

Country name	The Project for Groundwater Development in the Province of Chimborazo
Republic of Ecuador	(El Proyecto de Desarrollo de Aguas Subterráneas en la Provincia de Chimborazo)

I. Project Outline

Background	<p>In Chimborazo province, one of the poorest provinces in the Republic of Ecuador (hereinafter called as "Ecuador"), the main sources of drinking water were surface waters. However, the water volume in these sources had declined because of the tendency of shortage of rainfall in recent years. Although the rate of water served population with individual connection (65.80% in 2002) was almost the same level as the national average of 67.49%, the rate of use of rivers and springs was twice as high as the national average (24%). In addition, the hygienic conditions were poor in rural areas, because of the water contamination by livestock, insufficient number of toilets installed and other reasons. As a result, infant mortality rate of 55 to one thousand births (from 1989 to 1999) in the province was much higher than the national average of 33, and many cases of waterborne disease were reported including acute diarrhea and parasitic diseases. Under this circumstance, the provincial government of Chimborazo was preparing a groundwater development plan to utilize the safe and sanitary groundwater as a new water resource to improve living conditions in the rural areas. Under the plan, the government of Chimborazo aimed to drill 80 deep wells in 90 villages, however, the government was in a difficult situation to implement the plan due to the lack of drilling machines and equipment as well as the insufficient financial resources and therefore, needed technical and financial support to implement the plan.</p>		
Objectives of the Project	<p>To improve the access to safe and stable drinking water of people in the rural areas in the Chimborazo by constructing water supply facilities, establishing water committees, and procuring drilling machines with accessories and construction materials in 13 villages in 14 cantons in the Chimborazo province, and thereby contributing to the decrease in waterborne diseases.</p>		
Outputs of the Project	<ol style="list-style-type: none"> 1. Project site: 13 villages in 4 cantons in the Chimborazo province (Riobamba, Guamate, Guano, and Cumandá) 2. Japanese side: <ol style="list-style-type: none"> 1) Construction of wells water supply facilities : 9 deep wells and other water supply facilities (10 well administration buildings, installation of a 9.9 km pipeline, 10 distribution reservoirs (10-50m³), spring intake, a water pump, and 11 disinfection facilities) 2) Procurement of equipment and materials : 1 set of well drilling machines and equipment, examination equipment, materials for 13 wells, pipeline materials (PVC, copper pipe) and others 3) Technical guidance for well drilling: OJT for well drilling, soft component (technical geophysical prospecting / hydrogeology, hygiene education, strengthening of well operation and maintenance system in the villages) 3. Ecuadorian side <ol style="list-style-type: none"> 1) Securing lands for construction 2) Construction of wells and water supply facilities: 5 deep wells and other waters supply facilities (5 well administration buildings, : installation of a 2.9 km pipeline, 3 distribution reservoirs(10~50m³), 4 disinfection facilities) 3) Installation of protective fences for wells and distribution reservoirs, supply of power to the wells, securing places for storing equipment and spare parts 4) Awareness and education activities for the beneficiaries, organizing workshops for hygiene education, and administrative support for water committees 		
E/N Date	Phase 1: 30 August, 2004 Phase 2: 5 July, 2005	Completion Date	15 February, 2007
Project Cost	E/N Grant Limit: Phase 1: 520 million yen Phase 2: 270 million yen	Contract Amount: Phase 1: 516 million yen Phase 2: 268 million yen	
Implementing Agency	Department of public works, the provincial government of Chimborazo (Formerly known as Directorate of public works of the provincial council of Chimborazo. Currently, the department of groundwater development, which was established after the project completion, is in charge.)		
Contracted Agencies	Kyowa Engineering Consultants Co., Ltd., Tone Engineering Corporation, and Mitsubishi Corporation		
Related Studies	Basic Design Study: January, 2004 – July, 2004		
Related Projects	<p>Japan's Cooperation: Rural Water Supply Project in Ascós, the Province of Chimborazo (1999, Grant assistance for grassroots projects)</p> <p>Other donors' cooperation: PRAGUAS Project by Ministry of Urban Development and Housing (2002-2012), Development of water supply and sanitation facilities by Social Emergency Investment Fund, Hygiene education to children by Plan International (NGO)</p>		

II. Result of the Evaluation

1 Relevance

This project has been highly relevant to Ecuador's development policies, such as universal access to safe water under the national development plan (2000-2003), the Chimborazo provincial development plan (2002), the national development plan for good life 2009-2013, and the Chimborazo provincial development plan "Chimborazo Province territorial development plan

(2011)" at the time of both ex-ante and ex-post evaluation. The project also has been highly relevant to development needs of supplying safe potable water in Chimborazo where the rate of water served population has been lower than the national average and thereby improving hygiene conditions, as well as Japan's ODA policy prioritizing hygiene environment and water and sewage service including water supply facilities. Therefore, relevance of this project is high.

2 Effectiveness/Impact

This project has somewhat achieved its objectives of "to improve the access to safe and stable drinking water of people in the rural areas in the entire Chimborazo province by constructing water supply facilities, establishing water committees, and procuring drilling machines with accessories and construction materials in 13 villages in 14 cantons in the Chimborazo province."

Among the wells constructed by Japanese sides (5 sites in 4 villages in the urban areas and 8 sites in 6 villages in the rural areas), wells at 4 sites do not function partly due to the breakdown of control panels¹. Water supply volume per day per person (indicator 1) of the sites who answered the questionnaire survey is 90-100ℓ/day/person in the urban areas and 10-51ℓ/day/person in the rural areas, which has not reached the target, especially in the rural areas². Since the water is distributed to each individual house, the time required to collect water (indicator 2) has become zero at the sites in both urban and rural areas where the wells function. Therefore the target of collecting water in less than 30 minutes has been achieved at those sites.

On the other hand, among 2 sites in 2 villages in the urban areas where wells were supposed to be constructed by Ecuadorian side, a well is now under construction in one site while the other site has not started drilling. As to 3 sites in 3 villages in the rural areas, a well is under construction at one site while the other two have not started drilling. Thus, none of the planned well construction at 5 sites in 5 villages has been completed, and therefore, it is not possible to evaluate the effects in terms of water supply volume and time required for collecting water. The situation happens because 1) although the city governments are responsible for basic services including water supply under the constitution proclaimed in 2008, the city government did not have sufficient budget to implement the project, 2) there are some breakdown of the hydraulic system in drilling equipment, and 3) the budget for implementing the project allocated to the provincial government allowed the drilling of only four wells per year.

【Quantitative Effects】

1) 13 sites in 10 villages where facilities were constructed by the Japanese side

Indicators	2004 (before the project) Actual value	2009 (Target year) Target value	2009 (Target year) Actual value	2013 (Year of ex-post evaluation) Actual value
Indicator 1 Water supply volume per day per person (ℓ)	Urban areas (5 sites in 4 villages) 20-40ℓ/day/person	100ℓ/day/person	unanswered	80~100ℓ/day/person(The degree of achievement: 80-100%) (The actual values of 2 sites which answered the questionnaire)
	Rural areas (8 sites in 6 villages) 5-15ℓ/day/person	40-60ℓ/day/person	unanswered	10~50ℓ/day/person (The degree of achievement:25-83%) (The actual values of 5 sites which answered the questionnaire)
Indicator 2 Time required to collect water	1-3 hours	Less than 30 minutes	unanswered	0 minutes /day/person (In the 7 sites referred above)

Source: Questionnaire survey to water committees

2) 5 sites in 5 villages where facilities were constructed by the Ecuadorian side

Indicators	2004 (before the project) Actual value	2009 (Target year) Target value	2009 (Target year) Actual value	2013 (Year of ex-post evaluation) Actual value
Indicator 1 Water supply volume per day per person (ℓ)	Urban areas (2 sites in 2 villages) 20-40ℓ /day/person	100ℓ/day/person	unanswered	A well is under construction at one site while the other site has not started drilling.
	Rural areas (3 sites in 3 villages) 5-15ℓ /day/person	40-60ℓ/day/person	unanswered	A well is under construction at one site while the other two sites have not started drilling.
Indicator 2 Time required to collect water	1-3 hours	Less than 30 minutes	unanswered	NA

Source: Questionnaire survey to water committees

【Qualitative effects】

Currently functioning six wells and other water facilities which were drilled and constructed by the province of Chimborazo utilized the equipment procured by the project effectively. However, a tooth drill bit (12¼ inches) did not match the geographical condition at the sites and therefore has not been used. The equipment for DTH method (compressors, drivers and others) had not been well used due to the capacity shortage of a large size compressor and lack of technical capacity on the DTH method. As the consultant bought a large size air compressor at its own expense in 2012, and the training on DTH method was carried out, the equipment is currently used for drilling at the time of ex-post evaluation. As to the effect of a soft

¹ The panels are scheduled to be repaired/replaced by the water committees, however, the exact schedule is unknown.

² Some sites confine the water supply volume in order to maintain the aquifer, even though the wells are functioning.

component, an engineer of the provincial council of Chimborazo acquired all skills necessary for groundwater development and is still involved with development projects as an engineer of the provincial government. Another engineer acquired skills of land surface exploitation and development of hydrogeological prospect maps, however, resigned in September 2009. Among the 13 target sites of the project, water committees were established at 10 sites and have been engaged in the maintenance of the wells.

As to impact, the groundwater development department to whom the technical transfer was carried out under the project was expected to plan and implement groundwater development projects in the entire province. The province has drilled 10 wells by its own so far, and 6 wells (at 2 sites in urban areas and 4 sites in the rural areas) among them were completed by 2009 and have functioned since then. The drilling of the other 4 wells (in rural areas) was completed after 2009, and currently water supply facilities are being constructed (indicator 3). Regarding the water supply volume per day per person of those wells, a site in the urban areas which answered the questionnaire survey reported the volume 156 l/day/person which achieved the target. On the other hand, the average water supply volume at 4 sites in the rural areas is 15-20 l/day/person and did not reach the target (indicator 4). The time required for water collection is 0 minutes (indicator 5).

Impact

Indicators	2004 (before the project) Actual value	2009 (Target year) Target value	2009 (Target year) Actual value				2013 (Year of ex-post evaluation) Actual value
			2009	2010	2011	2012	
Indicator 3 (Entire province) Number wells drilled by the province (*)	0	6/year	3/year	0/year	0/year	0/year	1/year
Indicator 4 (Entire province) Water supply volume per day per person(ℓ)	Urban areas: 20-40ℓ /day /person	100ℓ /day /person	unanswered				156ℓ/day/person (The actual values of 1 site which answered the question)
	Rural areas: 5-15ℓ /day /person	40-60ℓ /day /person	unanswered				15-20ℓ/day /person (The actual values of 4 sites which answered the question)
Indicator 5 (Entire province) Time required to collect water	1-3 hours	Less than 30 minutes	unanswered				0 minutes

Source: Questionnaire survey to water committees (*) The number indicates those which were constructed after 2009. Other than this number, another 6 wells and facilities was completed before 2009.

As to other impact, people use the water supply facilities regularly and currently do not have to go to springs to collect water, and therefore, the burden of women who are responsible for water collection has decreased. In addition, according to the questionnaire survey to the water users, 8 villages out of 11 villages said the number of waterborne diseases has decreased. No negative impact on the natural environment was found and there is no case of land acquisition/involuntary resettlement.

Therefore, effectiveness/impact of this project is fair.

3 Efficiency

The outputs of the project were produced as planned and both the project cost and the project period were within the plan (ratio against the plan: 99%, 98%). Therefore, efficiency of this project is high.

4 Sustainability

In Chimborazo province, after the transfer of the water supply services from the province to city governments in accordance with the constitution proclaimed in 2008, the drilling of wells is implemented by the province (contracted from city governments), and the construction of wells and water supply facilities is implemented by the city governments. As a result, the current institutional setting is set as follows: (1) drilling of wells by utilizing the equipment procured by the project is implemented by the province, (2) water supply services are carried out by the city governments, and (3) the constructed wells are operated and maintained by the water committees.

As the responsibilities of the provincial government are limited to the well drilling on a contract basis, the current institutional setting of 7 staff members who are responsible for groundwater development sufficient in the quality control/ engineering geology/ experiment section of the public works department. On the part of the city governments, 5-12 staff members are allocated, although the number varies depending on the size or financial conditions of cities. Institutional setting of water committees is not stable as there were problems over water tariff collection in the past. In terms of technical aspect, the provincial government has one engineer who has the technical capacity of electrical prospecting and another engineer who can utilize hydrogeological technology. One person is allocated to each water point who is in charge of operating water pumping, reading meters and distributing water from the water storage tank. The provincial government has a minimum number of staff to continue well drilling and the technical level is maintained to a certain extent. One engineer to whom the technical transfer was carried out implements training to water committees with the Ministry of Urban Development and Housing. Additional engineer is scheduled to be recruited in the next fiscal year.

As for the financial aspect, the provincial government is expected to secure a certain amount of the budget, however, the city governments who are also responsible for construction in addition to the well drilling cannot secure the budget stably. Many water committees have problems for securing maintenance budget due to the problem of water tariff collection and others, and there are problems of securing stable budget allocation in the future. The drilling equipment owned by the provincial government is generally maintained well. The broken equipment items are repaired and currently function properly. The equipment is expected to be maintained by the provincial government by its own effort. The maintenance of the wells is carried out mainly by the water committees, but not necessarily stably. Some water committees have the problem of water tariff collection, and therefore are unable to purchase necessary equipment.

Thus, as there are problems in institutional aspect (water committees), financial aspects (city governments and water committees) as well as the current status of operation and maintenance, sustainability of the project effect is fair.

5 Summary of the Evaluation

This project has somewhat achieved its objectives of “to improve the access to safe and stable drinking water of people in the rural areas in the entire Chimborazo province by constructing water supply facilities, establishing water committees, and procuring drilling machines with accessories and construction materials in 13 villages in 14 cantons in the Chimborazo province.” People utilize the water supply facilities regularly, and therefore the people’s access to safe water in the target areas is continuously secured. However, some wells and water supply facilities do not function, and therefore, some sites have not reached the target of water supply volume per day per person. On the other hand, some favorable impacts are found. As people do not have to go to springs to collect water thanks to the project, the burden of women has decreased. In addition, according to the interviews with the water users, the number of those who have waterborne diseases has decreased.

As for sustainability, a certain level of technical capacity is secured, however, there are problems in financial and institutional aspects as well as the current status of operation and maintenance as some sites cannot purchase equipment necessary for maintenance as a result of water tariff collection problems.

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

III. Recommendations & Lessons Learned

Recommendations to implementing agency:

–Although the water committees have maintained functions to some extent, the provincial government and Ministry of Urban Development and Housing are recommended to extend support to the committees to strengthen their technical capacity.

Lessons learned for JICA:

–The tooth drill bit (12¼ inches) procured by the project has not been used due to the geological reason. In selecting equipment, while cost effectiveness is important, a procurement plan needs to pay attention o the environment for the equipment usage in order to achieve project objectives.



Engineers who gave instructions at a well drilling site.



Drilling equipment procured by the project.



A well administration building constructed by the project