to the delays in implementation of the most important civil works of the project, remediation of the Malargüe site. These problems notwithstanding toward the end of the project, performance improved once CNEA took over more effective control of the contract. The acquisition processes in general were not characterized by great complexity. The problems mentioned above did not have a significant impact on the achievement of project objectives, and thus its procurement risk was considered **Moderate** throughout the implementation period.

73. **Financial Management.** Project FM performance rating has ranged from **Satisfactory** to **Moderately Satisfactory** throughout the implementation period. The Project showed adequate FM arrangements that complied with Bank requirements. The project implementation initially developed at a very slow pace. Interim Financial Reports received by the Bank with some delays were reviewed and found acceptable. Some budgetary constraints caused delays on the remediation works payments. Extensions of the Loan closing date as well as reallocations of proceeds amongst disbursement categories were required by the client and approved by the Bank to allow CNEA to complete project implementation. Minor FM shortcomings identified during supervision missions were properly addressed by the project team and the FM agreed actions were complied with. The Project financial statements audits were carried out by Argentina Supreme Audit Institution (Auditoria General de la Nación- AGN) since project inception. Audit reports were received by the Bank with some delay but were reviewed and found acceptable. No accountability issues have arisen throughout the entire project life. The last audit report, covering the period from January 1, 2017 to the closing date, including the grace period, is expected to be submitted to the Bank not later than April 27, 2018. The last advance to the Designated Account has not been fully documented yet. It is expected that CNEA will reimburse the Bank US\$334,593 corresponding to non-executed funds.

C. BANK PERFORMANCE

Quality at Entry

74. Quality at entry is rated **Moderately Unsatisfactory** given the shortcomings with: (i) the weak M&E system; (ii) the need to substantially revise the PDO and intermediate outcome indicators following the MTR, and again at a later date, through Level II restructurings in order to improve the relevance and quality of project monitoring activities; (iii) the inadequate calculations for the remediation costs under Component 1 (which had to be amended and required reallocation of Loan proceeds); (iv) the other deficiencies with the original economic analysis (i.e., the underestimation of the average remediation cost and the use of a measure of weight (US\$/ton) rather than volume (US\$/m³) at appraisal; and (v) the failure to trigger OP 4.12 although it was later correctly applied in practice. In addition, there was also a disconnect between the way the second PDO was stated which referred to “potential health and economic damages” at Malargüe rather than “potential health and economic risks” as in the Results Framework and associated project performance indicators. However, this complex, ambitious and pioneering project,



the first of its kind by the Bank, was otherwise well-prepared and realistic from a technical perspective and its objectives and components remained unchanged during implementation except for the cost reallocation among components following the MTR and the reorientation of Component 2.3 by substantially shifting the projects initial capacity building focus from the federal to the provincial and municipal levels. The Bank also enabled two PPF advances for purposes of project preparation that contributed to the readiness of the counterparts and to the quality of the project after effectiveness even though effectiveness itself was delayed for 21 months.

Quality of Supervision

75. The quality of Bank supervision is rated **Moderately Satisfactory**. The project team was successfully able to improve the pertinence and quality of the project's results indicators. It also contributed in establishing the required International Advisory Panel when the Borrower proved unable to do so and at no additional cost to the project. Even though the Borrower expressed general appreciation for the quality of the Bank's supervision with respect to technical, financial, procurement, and safeguard issues, it also observed that the transition among the four TTLs led to continuity issues. The project's ISRs were comprehensive and highlighted the key issues for management's attention and as reflected above, the fiduciary and safeguards aspects well complied with. The Bank team also demonstrated its ability to be responsive to government and improve on project design through the incorporation of the green space under Component 1. Missions were carried out on average twice a year and the Bank team was proactive and carried out its due diligence with regards to safeguards concerning the remediation of the neighboring lot (at Finca Cabus).
76. Overall Bank supervision was adequate in that it included a balanced team in terms of skills and competencies. When key issues need to be addressed (such as the lack of funding from government), the task team relied on the CMU for support. Likewise, key consultants and technical staff (including a mining engineer and a social specialist) were brought on board to support the task team and address key challenges during implementation.

Justification of Overall Rating of Bank Performance

77. The overall rating of Bank Performance is **Moderately Satisfactory** due to the initial quality at entry shortcomings highlighted above with respect to the project's appraisal, including the economic analysis, and monitoring indicators. The latter, however, was successfully overcome during supervision although this required two restructurings (July 2013 and November 2015). Furthermore, the Bank had four TTLs during the life of the project which, according to CNEA, contributed to interruptions in operational continuity.

D. RISK TO DEVELOPMENT OUTCOME

78. As part of the project's legal agreement between the World Bank and the GOA (through CNEA), the remediation of Malargüe and other sites included in the environmental and radiological monitoring plan will have to be monitored for at least 20 years. The development of SIGA, an intelligent remote environmental



monitoring system financed by the project, will support the collection, storage, and management of the information that will demonstrate if the remediation works at Malargüe are successful over the long term. To date, the monitoring results indicate a very significant reduction of gamma radiation. In addition, the local governments of San Rafael and Malargüe have established their own procedures to monitor the remediation site with the assistance and participation of the University of Cuyo. Due to the project's activities under Component 1, CNEA's mine restoration planning and environmental management arrangements have been considerably strengthened and it has gained the experience necessary to assess risks and undertake remediation of the other seven contaminated former uranium mining or milling sites in the country once the required financial resources, whether from international or exclusively domestic sources, become available. Thus, risk to development outcome can be considered **moderate**.

V. LESSONS AND RECOMMENDATIONS

79. The key lessons and recommendations are as follows:

- **Complex remediation works need to consider exogenous factors in calculating overall contracting time.** In addition to the largely underestimated contract time for remediation works, key climatological and seasonal weather factors that affected implementation were not taken into account, leading to additional delays and the need to amend the contract multiple times.
- **Political and budgetary decisions at the federal level affecting provision of project and counterpart funding need to be properly dimensioned.** The Fiduciary Risks at appraisal did not consider that budgetary restrictions or changes in political priorities at the federal level (Ministry of Economy/Finance, Ministry of Planning/Energy and Mines), could pose one of the key challenges to project implementation. Future project should adequately identify this risk with proper mitigation measures.
- **Local regulations should be reviewed and understood during project preparation.** The project was expected to finance a panel of international experts to advise on international best practice with respect to the planning and design remediation efforts. However, due to internal contractual regulations of the Ministry of Energy and Mines (initially the Ministry of Planning and Public Works) this panel was not established as originally envisioned.
- **Currency fluctuations and inflation need to be considered as potential risks to project implementation.** The multiple currency devaluations and inflation affected the remediation works contract leading to a series of delays and contractual amendments. This fiduciary risk should be contemplated with possible mitigation measures during project preparation/design.
- **A communication strategy should be developed and applied from effectiveness and should consider institutional restrictions.** While the project succeeded in undertaking some important communication campaigns and established a dialogue with local government on tailing remediation which had not previously been done in Argentina, a broad communication strategy which considers community risk perception (vs. actual risks) and include risk management should be designed and implemented from



the outset.

- **Enhancing local ownership are key to project acceptance.** A key lesson, particularly for a sensitive project related to remediation of contaminated sites, was the incorporation of the public (green) space as a mitigation measures at the legacy site. The flexibility that CNEA, the municipality and the Bank had in incorporating a new activity is noteworthy. As a result, a general acceptance for the remediation works at Malargüe has been increased.
- **The Bank should consider further engaging in high risk-high return operations.** While the project had several shortcomings ultimately the Bank managed to support GoA in delivering the first uranium site remediation in the country setting a new precedent and model for future remediation efforts in the country. According to IAEA experts, despite all its limitations the Bank is still one of the few global institutions capable of bringing technical expertise, sound environmental and social standards, financial resources and best international practices in the remediation of contaminated sites, demonstrating that it is worth engaging in high risk – high return operations.
- **Technical criteria in the selection process for complex works should be robust and should consider implementation risks.** While the remediation works under Component 1 were concluded in a technically sound manner, the selected firm through a least cost bidding process lacked certain technical expertise (as no remediation had previously been done in Argentina). In this case, budgetary restrictions ended up affecting more the implementation of works which led to multiple amendments to the contract.
- **Relying on PPFs during project preparation was not a guarantee to ensure project readiness.** The two Project Preparation Facility (PPF) grants that were approved during project preparation were key in undertaking key studies, the operational manual, safeguard consultations, feasibility studies and for the establishment of the GP. While all this was positive and it contributed to a certain familiarity with the Bank's requirements and procedures, they were no guarantee in ensuring overall project readiness by appraisal, and thus should have been complemented with broader commitment, resources (human and financial), and capacity at the local level. The PPFs did not, for instance, contribute to building a solid baseline with regards to economic and health impacts from the Malargüe site.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: (a) strengthen Government of Argentina's capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments in accordance

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Environmental risks of Los Gigantes and El Chichon sites identified; baseline environmental studies completed; remediation plan consulted and agreed with authorities and engineering design completed	Text	0	Engineering design completed	Baseline Environmental Study completed; Remediation plan consulted and agreed with local authorities; Detailed engineering design completed	Baseline Environmental Study completed; Remediation plan consulted and agreed with local authorities; Detailed engineering design completed
		28-Apr-2010	27-Jun-2017	16-Feb-2017	29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

- 1) Environmental risks of Los Gigantes and El Chichon sites identified. This was achieved by undertaking baseline environmental studies, a legacy characterization, and through environmental legacy management studies at Los Gigantes and el Chichon. This highlighted the environmental risks



(leachate of radioactive material to the aquifer, exposure through suspended materials etc.) and potential impacts at both sites and a methodology on how to address them.

- 2) Baseline environmental studies completed. By developing environmental baseline studies, the GoA, and in particular the provincial government of Cordoba, have enhanced its capacity to understand the magnitude of the mining legacies and its associated environmental risks;
- 3) Engineering design completed: Based on the baseline studies and legacy characterization, engineering design studies (which included seismic analysis) were developed. The engineering designs outline the technical solutions for the remediation plan on how to address and mitigate the latent environmental risks posed by the mining uranium legacies.
- 4) Remediation plan consulted and agreed with authorities. Based on the engineering design studies, the remediation plan (which a population perception analysis, social and communication aspects) was developed and presented to provincial and local governments for their consent. Both the local authorities of El Chichon and Los Gigantes agreed with the proposed elements of the remediation plan.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Environmental risks of other five legacy sites (Tonco-Salta, Pichiñán- Chubut, La Estela-San Luis, Los Colorados-La Rioja and Huemul-Mendoza) identified and baseline environmental studies completed	Yes/No	N 28-Apr-2010	Y 27-Jun-2017	Y 06-Feb-2017	Y 29-May-2017

Comments (achievements against targets): Through baseline studies and environmental risks analysis at the five additional legacy sites (Tonco-Salta, Pichiñán-Chubut, La Estela-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza) the local authorities have been able to identify the key impacts and risks posed to the environment and the population. These studies not only highlight the environmental risks and potential impacts (leaching radioactive materials to the water bodies, aerobic exposure through suspended particles, etc.), but the key elements that would have to be considered as part of the



remediation plan.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of CNEA laboratories accredited ISO 17025 to monitor water, air, soil and radiological parameters	Text	0 28-Apr-2010	4 27-Jun-2017	4 16-Feb-2017	4 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

CNEA laboratories at San Rafael; Cordoba; Mendoza; & Ezeiza have been fully equipped and accredited by ISO 17025 and currently have the recognized quality and capacity to monitor water, air, soil and radiological parameters (obtaining ISO 17025 accreditation entails to have demonstrated the installed capacity and standards to be deemed technically competent for processing, testing and interpreting water air, soil and radiological samples according to international principles and criteria). The ISO 17025 standard itself comprises five elements that include Scope, Normative References, Terms and Definitions, Management Requirements and Technical Requirements. Laboratories use ISO 17025 to implement a quality system aimed at improving their ability to consistently produce valid results. It is also the basis for accreditation from an accreditation body. Since the standard is about competence, accreditation is simply formal recognition of a demonstration of that competence. A prerequisite for a laboratory to become accredited is to have a documented quality management system. The usual contents of the quality manual follow the outline of the ISO 17025 standard.

This has allowed CNEA to reduce the time in processing and analyzing data and the reliance on external and private laboratories, thereby consolidating and strengthening the quality of information and the time for reaction. In addition, the installed equipment and improved protocols has allowed the laboratories to implement improved analysis techniques for solid and liquid parameters with enhanced precision and detection limits (using national norms but consistent with international standards). Strengthening and improving the capacity of the labs has also enhanced the autonomy in the determination of physical/chemical and radio-chemical analysis. All of this has been complemented by the sample monitoring protocols and the capacity building to the CNEA and provincial technical teams. The enhanced data collection and analysis is for CNEA’s internal processing and for taking specific action depending on the analyzed sample parameters.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised	Actual Achieved at
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				Target	Completion
Number of governmental agencies, where legacy sites are located, trained on environmental monitoring procedures for management and supervision of mining operations or uranium legacy sites	Text	0	15	12	12
		25-Jul-2013	27-Jun-2017	16-Feb-2017	29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

CNEA and 12 provincial governments have been trained to follow IAEA’s international best practice on procedures, protocols and standards on environmental monitoring and managing environmental risks associated to uranium mines and legacies and on procedures for management and supervision of mining uranium operations.

In addition to technical assistance and capacity building workshops, six key training modules have been delivered to technical and administrative staff from the Nuclear Regulatory Authority (ARN); the Environmental, Irrigation, Water and Mining Agencies from the Mendoza Province; the Environmental and Public Works Secretariat from the municipality of Malargue; the environmental, mining agencies of the province and municipality of Cordoba. More than 80 staff from these agencies have benefited from the training modules which have been delivered with support of the IAEA on planning and management for the remediation and monitoring of uranium remediation sites. As a result of these trainings, staff from these have already been applying updated environmental monitoring protocols.

In addition, in spite of the change of focus from building capacity from the federal level to the local/provincial level, the Ministries of Environment and of Mines were also beneficiaries of the technical trainings (particularly on environmental risk management associated with uranium mining sites) that were provided under the project.

Objective/Outcome: (b) reduce potential economic and health damages associated with a closed uranium mining site in Malargue, Mendoza.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reduced health, environmental and economic risks associated with the Malargüe site to be addressed through the removal of the tailings according to the remediation plan agreed with authorities	Text	0 28-Apr-2010	100% 27-Jun-2017	100% 27-Jun-2017	100% 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

Through the works at the Malargüe milling site which included the complete removal, transportation, containment, encapsulation and final closure of the uranium tailings, the agreed remediation plan was fully achieved and thus, the exposure to pollutants and radiation and its associated health and economic risks had been reduced.

The project did not carry out a public health baseline (nor periodic sampling of the population during implementation) to determine radiation/pollution levels. However, baseline reports undertaken during project preparation (December 2006) revealed that radon exposure from plumes of the untreated uranium tails could reach as far as 2.5 km and that the population directly exposed to the site and its plume could be at risk of gamma ray radiation and contamination from Radon 222 inhalation. The study also disclosed that that surface and shallow groundwater systems, had traces of uranium contamination from the untreated tailings.

By contrast, the latest CNEA Technical Environmental Monitoring Reports (2016-17) reveal through multiple samples at Malargüe that the radon, gamma ray and pollution parameters tested for air, water, soil, and households have been contained to below the permissible international (US-EPA) and local levels thereby controlling the contamination exposure to the nearby population. In addition, the testing done to CNEA workers at the Malargüe site (through semester blood and weekly urine samples) reveal that radiation levels were under the norm.

In spite of lacking public health baseline studies, it can be concluded through the recent radiation parameters monitored on the air, water, soil and through the health samples of CNEA’s workers at the site, that the project has had a decisively positive impact on public health of the Malargüe community by controlling a legacy that for the past 50 years had contaminated land, water, and air in the vicinity of the former milling site.



Likewise, at time of appraisal the economic impacts associated to the pollution from uranium milling site were not estimated nor where monitored during implementation. Nonetheless, it can be concluded that complementary to the human health, safety and environmental benefits that bring about improvements in the quality of life to the population of Malargüe, the effective containment and greening of the site would also help the local economy, which is dependent on tourism and on the wide marketability of local potato seedlings. Reducing the perceived dangers of radioactive contamination is likely to bring additional benefits which could also include new employment opportunities and a greater demand for products and services in the area.

A.2 Intermediate Results Indicators

Component: Component 1 : Remediation of the closed uranium milling site in Malargue, Mendoza

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Percentage of planned site - Malargue- remediation works completed	Text	0 28-Apr-2010	100 30-Nov-2013	100 27-Jun-2017	100% 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

The works at Malargue included the following two key activities: (i) relocating the tailings from their current location (which were subjected to frequent flooding) to the highest location at the site, and (ii) encapsulating (or geologically isolating) the relocated tailings so as to confine it with materials that would control the radiation from being in contact with key environmental media (namely soil, water and air) and thus comply with the established radiation norms and standards. To ensure the containment of the mineral waste piles, an engineering solution comprising a system of multiple and redundant barriers of impermeable clays and rocks that supported their encapsulation, and designed a semi-peripheral drainage system in order to depress the level of the phreatic aquifer below the relocated tailings' site.

Thus, the Malargüe remediation Works were fully achieved (including the tailing removal (completed 100) and the encapsulation cell (100% completed)).



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reduced risk of environmental pollution by the transportation and removal of tailings	Text	0	100% transportation of tailings completed	100%	100%
		28-Apr-2010	30-Nov-2013	27-Jun-2017	29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]. The transportation of tailings and final enclosure completed.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Proportion of field samples and lab analysis which adhere to QA/QC procedures	Percentage	0.00	100.00	100.00	100.00
		28-Apr-2010	30-Nov-2013	27-Jun-2017	29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

All samples collected as part of the environmental, physical and radiological monitoring plan followed quality assurance and control procedures in the field and in the laboratories in conformity to the IAEA standards. The ARN and COCALIN (for labs) verified that the QA/QC procedures consistent with local norms and up to international standards. Considering that prior to the project the samples did not follow any particular protocol, it can be concluded that capacity has been improved and strengthened for undertaking field samples and laboratory analysis.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Communication Strategy in	Text	0	100	100	100



Malargüe is designed, implemented and results evaluated		28-Apr-2010	30-Nov-2013	27-Jun-2016	29-May-2017
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Comments (achievements against targets): Indicator Achieved [100%]

The communication strategy (which began with the consultation process before the project became effective) was implemented as follows: (a) a communication specialist was hired by PRAMU; (b) survey with focus groups were conducted at project sites and a report prepared; and (c) perception analysis were undertaken. In addition, events were organized to create awareness and to share best practices on the remediation of legacy mining sites. At Malargüe, the results of the works were disseminated in a seminar delivered with ample participation of local stakeholders on April 19, 2017 during the National Radiological Protection Day.

Likewise, the Provincial Government of Mendoza organized an event in Malargüe on May 5, 2017, the National Mining Day, to discuss the mining priorities of the invitees and had a site visit to the Malargüe remediation site to show case good practice in remediation of mining legacies.

Furthermore, the communication strategy included a consultation process and dissemination of the agreed design for the green public space at Malargüe. For the most part, the audience of the communication strategy were the communities at the project sites (namely Malargüe, Los Gigantes and El Chichon). The consultation processes and exchanges with the community often impacted on the works and plans (as evidenced by the design of the green public space at Malargüe).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Design of public (green) space at the Malargüe site agreed with stakeholders and with municipality and preliminary works initiated	Text	0 28-Apr-2010	100 30-Nov-2013	100% 27-Jun-2017	100 27-Jun-2017

Comments (achievements against targets): Indicator Achieved [100%]



The Environmental Management Plan that resulted from the EIA, recommended the establishment of a green park/public recreational space adjacent to the remediated legacies. Thus, as part of the mitigation measures at the legacy site, the municipality and CNEA agreed to build a public green space in a non-contaminated area adjacent to the Malargüe site based on a design proposed by local citizens through a consultation process. The green park (valued at US\$1.2M) comprises a 7-hectare space and includes bike paths, playground for kids, an amphitheater, sports facilities, and an expo space where the history of the milling site and the risks associated to radioactive pollution would be highlighted.

Since its inauguration, the park has had already a large number of visits, and an overall positive social impact to the community in that it has reduced the local concerns towards the legacy site. By building this public space, CNEA (and local authorities) have enhanced its capacity by applying one of the key lessons of remediating a contaminated site: building the trust with the local community.

Component: Component 2: Mine Restoration Planning and Institutional Strengthening by providing assistance designed to: (a) develop technical options, environmental, and social processes for addressing the remedi

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of the other seven CNEA sites (El Chichon, Los Gigantes, Tonco, Pichiñan, La Estela, Los Colorados, Huemul) with environment evaluation of legacy issues	Text	0 28-Apr-2010	7 30-Nov-2013	7 27-Jun-2017	7 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

The seven legacy sites: Tonco-Salta, Pichiñan-Chubut, La Estela-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza, in addition to Los Gigantes and El Chichon fully achieved the development of environment evaluation of their legacy issues in order to inform the local communities, provincial governments, and CNEA of the risks, potential magnitude of pollution and environmental dimensions of their uranium sites.

For this, a firm was contracted to develop and environmental evaluation at each site. The environmental evaluation consisted in reporting the environmental conditions of the mining legacy, volume, levels of pollution and radiation, topographical and groundwater analysis and development of a



baseline report for each site. These evaluations serve as a key decision making instrument and thus are considered a key element in strengthening the overall local and central technical capacity.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of CNEA laboratories with equipment and installed capacity for monitoring environmental parameters (including radiological) on water, soil and air samples, which are supervised by COCALIN	Number	0.00 28-Apr-2010	5.00 30-Nov-2013	5.00 27-Jun-2016	5.00 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

In addition to the 4 CNEA laboratories have been fully equipped and accredited by ISO 17025, one more laboratory (Buenos Aires Province) has been equipped and has the technical capacity to monitor water, air, soil and radiological parameters. This laboratory has not yet been certified by COCALIN.

This network of laboratories has allowed CNEA to reduce the time in processing and analyzing data and the reliance on external and private laboratories, thereby consolidating and strengthening the quality of information and the time for reaction. In addition, the installed equipment and improved protocols has allowed the laboratories to implement improved analysis techniques for solid and liquid parameters with enhanced precision and detection limits (using national norms which are consistent with international standards).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of the other seven	Number	0.00	2.00	2.00	2.00



CNEA sites with remediation designs completed		28-Apr-2010	30-Nov-2013	27-Jun-2017	29-May-2017
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Comments (achievements against targets): Indicator Achieved [100%]
 The seven legacy sites which now have proposals for remediation of the contaminated sites and with engineering designs completed are: El Chichon, Los Gigantes, Tonco, Pichiñan, La Estela, Los Colorados, Huemul. This instrument will strengthen contribute to strengthening the local, provincial and central capacity to take technically sound decisions and actions regarding the eventual remediation of contaminated sites.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of training modules (on environmental monitoring, remediation and other relevant topics) agreed and delivered to governmental agencies, where uranium legacies sites are located.	Percentage	0.00 28-Apr-2010	4.00 30-Nov-2013	5.00 27-Jun-2017	6.00 27-Jun-2017

Comments (achievements against targets): Indicator Achieved [100%]
 CNEA and 12 provincial governments have been trained to follow IAEA’s international best practice on procedures, protocols and standards on environmental monitoring and managing environmental risks associated to uranium mines and legacies and on procedures for management and supervision of mining uranium operations.

In addition to technical assistance and capacity building workshops, six key training modules have been delivered to technical and administrative staff from the Nuclear Regulatory Authority (ARN); the Environmental, Irrigation, Water and Mining Agencies from the Mendoza Province; the Environmental and Public Works Secretariat from the municipality of Malargue; the environmental, mining agencies of the province and municipality of Cordoba. More than 80 staff from these agencies have benefited from the training modules which have been delivered with support of the IAEA on planning and



management for the remediation and monitoring of uranium remediation sites. As a result of these trainings, staff from these agencies have already been applying updated environmental monitoring protocols.

In addition, in spite of the change of focus from building capacity from the federal level to the local/provincial level, the Ministries of Environment and of Mines were also beneficiaries of the technical trainings (particularly on environmental risk management associated with uranium mining sites) that were provided under the project.

The six training modules include:

- 1) Environmental Remediation Workshop, City of Carlos Paz (Cordoba) - April 2015
- 2) Environmental Management Workshop of the Uranium Mining, City of Cordoba- October 2015
- 3) Workshop on Environmental Monitoring, City of Carlos Paz (Cordoba) - December 2015
- 4) Workshop Remediation Engineering - Malargue Site, Malargue (Mendoza) - March 2016
- 5 & 6) Two 2 trainings held in Buenos Aires in June 2017 – with the support of the IAEA on Planning and Management, for monitoring of uranium remediation sites.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Environmental Information Management System developed and under implementation, consistent with best international practices, and including data on all Project sites	Percentage	0.00	100.00	100.00	98.00
		28-Apr-2010	30-Nov-2013	27-Jun-2017	29-May-2017

Comments (achievements against targets): Indicator Partially Achieved [98%]

The SIGA was developed and it is fully functional at the PRAMU sites providing live environmental and radiological data to decision makers. The SIGA processes data collected as per agreed monitoring protocols to determine the environmental conditions and risk associated at eight uranium legacy sites.



The SIGA processes systematically data on more than 50 parameters including air, water, soil and radiological levels in about more than 50 field testing locations in the legacy sites. The SIGA has been evaluated by IAEA specialist who consider it to be in line with best international practices and standards for monitoring networks.

Notwithstanding the success of the SIGA as a key instrument for monitoring and informing and enabling an informed decision-making process to CNEA, ARN, and other central and provincial agencies, sharing monitoring data on a public website has not yet materialized. CNEA has indicated that this failure was due to “technical reasons,” but the underlying reason appears to be that CNEA does not consider it appropriate to share the results of radiological monitoring campaigns with the public since: (a) very few people are trained to properly interpret the raw data on radon radiation levels, which could easily lend to misinterpretations; (b) there is an embedded institutional culture at CNEA of not sharing data with the public; (c) the CNEA website had reportedly been hacked on multiple occasions and at the time of project closing an updated website was still under construction; and (d) CNEA wants to avoid concerns due to the external criticism of nuclear energy and associated tailings. While the disclosure of such information was not required in the Loan Agreement, CNEA has indicated that once its website is operational it will publish broad parameters from the monitoring campaigns that are easier to interpret by the public.

Given that information is not yet shared to the public, the achievement of this indicator has been rated at 98%.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Communication strategies under implementation at relevant CNEA sites included in the Project	Text	0 28-Apr-2010	3 30-Nov-2013	3 27-Jun-2017	3 29-May-2017

Comments (achievements against targets): Indicator Achieved [100%]

The 3 core communication strategies (with its respective campaigns) have been developed and delivered at:

- a) Malargue,
- b) El Chichon and
- c) Los Gigantes,



The communication strategy included a consultation process and dissemination of the environmental risks, the way CNEA is addressing the issue and basic information on radiation that the local population should know. The key audience of the communication strategy were the communities at the project sites (namely Malargue, Los Gigantes and El Chichon).

Component: Component 3: Project management.



B. KEY OUTPUTS BY COMPONENT

Component 1. Remediation of Malargüe Site

- 100% removal and encapsulation of uranium tailings which followed the remediation plan agreed with national authorities and the World Bank, reducing the risk associated with the pollution caused by the tailings to public health, the environment, and local economic assets.
- Malargüe site restoration works 100% completed.
- All samples collected as part of the environmental, physical, and radiological monitoring plan follow quality assurance and control procedures in the field and laboratories.
- The communication strategy with respect to the remediation and site restoration activities at Malargüe was implemented. A communications professional was hired by the project to lead this work; a survey with focus groups was conducted and many events were carried out to create public awareness and share best practices in the remediation of legacy sites.
- The civil works for the green park were completed by the project closing date.

Component 2. Mine Restoration Planning and Institutional Strengthening

- Environmental studies developed at all 7 legacy sites. These evaluations consisted in reporting the environmental conditions of the mining legacy, volume, level of pollution and radiation, topographical and groundwater analysis, and development of a baseline report for each site.
- Five CNEA laboratories fully equipped and possessing installed capacity to monitor environmental parameters (including radiological) on water, soil, and air samples which are supervised by COCALIN.
- Proposals for the remediation of contaminated materials and engineering designs at the El Chichon and Los Gigantes legacy sites completed.
- Six training modules on environmental monitoring, remediation, and other relevant topics agreed and delivered to government agencies where uranium legacy sites are located.
- Environmental Information Management System (SIGA) was developed and is fully functional at project sites.
- Communications campaigns carried out in Malargüe and Cordoba (El Chichon and Los Gigantes) and a beneficiaries survey underway at Malargüe.
- A dissemination event was organized in Malargüe in June 2017 with the participation of national authorities, CNEA, and local stakeholders to communicate to the completion of the remediation and site restoration works.

**ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION****A. TASK TEAM MEMBERS**

Name	Role
Preparation	
Supervision/ICR	
Ruth Tiffer-Sotomayor/Renan A. Poveda	Task Team Leader(s)
Gustavo Adrian Canu	Procurement Specialist(s)
Jose Simon Rezk	Financial Management Specialist
Ramana V. Pemmaraju	Information technology Officer
Lilian Pedersen	Social Safeguards Specialist
Esteban Fernando Travaglianti	Civil Engineer
Pablo Francisco Herrera	Environmental Safeguards Specialist
Paula Agostina Di Crocco	Financial Management
Veronica Jarrin	Operations Analyst
John Redwood	Senior Environmental Consultant

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
Preparation		
FY08	23.306	125,566.98
FY09	3.259	19,875.60
Total	26.57	145,442.58
Supervision/ICR		
FY09	8.805	42,827.03
FY10	13.629	75,019.92



FY11	35.909	112,363.41
FY12	14.548	99,012.91
FY13	9.563	76,629.23
FY14	11.325	65,670.29
FY15	7.289	71,796.89
FY16	20.004	95,577.72
FY17	13.424	141,692.96
FY18	4.775	35,940.22
Total	139.27	816,530.58



ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US\$M)	Actual at Project Closing (US\$M)	Percentage of Approval (US\$M)
Component 1. Remediation of the Malargüe Site	17.75	22.23	125.2 %
Component 2. Mine Restoration Planning and Institutional Strengthening	11.60	9.82	84.7 %
Component 3. Project Management	1.25	0.24	19.2 %
Total	34.25*	35.80**	104.5 %

*In addition, total project costs included: (i) 0.08 for PPFs; (ii) 2.77 for Contingencies; and (iii) 0.08 for Front End Fees for a total financing of \$30.00M from IBRD.

** This amount includes a reallocation from contingencies.



ANNEX 4. EFFICIENCY ANALYSIS

Because it was not possible to undertake a cost-benefit approach due to the inability to clearly quantify project benefits, the PAD utilized a comparative least-cost approach to assess the efficiency of the investment in Malargüe. This approach was justified due to the “legal imperative imposed on CNEA to clean-up its closed uranium sites and the fact that the most important determinants of the cost of any remediation program are the applicable regulations.” According to the PAD, “extremely conservative standards were imposed as a result of these regulations.” The estimated investment cost to achieve the imposed standard of remediation at the time of appraisal was US\$ 16.2 per ton of tailings.²⁸ Data for other countries (Canada, Germany, Spain, United States) at that time indicated an average of about US\$ 16 per ton. Thus, the design for the Malargüe works was considered to be within the range of unit costs for similar projects internationally.

The same comparative least-cost approach applied in the PAD is also used in this assessment, although several important adjustments first need to be made. Based on more detailed remediation costs at the time of the first restructuring in July 2013, the total cost of Component 1 was increased by US\$ 3.925 million through the reallocation of the full amount of the contingency of US\$ 2.77 million included in the cost table in the PAD, together with US\$ 500,000 from Component 2 and US\$ 650,000 from Component 3. This revised component cost, however, also included US\$ 1.2 million for development of a park at the Malargüe site, which had not initially been contemplated at appraisal. The revised estimated remediation cost was thus increased to US\$ 20.475 million. This also raised the estimated unit remediation cost to roughly US\$ 28.8/ton based on the assumption that the total amount of material to be removed was 710,000 tons.

It is not possible to directly compare the appraisal and/or revised estimated unit remediation costs with the actual remediation costs, however, because the actual quantity of contaminated materials moved and stored from the Malargüe site was measured in cubic meters (m3) rather than tons. This occurred because the materials in question consisted of a mixture of different substances (soil, sand, clay, compacted tailings, rocks) having different weights and densities and which, for this reason, were measured in terms of volume rather than weight. According to the project team, the total amount of materials actually moved during project implementation was 801,520 m3, of which 652,910 m3 – consisting of 62,705 m3 of rocks, 100,726 m3 of sand and clay, 67,250 m3 of soil, and 422,229 m3 of compacted tailings – were safely removed and stored, and 148,610 m3 were for soil remediation at the site itself. This represented a 14.5 percent increase in the actual volume moved during project implementation compared with that first estimated in the contracts (700,000 m3).

²⁸ The PAD did not explain how the US\$ 16.2/ton figure was obtained. This appears to represent a serious understatement of the estimated remediation costs for this component., which also calls in question the conclusions of the economic analysis contained in the PAD.



It is possible, however, to compare the revised estimated remediation costs at the time of the first restructuring (i.e., US\$ 20.475 million) divided by the initially estimated volume of materials to be moved according to the contracts, or US\$ 29.25/m³, with the actual remediation costs (US\$ 21.03 million, once the US\$ 1.2 million for the park is deducted from the total actual costs of Component 1 by the actual volume of contaminated materials and soils removed and safely stored (810, 520 m³). This yields an average unit cost of US\$ 25.95/m³ and indicates that the increased actual remediation costs were largely due to the increased volume of material that had to be moved. It also suggests that implementation of the project's remediation component with respect to the use of project resources was efficient, even though the actual unit costs cannot be directly compared with those indicated in the PAD. At project completion, moreover, these actual remediation costs represented 58.7 percent of actual total project costs, thereby accounting for nearly three-fifths of the total. In addition, actual project management costs were considerably lower than those estimated at appraisal (US\$ 240,000 compared with US\$ 1.25 million) and even with the revised much lower amount of US\$ 500,000 at the time of the first restructuring, even though this was partly due to CNEA's inability to hire international and local consultants and thus needed to rely essentially on its own staff. However, this nevertheless suggests substantial project administrative efficiency.

While there are only a few other Bank projects that have sought to remediate contaminated uranium mining sites for purposes of comparison, the ICR for one such operation, the Disaster Hazard Mitigation Project in the Kyrgyz Republic completed in December 2012, which had a uranium mining waste isolation and protection component, reported an average cost of US\$ 25/m³ for the remediation of tailings materials. This is very similar to the actual average remediation cost per cubic meter (US\$ 25.95) found for the Malargüe. However, these costs may not be directly comparable because, for other such projects, there has been a broad range of average remediation costs, varying from US\$ 2 to US\$ 225/m³, with an average varying from less than US\$ 24 to about US\$ 225 per cubic meter, according to the same source. This very wide range of average costs is attributed to economies of scale achieved in large clean-up projects together with the varying nature of national regulations. This notwithstanding, the average remediation costs for both the Kyrgyz and Argentine projects supported by the Bank fall at the lower end of the range.

On the other hand, it is also important to take into account that, project implementation took much longer than anticipated and, as a result, the closing date had to be extended four times for a total of 43 months. (from November 2013 to June 2017). This was due in part to the 21-month loan effectiveness delay and partly to chronic delays in the receipt of Government counterpart funds. However, there are also indications of inefficiencies on the part of the contractor selected to implement the civil works at the Malargüe site, including construction of the park, as well as for the final deployment of the project's Environmental Monitoring System Management Tool (SIGA). For these reasons, overall project Efficiency is rated Modest.





ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

Summary of the Clients ICR

The PRAMU project has as an objective the strengthening of the capacity of CNEA to undertake the remediation of mines, millings and mining complexes and legacies through technically sound and acceptable procedures. The following are the key attained objectives: (i) through component 1, the works and encapsulation had contributed in containing dispersion of materials and exposure of pollutants while substantially improving environmental aspects for the city of Malargüe. In addition, this component financed the green space Park “El Mirador” which was developed in a 7 ha space for the community of Malargüe.

Component II, developed the characterization studies of environmental legacies of all other mining/milling sites, completed engineering studies for the remediation of Los Gigantes and El Chichon in Cordoba, the seismic and public perception studies. Overall the local and provincial teams have enhanced their technical capacity through specific workshops and training. In spite of great difficulties, CNEA Labs now have the equipment and infrastructure to position it among the best in the region and internationally. This has enabled the Labs to minimize precious time in the processing and analysis of data, and stop relying on external laboratories for this important task. In addition, the PRAMU project developed the SIGA monitoring system which allows CNEA and provincial governments to monitor key environmental parameters in real time. Lastly, Component III helped to consolidate the operational and administrative capacities of the GP.

Some **lessons learned** include: (i) the PRAMU has developed the necessary expertise for the planning, contracting, and execution of remediation works; (ii) a work methodology for the control of works according to the need has to be developed for future remediation of works; (iii) the participation of local authorities and representatives of organisms directly or indirectly related to the project have to be contemplated; (iv) there should be the capacity, commitment and willingness to solve challenges during the development of the works; (v) with regards to consultancy contracts, the identification of the expected products and its definition in the TORs has to be dimensioned; (vi) it is very important for the technical team at PRAMU and the procurement specialist/administrative staff to work together.

Bank’s Performance: In general terms, the Bank has joined the execution of the project in a satisfactory manner. In particular, the technical specialists of the Argentina Office has assisted in seeking alternatives that would be acceptable to the Bank in relation to the weaknesses in the context of the country. Likewise, the Bank has contributed in strengthening the human resources of the PRAMU in the applicability of its methodologies and institutional norms.



Comisión Nacional de Energía Atómica

INFORME FINAL DE EJECUCIÓN Y DE RESULTADOS (ICR)

Resumen ejecutivo

El proyecto PRAMU tuvo como objetivo fortalecer la capacidad de la CNEA para llevar a cabo la remediación de minas y complejos mineros fabriles de uranio cerradas a través de la adopción de procesos, técnicamente sólidos y aceptables para el público y las autoridades regulatorias pertinentes.

Dicho proyecto forma parte del programa general de la CNEA destinado a restituir el legado de todas las explotaciones mineras de uranio, bajo responsabilidad del organismo.

Los objetivos del Proyecto fueron:

- (a) fortalecer la capacidad del Gobierno de Argentina para evaluar y mitigar los riesgos ambientales asociados con las minas y complejos mineros fabriles cerrados de uranio, de acuerdo con las buenas prácticas internacionales;
- (b) reducir el potencial impacto ambiental asociado con un sitio cerrado de minería de uranio en Malargüe, Mendoza.

Los principales logros alcanzados:

En el marco del componente I se logró la finalización de la obra de encapsulamiento de acuerdo a las actividades contempladas en el pliego licitatorio. La ejecución total fue del 109,31 %. La culminación de las tareas de remediación de las colas de mineral permitieron alcanzar los valores de radiación y emanación de gas radón a valores del fondo natural de la zona. El encapsulado realizado impide la dispersión eólica de material particulado de las colas por los Sitios aledaños. Lo mencionado anteriormente mejora sustancialmente los aspectos ambientales de la ciudad de Malargüe al impedir la dispersión de los posibles contaminantes.

Se mantuvo una vinculación estrecha con los organismos de control. Se destaca en este aspecto la



estrecha colaboración alcanzada con el personal técnico del Banco Mundial quien mostró oportunidades de mejora y brindó su apoyo constante al equipo técnico del Programa.

La Obra de "gestión de las colas de mineral y rehabilitación del área" - Sitio Malargüe es la primera obra de remediación ambiental de la minería del uranio en Argentina y Latinoamérica.

Asimismo este componente financió como objetivo complementario la parquización del predio Malargüe. La obra se ejecutó en general conforme a lo proyectado alcanzando un nivel de ejecución del 97,02 %. Dicho porcentaje se debió a que se realizaron algunas modificaciones de proyecto por razones técnicas y constructivas lo que tuvo su incidencia en algunos ítems, los cuales se ejecutaron en un porcentaje menor y en otros casos, no se ejecutaron de acuerdo a lo estimado por pliego.

En cuanto al impacto ambiental y social pudo percibirse el reconocimiento por parte de la sociedad de las tareas que realiza la CNEA para mejorar y preservar el ambiente, realizando obras como la del Parquizado destinado a la comunidad.

El Parque "El Mirador" es un nuevo espacio público de esparcimiento de 7 hectáreas para la comunidad de Malargüe. Se encuentra en el predio de la CNEA que a partir de ahora lo cede a la Municipalidad de Malargüe, que se encargará de su administración como "área verde". Tiene un área destinada a actividades deportivas con una bicisenda (1510 metros), un sendero aeróbico (2120 metros) y otro peatonal incluyendo un sector para personas con discapacidad visual (1930 metros) y un playón deportivo de usos múltiples. También cuenta con sectores de pérgolas con áreas sociales, juegos infantiles, un anfiteatro y sanitarios.

Por su parte el Componente II financió estudios de caracterización de los pasivos ambientales de todos los sitios y el estudio de ingeniería para la remediación de los sitios Los Gigantes y Córdoba (El Chichón), estudios sísmicos y estudios sobre la percepción de la población sobre los sitios Malargüe, Los Gigantes y Córdoba (El Chichón).

El equipo técnico fortaleció sus capacidades para la definición de objetivos, elaboración de los términos de referencia y la supervisión de los trabajos, particularmente aquellos que implicaron estudios hidrogeológicos, geotécnicos, meteorológicos ambientales geofísicos, etc.

Por su parte a través del subcomponente de Consolidación de la capacidad ambiental de la CNEA se logró consolidar un grupo de personas de alto nivel profesional, proactivas, provenientes de distintas ramas de la analítica. Este grupo fue empoderado con la capacitación recibida dentro y fuera del marco de las actividades del Proyecto PRAMU.

Sorteando diversos obstáculos a lo largo de la ejecución del Proyecto, se ha logrado la adquisición del equipamiento e instalaciones de última tecnología a nivel regional y mundial.

Con la puesta en marcha del laboratorio se lograron reducir los tiempos en la obtención de datos, minimizando las determinaciones en laboratorios externos al PRAMU. También se pudieron implementar técnicas de análisis superadoras. Actualmente, se pueden realizar determinaciones tanto de



matriz sólida como líquida con la misma exactitud y límites de detección. Asimismo, esta puesta en funcionamiento consolidó el sistema de calidad de la CNEA dentro del PRAMU. La nueva tecnología permitió implementar nuevas técnicas analíticas, siempre utilizando la normativa nacional complementada con la internacional.

Finalmente, se ha logrado la autonomía en determinaciones radio-químicas.

Cabe destacar que paralelamente a la puesta en funcionamiento del laboratorio, se realizaron capacitaciones a los equipos técnicos y adquisición de equipamiento para muestreo ambiental, lo que contribuyó a estandarizar prácticas.

Uno de los objetivos alcanzados fue homogenizar con la Autoridad Radiológica Nacional el sistema de medición, control y monitoreo en el área radiológica. Se realizan las mediciones en paralelo y con los mismos equipos y metodologías, de manera tal de obtener los mismos resultados que puedan ser comparados dentro de las incertidumbres o errores correspondientes en cada caso.

Lo expuesto precedentemente conlleva a que actualmente se cuenta con la capacidad para incorporar nuevas técnicas analíticas y realizar determinaciones puntuales.

Asimismo, entre los principales logros se pueden destacar que se cuenta con toda la información que posee el PRAMU en un sistema único y disponible en todas las dependencias del Proyecto. La implementación del Sistema SIGA implicó un cambio en la cultura de trabajo y sistematizó todas las etapas para la realización de las tareas de monitoreo en los distintos Sitios. Esta nueva cultura minimizó los registros en formato papel.

Principales ventajas de la implementación del Sistema SIGA:

- Se informatizó todo el trabajo de monitoreo del personal involucrado en el SIGA. Se unificaron los procedimientos i) PG-SNA/Pramu-CT-002 Rev.: 0 Toma, conservación y transporte de muestras de agua superficial, subterránea y sedimentos ii) PG-SNA/Pramu-CT – 003 Rev.: 0 Monitoreo Radiológico y el iii) PG-SNA/Pramu-CT – 004 Rev.: 0 Toma y manejo de muestras de material particulado en Aire que posee el Proyecto.
- Se sistematizaron de los indicadores de avance de los proyectos de ingeniería que posee el PRAMU.
- Implementación de entrega de resultados a través de sistema por parte de los laboratorios de CNEA que involucran al proyecto.
- El sistema contribuyó a centralizar la información relacionada a la planificación de las acciones de monitoreo, comparación de parámetros (esperados vs real), mejora en la toma de muestra por realizar en campo, automatización de los procedimientos que PRAMU posee, comparación de datos históricos.
- La toma de datos en campo se realiza mediante tabletas electrónicas con el fin de actualizar la en forma automática la base de datos, desde la aplicación móvil que posee el SIGA.
- La adquisición del software MicroStrategy permitió el procesamiento y modelado de la base de datos proporcionada por el SIGA.



Cabe mencionar que el SIGA se encuentra implementado y para ser transferido a otras Gerencias de CNEA.

Adicionalmente a la meta propuesta, se ha realizado el diseño, desarrollo e implementación de herramienta de Business Intelligence (BI) en el SIGA.

Como conclusión, el SIGA es una importante herramienta de trabajo para el Proyecto la cual sistematiza, recopila, simplifica y organiza toda la información, con la finalidad de elaborar documentos varios, resultados de monitoreo, informes y estudios de consultorías; logrando así una base de datos única y unificada que esté a disposición en cada una de las dependencias del Proyecto y al alcance de cada usuario y de la misma CNEA.

En el marco del subcomponente de Consolidación de la capacidad ambiental de la Secretaría de Minería (SM) y la Secretaría de Ambiente y Desarrollo Sustentable (SE) se desarrollaron actividades de asistencia técnica y de capacitación sobre riesgo ambiental y actividades de gestión de riesgo para la consolidación de la capacidad ambiental de la Secretaría de Minería (SM) y la Secretaría de Ambiente y Desarrollo Sustentable (SAyDS) y los organismos de minería y medio ambiente provinciales sobre riesgo ambiental y actividades de gestión de riesgo.

Por último el Componente III "Gestión del Proyecto" financió actividades para la consolidación de la capacidad operativa de la GP con el objeto de fortalecer la gestión operativa del Proyecto.

Principales desafíos

Componente I

El llamado a licitación por la presente Obra se realizó en el mes de febrero de 2011. Con fecha 28/12/2011, se firmó contrato con la empresa Stornini SA por un monto original de \$56.685.978,65. Los trabajos de obra se iniciaron el día 25/01/2012, 28 días después de la firma del Contrato.

En el período de tiempo transcurrido durante la ejecución de la Obra se suscitaron diversos inconvenientes de índole económica del país, que perjudicaron el normal desempeño de las actividades; entre las cuales se destaca la escasez de gas oil y la imposibilidad de importar repuestos para las maquinarias de movimiento de suelos.

Por otro lado, en contadas oportunidades se tuvieron inconvenientes a la hora de realizar los pagos de los certificados de obra, demorándose el mismo más de lo previsto.

Se destaca que el seguimiento del contrato fue realizado por personal técnico del Banco Mundial, auditorías ambientales de la Provincia de Mendoza, auditorías internas de CNEA y el grupo técnico del PRAMU.

Con relación a la obra de parquización del predio Malargüe con fecha 08/06/2016, se firmó contrato con la empresa Muñoz y Asociados SA por un monto de \$25.814.241,95. Los trabajos de obra se



iniciaron el día 06/07/2016, 28 días después de la firma del Contrato.

Las restricciones presupuestarias del Proyecto atentaron contra el normal desempeño de las actividades. Sobre el particular se evidenciaron atrasos dentro del plazo contractual lo que motivó la realización de cinco enmiendas de extensión de plazo. El día 28/07/2017 se labró el Acta de Recepción Provisoria de los trabajos correspondientes a la Obra. A partir de esta fecha comenzó a transcurrir el período de responsabilidad por defectos, cuya duración es de 365 días.

En el desarrollo de la obra uno de los desafíos fue lograr que el contratista se adaptara al sistema de trabajo de CNEA, entendiendo que la Obra se encontraba dentro del Programa de Remediación Ambiental.

Otro aspecto relevante fueron las condiciones climáticas del lugar, que ocasionaron retrasos en la ejecución de las tareas.

En cuanto al personal del contratista se contó con personal técnico como Jefe de Obra, Capataz, Técnico en Higiene y Seguridad y Técnico Ambiental, Topógrafo, operarios, y maquinistas. Lo cual implicó una tarea importante de control y seguimiento en cuanto a control de registros y documentación del personal de la Contratista y Sub Contratista.

Componente: II

Entre los principales desafíos se puede mencionar la inexperiencia, en un primer momento, del equipo técnico para el desarrollo de este tipo de proceso de contratación de firmas de acuerdo a la normativa del Banco Mundial.

La elaboración de los términos de referencia y necesidad de someterlos a revisión de diversos especialistas del Banco Mundial requirió de mayores tiempos y de entendimiento de las problemáticas particulares del contexto país.

Para el caso en particular del nuevo Sistema SIGA, los desafíos - además de lograr el consenso sobre los términos de referencia y requerimientos sobre las firmas consultoras requeridas para la consultoría, fueron: la distribución geográfica del grupo de trabajo de CNEA para la implementación y el cambio de cultura de trabajo.

Adquisición de equipamiento de laboratorio

Debido a la especificidad de la temática nuclear y el contexto político a los largo de la ejecución del Proyecto resulto complejo la posibilidad de cumplir con determinados requerimiento de la normativa de adquisiciones del Banco Mundial (ej: buena cantidad de procesos desiertos por falta de cotizaciones debido a las condiciones adversas del mercado, las restricciones a las importaciones, la imposibilidad de pagar en divisas, entro otros). En este sentido falta una política de adaptación de los requisitos



normativos al contexto país.

Otro aspecto importante fue el proceso inflacionario existente durante la ejecución del Préstamo, que en el contexto indicado en el párrafo anterior generaban trámites de muy larga duración, lo que implicó negociar prórrogas de entregas manteniendo las condiciones contractuales, con la consecuencia de los perjuicios económicos para los proveedores. Esto trajo como consecuencia solicitud de cancelaciones de procesos, baja de proveedores que trabajaban con la institución, etc.

Los pagos al exterior requerían de mucho esfuerzo administrativo y negociaciones con las autoridades de gobierno, la metodología de pago directo no fue posible utilizarse. Todo esto atento contra el normal desarrollo de las actividades planificadas.

Lecciones aprendidas

Ejecución de obras:

- Se ha desarrollado el expertise necesario para la planificación, contratación y ejecución de obras de remediación.
- Se desarrolló una metodología de trabajo de control de obra acorde a las necesidades posible de aplicarse en futuras obras de remediación.
- Se adquirió el entrenamiento para la elaboración de Especificaciones Técnicas de proyectos de obras.
- Participación de autoridades, y representantes de los distintos organismos relacionados directa o indirectamente con el Proyecto.
- Capacidad y voluntad para resolver situaciones durante el desarrollo de la Obra.
- Importancia de la supervisión por parte del ente financiador, como de entes y organismos de control locales, provinciales y nacionales.

Servicios de consultorías:

- La identificación de los productos esperados y su importancia en la definición de los TdR.
- Los procesos de evaluación técnico-financiera de las empresas participantes, logrando un aprendizaje para simplificar los expedientes futuros.
- Interacción entre el personal técnico de PRAMU y especialistas de los contratistas.
- Cumplimentar los requerimientos técnicos en relación a las normas del Banco Mundial.
- Dimensionar las acciones de implementación del Sistema SIGA.

Puesta en Funcionamiento del Laboratorio de Córdoba

El equipo técnico del PRAMU ha desarrollado los conocimientos para la planificación de la puesta en funcionamiento de un laboratorio de estas características. Asimismo se fortalecieron los conocimientos



para la planificación y ejecución de procesos de equipamiento.

Desempeño

Autoevaluación:

En los aspectos fiduciarios, consideramos que el PRAMU ha podido resolver de manera satisfactoria las debilidades detectadas en la etapa de implementación. En función de los informes de organismo de control externo y de supervisión del Banco los procedimientos desarrollados fueron aceptables respecto del cumplimiento de la normativa, el soporte documental y elegibilidad. Es importante destacar la elaboración y ejecución del plan de acción, y controles en los procedimientos que se implementaron a lo largo de la ejecución del Proyecto en función de las recomendaciones.

Dentro de las debilidades podemos destacar que los arreglos institucionales acordados para la ejecución del préstamo estableció que la UEP debía apoyarse en procesos administrativos de la CNEA. Esta falta de independencia implicó un esfuerzo adicional para la tramitación de procesos importantes como la gestión del presupuesto, la gestión de pagos a contratistas y la gestión de importación de bienes.

Desempeño del Banco Mundial

En líneas generales, el Banco ha acompañado al Proyecto en la ejecución de sus procesos de manera satisfactoria. Particularmente el equipo de especialistas de la Representación Argentina que ha asistido en la búsqueda de alternativas aceptables para el Banco en relación a las debilidades del contexto país.

Asimismo el Banco ha contribuido al fortalecimiento de los recursos humanos del PRAMU en las metodologías y las normas del organismo.

Como sugerencias de mejoras podemos mencionar:

- Normativa: Se sugiere que el Banco realice una adecuación normativa al contexto país, ya que puede derivar en retrasos significativos en la ejecución del Proyecto. Ejemplo de esto se verificó en la garantía contractual solicitada para la obra de remediación lo que derivó en una demora de inicio de actividades de casi un año.

- Especialistas: El Banco propicia la intervención de especialistas en materias específicas que pueden demorar la aprobación de términos de referencia. Ejemplo: especialistas en comunicación y los TdRs de los estudios de percepción de la población y el caso de los TdRs de la contratación del diseño del Sistema SIGA. En ambos casos los especialistas realizaron sugerencias que no eran posibles en el contexto del Proyecto y derivó en demoras en la aprobación de los documentos de Pedidos de Propuestas.

Por el contrario el especialista que audito la obra de Malargüe fue de gran utilidad y ayuda en el seguimiento de la misma.

- Planificación de las adquisiciones y contrataciones (PAC y sistema SEPA):

- i) El plan de adquisiciones y contrataciones, en determinados momentos de la ejecución del Proyecto, ha tenido retrasos significativos para su revisión y aprobación lo que condujo a retrasos en el



inicio de determinados procesos de compra.

ii) Modificaciones en los umbrales de revisión: el Banco debería comunicar formalmente las modificaciones a los umbrales.

iii) Asimismo el sistema SEPA ha tenido una serie de problemas a lo largo de la ejecución del préstamo con una baja disponibilidad de soporte al usuario.

- Revisión posterior:

El Banco debería compartir con el Proyecto los resultados de las supervisiones de los procesos de adquisiciones con el objeto de contar con las recomendaciones y oportunidades de mejora, y en caso de ser necesario, realizar comentarios sobre errores de interpretación o documentación obrante en los legajos.

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The Bank team received specific comments from the Borrower, which are greatly appreciated. The team agree with the comments provided which are reflected through minor revisions in the current ICR text.



ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)

ANNEX 6-A. Explanation of Changes in the Results Framework

Objective/Outcome 1: Strengthen the Government of Argentina’s capacity to assess and mitigate environmental risks associated with closed uranium mines, processing sites, and related mining sector investments, in accordance with international best practice.

Outcome Indicators

- 1. All potential health and economic risks associated with at least four closed uranium sites to be addressed through credible implementation, with stakeholder buy-in, of site-specific remediation plans. **Dropped** following Mid-Term Review (MTR), according to Restructuring Paper of July 25, 2013. The original indicator was dropped because the Project never intended to finance remediation works in any site other than Malargüe. Legacy issues would be identified in the seven other CNEA sites and possible remediation alternatives would be proposed, but risk mitigation measures were never intended as part of the approved activities to be financed. This indicator, therefore, was not consistent with the scope of the Project and dropping it does not impact the original objectives.
- 2. Measurable environmental risks reduced to acceptable levels in other sites or mining sector investments, particularly as relates to siting, monitoring and compliance, public disclosure, and management plans for future closings.
 - 2.a **Revised** following MTR as above to read: Environmental risks in other seven CNEA sites identified, management plans evaluated, disclosed and agreed with stakeholders. The reason for revision of this indicator was as follows. The wording of this indicator was vague. It was not clear what “other sites of mining sector investments” this indicator referred to, and how CNEA would have had an incidence on risk reduction measures at other sites outside its mandate. The indicator was revised to refer explicitly to sites for which CNEA holds responsibility.
 - 2.b **Revised** at time of third restructuring to read: Environmental risks of Los Gigantes and El Cichón sites identified: baseline environmental studies completed; remediation plan consulted and agreed with authorities and engineering design completed.
 - 2.c **Added** at time of third restructuring: Environmental risks of five other legacy sites (Tonco-Salta, Piciñán-Chubut, La Estela-San Luis, Los Colorados-La Rioja, and Huemul-Mendoza) identified and baseline environmental studies completed.
- 3. CNEA laboratories receive full ISO 17025 management system accreditation for its quality, administrative and technical operations.
 - 3.a **Revised** following MTR as above to read: CNEA laboratories where PRAMU



	<p>analysis (sic) are carried out implement ISO 17025 procedures for its quality, administrative and technical operations, and are accredited by COCALIN. The reason for revision of this indicator was as follows. CNEA’s laboratories that serve the Project and that provide management services will implement ISO 17025 procedures as originally proposed. However, accreditation will be sought from the Qualification Committee of Laboratories and Nuclear Facilities (COCALIN), not from ISO as stated in the PAD, in a manner consistent with CNEA’s accreditation procedures.</p> <p>3.b Revised at time of third restructuring to read: Number of CNEA laboratories accredited ISO 17025 to monitor water, air, soil, and radiological parameters.</p> <p>4. Added following MTR as above: Environmental monitoring procedures for management of mining operations and/or former uranium mining sites have been transferred to government agencies. This indicator was added in order to capture the institutional strengthening results of the Project.</p> <p>4.a Revised at time of third restructuring to read: Number of governmental agencies, where legacy sites are located, trained on environmental monitoring procedures for management and supervision of mining operations or uranium legacy sites.</p>
<p>Intermediate Results Indicators</p>	<p>1. Number of sites with inventories and plans – including EIAs, engineering design and social assessments completed in accordance with established procedures.</p> <p>1.a Wording revised following MTR as above to read: Number of CNEA sites with completed assessments of legacy issues, engineering designs for remediation measures, environmental impact assessments under consultation. The reason for this revision was as follows: The wording of this indicator was vague. It was not explicitly stated which sites were being considered. The revised indicator specifically refers to the CNEA sites.</p> <p>1.b Revised at the time of third restructuring to read: Number of the other seven CNEA sites (El Chichón, Lost Gigantes, Tonco, Pichiñan, La Estela, Los Colorados, Huemul) with environment evaluation of legacy issues.</p> <p>2. Number of sites obtaining “DIA” and other authorizations granted to authorize works. Dropped following MTR as above. This indicator was dropped because, as noted above, the implementation of remediation measures at seven other sites was never contemplated under the Project. Therefore, licensing and financing of these remediation measures falls outside the scope of what can be achieved under the Project.</p> <p>3. Number of sites with confirmed financing for remediation works. Dropped</p>



	<p>following MTR as above. This indicator was dropped for the same reason as the previous indicator.</p> <p>4. Proportion of institutional needs assessments and action plans completed. Revised and combined with initial intermediate outcome indicator 5 (see next item below)</p> <p>5. Proportion of units implementing institutional strengthening plans in accordance with action plans. Revised and combined with initial intermediate outcome indicator 4 (see above) which was Added to read: Number of CNEA laboratories with installed capacity for monitoring environmental parameters (including radiological) on water, soil and air samples, which are accredited by COCALIN.</p> <p>5.a Revised at the time of third restructuring to read: Number of CNEA laboratories with installed capacity for monitoring environmental parameters (including radiological) on water, soil and air samples, which are accredited by COCALIN.</p> <p>6. Added at the time of third restructuring: Number of the other seven CNEA sites with remediation designs completed.</p> <p>7. Number and type of non-uranium mine sites where new procedures are utilized. Dropped following MTR as above. This indicator was dropped because it was vague and did not capture the results of any activity financed under the Project.</p> <p>8. Evidence that new procedures are developed in accordance with good international practice. Dropped following MTR as above. This indicator was dropped for the same reason as the previous one.</p> <p>9. Proportion of CNEA project sites where environmental policies are defined and applied in a transparent, inclusive, and technically high-quality manner. Dropped following MTR as above and replaced with new indicator immediately below. This indicator was dropped and replaced by one (see the next indicator below) that explicitly captures the environmental management activities that will be financed at the other sites.</p> <p>10. Added following MTR as above: Number of CNEA sites with completed assessments of legacy issues, engineering designs for remediation measures, environmental impact assessments under consultation.</p> <p>10.a Revised at the time of third restructuring to read: Number of other seven CNEA sites (El Chichón, Los Gigantes, Tonco, Pichiñan, La Estela, Los Colorados, Huemul) with environment evaluation of legacy issues.</p> <p>11. Number of sites where monitoring and public information systems are operational and have significant levels of public involvement. Dropped following</p>
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	<p>MTR as above and replaced with new indicator immediately below. This indicator was dropped and replaced by one (see the next indicator below) that explicitly captures the results that will be achieved in the area of information management.</p> <p>12. Added following MTR as above: Environmental Information Management System developed and under implementation, consistent with best international practices, and including date on all Project sites.</p> <p>13. Number of mine sites where concepts of environmental risk management are applied to mine closings and/or remediation at other than uranium mines. Dropped following MTR as above. This indicator referred to activities outside of the mandate of CNEA, which are outside the control of the project.</p> <p>14. Number of CNEA laboratories with installed capacity for monitoring environmental parameters (including radiological) on water, soil, and air samples which are accredited by COCALIN.</p> <p>14.a Revised at time of third restructuring to read: Number of CNEA laboratories with equipment and installed capacity for monitoring environmental parameters (including radiological) in water, soil and air samples which are supervised by COCALIN.</p> <p>15. Communication strategies under implementation at relevant CNEA sites included in the project.</p>
<p>Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)</p>	<p>1. The 100% removal (encapsulation) of the uranium tailings at the Malargüe site which followed the remediation plan agreed with the national authorities and the World Bank has reduced the health, economic, and environmental risks associated with the pollution caused by these tailings. More specifically, remediation works 100% completed, tailings removal 100% completed, encapsulation cell 100% completed; transportation of tailings 100% completed, and final enclosure 100% completed.</p> <p>2. All field samples collected as part of the environmental, physical, and radiological monitoring plan and subsequent laboratory analyses have followed quality assurance and control procedures.</p> <p>T3. he communications strategy for the Malargüe remediation works was designed and implemented as follows: a communications professional was hired by PRAMU to lead this work, a survey with focus groups was conducted and report prepared. In addition, many events were organized to create awareness and share best practices on the remediation of legacy mining sites. During the final stages of the project, the Malargüe works were disseminated in a seminar with ample participation of local stakeholders on April 19, 2017 during the National Radiological Protection Day. The provincial government of Mendoza also organized an event at Malargüe on May 5, 2017, the National Mining Day, to discuss the mining priorities</p>



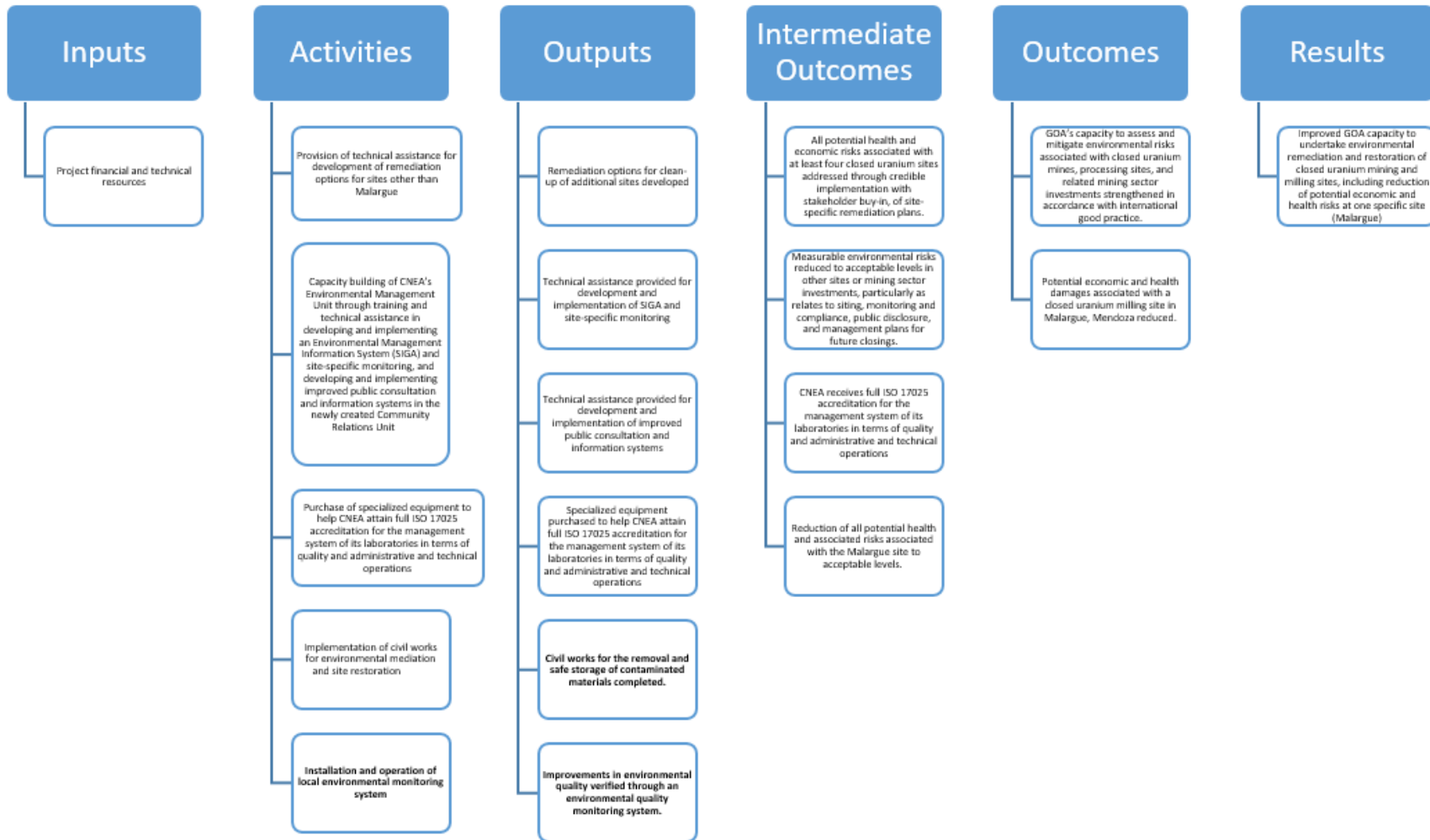
	<p>of the invitees and included a site visit to the Malargüe remediation site to showcase good practice in the remediation of mining legacies.</p> <p>4. The design of the public green space at Malargüe site was agreed with the municipality and local stakeholders and implementation of the associated works has been completed.</p>
<p>Objective/Outcome 2: Reduce potential economic and health damages associated with a closed uranium milling site in Malargüe, Mendoza.</p>	
<p>Outcome Indicators</p>	<p>1. All potential health and economic risks associated with the Malargüe site reduced to acceptable and verified levels.</p> <p>Wording revised following MTR according to Restructuring Paper, July 25, 2013 to read: All potential health and economic risks associated with the Malargüe site to be addressed through the implementation of remediation plans agreed with stakeholders. The wording of this indicator was revised in order to make the targets more specific.</p> <p>Revised at time of third restructuring (November 2015) to read: Reduced health, environmental, and economic risks associated with the Malargüe site to be addressed through the removal of the tailings according to remediation plan agreed with authorities.</p>
<p>Intermediate Results Indicators</p>	<p>1. Percentage of planned site remediation works completed.</p> <p>2. Percentage of contaminant exposure levels which have been reduced at or below defined standards.</p> <p>The wording of the two indicators above remained unchanged following the MTR, but the methodology/data source for measuring them was explicitly defined.</p> <p>2.a Revised at time of third restructuring (November 2015) to read: Reduce risk of environmental pollution by the transportation and removal of tailings.</p> <p>3. Proportion of field samples and lab analysis which adheres to QA/QC procedures.</p> <p>4. Evidence that public information campaigns are relevant, meaningful and meet or exceed stakeholder expectation.</p> <p>4.5 Revised at time of third restructuring to read: Communication strategy in Malargüe is designed, implemented, and results evaluated.</p> <p>5. Added following MTR as above: Design of public (green) space at the Malargüe site agreed with stakeholders and with municipality and preliminary works initiated.</p>



<p>Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)</p>	<ol style="list-style-type: none"> 1. Environmental Risks of Los Gigantes and El Chichon identified – baseline Environmental Study was completed. The remediation alternatives were prepared and discussed with local authorities (but not yet agreed) and the detailed engineering design completed. 2. The environmental risks of the five other legacy sites (Tonco-Salta, Pichiñan-Chubut, La Estela - San Luis, Los Colorados-La Rioja, and Huemul-Mendoza were identified and the baseline environmental studies completed. 3. The completed environmental evaluations at all seven sites, for which a specialized firm was contracted, consisted in reporting the environmental conditions of the mining legacy, volume and levels of pollution and radiation, topographical and groundwater analysis and development of a baseline report for each site. 4. Four CNEA laboratories (San Rafael – uranium in water, Cordoba, Mendoza, and Ezeiza) were accredited ISO 17025 to monitor water, air, soil, and radiological parameters. 5. Training activities for provincial and local government agencies where legacy sites are located on planning and management, and on monitoring of uranium remediation sites completed, with IAEA support, in June 19-25, 2017. Earlier completed training events were: (i) Environmental Remediation Workshop, City of Carlos Paz (Cordoba) – April 2015; (ii) Environmental Management of Uranium Mining Workshop, City of Cordoba – October 2015; (iii) Workshop on Environmental Monitoring, City of Carlos Paz (Cordoba) – December 2015; (iv) Workshop on Remediation Engineering, Malargüe Site, Malrague (Mendoza) – March 2016. 6. Environmental Information Monitoring System (SIGA) was developed and is fully functional at PRAMU. However, the public portal was not completed in the website at CNEA as agreed with the Bank, so the resulting intermediate results indicator was only partly met. 7. Communication strategies under implementation at relevant CNEA sites included in the project. Communication campaigns were completed at Malargüe and the two sites in Cordoba (El Chichon and Los Gigantes). A beneficiary survey was under development in Malargüe. In June 2017, the project organized a dissemination event in Malargüe to communicate the completion of works with participation of national authorities, CNEA, and local stakeholders.
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ANNEX 6-B – Support evidence to Theory of Change (second revision of the outcome indicators in Nov. 2015).





ANNEX 7 - MAP

