

Country Name	<b>Capacity Development Project for Non Revenue Water Reduction in Goa</b>
Republic of India	

**I. Project Outline**

Background	<p>In the State of Goa, there was an urgent need to improve water supply and sewage systems due to an expanding local population and increasing levels of tourism. JICA conducted a development study, “The Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India” (2005–2006), and based on the study results, an ODA Loan project, “Goa Water Supply and Sewerage Project” (Loan Agreement signed in 2007) was implemented. The development study also identified many problems regarding the operation and maintenance of waterworks. In particular, a high level of non-revenue water (NRW) was raised as a serious issue. To reduce the NRW level, the Government of India (GOI) requested this technical cooperation project as a complementary project to the mentioned ODA loan project.</p>				
Objectives of the Project	<p>This project aimed to strengthen the capacity of the Public Works Department (PWD) to reduce NRW through (i) formulating the Long-term/Annual NRW Reduction Plan, (ii) planning and implementing NRW reduction in pilot project areas, (iii) sharing the technologies and skills for NRW reduction within the PWD, and (iv) sharing the knowledge and technologies for NRW reduction with another state, thereby reducing NRW in the State of Goa.</p> <ol style="list-style-type: none"> <li>Overall Goal: Non-revenue water (NRW) is reduced in the State of Goa.</li> <li>Project Purpose: Capacity of the Public Works Department (PWD) to reduce NRW is strengthened.</li> </ol>				
Activities of the Project	<ol style="list-style-type: none"> <li>Project site: The State of Goa. Three pilot project areas were selected from Salaulim, Opa, and Assonora Water Supply Schemes (WSSs).</li> <li>Main activities: (i) Formulation of the NRW Reduction Plan, (ii) NRW reduction pilot projects including on-the-job training (OJT), (iii) organizational sharing of NRW reduction expertise including the preparation of a manual, replication of the pilot activities, and seminars, and (iv) organization of a workshop with another state.</li> <li>Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Japanese Side</b>            1) Experts: 6 persons            2) Trainees received: 31 persons in Japan            3) Equipment: Listening rods, leak noise detectors, pipeline and cable locators, metal locators, portable water pressure recorders, ultra-sonic flow meters, gate valves, office equipment, etc.            4) Local cost         </td> <td style="width: 50%; vertical-align: top;"> <b>Indian Side</b>            1) Staff allocated: 13 persons for project management and 67 persons for technical counterparts            2) Land, building, and facilities: Three liaison office spaces in the pilot areas            3) Local cost for travel expenses, construction of pits in the pilot areas, materials to repair the detected leakage, and consumer meters         </td> </tr> </table> </li> </ol>			<b>Japanese Side</b> 1) Experts: 6 persons 2) Trainees received: 31 persons in Japan 3) Equipment: Listening rods, leak noise detectors, pipeline and cable locators, metal locators, portable water pressure recorders, ultra-sonic flow meters, gate valves, office equipment, etc. 4) Local cost	<b>Indian Side</b> 1) Staff allocated: 13 persons for project management and 67 persons for technical counterparts 2) Land, building, and facilities: Three liaison office spaces in the pilot areas 3) Local cost for travel expenses, construction of pits in the pilot areas, materials to repair the detected leakage, and consumer meters
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Project Period	(ex-ante) October 2010–September 2013 (actual) January 2011–March 2014	Project Cost	(ex-ante) 372 million yen, (actual) 394 million yen		
Implementing Agency	Public Works Department (PWD), Goa				
Cooperation Agency in Japan	Nihon Suido Consultants Co., Ltd.				

**II. Result of the Evaluation**

## &lt;Special Perspectives Considered in the Ex-Post Evaluation&gt;

- The terminal evaluation judged the Project Purpose Indicator 4 (PWD staff being confident to teach their colleague(s) NRW reduction activities) as “accomplished” based on questionnaires and interviews with stakeholders, but we could not validate this judgment since no concrete survey results are indicated in available reports. We followed the terminal evaluation’s judgment with this reservation.
- The Project Design Matrix (logical framework) does not mention the target year for the achievement of the Overall Goal (Indicator: NRW ratio <23%). Based on the terminal evaluation that examined the likelihood of the achievement of this goal after “3–5 years of the completion of the project” and the statement, “the indicator was adjusted to synchronize the target with the Long-term NRW Reduction Plan,” we regarded the target year to be 2019, five years after project completion.

<b>1 Relevance/Coherence</b>
<p>[Relevance]</p> <p>&lt;Consistency with the Development Policy of India at the Time of Ex-Ante Evaluation &gt;</p> <p>The project was consistent with the development policy of India at the time of ex-ante evaluation. India’s “Eleventh Five-Year Plan” (2007–2012) set out policies related to the water sector, such as safe water supply, 24-hour water supply, and effective use of water resources. The “Eleventh Five Year Plan of the State of Goa” (2007–2012) aimed to achieve a 24-hour water supply and to increase the daily per capita water supply to 100 liters in rural areas and 150 liters in urban areas during the period 2007–2012. The PWD also aimed to increase the daily water supply to 100 liters in rural areas and 150 liters in urban areas. To this end, the PWD was to work to strengthen the water supply infrastructure in the province and enhance the level of water supply services, including NRW measures.</p> <p>&lt;Consistency with the Development Needs of India at the Time of Ex-Ante Evaluation &gt;</p> <p>As mentioned in the “Background” above, the project was consistent with the development needs of India (reduction of NRW) at the time of ex-ante evaluation.</p> <p>&lt;Appropriateness of Project Design/Approach&gt;</p> <p>The project design/approach was appropriate. No problem attributed to the project design/approach was confirmed.</p> <p>&lt;Evaluation Result&gt;</p>

In light of the above, the relevance of the project is ③<sup>1</sup>.

[Coherence]

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

The project was consistent with the Japan's ODA policy to India at the time of ex-ante evaluation. In the Country Assistance Program for India formulated in May 2006, "improvement of poverty and environment issues" was one of the priority areas. In order to secure sufficient and safe water resources and achieve a stable water supply, the plan clearly states that it will actively promote the effective use of water resources through measures such as water conservation and leakage prevention.

<Collaboration/Coordination with other JICA's interventions>

The utilization of the results of the development study mentioned in "Background" above (i.e., findings on the NRW issues and the equipment provided) was planned at the time of ex-ante evaluation and implemented, and the positive effect was confirmed at the time of ex-post evaluation. Also, there was a high degree of complementarity, such as awareness raising activities to reduce NRW were conducted in the ODA loan project,<sup>2</sup> and the positive effect was confirmed at the time of ex-post evaluation.

<Cooperation with other institutions/ Coordination with international framework>

Any cooperation/coordination with other development partners was not clearly planned at the time of ex-ante evaluation.

<Evaluation Result>

In light of the above, the coherence of the project is ③.

[Evaluation Result of Relevance/Coherence]

In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the Time of Project Completion>

At the time of project completion, the Project Purpose was mostly achieved as planned. The average NRW ratio in the pilot project areas (Indicator 1) was reduced from 52.3% to 29.5% before and after the pilot projects. Although the ratio did not reach the target of "less than 20%," partly due to the very high NRW ratio before the pilot projects, the reduction in NRW ratio (baseline minus endline) was 22.8 percentage points against the targeted 32.3 percentage points, making the degree of achievement 74%. NRW reduction activities were undertaken in ten District Meter Areas (DMAs) outside the above-mentioned pilot project areas, exceeding the targeted nine areas (Indicator 2). The PWD acknowledged that the OJT and seminars were very helpful in understanding the concept in detail, and as a result of such training and the pilot projects, its staff in each sub-division became confident to utilize/run the equipment to detect leakage without assistance (Indicator 3). The terminal evaluation reported that the enhancement of confidence of PWD staff to teach their colleague(s) NRW reduction activities was "accomplished" based on questionnaires and interviews with stakeholders (Indicator 4), while the contents of such surveys were not available at the time of ex-post evaluation.

<Continuation Status of Project Effects at the Time of Ex-Post Evaluation>

By the time of the ex-post evaluation, the project effects have partially continued. Since the project completion, some works such as attending to visual leaks and replacing meters are continuing, and leak detection activities have been carried out in the pilot project areas and the DMAs supported by this project. However, these activities are not systematically implemented as per the Long-term/Annual NRW Reduction Plan prepared under this project. The Plan was discontinued in 2017 due to (i) changes in administration and subsequent no allocation of dedicated staff on NRW activities and (ii) failures to equip each DMA with flow meters, GIS mapping, asset management, etc., due to budget constraints. The Plan proposed establishing the Central NRW Control Unit (CNCU) and the Regional NRW Reduction Cells (RNRCs) as a mechanism for NRW reduction. Both organizations were established during the project period but did not function as planned due to a lack of dedicated personnel. Among the equipment procured under this project, water leak detectors and listening rods are still used when required but not on a regular basis. The PWD commented that the equipment is reasonably effective and useful. However, other equipment, such as ultrasonic flowmeters, pipe and cable locators, metal locators, and water pressure recorders, which accounts for about 60% of the technical equipment provided, is not operational due to non-functional batteries, misplacement of the equipment, and no replacement of spare parts. PWD staff use and share the techniques/knowledge obtained/transferred under this project.

NRW ratio after the project completion was available only for Opa WSS (with Khadpaband pilot project area as part of it) up to 2017. The data showed a further decrease (although the target was not reached) as the knowledge gained by this project encouraged the engineers to continue NRW reduction measures. NRW ratio at specific pilot project areas and other WSSs was not available.

<Status of Achievement of the Overall Goal at the Time of Ex-Post Evaluation>

At the time of ex-post evaluation, the achievement of the Overall Goal is unverifiable. NRW ratio has not been measured as a state average. NRW ratio at the DMA level is not measured, either, because of the change in project administration. NRW ratio is calculated at the water treatment plant level covering large areas, and system inputs data and consumption data are available. However, the NRW ratio is not calculated accurately on a regular basis. As mentioned above, the only available data (Opa WSS) showed improvement but did not reach the targeted "less than 23%."

<Other Impacts at the Time of Ex-Post Evaluation>

No negative impacts on the natural environment have been observed. There was no land acquisition for this project. As a positive impact on gender equality, by achieving all the households to be connected to tap water in Goa in the process of reducing NRW,<sup>3</sup> all women and girls in Goa became free from the drudgery of collecting water.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ②.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results	Source
(Project Purpose)	Indicator 1: NRW ratio in	Status of the Achievement (Status of the Continuation): mostly achieved as planned	Source:

<sup>1</sup> ④: very high, ③: high, ②: moderately low, ①: low \* To be the same afterwards.

<sup>2</sup> Awareness raising activities for water users was excluded from this project and implemented in the ODA loan project.

<sup>3</sup> Website: 'Har Ghar Jal' achieves another milestone, covering 9.33 crore rural households with Goa being first certified state' (newsonair.com)

Capacity of the PWD to reduce NRW is strengthened.	the pilot areas (<20%).	(not continued) (Project Completion)	Terminal Evaluation Report, PWD					
		Pilot project area	NRW ratio		Reduction (baseline – target NRW ratio of 20%)			
			[A] Baseline (Oct.2012- Feb. 2013)	[B] Endline (Jan. 2014- Feb. 2014)	[C] Targeted reduction (A-20%)	[D] Actual Reduction (A-B)	[E] Target achievement (D/C)	
		Curtorim (Salaulim WSS)	45.1%	18.0%	25.1 points	27.1 points	108%	
		Khadpaband (Opa WSS)	58.7%	34.4%	38.7 points	24.3 points	63%	
Moira (Assonora WSS)	53.0%	36.1%	33.0 points	16.9 points	51%			
Average	52.3%	29.5%	32.3 points	22.8 points	74%			
		(Ex-Post Evaluation) No other data than below was available.						
		WSS	NRW ratio					
			2014-15	2015-16	2016-17			
		Opa WSS	34.04%	33.31%	31.18%			
	Indicator 2: NRW reduction initiatives are undertaken in nine (9) areas by PWD outside of the pilot areas.	Status of the Achievement (Status of the Continuation): achieved beyond the plan (partially continued) (Project Completion) Ten DMAs: Colva, Curhorem, Sangem, Canaona, Miramar, Maraoaim, Parvorim, Parnem, Mayem and Vaipoi. (Ex-post Evaluation) Some leak detection technologies are utilized at some of the areas in the above-mentioned pilot project areas and the ten DMAs.	Ditto					
	Indicator 3: At least one staff in each sub-division is in a position to utilize the equipment to detect leakage without assistance.	Status of the Achievement (Status of the Continuation): mostly achieved as planned (partially continued) (Project Completion) The PWD acknowledged that staff in each sub-division became confident to utilize/run the equipment to detect leakage without assistance after the technical transfer of this project. (Ex-post Evaluation) In the sub-division offices, staff (one or more) continues to share the skills and knowledge acquired and transferred in the project, and some equipment is utilized to conduct leak detection. However, there is equipment that is not operational.	Ditto					
	Indicator 4: At least one staff in each sub-division is confident to teach his/her colleagues and/or staff members the technique to conduct NRW reduction activities.	Status of the Achievement (Status of the Continuation): mostly achieved as planned (partially continued) (Project Completion) The terminal evaluation judged this indicator as “accomplished” based on questionnaires and interviews with stakeholders. (Ex-post Evaluation) PWD staff use and share the leak detection techniques/knowledge obtained/transferred under this project at some of the areas (although the staff has the necessary skills and knowledge to teach other staff, it was judged as “partially continued” due to the difficulty in identifying the actual degree of sharing).	Ditto					
(Overall Goal) NRW is reduced in the State of Goa.	Indicator: NRW ratio in the State of Goa reduces average of 2% per year till reaching the target (<23%).	(Ex-Post Evaluation) unverifiable Data is not available.	Source: PWD					

### 3 Efficiency

Both the project cost and project period slightly exceeded the plan (the ratio against the plan: 106% and 108%, respectively). The project period exceeded the plan due to insufficient involvement of PWD staff (in terms of awareness amongst staff members and involvement of senior/middle management) during the initial stage. The implementation in the second year was also affected by election activities. However, the delay was made up in the second half of the implementation period by promoting staff’s understanding through more frequent workshops, etc., and schedule adjustments. The project cost exceeded the plan because of combined factor. The Outputs were produced as planned.

In the light above, the efficiency of the project is ③.

### 4 Sustainability

#### <Policy Aspect>

“Har Ghar NAL SE JAL (Jal Jeevan Mission),” a rural drinking water program of the GOI, is envisioned to provide safe and adequate drinking water through individual household tap connections by 2024 to all households, including water conservation. Goa became the first certified state achieving all the households equipped with water taps. Also, preparation of the “Master plan to achieve 24x7 Water Supply in Goa” including NRW reduction, is underway (currently, the procurement of a consultant is under process).

#### <Institutional/Organizational Aspect>

After the project completion, PWD’s new divisions were created for NRW; however, sufficient workforce was not allocated. The organization was retained until the administrative change in 2017. No recruitment of additional engineers has taken place in the last ten years in Goa PWD due to budget constraints. Therefore, the situation that NRW team members are given dual responsibilities (i.e., NRW activities

in addition to their routine responsibilities of work in the PWD) has not changed since the project implementation period. Nevertheless, some leak detection technologies are carried out at some areas, and PWD stated that their plan to achieve NRW ratio reduction at 20-25% throughout Goa is underway.

<Technical Aspect>

The techniques the PWD officers obtained through the project, such as how to read the meter, classifying the types of connections (domestic/commercial/others), consumer-related data like consumer number and ID on the bill, and ascertaining the faults or errors in meter reading, have been practiced to some extent by those who had received the technical transfer. However, they have not been disseminated to other staff after the project completion. Also, no new training system has been established due to a lack of budget. The manual on NRW reduction developed under the project is available; however, it is not used to train new people to conduct NRW activities.

<Financial Aspect>

The budget for operation and maintenance of water-related facilities is secured by the State Government, while it has not been well allocated to NRW reduction-related matters, including deployment of equipment (such as flow meters), staff allocation and training as mentioned above. Nevertheless, 50 crores of work, including NRW reduction activities, is under the process of implementation for the “Master plan to achieve 24x7 Water Supply in Goa” and the procedure for hiring consultant is ongoing.

<Environmental and Social Aspect>

No issues with the environmental and social aspects caused by this project have been observed, and it has not been necessary to take any countermeasures.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the institutional/organizational, technical, and financial aspects of the implementing agency. Therefore, the sustainability of the project effects is ②.

5 Summary of the Evaluation

The project mostly achieved the Project Purpose of strengthening the capacity of the PWD to reduce NRW as planned. The Overall Goal of reducing NRW in the State of Goa is unverifiable as the NRW data is not available at the state level. After the project completion, the project effects have partially continued as some leak detection technologies have been utilized by PWD staff at some areas. Regarding sustainability, some problems have been observed in terms of institutional/organizational, technical, and financial aspects, i.e., deployment of equipment (such as flow meters), staff allocation and training have not taken place due to the administration change in 2017 and budget constraints.

Considering all of the above points, this project is evaluated to be partially satisfactory.

**III. Recommendations & Lessons Learned**

Recommendations for Implementing Agency:

- Commitment by high management of the PWD is necessary in order to regain and sustain the project’s impact. It is important to formulate “Master plan to achieve 24x7 Water Supply in Goa” and to implement it steadily. It is suggested to initiate the budget and formulate a team exclusive for NRW reduction.

Lessons Learned for JICA:

- Change of Project Director or other related officials of the project led to the decline in momentum to push for NRW reductions and thus discontinued the activities. The project should have carried out activities to make the NRW organizational structure more robust.
- The commitment from the Government of Goa needed to be addressed on the continuous funds for operation and maintenance.



Leak detection equipment at PWD, Ponda, functional



Leak detection equipment at PWD, Curtorim, functional



Miramar DMA which covers Fire and Emergency Services Headquarter and Caculo Mall