Final Evaluation: Increasing Climate Resilience through an Integrated Water Resources Management Programme

FINAL Report

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Foreword

This evaluation report has been prepared by the Final Evaluation (FE) lead specialist: Ms Jessica Troni and Ms Hana Saeed

The 'Increasing Climate Resilience through an Integrated Water Resources Management Programme' is a full size project nationally executed by the Ministry of Environment and Energy from late 2011 to 2015 with support of UNDP and UNOPS, funded by the Adaptation Fund. The objective of the project was *"to ensure reliable and safe freshwater supply for Maldivian communities in a changing environment."*

The aim of this final evaluation report is to assess the extent to which the project achieved its objective and targets and any other benefits; and to provide a platform for lesson learning for future investments of this nature, and a set of recommendations that can be acted upon to improve the likelihood of achievement of project Outcomes as well as to help design future initiatives. The evaluation Report is structured as follows. Section 1 covers the scope of the evaluation. Section 2 provides an overview of the project. Section 3 presents the evaluation findings with overall ratings for the project. Finally, sections 4, 5 and 5 set out the main conclusions, recommendations and lessons learnt from the implementation experience. A number of Annexes are also included in the final evaluation report.

A draft final evaluation report was submitted to UNDP, UNOPS and Ministry of Environment and Energy on the 15 December 2015 for review.

Executive Summary

The objective of the project '*Increasing climate resilience through an Integrated Water Resource Management Programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island*' (forthwith called 'The Project') was to ensure reliable and safe freshwater supply for Maldivian communities in a changing climate.

The project was designed to address water insecurity driven by a complex web of factors. Conventional water resources available on islands in Maldives are confined shallow ground water aquifers and rainwater. Demand for water resources is continuously increasing due to increasing population and standards of living. At the same time, the capacity to meet this demand is in decline because groundwater pollution and over-abstraction.

The solution to be implemented by the project, as envisaged in the project document, was for an integrated three-water source water supply system by building community rainwater storage capacity; improving the ground water resources through recharge and wastewater management and expanding desalination capacity; and to deliver the water to households through a piped system. The project focused on a two-source water supply model instead of a three source water supply model as the groundwater element was jettisoned from the project design. The inclusion of ground water in the integrated water supply system was advocated in the project document as an essential adaptation strategy for freshwater provision on the islands because of the widely accepted ecosystem resilience principle that in diversity lies resilience. The reduced scope of the project was due in part because of a significant budget constraint, as well as a lack of leadership and expertise on applying the principles of Integrated Water Resources Management (IWRM) to the project design.

Because of the reduced scope of the investment, the conclusion drawn is that climate change risk has only partially been mitigated as envisaged in the project proposal, though documentary evidence and stakeholder views suggest that this project catalysed a shift in mind-set within Government of Maldives towards an IWRM approach; therefore an adaptation pathway has been forged.

The project did contribute to the AF Goal of assisting vulnerable countries to implement climate-resilient measures in the sense that it moved Maldives on a trajectory towards adaptation and self-sufficiency at the island level, starting from a baseline characterised by limited amounts of private supplies of rainwater water and expensive desalinated water currently shipped from the Capital - Male. The island water supply systems installed represent a significant milestone on a critical path towards a communal management of water resources, which will be the most efficient outcome for the islands regarding water supply. If the water supply system can be made to work sustainably, the project experience could create an important platform towards the eventual possibility of communal management of the aquifer (the third water source), which will be essential to reducing vulnerability to climate change. With higher amounts of rainfall projected, falling in heavier bursts, there is an opportunity to harvest more both in the aquifer and above ground. Thus a comprehensive adaptation strategy would need to encompass aquifer management.

The AF project helped Maldives meet the costs of concrete adaptation project in a wider sense too. This project has had a catalytic effect. A number of projects are being designed in the Ministry of Energy and Environment that are based on the AF concept. For example, the recently won investment funds from the Green Climate Fund and a USAID-funded project in

Hinnavaru and Thoddoo, as was a three-island concept design on Mulah, Dhiggaru and Maamigili. According to stakeholder interviews, there is an intention by MEE to review all new water and projects on the basis of IWRM.

The project had more success in its influence in changing mind-sets on how to 'do' integrated water resources management than in implementing a successful adaptation model. Climate change adaptation did not drive the system design. Focusing the project on a two-water source model rather than a three-water source model reduced the potential of the project to build island communities' resilience to changing patterns of rainfall and dry periods, and to capitalise from climate change regarding the expected increased amounts of rainfall and heavier bursts of rainfall, which would facilitate recharge, together with abstraction management.

The project had mixed results at the level of water supply to the islanders and sustainability cannot be assured without some key retrofits made to the investments on the three islands, as detailed in the Recommendations section of this report. It should be noted that these are detailed in the Recommendations section. This evaluation was carried out before the water delivery service had started which may have affected the perceptions and feedback provided to the evaluators. Nevertheless, at the time of the evaluation, the main risks to sustainability have been observed to be two-fold. Firstly, community relations had been negatively affected on all three islands were observed. The installation process over the last two years negatively affected trust in the island authorities to be able to deliver, which may affect willingness to pay for the service. Secondly, the quality of the materials used and workmanship means that the rainwater conveyance system will not perform to the standard required without pipe and fittings replacement, none of which were planned at the time of the evaluation. Thirdly O&M may also be an issue affecting the sustainability of the desalination plant without the application of a longer-term plan for staff training and development. Fourthly, the design of the system lacked a business model, and the result is that the entire operation is unlikely to be financially sustainable, without designing and applying a business plan which engages island communities to generate the buy-in.

These risks to sustainability arose because the IWRM project design was generic and not sufficiently tailored to the island situation; the detailed project design was supply-driven rather than user-driven; and management effectiveness could have been better with the right implementation team in place from the start. Implementation challenges were mainly institutional in nature, specifically the questionable capacity to deliver an IWRM system by the implementers, a fragmented, unstable and weak implementation team, and a lack of cooperative management between the three main parties, but the serious budget gap cannot be ignored; it was impossible to deliver on the three source water supply model on three islands as envisaged in the project document and choices had to be made on the outputs to deliver and which ones to jettison.

The evaluation identifies 18 recommendations, divided into three areas: i) those that are intended to improve the impact of the AF project (seven recommendations); ii) those that are intended to guide future investments of this nature regarding the policy framework (six recommendations) and regarding the investment structure (5 recommendations).

The report ends with six main lessons learned for future investments of this nature.

Acronyms and Abbreviations

ARUP	International consulting company
AF	Adaptation Fund
CDR	Combined Delivery Report
CRWH	Community Rain Water Harvesting
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
GoM	Government of Maldives
GRP	Glass Reinforced Plastic
FE	Final Evaluation
Feneka	Maldives State Utility
IMWI	International Water Management Institute
IWRM	Integrated Water Resources Management
m^3	Cubic meters
M&E	Monitoring and Evaluation
MEE	Ministry of Energy and Environment
MWSC	Maldives Water and Sewerage Company
NDMC	National Disaster Management Centre
O&M	Operational and Maintenance
RO	Reverse Osmosis
RP	Responsible Party
PID	Project Initiation Document
PMU	Project Management Unit
Stelco	Maldives State Utility
UNDP	UN Development Programme
UNOPS	UN Office of Project Services
USAID	USA International Development Agency
WTP	Willingness to Pay

1. Introduction

1.2. Objective of final evaluation

1. The objective of the final evaluation is to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. Final evaluations (FE) for AF projects include the following objectives:

- To systematically assess and disclose levels of project or programme accomplishments;
- To organize and synthesize experiences and lessons that may help improve the selection, design, implementation and evaluation of future AF-funded interventions;
- To understand how project achievements contribute to the mandate of the AF;
- To assess the relevance, effectiveness and efficiency of project design, objectives and performance.
- To help decision-makers learn from the implementation experience as a basis for improving implementation results in future investments.

2. The FE of AF projects and programmes should assess progress towards achievement of increased resilience and/or reduced vulnerability.

3. The FE will be conducted according to the guidance, rules and procedures reflected in the 'UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects' (2012)'.[1] The Final Evaluation is aligned to the requirements of the Adaptation Fund guidelines for final evaluations.

4. The target audience for this final evaluation is the Government of Maldives and in particular the Implementing Partner the Ministry of Energy and Environment, UNDP at country, regional and HQ levels, UNDP Evaluation Office, and the AF Secretariat.

1. 2. Scope of work

5. The final evaluation will report on the following dimensions:

1- Achievement of outputs and outcomes, providing ratings for targeted project objectives and outcomes;
   a. Relevance (discussion and rating)
   b. Effectiveness (discussion and rating)
   c. Efficiency (discussion and rating)
   d. Overall rating

2- Likelihood of sustainability of Outcomes at project completion, providing a rating for this;
   a. Financial and economic (discussion and rating)
   b. Socio-political (discussion and rating)

[1] The guidance document for UNDP-supported GEF financed projects can be used for AF financed projects as well. The document is available via this link.

c. Institutional framework and governance (discussion and rating)
d. Environmental risks (discussion and rating)
e. Uncertainties on climate change impacts – baselines (discussion and rating)
f. Overall rating.

3- Processes influencing achievement of Programme results;
   a. Preparation and readiness (discussion)
   b. Country ownership (discussion)
   c. Stakeholder involvement (discussion)
   d. Financial management (discussion)
   e. Implementing Entity supervision and backstopping (discussion)
   f. Delays in programme start-up and implementation (discussion).
4- Contribution of project achievements to the AF targets, objectives, impact and goal;
   a. Contributions to AF goal (discussion and rating);
   b. Contribution to AF Impact (discussion and rating);
   c. Contributions to AF objective (discussion and rating).
5- Monitoring and Evaluation (M&E) systems.
   a. M&E plans (discussion and rating)
      i. Design (discussion and rating)
      ii. Implementation (discussion and rating)
      iii. Budgeting and funding for M&E activities (discussion and rating)
   b. Indicators (discussion and rating);
   c. Programme baselines (discussion and rating);
   d. Alignment of programme M&E frameworks to national M&E frameworks (discussion and rating)
   e. Overall rating.

6. A set of questions covering each of these five dimensions was prepared and is included in Annex 1.

7. An assessment of project performance was carried out, based on the Project Logical Framework/Results Framework (see Annex 1, which provides performance indicators for project Outcomes along with their corresponding means of verification). Output achievement was evaluated as it provides information about whether the interventions were effective in delivering the project Objective and Outcomes. Longer-term outcomes (impacts) were assessed through a consideration of risks to sustainability and progress towards impacts.

1.3 Structure of report

8. The rest of the report is structured as follows: Section 2 provides an overview of the report. Section 3 presents the evaluation findings organised in five sub-sections, with overall ratings for the project. Finally, sections 4, 5 and 5 set out the main conclusions, recommendations and lessons learnt from the implementation experience. A number of Annexes are also included in the final evaluation report.

2. Programme Overview

2.1 Key project details

9. The key Project details as indicated in the project document are as follows:

- Programme Title: Increasing climate resilience through an Integrated Water Resource Management Programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island
- AF Project ID: 00078494
- UNDP Project ID (PIMS#): 4582; Atlas ID: 00078494
- Country: Maldives
- Executing Agency: *Ministry of Housing and Environment*
- Other Partners involved: *Ministry of Environment and Energy/ UNOPS*

10.The following two tables set out the key project milestones and the project components, outputs and budget.

Table 1 Key project milestone dates

Project timetable	Expected date	Actual date
Start of programme implementation	April 2012	25 April 2012
Mid-term review	October 2013	February 2014
Programme closing	October 2015	December 2015
Final evaluation	July 2015	November 2015

2.2 The rationale for the programme

11. The project was designed to address water insecurity driven by a complex web of factors. Conventional water resources available on islands in Maldives are confined shallow ground water aquifers and rainwater. Demand for water resources is continuously increasing with increasing population and standard of living. At the same time, the capacity to meet this demand is in decline because groundwater pollution and over-abstraction. In the face of the limited conventional sources of freshwater, use of non-conventional water resources such as desalinated water and bottled water both from imported and local production has increased in the islands, neither of which are optimal solutions from an efficiency or resilience point of view.

12. The aquifers on many of the islands are contaminated with wastewater discharged into them due to the absence of appropriate systems for wastewater discharge, treatment and disposal. In addition, overexploitation of the freshwater aquifer in some islands has led to the salinization of the groundwater. This situation has been aggravated by flooding of the islands during extreme water events, which has increased saltwater intrusion into the freshwater lens. Over-abstraction of the aquifer leads to saltwater intrusion into the aquifer, further increasing vulnerability to climate change. The 2004 Tsunami was an external shock which impacted the ground water resource negatively through saline over-topping of the island – a warning of things to come regarding climate change effects on wave dynamics. Many communities do not have sufficient freshwater to last the year, and since 2005, government has provided emergency freshwater to the islands, shipped from the Capital - Male..

13. The solution to be implemented by the project was to implement an integrated three-water source water supply system on the three islands by building community rainwater storage capacity and to improve the ground water resources through recharge and wastewater management, and to deliver the water to households through a piped system.

14. Thus a conjunctive three-water source model of water supply was proposed in the project document. The inclusion of ground water in the integrated water supply system was advocated in the project document as an essential adaptation strategy for freshwater provision on the islands because of the widely accepted ecosystem resilience principle that in diversity lies resilience. Table 2 sets out the key details of how the project was targeted.

Table 2 Targeting of the AF Maldives project

	Region	Size (ha)[11]	Population (Census 2006)[12]	Population density
Ha. Ihavandhoo	North	61.9	2447	40
ADh. Mahibadhoo	Central	22.3	1780	80
GDh. Gadhdhoo	South	25.2	1439	57

2.3 Immediate and development objectives of the project

15. The objective of the project '*Increasing climate resilience through an Integrated Water Resource Management Programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island*' (forthwith called 'The Project') was to ensure reliable and safe freshwater supply for Maldivian communities in a changing climate. The project outputs and budget are presented in Table 3.

Table 3 Project components, outputs and budget

Project components	Project outputs	Output & Outcome budget Amount USD
Outcome 1: Establishment of integrated, climate-resilient water supply and management systems in Mahibadhoo, Ihavandhoo and Gadhdhoo.	1- Artificial groundwater recharge systems established to protect groundwater resources from salinization and improve aquifer yields in dry seasons. 2- Existing rainwater harvesting schemes are redesigned, interconnected and structurally improved to buffer climatic extremes and ensure equal water supply for all households during dry periods. 3- Production and distribution system for desalinated water supply established. 4- Existing wastewater management systems redesigned and improved to ensure sufficient quantities of safe groundwater.	228,296 3,717,893 3,296,733 77,476 7,320,397
Outcome 2: Increased participation in the	1- Community consultations on each target island ensure participative design, sustainability and continued maintenance of integrated water resource management schemes	70,000

development, allocation and monitoring of freshwater use in a changing climate.	2- Targeted training events conducted in each region to strengthen water user participation and skills in adaptive, integrated water resource management	40,000 110,000
Outcome 3: Replication and up-scaling of climate-resilient freshwater management	1- Training of technicians in the design, operation and management of integrated water resource management systems 2- Output 3.2: Institutional mechanisms created to integrate adaptive management of freshwater resources into the design and rollout of new water management projects and schemes 3- Output 3.3: Action plan developed and financing mobilized to replicate integrated, climate-resilient freshwater management on at least 4 additional islands	30,000 30,000 20,000 80,000
Programme execution cost incl. M&E		774,602
TOTAL		$8,285,000

2.4 Main stakeholders

16. The main stakeholders on the Project Board are indicated in Table 4. Other stakeholders to the project were the Environmental Protection Authority (EPA), Maldives Water and Services Company (MWSC), Fenaka (a State Utility) , the Island Council members and over 5000 people living on the three islands.

Table 4 Composition of the Project Board

Organization/Institution	Name of Officer	Position
Project Board		
Ministry of Energy & Environment	Mr. Addul Matheen Mohamed. Ms. Shaheedha Adam Ibrahim	Minister of State, MEE Project Director, MEE
Ministry of Home Affairs	Mr. Ahmed Shareef Nafees Mr. Ibrahim Hameed	Director General Permanent Secretary
Ministry of Finance and Treasury	Ms. Aminath Nashia Mr. Mohamed Imad	Director Director General
Ministry of Housing & Infrastructure	Mr. Abdulla Ziyad	Deputy Minister
National Disaster Management Centre (NDMC)	Mr. Hisan Hassan	Project Director
UNOPS	Ms. Francoise Jacob	Director and UNOPS representative
UNDP	Ms. Shoko Noda*	UNDP Resident Representative

***** UNDP Resident Representative (RR) changed a number of times during project implementation period. Ms Noda was the latest RR at the time of the evaluation.

2.4 Expected results

17. The programme had two objective targets and 13 Outcome targets. The programme results indicators are set out in Table 5. Annex 1 contains the full results framework with baseline values and indicators.

Table 5 Programme targets

Objective
Integrated water resource management systems on Ihavandhoo, Mahibadhoo and Gadhdhoo provide 24% of all Maldivians who are vulnerable to water shortages and degrading water quality in a changing climate with a reliable supply of safe freshwater. Replication of the project on 4 additional islands provides at least 50% of all Maldivians who are exposed to water shortages and degrading water quality in a changing climate with a reliable supply of safe freshwater.
Outcome 1
1. Access to freshwater: 100% of the population living on HA. Ihavandhoo, ADh. Mahibadhoo, and GDh. Gadhdhoo will have uninterrupted access to reliable and safe freshwater supply of at least 20 liters per person per day at all times, including during extreme climate events **2. Ground water quality:** By the end of the project, the quality of groundwater in each target island has improved to levels that are safe for hygiene and agricultural purposes • Ihavandhoo: 700 groundwater recharge pits and 30 community recharge wells developed • Gadhdhoo: 495 groundwater recharge pits and 30 community recharge wells developed; • Mahibadhoo: 275 groundwater recharge pits and 30 community recharge wells developed **3. Rainwater harvesting**: Improved rainwater harvesting and storage capacity will be installed as follows: • Ihavandhoo: 9,000 m3 • Mahibadhoo: 6,300 m3. • Gadhdhoo: 6,300 m3 All new rainwater harvesting systems will be equipped with disinfection safeguards to ensure safety of water supply **4. Desalination:** The following minimum amounts of desalination capacity will be installed on each target island: • Ihavandhoo: 90 m3 • Mahibadhoo: 60 m3. • Gadhdhoo: 60 m3 Potable water quality levels will be in conformity with WHO standard at all times **5. Sewage disposal:** All sewage and wastewater management systems which are planned and/or constructed on the 3 target islands integrate targeted measures to reduce groundwater pollution. All septic tanks on each target island are cleaned at least twice per year to prevent groundwater pollution from flooding events.
Outcome 2
1. Integrated water management systems on all target islands are designed and installed based on community participation, and their operation and maintenance is based on actual willingness to pay. 2. Integrated water resources management systems on each target island are designed and installed on the basis of community input, and their continued operation is aligned with actual willingness to pay for the operation and maintenance of the installed infrastructure. 3. At least 1 IWRM training campaign is conducted in each administrative region (7 total) to strengthen dialogue between water users and providers and increase sensitization about the economic, social and environmental role of water in a changing climate.
Outcome 3
1. Project approach is replicated on at least 4 islands 2. At least 5 staff from each water and sewage utility company currently active in Maldives are trained in the technical principles of integrated water resource management and recognize basic design principles which make water supply and sewage systems adaptive to a changing climate. 3. Each new water and wastewater management project that is approved by the Government of Maldives is subject to technical reviews on the basis of IWRM and climate resilience principles. 4. The government approves at least 4 new, fully financed freshwater and/or wastewater management projects on the basis of lessons learned and design principles replicated from the proposed project.

18. The final evaluation also assesses the extent to which the project delivered against the AF standard indicators. Table 6 indicates in pink which of the AF portfolio targets the Programme was expected to contribute to, highlighted in pink.

Table 6 Adaptation Results Framework: relevant standard indicators for the project

EXPECTED RESULTS	INDICATORS
Goal: Assist developing-country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change in meeting the costs of concrete adaptation projects and programmes in order to implement climate-resilient measures.	
Impact: Increased resiliency at the community, national, and regional levels to climate variability and change.	
Outcome 1: Reduced exposure at national level to climate-related hazards and threats	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis
Output 1: Risk and vulnerability assessments conducted and updated at a national level	1.1. No. and type of projects that conduct and update risk and vulnerability assessments
	1.2 Development of early warning systems
Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks
	2.2. Number of people with reduced risk to extreme weather events
Output 2.1: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events
Output 2.2: Targeted population groups covered by adequate risk reduction systems	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased
	2.2.1. Percentage of population covered by adequate risk-reduction systems
	2.2.2. No. of people affected by climate variability
Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses
	3.2. Modification in behavior of targeted population
Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level
	3.1.2 No. of news outlets in the local press and media that have covered the topic
Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress

3. Findings

This section is divided into five main evaluation areas and a final sub-section on project ratings, based on implementation progress at the time of the evaluation. It should be noted that at the time of evaluation none of the island water supply systems were operational, for a

number of reasons, and this may have affected some of the feedback which the evaluators received from the island communities and authorities.

3.1 Achievement of outputs and outcomes

3.1.1 Relevance

19. The project was highly relevant according to all stakeholders that the evaluators were able to consult with on and outside the three project islands. The project aimed to address the lack of piped water supply and effective wastewater treatment system on the three islands, where households are obliged to rely on traditional rainwater harvesting techniques for their drinking and cooking water requirements. Contaminated groundwater is used for other domestic water needs such as washing of clothes and bathing, negatively affecting people's health. Imported and locally produced bottled-water is extensively utilized for drinking and cooking, particularly during dry season.

20. Provision of access to safe drinking water and adequate sewerage systems to people in Maldives became a constitutional right for the first time in 2008. The Goals and Objectives of the water and sanitation sector are to:

1. Ensure access to safe drinking water and sanitation facilities as a basic human right
2. Protect and preserve the country's vital fresh water resources and establish water stocks for use in emergency and disasters.
3. Enhance the role of private sector participation in the provision of water and sanitation services while encouraging a smooth shift in the role of the government as a regulator and facilitator in the provision of these services.
4. Introduce the use of renewable energy and other modern, appropriate and sustainable technologies to minimize the cost of providing drinking water and sanitation systems and to protect the ground water.

21. These objectives are not being met because of a lack of effective wastewater management, the remoteness of the islands, the small island populations and weak capacities to manage water as a common resource. Over-abstraction of the aquifer leads to saltwater intrusion into the aquifer, further increasing vulnerability to climate change. Without adaptation, expected climate change impacts for Maldives are likely to worsen an already vulnerable situation. This situation analysis confirms the relevance of the project to the people of Maldives.

3.1.2 Effectiveness

22. The project had three components and nine outputs. The three Outcomes are as follows:

1. Establishment of an integrated water supply and management system;
2. Increased participation in system design;
3. Up-scaling and replication.

23. Two of the outputs in Outcome 1 were delivered though with sustainability issues and with less adherence to IWRM principles than was needed for full effectiveness. For Outcome 2, it would be fair to say that the outputs were not delivered in any meaningful way. For Outcome

3, the sustainability strategy for operation and maintenance needs further work, but the replication value of the project has been good. The project focused on a two-source water supply model instead of a three source water supply model, which nevertheless is viewed as progression itself from the previous water supply model relying on private rainwater harvesting supplies and desalination only. A detailed report of progress against the project Outcomes and outputs now follows.

24. ***Objective: Establishment of integrated, climate-resilient water supply and management systems in Mahibadhoo, Ihavandhoo and Gadhdhoo.*** The project was geared towards fixing a baseline vulnerability regarding the security of drinking water during the dry season but therefore, once the water supply systems are operational, will only partially achieve its objective of establishing a climate-resilient system.

25. As of the time of the evaluation, the three island communities are waiting for their installed systems to become operational, which are currently waiting to be officially handed over to the island utilities. The signs are that technical and financial sustainability will be undermined by a number of issues. The collection pipework in the community rainwater harvesting system is poor quality and will undermine the efficiency of the collection process. Leakages in the water distribution network were reported during the evaluation island visit in Mahibadhoo; at the time of the evaluation leakages, as reported by island Councils and the UNOPS engineer located on the islands, were being addressed by UNOPS. Island authorities and communities on all three islands questioned the feasibility of the operation and maintenance requirements of the community rainwater harvesting system. In addition, it is unclear whether the community rainwater tanks have enough capacity to provide freshwater with a 75/25 blend level with desalinated water for the duration of the dry season, especially considering the changes in rainfall distribution expected due to climate change (see Section 3.2.4 for details). In a Project Board meeting in August 2014, the UNOPS senior engineer reported that a 10 percent blend could be expected, rather than the planned 25 percent. This would have impacts on affordability as desalinated water is more expensive.

26. Outcome 1 is the establishment of integrated, climate-resilient water supply and management system on the three islands of Mahibadhoo, Ihavandhoo and Gadhdhoo. The component has four Outputs (ground-water recharge, rainwater harvesting, desalination and waste water treatment) with a total budget of USD7,320,397. Table 3 in this report sets out the budget for each of the Outputs. The Responsible Party for delivering this Outcome was UNOPS. An assessment of the extent to which each of the Outputs were delivered follows below.

27. **Outcome 1.1: Artificial groundwater recharge systems**: Not delivered. Work to scope out the options was reported as early as second quarter of 2012. The EIA (June, 2013) indicates that further assessment of the size of the potential recharge volume on each island together with recharge water dynamics in the aquifer would be needed (it also noted that abstraction management should be an essential co-management strategy). The groundwater recharge method that had been applied in Male proved problematic due to clogging, and the AF project therefore did not have a proven method of recharge it could apply with confidence. The issue was debated at length through the Project Board and outside it. A desk review of artificial recharge options was undertaken through UNOPS (Responsible Party for Outcome 1) in March 2013 and proposals for follow-on work was explored with potential contractors. Consideration of this output rumbled on until mid-2014, with MEE proposing the work be done through another contractors. By this time, the time and funds were too limited for UNOPS to follow through with the work and MEE decided to take back the output from UNOPS.

28. **Outcome 1.2 Communal rainwater harvesting (CRWH)**. Delivered but operational sustainability is questionable without additional retrofits as detailed in the recommendations section of this report. It is unclear whether rhe rainwater storage tanks will be big enough to integrate with the desalinated water system for the full duration of the dry season, especially considering the changes in rainfall distribution expected due to climate change. On a positive note, the community tanks on each of the three islands are collecting water.

29. Rainwater was designed into the project as a significant part of the water supply model for a number of reasons: to make the water supply system more affordable, to provide better water taste, to increase the incentives for the operator to use the CRWH part of the integrated system and as a way of justifying the capital cost of this element of the system. This component consists of a gravity-fed conveyance pipe network connecting up between 30 to 40 private house roofs to community water tanks. Each private house has a two valve system that allows 30 minutes of first flush to be ejected, then each of the 30-40 valves has to be turned to direct the water to the private household water tank then, when that is full, each of the 30-40 valves have to be turned to direct the rainwater into the pipeline network that leads to the community collection tank, then the valve for the 30-40 houses has to be turned back to the default position when the rain stops. When the rain starts again, the operation should be repeated.

30. In each island two to three tanks were built with project funds (two tanks in Mahibadhoo because of space restrictions) with a total collection capacity of 550m^3 on each island, following the proposed design in the detailed design report. Stored water from each community tank is pumped to the central facility where the rainwater would be blended with desalinated water. Disinfection and safeguards have been included at the central water supply plant for the rainwater to be treated prior to it being pumped into the distribution network. Inclusion of Ultraviolet treatment in addition to chlorination was recommended by MEE and supplied by UNOPS. The current design allows for expansion of the system to integrate more households that are willing to pay for the service. The stored rainwater would be treated and then distributed to consumers via a piped network.

31. The problems with the design of the CRWH system are two-fold. Failing to apply the valve turning routine for each of the 30 to 40 houses connected to the conveyance system will compromise the rainwater collection efficiency. The questions that arose in all three islands are i) who is going to clean the roofs linked to the communal rainwater harvesting system and ii) who is going to turn the valves? It would be easy to say that the island utility staff would need to take responsibility but it is questionable as to whether anyone want to do this at regular intervals for the six to eight months of rains. The responsible entity for running the system may simply opt to provide only desalinated water due to the cost of maintaining and operating the rainwater harvesting component. These are not trivial questions; they undermine the affordability of the system and could potentially cause conflicts in the community. Automated solutions could have been applied and have indeed been taken up in the USAID-funded investment in a similar integrated water supply project in the island of Hinnavaru.

32. Secondly, the total capacity of the community rainwater tanks on each island is too small to provide a 75/25 mix of blended water (the ratio of desalinated water to rainwater) throughout the duration of the dry season. The project document provisioned for tank capacity in each

island of between 6300 to 9000 m^3, revised during the project design phase[2] to between 1,250 to 2,550 m^3. The UNOPS basic design concept (March 2012) envisaged a 75/25 mix the other way (a greater mix volume of rainwater relative to desalinated water). The tanks are much smaller than this on the three islands. Reservoir sizes were determined based on the roof area available for catchment and land space available.

33. There are on-going quality issues. Inspection visits and community consultations during the evaluation mission highlighted the issue of quality with the valves used at the harvesting points in public buildings and private homes which could lead to costly maintenance. In addition, visible signs of degradation of the rainwater conveyance pipe network, due to intense UV radiation, were seen by the evaluators in Mahibadhoo and Gadhdhoo, indicating poor quality PVC pipes were used. This could be significant health risk as the water running through these pipes is meant for drinking use. It is not expected that the conveyance pipe network will last very long (certainly not as long as the 30 year EPA standard). The connections in the conveyance pipeline also compromise water collection efficiency. In Mahibadhoo and Gahdhoo, there were numerous ill-fitting connections between the guttering and the project pipe network, between the existing pipes and the project pipe network and even between the valves and the pipe networks put in by the project which will affect the efficiency of rainwater collection. In some place the pipes have become disconnected from the walls and in one place the evaluators saw the pipe had dropped to the ground completely. As the same materials supplier was used for the three islands, it is expected that the same quality issues in the CRWH conveyance pipeline are present in Ivahandhoo.

34. **Outcome 1.3 Desalinated water supply**: Delivered but operational sustainability is questionable due to the uncertainty of whether the management systems have been put into place to ensure continuity of service into the future. Test certificate has been issued for Ihavandhoo but not yet for Mahibadhoo and Gadhdhoo.

35. The Reverse Osmosis (RO) plant is a double storey building with the plant machinery on the ground level and an office, laboratory and storage room on the top level. A Glass-Reinforced Plastic (GRP) tank is located outside the plant building and acts as the mixing tank for the rainwater and desalinated water. A water distribution pipe network provides piped water to households. Solar panels have been installed to provide full power needs. The panels are tied to the grid allowing power transfer in as well as out from the plant. In addition, for Gadhdhoo, a de-gasifier was installed to remove the sulphur hydroxide smell from the desalinated water.

36. The capacities of the RO plant are larger than the size proposed in the detailed design report. The supplier proposed larger capacity plants for the same costs provided that the rehabilitation work of existing plants were removed from the contract since the existing plant were beyond repair. The capacity of the RO plant in Gadhdhoo was 70 m^3 per day which is much higher than actual demand estimated at 40 m^3 per day[3]. The risk highlighted in the project monitoring reports was that larger capacity plants could deter the use of rainwater which was designed into the project as a measure to make the water supply system more affordable and palatable. The larger plants also present more complexity in the operation and maintenance of the plant.

[2] UNOPS Project Initiation Document, April 2012, Annex 3

[3] Pers comm. UNOPS engineer on Gadhoo island.

37. The approved detailed design report (March 2013) indicates that "*Capacities of the RO desalination plants have been selected to have two parallel streams of processing lines of equal capacity with the option of producing 50% of daily demand. Although it is costly by at least over 25% compared to a single full production capacity plant it has the advantage of permitting half and full production capacity operations and plant maintenance is possible without complete shutdown of the entire operation*." The reasons for procuring such large units are understandable but applying a management lens to the question regarding operational and maintenance capacities in Maldives might have led to a different decision on the type of unit to be procured.

38. Delivering water of a consistent quality, especially considering the dynamic effects of rainfall on groundwater salinity, will require management expertise. The percentage blends of desalinated and rainwater also affects the price. Management information about quality, blend ratios and costs, would be essential inputs into an effective and affordable water service delivery. But, from what the evaluators could see, there has been scant attention given to management training. There are physical maintenance issues that are required such as regular changes of the membranes. Maintenance issues were noticed at the RO plants, namely rusting of the flow levers at two of the plant and a leakage in the plant in Ihavandhoo.

39. Energy is the major cost of operation and the plant is advantageous from this point of view, but in practice this may be no advantage at all. The detailed design report indicates that the net energy balance for the system in Mahibadhoo and Gadhdhoo would be zero because the excess energy generated during the day and sold to the grid would be consumed at night. Recent test results in Gadhdhoo shown to the evaluators indicated that on sunny days the plant is a net producer of energy, though it is currently being used for only 1-2 hours per day and therefore may not be a true reflection of the net energy balance once the plants are operated fully. Back-up generators for the plant were jettisoned due to budget constraints.

40. **Outcome 1.4 Waste water management:** Not delivered. Sewage treatment was considered outside the scope of the project in the detailed design document because of budget constraints. It was already raised as a budget issue in the early stages of project design (2012). The intention in the project document was establish a cleaning protocol for septic tanks and ensure an annual cleaning of the tanks before the wet season and providing workable design options on integrating the water supply and waste water treatment systems planned in Mahibadhoo and Gahdhoo.

41. **Outcome 2: Increased participation in system design:** Not delivered in a meaningful way. This component has a small budget of USD110,000 which was underspent. The Responsible Party was MEE.

42. The inception phase of the project created the space for consultations with the community on their expectations for the water service, which is documented in the project inception report. But the advice and recommendations were not incorporated into the system design, which could have prevented many of the problems that challenged the project. This could therefore be characterized as a process of consultation without really listening. As early as Q2 2012, UNOPS raised the issue of considerable cost variation, because of the unrealistic budget assigned to the different outputs in the project. UNOPS foresaw the need to discuss with communities the shape of the water supply system given the need to re-configure the original plan due to the budget shortfalls, but this was never really taken forward by the Project Management team. The lack of attention given to this component shows a fundamental

misunderstanding of the centrality of paying customers to making the water supply system work.

43. Discussions with the island authorities and communities revealed different levels of understanding about the rationale for the water mixing and the technology behind it. In other words, the ownership in the system was largely absent. A community awareness visit was documented in Q3 of 2014 to trouble shoot a problem in Mahibadhoo around the CWRH design (communities thought they would lose private access to rainwater). During the evaluation mission, public feeling in the project was shown to be at a low ebb because of the installation problems and the delays that occurred over the two and half years of the project installation period. The problems that emerged in the installation process eventually led to emergency talks between MEE and the communities in 2014/2015. The communities on all three islands were upset because the roads had been dug for months, excavations had to be done twice on account of leakages; the road excavations lacked safety markings and had materials blocking traffic resulting in disruption to everyday life. During the evaluation mission, the Council President in Ihavandhoo indicated that the public has lost trust in the Council. The Ihavandhoo community said nothing was communicated to them about the timeline and process of installation. The Gadhdhoo community indicated an outright rejection of the proposed tariff structure, with no confidence in how the systems would be maintained. One community member was outright in saying he did not believe the system would work that it would be better to have a private water supply system.

44. The main piece delivered under this component was the Willingness to Pay Study, commissioned by MEE and delivered in May 2013 and presented at a high level presentation to stakeholders in July 2013. While useful at the level of providing indications of the level of cost recovery possible, it could have gone further in assessing willingness to pay for different configurations of a two-source and three-source water supply model. It could have explored the issue of a lifeline tariff to provide water free of change for up to a certain level of consumption. Walks around Mahibadhoo and Gadhdoo revealed that community taps had been installed to provide free water for those that could not afford the service. The problem with this approach is that it would be difficult to keep the use of this restricted to those that really need it, opening up the system to financial losses associated with non-revenue water.

45. A one day, multi-stakeholder seminar on integrated water resource management was held in January 2014, run by the International Water Management Institute (IWMI).The objective of the seminar was to increase awareness on the principles of IWRM applied in the context of the Maldives islands. It is unclear from the documents whether any outputs were delivered.

46. Plans for an awareness campaign for national awareness and capacity building on IWRM began in December 2012 when a consultant was selected to develop an awareness strategy; the final strategy for community engagement was delivered in April 2013. The procurement process for Phase 1 of the awareness campaign began in Quarter 3 of 2013 but only one bid was received – the monitoring reports suggest that this was due to the tender being overshadowed by the run-up to the elections. The tender notice was re-launched but again received poor interest. A third round of procurements was launched in February 2014. Protracted procurement processes, because of high differentials in bid amounts, delayed the contract award further. It took a total of eight months for the contract to be awarded since the procurement process was first initiated. The contract was expected to be awarded by the end of May 2014. The Project prepared a national logo for the water department to launch the national campaign on water in 2015. Further delays meant that the awareness campaign has not yet taken place.

47. **Outcome 3: Up-scaling and replication.** Unclear the extent to which this has been delivered. This component had a budget of USD80,000, split between training with a budget of USD30,000 and USD50,000 for policy mainstreaming-type activities. The Responsible Party for this Component was MEE.

48. Most, if not all, the activities on training were undertaken by UNOPS. The commitment made by UNOPS in their project initiation document was to develop and implement a training programme to assist MEE to enhance project management, procurement, environmental management and project planning. In practice, UNOPS' understanding of that commitment related to assurance that all elements of the works were tested and commissioned with handover procedures and training related to initial operation only. A planning training schedule for operational and maintenance (O&M) was to be developed by UNOPS. The evaluators did not see this training schedule, if it was ever developed. Training manuals were published between June and November 2014 as follows: 1. Training manual for the construction period/basics of IWRM, 2. Operation and maintenance guide for Solar system 3. RO Installation & Training manual (Plan) 4. Preventive Maintenance plan. The evaluators saw attendance sheets for all three islands for several days of RO training on each island. However, the training on RO plant appears not to have been enough. For example, talking to one of the RO plant operators in Ihavandhoo revealed that he was not aware of how to use the GRP tank to produce the blended water. In addition, a two week training course was being provided by MWSC on O&M at the time of writing this evaluation.

49. Operational manuals plus daily, weekly and monthly maintenance sheets were reported to have been provided by the RO plant supplier, though these were not seen by the evaluators. A complete operational and maintenance manual for the system in the local language might have been preferable; this applies also to the training manuals produced by UNOPS.

50. The other way that UNOPS undertook to develop institutional capacity was by agreeing to employ local personnel and train them through on-the-job training during project implementation, to be hired later by the Utility operators. MEE and Fenaka were asked to participate in the initial recruitment. Unfortunately, the strategy did not work because Fenaka and Stelco backed out of the commitment to recruit the staff employed by the project and there was no contract between MEE and the two Utilities to enforce this handover as far as possible.

51. As late at September 2014, the proposal was made during a project coordination meeting for a training of trainers' course within Fenaka as part of the handover process to support long-term sustainability for the project, recognising the reality of staff changes. No information was availed on whether this took place or not, but a strategy of this kind is moving in the right direction.

52. A bit of background on the political dynamics around the Utilities and their receptivity to capacity development and responsibility for the water supply in the three islands is helpful to consider in the assessment of implementation progress on Outcome 3. Prior to Nasheed's Government (The Government previous to the current one) which came to power in 2008, two main utilities companies existed in the Maldives. MWSC focusing on water in Male' alone and Stelco focusing on electricity across all islands. With Nasheed's government six "Provincial utilities companies" were newly been formed who were to be responsible for water, electricity and sewerage for the islands in each geographic area. During the formulation and prodoc signature stage, there were three utility companies from three provinces (where the three islands were located) that would be engaged in the design, implementation and, ultimately,

takeover operations as well. With the change of Government in February 2012 it was unclear for a long time how the provincial utilities would function or even of their continuation. FENAKA was eventually formed in June 2012 by combining the six provincial utilities companies as a state-owned utilities company. However, even at this time it was uncertain as to which utilities company (between FENAKA and MWSC at the time) the three AF project islands will be allocated to. With the change in power to the current Government in November 2013 more changes have been brought continuously to the utilities setup. This included all inhabited islands being divided between the 3 utilities companies (FENAKA, Stelco and MWSC) and each company to be responsible for all three services (water, electricity and sewerage) in each island. Eventually the decision was made that FENAKA will take over 2 islands while Stelco took over Mahibadhoo. This would be the first time Stelco takes over as a water service provider and there was a lot of hesitation in Stelco taking over. FENAKA being a state-owned utilities company is less reluctant to take over when requested by the Ministry.

53. On the policy mainstreaming activities under this component, efforts were made by MEE to organize a study tour to Sri Lanka in coordination with (IWMI) to learn about IWRM. This was dropped as the procurement and logistics of organizing this workshop proved difficult. Two personal were supported by the project from the Environment Department and Environment Protection Agency on sustainable to attend short courses on water engineering supervision at a Malaysian water institute. The course content was in the areas of applied water-sewerage infrastructure. The government officers who attended the courses are working at EPA and the Water Department in MEE. An exploration of training short courses on IWRM in the region revealed that none appeared to exist.

54. This project has had a catalytic effect. A number of projects are being designed in MEE that are based on the AF concept. For example, the recently won investment funds from the Green Climate Fund and a USAID-funded project in Hinnavaru and Thoddoo, as was a 3-island concept design on Mulah, Dhiggaru and Maamigili. There is an intention by MEE to review all new water and projects on the basis of IWRM.

3.1.3 Efficiency

55. The main inefficiencies can be categorized as financial and technical at the level of the rainwater collection efficiency. These points are linked because a lower efficiency of rainwater harvesting will impact on the affordability of the system for households. The financial inefficiencies are discussed in the following paragraphs, mainly in relation to the procurement strategy. The rainwater collection inefficiency is mainly in relation to the CRWH system design, which will imply high operational costs (see paragraphs 31 and 33 for details) and the quality of the materials which led to many leakage problems and cost variations (linked to the procurement issue discussed below). There were other inefficiencies in project design due to poor planning. Two studies commissioned were not used for the development of the detailed project design; and the lack of proper integration with desalination system also has led to oversizing of the GRP tank, with associated cost implications. The main conclusion drawn is that the project cost more than it should have done, which could have been avoided with better planning and execution.

56 The project was under-funded with respect to what it was intended to achieve, which was a factor in the quality of materials procured. But procuring lower quality materials proved to be a false economy as 1500 house connections had to be replaced and there are on-going still problems with the water distribution pipework. The disruptive installation process at the island level also generated significant reputational costs for MEE and the island authorities *vis a vis*

the island communities, and distress costs for the island communities during a disruptive two and a half year implementation period. A Presidential inauguration ceremony in Ihavandhoo was planned in March 2015 for World Water Day but a major leak resulting in the loss of nine tonnes of water was reported and the event had to be cancelled.

57. The largest contract value was for materials, at just over USD856,000[4]. Unfortunately, the cost variation to account for the 1500 deficient house connections ended up costing nearly double the original contract price (an additional USD 756,000), representing 10 percent of the value of the infrastructure works entrusted to UNOPS. Other cost variations also took place. Additional costs to the hardware part of the project compromised the meagre budget available for the management aspects of the project (Components 2 and 3).

58. Too many small sub-contracts ended up undermining the incentive by contractors to deliver parts of a system that could easily be integrated, as well as adding costs to the supervision of the project. A total of 11 contracts were issued for i) pipe and fittings supplies, ii) construction of RO plant and tank foundations, iii) construction of the glass reinforced tanks at the RO plant, iv) supply of the RO plants, v) construction of the CRWH tanks, and vi) laying of pipe network. Two of these contracts had to cancelled and re-tendered due to insufficient bids being submitted. Part of the reason for the need for many sub-contracts was probably due to the pressure to install the three island systems in parallel, given the time constraints. Another reason may have been to enable participation of small and medium enterprises (SMEs) in the country and the region, who would not have been able to deliver one integrated contract. The strategy of working through SMEs has reportedly been successful in developing skills and the local economy in neighbouring Sri Lanka but was less successful in this project.

59. The replacement works was carried out through a sub-contract to MWSC, who were one of the bidders for the original procurement. The original bid by MWSC to supply the pipes and fittings was $140K higher than the winning bid, meaning that, taking the cost of the original contract and the repair work contract together, the end result was $616,000 more expensive than if MWSC was chosen as the contractor in the first place, as well as delaying implementation by the best part of a year, not to mention the ill feeling created at the level of island communities and the national authorities. All the bids were selected according to lowest bid price but preference should have been given to contractors with local experience and a track record, as indicated they would be in the UNOPS Project Initiation Document.

60. The GRP tank can hold 700 m^3 in Mahibadhoo, 900m^3 in Gadhdhoo, and 1000 m3 in Ihavandhoo. It can be divided into two compartments, half of which is for desalinated water and half of which is rainwater. The flow meters are placed at the entrance to the GRP tank. To provide the 75/25 mix the two compartments in the GRP would need to be opened up so that the GRP tank effectively becomes the mixing tank. What this means in practice is that rainwater from the community tanks needs to be pumped in in small quantities for mixing with desalinated water at the 75/25 level. Because there are only two compartments (which can be converted into one compartment) the choice is either to fill up the full capacity of the tank, which in the case of Gadhdhoo (900m^3), which would provide 45 days of emergency water or to keep the seven days of emergency water but accept that more than half of the tank remains empty. The first option carries water quality/health risks and the second implies an inefficient use of funds for an oversized tank. The cost of a retrofit to install more compartments in the GRP tank could be warranted by the additional water storage it would bring to the islands.

[4] The medium size of contract was just over USD280,000.

61. Elsewhere, another problem that surfaced during the evaluation mission was in Gadhdhoo, where house connections and meters were placed on a significant number of vacant houses in the name of equity, at the behest of the Island Council. One house that the evaluators saw was derelict. This of course would have affected the cost of installation. Not enough had been done to bring the new Council staff on board with the aims and intentions of the project. Gadhdhoo Island Councillors changed following the 2013 elections and they indicated during the evaluation mission that they did not know much about the system being installed. Finally, piles of unused pipe were found outside the Reverse Osmosis (RO) plant in Gahdhoo, degrading fast through UV exposure, due to a lack of management of the RO plant.

62. The handover period has been messy and protracted, with Island Authorities complaining about the absence of test certificates, 'As built' drawings and other hand-over documents. The evaluators found it difficult to understand the complete picture of documents that had been handed over and when, and those that remained outstanding, The MTE Recommendation 1. was to establish a written agreement about the handover process and procedures to ensure that all relevant aspects of the handover process were adequately covered, including transfer of staff, capital assets, maintenance and operations support, which, on the basis of the complaints that the evaluators heard, appears to have been ignored.

63. A desk-based cost-comparison is made with three projects. The first is the IWRM project that funded by USAID in Hinnavaru island which has a budget of USD7 million for an integrated groundwater, rainwater and desalinated water system, i.e a budget three times as large as the AF project. The other two systems are first the combined rainwater-desalinated water supply systems in Ukulhas island which includes a 1350 tonne rainwater harvesting tank and 850 household connections cost just over USD1.4 million. The second example provided was a combined rainwater harvesting (underground tank) and desalination system designed for a resort island with 2000 connections costing just over USD 0.5 million[5]. The Mid-Term Evaluation noted that a similar RO-rainwater system in Dhuvaafaru which cost half as much as the island system supported by the AF. The conclusion derived from the evidence accessible to the evaluators was that the AF investment was significantly under-funded for what the project document committed to do but more expensive than analogous combined water systems on other islands, though it should be noted that this is only a desk-based cost comparison which does not capture any observations on quality or coverage of technical design of the combined systems on the other islands.

64. A positive aspect around efficiency is that the desalination plants have been fitted with enough solar panel capacity to enable a zero net energy balance, thus making the operation more cost effective than the normal design, and also eliminating the risk of non-operation due to fuel shortages.

3.2 Likelihood of sustainability of Outcomes

65. A number of risks and risk mitigation actions were detailed in the project document. Most of them did indeed negatively affect project implementation progress. The main reason was either that the correct response was not identified or that the correct response was not followed through effectively. This also highlights an important design issue: risk management is an

[55] Pers Comm. Mr Ahmed Saleem, Managing Director of Maldives Energy and Environment Company.

integral part of project design and not merely an add-on. In some cases, the risk mitigation actions can be critical enough to entirely condition how the project activities and outputs are combined and sequenced. This was the case of stakeholder engagement strategy because the aim was not to provide a hardware system, it should have been to provide a customer-focused water supply service. An assessment of the risk identification and management plan is provided in Table 7.

Table 7 Assessment of the risk identification and mitigation plan

No.	Type	Description	Rating	Risk Mitigating Actions	Assessment of the effectiveness of the plan
1	Institutional	Effective engagement and consensus building by different water users, public and private stakeholders to agree on an integrated approach to freshwater and wastewater management	Low	No infrastructure investments on target islands without comprehensive participatory consultations involving island councils, community representatives and utility companies (Output 2.1 to precede Outputs 1.1-1.4)	An identified risk that impacted on project implementation. The right risk mitigation action was identified but there was no effective follow-through. A case of consultation without really listening. Separation of the management and technical design aspects of the systems, and the supply driven process in the design mitigated against designing a user-led water supply system. One key issue is to identify the purpose of the consultations: what design features need discussion and agreement?
2	Institutional	Human resources capacity issues (e.g. staff turnover) in different government offices preclude effective engagement of particular stakeholders in the project	Medium	External recruitment of a new NPM to head a Project Management team which is hosted in MHE	An identified risk that impacted on project implementation. The risk is a generic one but it was not tailored to the situation or the project at hand so the risk mitigation action was wrongly identified. An IWRM approach requires IWRM expertise, but this was missing first and foremost at the level of the implementers. The Responsible Party had no technical leadership or expertise on IWRM. The PM should be an IWRM expert or have had advisory support from the very start on IWRM actively applied to the project design. The Quality Assurance function by UNDP to ensure an IWRM approach was thwarted by lack of accountability of the implementers to the organisation. Not enough done to plan for staff changes, which is especially pertinent to the O&M of the combined system.
3	Environmental	Extreme weather events during project implementation damage construction works;	Medium	Engineering safety plans, contingency plans for construction	The risk is not well defined. Which extreme events could affect construction works? Overall, site management was reportedly poor. UNOPS is certified to ISO standards but these standards were not transferred to the sub-contractors. More could and should have been done to ensure site safety

No.	Type	Description	Rating	Risk Mitigating Actions	Assessment of the effectiveness of the plan
					and minimise of disruption to the island communities.
4	Institutional	Delays in recruitment of qualified project staff may affect the timeframe of different project activities.	High	At the request of MHE, direct execution of Component 1 by a Responsible Party (RP) to avoid implementation delays.	An identified risk that impacted on project implementation. The solution identified could only have worked if the RP had been experienced in applying IWRM principles. It was not. This could easily have been discerned from the start and an appropriate risk management strategy been agreed with them. This required leadership and technical expertise from the PMU.
5	Financial	Government is not able to leverage sufficient co-financing to increase and upscale project impact	Medium	UN support in the combination, sequencing and mobilization of climate change financing	The risk was wrongly identified. The AF Fund does not require co-financing and the project budget should have been estimated correctly from the start. The project was under-funded from the start to support a 3-water source IWRM approach. Resources were inefficiently spent in the implementation of the two-water source model though lack of proper, use-led planning. An effective team structure with the necessary reporting lines and a user-led approach could have avoided the risk of inefficient use of resources.
6	Institutional	Community acceptance of technical design options proposed by project	Low	- Island-level community consultations (Output 2.1) will be the first activity of the project to validate and approve technical design options - Communities will be engaged and consulted during a participatory EIA, which will analyze the social, economic and environmental effects of the project on each target island - A willingness to pay survey will be conducted to ensure community buy-in and involvement in the continued operation and maintenance of	An identified risk that impacted on project implementation. The risk mitigation actions are all appropriate but there was no sustained follow through on community engagement.

No.	Type	Description	Rating	Risk Mitigating Actions	Assessment of the effectiveness of the plan
				new water supply systems - Elected island council members from each island will have a seat on the Project Board - Project offices will be established on each island to facilitate continued communication with communities -Community members will be represented on the project workforce	

66. This evaluation was carried out before the water delivery service had started which may have affected the perceptions and feedback provided to the evaluators. Nevertheless, at the time of the evaluation, the main risks to sustainability are damaged community relations on all three islands. The installation process over the last two years negatively affected trust in the island authorities to be able to deliver, which may affect willingness to pay for the service. Secondly, the quality of the materials used and workmanship means that the rainwater conveyance system will not perform to the standard required without pipe and fittings replacement, none of which were planned at the time of the evaluation.. Thirdly O&M may also be an issue affecting the sustainability of the desalination plant without the application of a longer-term plan for staff training and development. Fourthly, the design of the system lacked a business model, and the result is that the entire operation is unlikely to be financially sustainable, without designing and applying a business plan which engages island communities to generate the buy-in. An assessment of specific risks to sustainability follows in the next four sections.

3.2.1 Financial and economic

67. Regarding financial and economic sustainability, the project was designed with two main aims in mind: i) increase self-sufficiency of the islands, which is important for risk management for the island communities, especially given climate change ii) improve ground water quality and impacts on health. The main conclusions drawn are that i) without a business model to sustain the water supply systems on the three islands, the financial sustainability of the operation is at stake; ii) retrofits are needed to make the systems sustainable over the next 30 years (which is the EPA standard) and iii) that economic benefits are far lower that envisaged in the project proposal, mainly because of proper planning and execution.

68. Self-sufficiency of water supply needs a sustainable business model to underpin it. The combined rainwater and desalination system was designed with affordability (lower tariffs) in mind. In the first draft of the detailed system design in the three islands, submitted by UNOPS (Responsible Party for Component 1) to MEE in August 2012, rainwater constituted only 3 percent of the final mix. This limitation was due to consideration of only public or community

buildings in the catchment area. Following a request by EPA, this was raised to a 25 percent mix by including private roofs to the CRWH system, and the capacity of the RO plants were reduced (though as para 36 notes, RO plant capacity was in fact increased), noting that by installing RO plants to cater to the full water demands, the incentives for the operators to utilize rainwater would be diminished. That would have had a knock-on impact on the tariff, which would result in loss of the project's objective to provide affordable water supply in the three islands.

69. Despite the best intentions noted above, the technical design of the water supply was not led by a business model, which will negatively affect the prospects for operational sustainability. One issue is that the blended mix can only last for a fraction of the dry season duration because the community tanks are simply too small at 550 m^3 in each island. Considering a daily island demand of 50 m^3 for drinking water (350 m^3/week), and a 75/25 mix with desalinated water, the community rainwater supplies are likely to last less than 5 weeks – *only if* households restrict themselves to 15 litres per person per day. The water supply standard in Maldives is 150 litres per person per day. In practice the 15 litre limit would be difficult to enforce and water stores would run out more quickly. There is also the question as to whether households would be prepared to pay for a service which does not meet their needs consistently throughout the dry season, especially considering the erosion of good will over the last three years.

70. The second issue is the financial strategy to keep the desalination plants operating year-round when households are able to collect their own private water supplies during the 7-10 months of rains and the incentive to pay for a year-round service may be missing[6]. The desalination plants need to run every day if an annual decommissioning and commissioning process is to be avoided. To shift this system into one where islands run a sustainable and affordable operation would mean a complete switch into a year-round island water supply system (which takes into account the need to run the RO plants throughout the year). And because of the difficulties of placing limits on water consumption from the household taps, the system should ideally be designed for a complete water supply service. Using and paying for supplied water year-round together with an agreement to refrain from using own-water supplies should be possible for reasons of reduced health burden and convenience but it requires full ownership by the community for the system, especially because CRWH was already being practiced and the water was provided at zero cost. This is critical because, given small island populations, the system can only remain financial sustainable if all households pay for the service. This was confirmed to the evaluators during community consultations in Ihavandhoo and Mahibadhoo, who said they were willing to pay the tariff as long as water security could be ensure throughout the year. Unfortunately the long and disruptive installation process has seemingly eroded trust in the system in at least two of the three islands. And the business plan was never discussed or agreed with the communities who were expected to pay for the service year-round.

71. The third issue is that the CRWH system will probably require additional staff for valve turning, roof cleaning and water quality maintenance which implies a fixed cost even if the production cost is lowered. Thus life-cycle production costs may or may not be reduced overall. Underground water storage may be a better option from the perspective of lower cost O&M.

[6] The general practice on the islands is for households to keep their own supplies of rainwater for drinking supplies, supplemented by bottled water, and use ground water for washing and sanitation needs. Dry season supplies are transported in via boat from Male.

72. The UNOPS Project Initiation Document did look at cost recovery by comparing operational costs (assuming a 50 percent blend of rainwater with desalinated water) with the willingness to pay amounts indicated in the study. This simple comparison showed that operational costs would be more than covered, enabling funds to contribute to capital investment. But what was missing was the human dimension: an assessment of what communities would have to give up and the effects that it would have on the willingness to pay; compensatory elements that would need to be included in the system, the value proposition of a water supply service to the island communities, and the strategy for building trust in the system in order to enable a shift from the current system to a better one. The UNOPS project initiation document recognizes that an appreciation of the 'human system within which these hard systems depend so that they are integrated effectively is required'. But the sequencing of the 'hard' and 'human' systems was unfortunately miscalculated.

73. One key aspect of financial sustainability is the technical quality of the installed systems because the WTP for the system depends on the quality of the water supply service i.e consistency and reliability. Leakage problems were noted in Q1 2015. A UNOPS third party reviewer confirmed the findings in April 2015, who noted that the lack of experience and quality control of the island-level contractors was one factor in the weakness of the installed structures. The quality of the materials was another key problem. Sealent had been used on some of the connections with obvious risks to sustainability. The quality of the elbow connections in the water distribution network was questioned in Mahibadhoo and Gadhdhoo with doubts that there would be no further leakages and that sufficient pressure could be maintained in the system. The evaluators heard about on-going leakage problems with the water distribution pipes in the Mahibadhoo which had caused flooding after recent rains. In Mahibadhoo, the Council President showed us photos of the pipework elbows which were leaking and were tied up temporarily with bicycle tyres and rope. In the Gadhdhoo consultation for this evaluation, there were complaints about the tap fittings breaking after a week of use. The UNOPS third Party reviewer (June 2013) reported that 86 of 400 household taps showed leakages, in some cases because of incorrect mounting using Teflon tape. At the time of the evaluation leakages, as reported by island Councils and the UNOPS engineer located on the islands, were being addressed by UNOPS. And the rainwater collection pipework today shows visible signs of degradation and gaps in connectivity.

74. The technical design and materials used did not conform to EPA standards in certain areas, with implications for efficiency, community relations and operational sustainability. Many of these issues have already been addressed by UNOPS but their occurrence did impact on project efficiency and effectiveness and so are reported here. Examples of these issues are as follows:

- Island communities identified non-compliance issues such as shallow pipes less that 0.6m deep being buried without concrete cover for protection;
- PVC fittings were used instead of the more flexible HDPE commonly used for water networks. Not only were these fittings the wrong type but they were thinner: 4.5 mm rather than the 6.0 mm in the technical specifications, resulting in breakage under pressure. 1500 connections underground had to be replaced with HDPE electro-fusion welded fittings to prevent leaks;
- 18 mm pipes were too small for house connections that were more than a short distance from the mainline, which would have affected water pressure;
- Pipes and fitting with no specification markings;

- Couplings not in accordance with specifications;
- Connections secured with sealant not electro-fusion

75. Once the piped water supply systems are operational, economic benefits from the project should arise from greater certainty and quality of drinking water supply which should positively affect disposal income and health outcomes– if the management of the water supply systems can be kept to good standards. Still, economic benefits are lower than they could have been. The islands still have polluted ground water which communities on all three islands would still like to see addressed, as evidenced in the community consultations. Other economic costs relate to the design of the conveyance pipes, specifically, the first flush system which is designed to flush water onto the roads, contributing to flooding of the roads and public inconvenience. Fenaka was reported to be concerned about the risk of households connecting their overflow pipes to the sewerage network to reduce the flooding inconvenience, with obvious risks of overspill of waste water. At the time of the evaluation, the island authorities in Mahibadhoo highlighted the issue of stagnant water sitting in the conveyance pipeline, in the junction boxes and in the community tanks themselves which exacerbate conditions for mosquito breeding with increased risks of dengue fever. Including a basic groundwater recharge feature by connecting the overflow from rainwater collection tanks and flush from rainwater pipes to the recharge pits was, in fact, included in the detailed design document, but was never implemented, indicative of a lack of oversight and supervision of the installation works. Finally, the degraded rainwater conveyance pipe network due to intense UV radiation could be a significant health risk to drinking water quality.

76. The social costs associated with the construction and installation process were significant but could have been avoided through effective site management. A lack of site management conditions was picked up in a number of site visit reports and communities complained frequently about the hazardous construction conditions on the islands. Reports of a disruptive installation process were recounted to the evaluators during community consultations, including open trenches in the road with no warnings and roads excavated twice to fix the leaking pipes.

3.2.2 Socio-political

77. The socio-political sustainability encompasses considerations at three levels: community level, island authorities and central government. The main conclusion drawn is that the construction and installation process created significant social costs among the community and eroded trust between the community and the island authorities at a crucial time when decentralization is still trying to take hold. The project was important to advance the Central Government political aim to provide water supply on all islands, which can now only be achieved with retrofits that are recommended in the Recommendations section of this report.

78. Island and Atoll councils and a functioning decentralized government system is a recent event in Maldives, inaugurated through the Decentralization Act in 2009. Service delivery is a key means of building confidence in the island authorities to deliver. This project could have helped in this process of decentralization but in fact, has contributed little to it. Overall, community relations have been tested because of the disruptive implementation process and good will towards the project is at a low ebb which may affect the financial sustainability of the water supply systems on the three islands. For example, the Island Council in Gadhdhoo explained to us that there was currently a push-back from communities to pay a monthly

connection fee of R30 in addition to the monthly service charge; the evaluators saw first-hand the strength of opinion by the community on this issue.

79. Using and paying for supplied water year-round together with an agreement to stop use their own private supplies (as private supplies would undermine the year-round payment for the communal system) requires full endorsement by the community for the system. To endorse this system, households would need to trust that the island authorities could provide year round water of drinking water standard. Important trust-building indicators are high quality materials and fittings and a responsible and smooth-flowing construction process. These conditions were not met on the three project islands at the time of the evaluation.

80. Building trust in the system being able to deliver was an essential first step to paying for the service. Most people would agree that dialogue with households on a water supply system is important but having a clear idea about how to structure the engagement strategy and for what purpose is central to a successful project. Understood from the perspective of the household, their main concern with a water supply system is water security, so the main concerns in changing from the prevailing system to an 'improved' system will be issues of risk management, encompassing questions such as:

i. Am I confident that I will receive quality drinking water *from this system*?
ii. Am I confident of the *island utility* to provide me with a sustainable and affordable service;
iii. Do I feel confident enough in the ability of the island authorities to provide me with a quality service that I would *give up my private access to groundwater?*

81. To address these concerns, the elements that a public awareness campaign would need to include are i) stakeholder involvement in the design of the system, the implications for the households in terms of price and operation leading to an agreement for the final design, which should be written up and the final design product distributed to households in user-friendly format with allowance for further consultations to seal the agreement on the system design ii) consultation and solicitation of inputs into the implementation strategy including handover and training process in order to build commitment and buy-in to the management arrangements, and iii) an awareness campaign on the interrelatedness of island ecosystems and interactions with climate change; the implications for personal responsibility in an integrated water supply and a discussion about how to update and enforce island regulations in this area. This could also include developing a plan for monitoring of ground water quality and publishing the results for the households to see, and development of an educational module for the schools. Elements of this approach were contained in the inception report but were not taken up in the development of a stakeholder engagement strategy.

82. The project was important to advance the Central Government political aim to provide water supply on all islands. A Presidential inauguration ceremony in Ihavandhoo was planned in March 2015 for World Water Day but a major leak resulting in the loss of nine tonnes of water was reported and the event had to be cancelled, with reputational costs to MEE. Since the time of the stakeholder consultations undertaken for this evaluation, the water supply was inaugurated on December 19 2015 with full satisfaction from the MEE Minister[7].

[7] UNOPS communication, January 2016.

3.2.3 Institutional framework and governance

83. The main issue regarding institutional framework and governance is whether the management systems have been put into place to ensure continuity of service into the future. The added consideration for Mahibadhoo is that, at the time of the evaluation, it was still unknown who will take responsibility for the water supply service. Until the timing of this evaluation, UNOPS continues to manage the operation and maintenance on the three islands with no financial resources allocated for that purpose. There are unanswered questions about who will bear responsibility for the O&M for the rainwater harvesting system in all three islands. The conclusion drawn at this point is that operation and maintenance arrangements that can sustain the system have not been put into place; this is urgently needed.

84. The history of desalination plant operation in Maldives deserved a mention. One significant deleterious effect of the 2004 Tsunami in Maldives was the salinisation of ground water resources due to the tidal surges and overtopping of the islands. As an emergency response, a great many desalination plants were donated to Maldives to help provide freshwater to the islands (as well as 2500 litre rainfall harvesting tanks for use at the household level). The emergency nature of the response meant that the operational and maintenance of the plants and the financial model to keep them running were not planned and as a result, 10 years later, most of them are now defunct. These issues were raised in the inception phase of the AF project by island authorities and communities but unfortunately were not incorporated into the project design, possibly because the management and technical aspects of the water supply system were delegated to different entities to implement and there was limited collaboration in the detailed design of the island systems (UNOPS for the technical installation, PMU for the management aspects with UNDP as a quality assurer for the management aspects). These institutional weaknesses should be addressed in order to avoid this project repeating the mistakes of the past.

85. Delivering water of a consistent quality, especially considering the dynamic effects of rainfall on groundwater salinity, will require management expertise. The percentage blends of desalinated and rainwater also affects the price. Management information about quality, blend ratios and costs, would be essential inputs into an effective and affordable water service delivery. But, from what the evaluators could see, there has been scant attention given to management training. Training has largely focused on RO plant O&M (see Section 3.2.3 for details). Given the complexities of running these integrated systems and the reality of staff changes, there is a need to provide a continuous training programme including on-going mentorship and support to the RO operators, who will be running these systems on remote islands.

86. Fenaka have agreed to take on the water supply system for Ihavandhoo and Gadhdhoo but Stelco, the electricity provider in Mahibadhoo, pulled out of the agreement, with a recent change of position to take responsibility for Mahibadhoo water services (communicated in an email dated 28 December 2015)[8] . Water services are new to Stelco and relatively new to Fenaka and capacities in this service area will take time to develop.

87. Other operation and maintenance risks to the plant are the risks of damage. The rainwater tank facilities in Mahibadhoo are at risk of damage because feeder pipes into the tank are unprotected and vulnerable to knocks. Graffiti was also noted at one of the tanks indicating a

[8] Pers comm. UNOPS communication in January 2016.

possible risk of more serious vandalism in future. A protection wall should have been built around the facility. And there are no back-up pumps at the community tanks (two to three in each island). Should the current pumps fail, the production of the blended water supply would be compromised.

3.2.4 Environmental and climate change risks

88. The inclusion of ground water in the integrated water supply system was advocated in the project document as an essential adaptation strategy for freshwater provision on the islands because of the widely accepted ecosystem resilience principle that in diversity lies resilience. Should the rains fail and the desalination machines break down, the last line of defence in water security at the island level is the ground water resource. The conclusion drawn is that climate change risk has not been mitigated as envisaged in the project proposal though documentary evidence and stakeholder views suggest that this project catalysed a shift in mind-set within GoM towards an IWRM approach. The reduced scope of the project was due in part because of a significant budget constraint, as well as a lack of leadership and expertise in applying IWRM principles to the project design.

89. The main climate change risks in Maldives are sea level rise, temperature increases, a rise in the intensity of tropical cyclones, changing patterns of seasonal rainfall, and potentially a large increase in average annual rainfall. Rainfall is expected to fall more heavily in shorter spaces of time, which could be an opportunity for greater levels of recharge. For example, a 180 mm/day rainfall event is currently a 100 year event but is expected to occur twice as often by 2050[9]. The flip side of this, is that there are greater risks of drier periods (and floods if drainage is lacking). Rising global temperatures may result in greater heat stress for people and ecosystems, thus, increasing water consumption and withdrawal from aquifers. In addition, sea-level rise, increased wave energy at the coast and increased frequency of tidal surges may increase island-overtopping events and coastal erosion, with possible saline water intrusion into the water lens, without adaptation measures. Climate-sensitive illnesses such as diarrhoea and vector borne diseases have shown increasing trends in recent years and there are marked seasonal patterns with peaks in diarrheal diseases in the wet season, which is consistent with reported pollution levels in the ground water especially following heavy rainfall events. Stakeholder consultations during the evaluation mission indicated that groundwater was polluted in all three islands. In Mahibadhoo one community member indicated that it was not safe enough to bathe their children in it.

90. The UNOPS project initiation document (April 2012) set out the case for IWRM and for its various characteristics such as i) diversity of supply ii) self-sufficiency of supply iii) back-up or redundancy in the system iv) increasing available supplies through storage and v) control and maintenance of the system including monitoring. There is, in addition, an essential principle that a participatory approach should be used for water development and management involving all users, planners and policy-makers. These principles were not acted upon as effectively as they could have been. The main example of this is that the project focused on a two-source water supply model instead of a three source water supply model, notwithstanding that there seem to be indications that this in itself is progression from the previous water supply model relying on desalination only. Other examples of a lack of application of IWRM principles are i) lack of an effective island-level participatory process in

[9] Hay, J.E (2006) Climate Risk Profile for The Maldives, for Government of Maldives.

the design of the system ii) no recharge of drainage and overflow pipes to the aquifer iii) no back-up pumps at the rainwater collection tanks nor back-up generators (these were jettisoned because of budget constraints) iv) a weak operation and maintenance plan to ensure self-sufficiency of water and v) smaller water storage capacity than the EPA requested.

91. The relevance of back-up pumps to the overall resilience of the IWRM system extends beyond mitigating the risk of pumps breaking down; in heavy rain events, one pump may not be able to circulate the rainwater from the CRWH system to the final storage tank which would waste precious rainwater without some other mechanism capture the benefits from it. Since rainfall is projected to fall in heavier bursts due to climate change, this loss may not be insignificant.

92. Improving ground water *quality* requires that sewage be managed in order to avoid the discharge of untreated waste into the ground water. It would also require centrally managed abstraction management using skimming wells to avoid saline water intrusion from the hundreds of private wells on each of the islands. Regarding ground water *quantity*, the main equation is that groundwater abstraction should be lower than the recharge, or recharge higher than abstraction, in order to increase the volume of water in storage. Groundwater recharge may or may not be possible or worth the cost, depending on the height of the water table and the permeability of the soils (i.e recharge may happen in any case). Abstraction management is likely to be crucial and this is more easily monitored and controlled if carried out centrally. The solution to improving the quality and quantity of ground water resource on each island needs to be informed by a water resources assessment for each island. This would determine rainfall availability, recharge rates, the potential for additional recharge, the trade-offs with harvesting the rainfall in man-made tanks compared to the natural aquifer, sustainable ground water yield levels, and current abstraction rates. Understanding the water resources available to each island and island water demands will also inform the type of sewerage system best suited to environmental and community needs (e.g. whether wastewater recycling is needed for recharge of the aquifer).

93. The issue of abstraction management brings in an additional point about management strategies and the need to involve communities in the decision-making process on water resources management, since they will need to commit to changing behaviours (e.g. by giving up private wells) and paying for an integrated service. Not only is IWRM about blending of different of water, it is about building ownership in the management of a shared resource, and establishing a management system that recognizes the interaction between financial, environmental costs and affordability on a life-cycle basis.

94. In Mahibadhoo, where the island authorities were aware of the centrality of groundwater recharge and were actively enforcing the building regulations on this point, the Island President noted that the groundwater recharge aspects of the project had been jettisoned against all expectations (provisioned as they was in the detailed design document). They reported to have asked UNOPS to sink the 'first flush' pipes into the ground. Instead the pipes are open to the road (on all three islands), which become flooded during the rainy season and prevent easy passage. In Mahibadhoo this take on a special significance as a breeding ground for mosquitos and dengue fever. Likewise the overflow pipes on the rainwater harvesting tanks could have been sunk into the ground. Building regulations on the islands stipulate that drainage from buildings should recharge the aquifer but community consultations in Mahibadhoo revealed that there is low awareness among the communities about why this is important for the islands, hence households do not comply willingly, as seen by the number of open drainage pipes to the road. Government-backed investments such as this one have

an important role in setting the gold standard in building standards and an important messaging value for the community. In all islands, communities were interested in reducing flooding and saw rainwater catchment as an opportunity to achieve that.

95. When asked, stakeholders across government could not offer a consistent view of what IWRM means for Maldives. The view from some stakeholders was that as long as rainwater was included, then the system could be called an IWRM system. A definition of IWRM for the Maldives is urgently needed. This will need to be backed with guidance developed on the basis of experience across a typology of islands (recognizing that different islands have different aquifer dynamics and population densities) which would be improved over time as experience grows and information becomes available.

96. The project is a missed opportunity for the Maldives on the kind of IWRM system that could work for Maldives. The evaluators noticed a difference in opinion among stakeholders about whether the project was supposed to deliver proven approaches to water supply or to inform GoM about the kind of system that *could* work for better resiience (suggesting an experimental approach), perhaps reflecting the tension between the need to deliver a water supply project and the rationale for the project in the first place which was to adapt to climate change and which certainly does require experimentation and learning.

3.3 Processes influencing achievement of Programme results

3.1 Preparation and readiness

97. The main points discussed in this section regarding preparation and readiness are i) quality of the IWRM project design in the project document ii) quality of the detailed IWRM project design iii) management effectiveness. The conclusion drawn is that the IWRM project design was generic and not sufficiently tailored to the island situation; that the detailed project design was supply-driven rather than user-driven and did not resemble an integrated IWRM design; and that management effectiveness could have been better with the right team in place from the start.

98. The quality of project design is essentially determined by an evidence-based theory of change (ToC): the logical connections between outputs, outcomes and delivery of the project objective. The proposition set out in the project document was designing a water supply system based on three sources of water would be cost effective because they could be used in stepped fashion based on the production costs (i.e use the cheapest water first). This simple economic model ignores the fact that desalination plants need to be run year-round to minimize maintenance costs and that the only financial model that could work is for year-round revenue generation from all households on the island based on complete water needs, not just 15 litres per person per day. The ToC needed bettering tailoring to the island conditions, economic and social constraints and institutional barriers.

99. Project design should also be influenced by explicit recognition of the assumptions being made between output delivery and achievement of the project objective, as well as understanding what the risks are to those assumptions holding - and to plan risk management accordingly-, as well as using the investment experience to explore whether the assumptions hold and under what conditions, for wider policy learning. Gathering results information on these experiences is the basis of learning from experience. But the questions need to be asked

in the first place. For example, an assumption was made that willingness to pay would translate into operation and maintenance of the water supply operations through the newly established state-owned utilities, but a number of other assumptions had to be made in order to that relationship holding (see paragraphs 79 and 80). Another assumption made was that the ground water table could be recharged (not always the case) but the bigger question may be one of abstraction management (see paragraph 93). An evidence-based problem analysis can help in the process of determining a tailored, island-specific theory of change.

100. For IWRM projects, a water resources assessment should be part of the development of the problem analysis. Statements in the project document such as 'optimisation of total storage capacity' or 'optimising water supply' should acknowledge that optimising resource use requires an understanding of the amount of the resource available to start with. This would need a water resource assessment of annual rainfall and how much is currently captured above ground and below ground, and the size of island aquifer as well as abstractions. Islands vary in their dimensions and geology so transferability of information and system design is not possible. For a truly IWRM design process, this kind of preparation is needed for each and every inhabited island.

101. The development of the project proposal was fast, going from concept submission to approval of the AF Board in nine months, with no project development funding from the AF. The lack of evidence-based investment proposal development meant that the targets and budget to do the work were, in no small measure, guess-work. As early as Q2 2012, UNOPS raised the issue of considerable cost variation, because of the unrealistic budget assigned to the different outputs in the project. The detailed technical design had to be left to the implementation phase of the project, leading to a 15 month period of detailed design between approval and implementation. The pressure to implement quickly together with the lack of IWRM expertise on the project probably contributed to some of the weak points in the project design, which disadvantaged the implementation strategy, identification of targets and results delivery.

102. The UNOPS Project Initiation Document stated in its project approach that the island teams would engage with the local communities on the possible technical infrastructure design options to agree on a proposed approach. This was a good start. Community consultations started off well at project start-up, soliciting views on lessons learnt from experience. The communities in the three islands were consulted about the system they wanted to see and potential risks and traps to avoid. Among these were:

- Household level rainwater harvesting meant that there was no demand for desalinated water during the wet season. Desalination plants became degraded because of the lack of use of them during the wet season (Atoll Councillor of Haa Alif Atoll);
- Changing of the valves after first flush is not always possible if the rains start at night (Atoll Councillor of Haa Alif Atoll);
- Availability of land for the siting of tanks and the plant would be an issue (Island Councillor in Mahihadhoo);
- The position of the meter in houses should be a matter of agreed guidelines.

103. The lessons learned from previous initiatives were indicated as follows:

- When preparing work packages for bidding ensure that island engineers are present in each island. It will be difficult to monitor many contractors by a single engineer over many islands.
- Reverse osmosis plants require regular maintenance to preserve the membranes in the system. Past experience is that these have broken down due to lack of use. This was a result of providing household rainwater harvesting tanks which meant that demand for desalinated water, outside of the dry periods, dropped.
- Plant manufacturers should have a presence in Maldives in order to obtain spares easily.
- Operation and maintenance of the plant is critical. Experiences of past projects should be incorporated into this project.
- Minimise over-sizing of the desalination plant.
- Set the expected return on each investment.
- What is important to communities is a quality service not a sophisticated system.
- Small contracts to island communities may not result in cost-effectiveness. Explore past experiences.

104. The problem was that this advice was not incorporated or in any way determine the final concept design. There were no clear statements in the project document or the inception report about whether the system should provide only dry season drinking water (20 litres/pp/day for 3-5 months) or a year-round supply for complete household needs (100 litres/pp/day for 12 months). Community consultations carried out during the inception phase asked this question. The findings from the inception follow-up meeting in June 2012, reported in the inception report, established that what the Mahibadhoo community wanted was a system to provide clean water enough for all household purposes throughout the year. The willingness to pay study revealed that in Mahibadhoo and in Gadhdhoo about 66 percent of households wanted all water needs to be covered while in Ihavaandhoo it was only about 30 percent. In addition to that, the WTP study shows that there are variances in the time period that households that face water shortages. These differences in starting conditions and preferences should have been looked at carefully for its implications for the business plan and the community engagement strategy.

105. In fact the detailed concept design, approved in March 2013, sets out the plans for a water system sized to provide less than complete water needs. It also is quite clear that it did not provide a design for an integrated system, rather it was designed as 'desalination first' supplemented with rainwater, but with no consideration of rainwater resource needs for a two-water source, truly integrated model, as indicated in the following extract from the detailed design document (pp9):

"The water supply system (desalination) shall be designed in a manner to provide sustained potable water to consumers within the supply area on a continuous basis under a normal situation. The service coverage will be for a minimum per capita consumption of 15 litres/pp/day during the dry period. Distribution network pipe shall be based on the forecasted population for the year 2050 with an estimated max per capita consumption of 70 lit/pp/day (for Mahibadhoo: 50 li/pp/day). The limited shortfall of water for non-potable water could be easily secured from other sources such as CWRH, DWRH and local wells. A new desalination plant could be installed in 2030 to complement the water supply if required."

106. The bias towards desalination and complete lack of understanding of how to apply IWRM principles to the system design, especially considering the climate change risk factor, can be discerned from the following statement both present in the UNOPS basic design concept, the UNOPS project initiation document (2012) and the detailed design report (p5)):

"The proposed integrated water supply system should essentially embrace the non-climate reliance desalination option due to unpredictable climate-induced rainfall pattern and the polluted groundwater".

107. The rationale provided is the exact reverse of the adaptation rationale which argues for diversity of supply as a key characteristic of resilience. A monitoring report from July 2013 (before the installation process had begun) reveals that MEE was concerned about the lack of IWRM content in the design, which could result in sustainability issues in future. In May 2013, UNOPS were asked to address these issues, though it is not clear how this was actioned by UNOPS.

108. The design process lasted about nine months and in that time a number of iterations of the detailed design were produced with back and forth letters and meetings to refine it. But without leadership on IWRM and an island-specific theory of change to achieve it, the technical design was heavily biased towards desalination with not much in the way of IWRM principles (see para 91). Stakeholders felt that a blueprint water supply system based on the most straightforward technology (desalination) had been foisted on Maldives where there was weak capacity to argue the case for a better model. Other indications of idea imposition were the lack of appreciation for an evidential basis for the detailed project design. For example, ARUP developed a report on the viability for artificial groundwater recharge based on available information in March 2013 and the EIA was completed in June 2013. But the detailed project designs were approved in March 2013, leading one to question why the ARUP work and the EIA were commissioned in the first place when they could not be acted upon. Advice provided by the EIA which could have improved the project results and adherence to the project results frame work was as follows:

- Recharge without abstraction management will not be effective. Natural recharge already happens.
- Replace recharge wells with/integrate with an alternative scheme such as converting household wells into a system of skimming wells to minimise salinization of the aquifer;
- Consider one of the three islands as a pilot island for the recharge wells. Ihavandhoo seems the most appropriate as it is higher in elevation that the other two;
- Create vegetated zones in order to increase permeability of the soil and minimise flooding.

109. The proposal for a team complement in the UNOPS project initiation document comprised of the following professionals:

- Part-time International IWRM expert (on retainer contract)
- Senior programme manager (technical assurance)
- 20% of electromechanical engineer (retainer contract)
- Officer manager for liaison and assurance
- Lead project engineer
- 50% project coordinator

- 1 draftsman
- 2 project engineers.
- 3 Island supervisors
- 6 technicians
- 1 logistics and procurement assistant
- 40% finance assistant
- 70% project support officer

110. The total cost for this team coming to approximately USD384,000, amounting to just over 5 percent of the budget for Component 1 of the project. This is very low considering the technical expertise across a range of skills sets that needs to feed into the design and implementation supervision. Actual expenditure on project management was not availed to the evaluators. Budget constraints will have been a contributing factor to the gaps in an effective project team that could deliver all components of the water supply system. Experts were hard to find locally for a range of positions and the search had to be widened to international experts. The project suffered from not enough senior level attention to it, another result of a constrained budget. The lack of an effective team led to a range of delays and implementation problems during the implementation process.

111. It was difficult to establish the exact shape of the UNOPS team throughout the project duration, and the extent to which is was aligned to the commitments made in the PID. No organigram of the actual team in place was availed to the evaluators. From what can be pieced together, the UNOPS team comprised of a chief engineer located in Colombo and a project manager located in Male. The project manager changed twice, so there were three project managers in total. The two project engineers and a technician were recruited in 2014. Up until that point, there was only one technician for the three islands who had many responsibilities including preparation of Bill of Quantities, bid preparation, bid evaluation and o-site supervision for the three islands. A project monitoring report in July 2013 details the decision to replace the island engineers for one supervisor and two technicians per island, though reasons for this were not given. One strategy undertaken for project supervision on the islands to address the staff shortages was to train junior professional staff whose responsibility would be monitoring of the contractors, backed up a UNOPS engineer. A UNOPS project manager was brought in during the repair works in the second half of 2015. An integrated water resource specialist was missing; so too were experts that could cover the ground water and sewage management components. The resultant picture is a fragmented, unstable and weak complement of technical support for the project.

112. Many sub-contracts operating with different timeframes and handing over periods on the three islands required good project management, particularly given the need to integrate them into operational units. A contracts manager was recruited in 2014, which was unforeseen in the original configuration of the project team.

113. The UNOPS project manager was initially located in the UNDP offices. The PMU comprising of Project Manager, under contract with MEE, and a project assistant who were located at MEE. The recommendation in the inception report (April 2012) was for the team to be co-located, but this did not happen because there was no space at the MEE offices for the entire team. The project manager was constrained in the time that could be given to the project, as two other projects were also being managed from the PMU, an implementation risk that was highlighted to MEE and the Project Board by UNDP, who proposed a number of

options to address this. A part-time (due to budget constraints) international technical engineer was hired to the PMU in early 2013 to support the PMU.

114. Project management was deemed by many stakeholders to have been efficient in relation to Project Board Meetings for example in sending the Project Board agenda and issue updates to the Project Board members ahead of time. Seven Project Board meetings were held over the 4 years (2012 – 2015) with the distribution as follows: one meeting in 2012, three in 2013, one in 2014 and two in 2015. This frequency of Project Board meetings and greater concentration in 2013 could be a reflection of the greater workload in the planning phase (2012 and 2013) prior to the installation works in 2014 and 2015. One Project Board member suggested that more frequent Project Board meetings could have been useful given the implementation problems, suggesting a stronger steer might have benefited the project during the installation phase.

3.3.2 Country ownership

115. There is strong country ownership for the principle of an integrated water resources management system, though clear statements about what this means for Maldives and establishing this as an implementation principle for water supply projects could be improved. Policies, legislation and guidelines are being developed to support action in this area; the problem is more in how this is implemented at the island level. Rainwater harvesting and desalination are not new in the Maldives, but the view from some stakeholders was that the AF project paved the way for a combined rainwater and desalination system, which was replicated in many other similar investments since then, indicating a mind-shift to previous water planning on the islands.

116. The legislative and policy basis for the provision of water supply and sanitation services in the Republic of Maldives is expressed though three main documents (*Constitution of the Republic of Maldives* (2008), the Manifesto of the Progressive Party of the Maldives (2013-2017) and the *Public Health Act* (2012). Legislation for the entire water sector (the Water Act) is forthcoming. *The Constitution of the Republic of Maldives*, Article 23 states that every citizen has a right to “adequate and nutritious food and clean water”, “the establishment of a sewage system of a reasonably adequate standard on every inhabited island. The Manifesto of the Progressive Party of the Maldives (2013-2017) outlines a number of policy areas, aims and solutions. Water and Sanitation fall in Section G of this Manifesto. The aim for water supply solutions is to ensure safe drinking water for all. The solutions include providing safe water to islands that face water shortages during the dry season, through desalination; increasing the storage capacity of water in all islands; establishing desalination plants in islands with large populations; and establishing a faster system to provide water to islands in emergencies through regional storage and desalination of water.

117. GoM is currently developing water legislation in order to help the nation achieve the water and sanitation goals set forth in its constitution. In addition, working is on-going to deliver a water and sanitation Masterplan – advanced stage - which has been in the making since 2008, and an early draft of a water and sanitation policy. Elements of IWRM appear in the Masterplan, such as the need to increase private and community rainwater harvesting and the need to protect and develop ground water resources, but a clearer definition of IWRM and approach could be developed to provide a better steer for investments. EPA guidelines for IWRM are also being developed indicating ownership of the project approach.

118. Regarding country ownership of the project, this was high at the start at the island level as evidenced from the inception report, but it would be fair to say that this has weakened significantly among island communities because of quality of the system installed leading to an erosion of confidence in the installed water system. This is not irreparable but the island systems will need retrofits.

119. At the national level, ownership of the project started strongly, as evidenced by an project initiation ceremony to award the contracts in October 2013 attended by the Minister and State Minister of Energy and Environment, UNDP and UNOPS. It is probably fair to say that it was overshadowed by the significant political instability which started in 2012 entailing three changes in government, a political coup, arrests of the former President, Vice-President and senior government officials, a police mutiny, an army intervention in the legislative process, an attempted assassination, mediation of an election process by the Supreme Court and riots and demonstrations. During the three changes in Government during the project period (the 2009 election, the 2012 ousting of the President and the 2013 election), Ministers and Permanent Secretaries were changed. The upheaval also translated to two of the ministries which were changed in that time (Ministry of Housing and Environment was split into two ministries and Ministries of Finance and Planning were merged into one). The decentralisation process, launched in 2009, also stalled during this time and there has been no fiscal decentralisation, causing dissatisfaction and distrust from the local government towards the central Government.

120. The project falls under the United National Development Assistance Framework (UNDAF) Outcome 8:“Communities have access to safe drinking water and adequate sanitation and sustainably manage the natural environment to enhance their livelihoods.” It is relevant to the primary outcome of “mainstreaming environment and energy” and secondary outcome of “expanding access to environment and energy services for the poor” under the UNDP Strategic Plan’s Environment and Sustainable Development.

121. The expected UNDP Country Programme (CP) Outcome is “environmental services and protection measures accessed by more communities with greater participation of youth in planning and implementation” and the expected Country Programme Action Plan (CPAP) Outputs are “1. Empower local communities concerning sustainable operation and management of infrastructure, on waste management and water and sanitation installed during tsunami recovery; and progressively devolve key management responsibilities to pilot communities within a strategy agreed with community-based organizations, and particularly youth;” and “2. National environmental policies / regulations / standards / guidelines on solid waste management, hazardous waste, water and sanitation, environmental health, land management, and coastal modification formulated to guide sectoral policies, programmes and local practices.”

122. Regarding the extent to which UNDP programming principles of poverty reduction (delivering the MDGs/SDGs), national ownership and capacity development, sustainable human development, participation and voice and gender equality have been realised through project implementation and achievements, the picture is mixed. If the water supply systems can work sustainably, the project will have delivered on MDG 7 on access to safe drinking water supplies. Awareness and capacities have been developed at the level of moving Maldives towards IWRM systems on the islands, but more needs to be done on institutionalising the O & M aspects of the island water supply systems. More could have been done to enhance human development on the islands with respect to the groundwater and reversing its negative effects on the health of the island communities, especially given climate

change (see Section 3.2.1 for details). Participation and giving voice to the islanders on the system design petered out after a strong start (see Section 3.3.3). The links to gender equality are strong if/once the water supply systems are operational since it is women who are the primary collectors and users of water in a household and the community, as well as carers for children and the elderly, and therefore it would be women who would experience the greatest benefits from a piped water system.

3.3.3 Stakeholder involvement

123. Stakeholder involvement in the project started off well in the inception period which created the space for consultations with the community on their expectations for the water service (documented in the project inception report). But the advice and recommendations were not incorporated into the system design, which could have prevented many of the problems that challenged the project. Political commitment was secured through the project launching ceremony held with involvement from island councils and government officials. From the end of the design period through the three years of project implementation, there is little reported in the way of stakeholder involvement in the planning of the infrastructure installation.

124. The project inception report reports the extensive process of community consultations on the three islands to solicit their ideas and advice on the conceptual design. Community contributions to the initial capital cost was reported for Mahibadhoo in one site visit report, indicating full ownership of the investment. But, it is clear from meeting the communities on the three islands, that a critical approach to the design of the project and associated consultations was not undertaken. This should have included presentation of different options for the water supply system, a discussion of the trade-offs involved, and the cost implications. In Mahibadhoo, the lack of sewage treatment was identified as an urgent need, as well as ground water protection. Flooding of roads was a significant hazard that communities were reported to want to control. In Gadhoo, households thought they might receive discounts on the tariff they paid due to the service provided by their roof in the CRWH system. In addition, during the evaluation consultation in Gadhdhoo, community members indicated that they were not aware of the roles of MEE, UNDP and UNOPS on the project neither were they aware of the funding source (nor presumably that it was meant to support adaptation to climate change). The rationale for the blended water with respect to affordability was understood in Mahibadhoo and Ihavandhoo Councils but not so by Ihavandhoo community nor by the Gadhdhoo Council who had come into position only after the construction and installation period had begun.

125. Technical surveys were undertaken by UNOPS at the start of the detailed design phase to establish how and how much households used water. The WTP survey was the other formal consultation instrument implemented. But it was lacking nuances in the value proposition to households regarding the design trade-offs that could be involved (e.g. between a two water source model and a three water source model). The issue of a lifeline tariff to help those unable to afford to pay for a basic service provision was not considered, though this was critical in developing a sustainable business model for the combined water system. Instead community taps have been provided but this runs the risk of abuse and unplanned and unsustainable levels of non-revenue water.

126. Seven Project Board meetings were held over the 4 years (2012 – 2015) with the distribution as follows: one meeting in 2012, three in 2013, one in 2014 and two in 2015. The main government departments and ministries represented in the Project Board were as follows:

- MEE;
- Ministry of Home Affairs;
- Ministry of Finance and Treasury;
- Ministry of Housing and Infrastructure;
- National Disaster Management Centre (NDMC).

127. From meetings with the representatives from these ministries, the evaluators found that Ministry of Housing and Infrastructure and NDMC had not attended more than one or two meetings each because of lack of awareness about the project. Other ministries which were noticeable by their absence were Ministry of Health and Ministry of Education who would have been important stakeholders because of the polluted groundwater issues and health linkages, falling into Component 1 and the links to curriculum development and sciences/island ecosystems, potentially falling into Component 2.

128. Site visits undertaken by MEE PMU or UNOPS over the course of the project installation period to the three islands is detailed in Table 8. Visits by the PMU were undertaken by the IWRM adviser and the programme officer.

Table 8 Site visits to the three islands during the water system installation period

Gahdhoo	Ihavandhoo	Mahibadhoo
Aug-13	Aug-13	Aug-13
Nov-13	Sep-13	Nov-13
Dec-13	Jan-14	Jan-14
	Sep-14	Sep-14
	Jan-15	Nov-14
		Dec-14
		Jan-15

129. No reason could be found as to why Gadhoo received so little attention from project implementers and Mahibadhoo received more than double the visits compared to Gahdhoo, but it may well have to do with the proximity of Mahibadhoo to Male.

3.3.4 Financial management

130. The project was operated on a NEX basis. Advance payments were largely made for the PMU expenditures. A Direct Payments system was also in place to pay vendors in lieu of a GoM system in order to attract vendors. Transfers were made to UNOPS directly from UNDP. Delays in processing quarterly payments were reported by the PMU which affected implementation progress – a few instances of this were recorded in the quarterly monitoring reports. The delays (three weeks) were in the range expected, especially considering the process of working through two organisations (MEE and UNDP). Two audits were undertaken and no major or unexplained irregularities were reported.

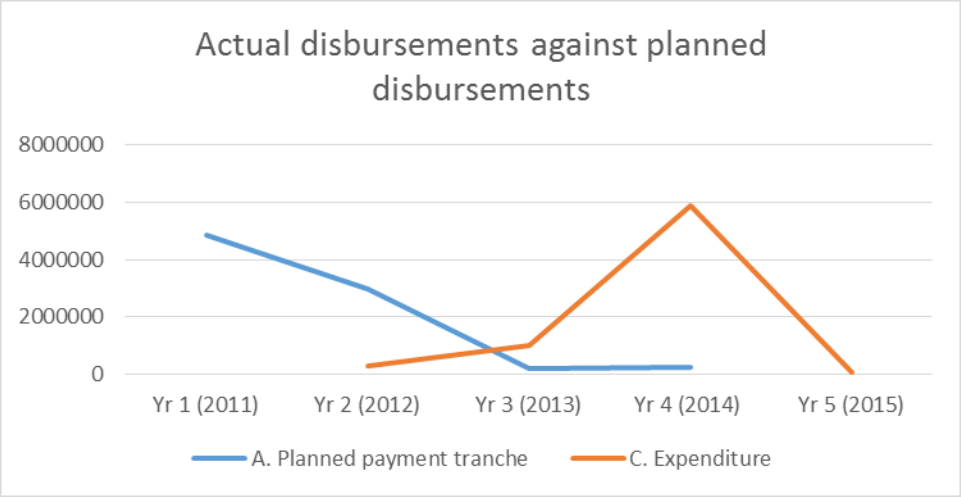
131. UNOPS established different allocations to different expenditure categories in their Project Initiation Document (PID). Many cost variations had to be made which were due to low quality of the materials procured and installation workmanship as well as deficient designs in some areas of the water supply system.

132. Project delivery differed substantially from the planned disbursement schedule. Table 9 shows actual disbursement figures against planned disbursement figures. Figure 1 shows the graphical representation of this data. The first main reason for the differences was the longer design period required which delayed the implementation of the systems' installation to 2014, two years later than planned for in the project budget. But there were also delays due to procurement processes and in addressing deficient pipe systems (see paragraph 148) and inn Earlier paragraphs in this evaluation explain why these implementation delays occurred.

Table 9 Annual Expenditures against annual planned budget

	A. Planned payment tranches	B. Funds transfer	C. Expenditure
Yr 1 (2011)	4841840		
Yr 1 (2012)	2988083	4,841,480	289,944.00
Yr 2 (2013)	210669	0	988,786.00
Yr 3 (2014)	244408	2,988,083	5,883,303.00
Yr 4 (2015)		0	45,602.28
Yr 5 (2016)		455077	

Figure 1 Graphical representation of annual disbursements against planned annual disbursements

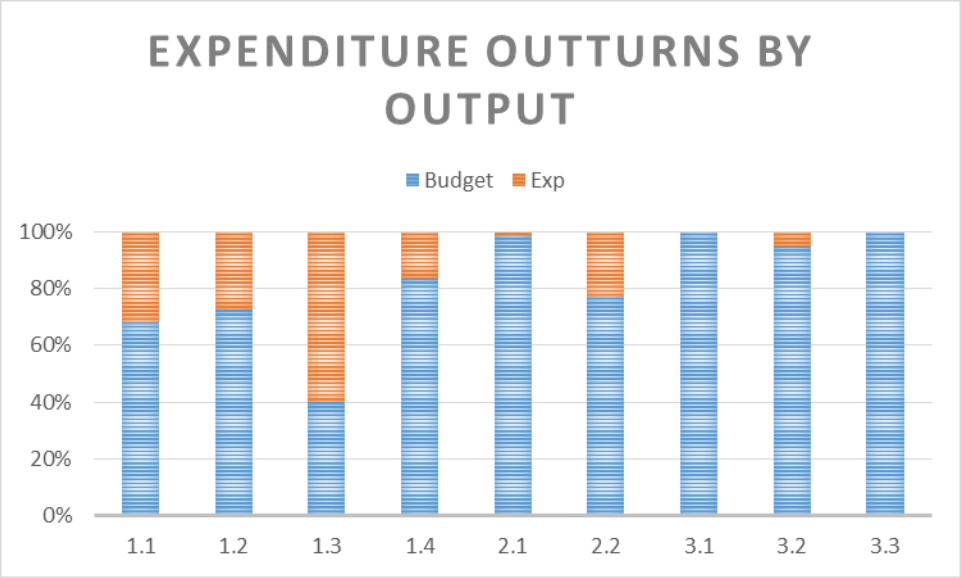


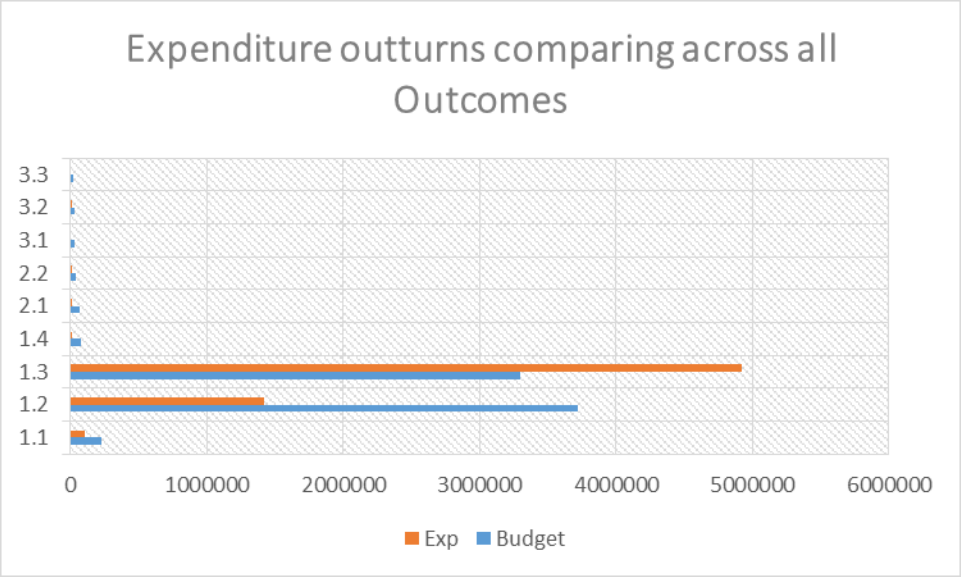
133. Regarding project delivery by Outcome and output, the picture is less clear. It was not possible verify output expenditures from the UNDP Atlas financial figures because Atlas records expenditures at the Outcome level. For the purposes of reporting in the annual PPR reports, the output expenditure data documented in the PPR reports were obtained from UNOPS for Outcome 1 and from the PMU for Outcomes 2 and 3. It is not clear how financial

controls at the Output level were able to be managed by UNDP. In addition, it is clear that expenditures entries which should have been entered into Outcome 1 were in fact recorded in the Atlas system as Outcome 5 (PMU) expenditures. It is unclear the extent to which smaller financial disbursements might have been recorded against incorrect Outcome budget lines.

134. The expenditures reported in the Project Performance Reports turned out to be significantly different to the planned budgets as set out in the Project Document for each of the nine Outputs. Figure 1 sets out the expenditures compared to the budget in the project document, plotted as relative shares by output. Expenditures reflecting the planned budget level would be indicated by 50% share of each of the columns. Where the orange shading is bigger, this indicates that more was spent than budgeted. Where the blue area is larger, this indicates that the planned budget was larger than the expenditure. Most outputs underspent on their budget except for Output 1.3: desalination systems. The expenditure on this output was nearly USD5 million compared to a budget of USD 3.2 million. Figure 2 is showing the same information but plotted according to scale. The largest output budgets were for Outcome 1 and it was Output 1.3 that took the lion's share of the budget. Output 1.2 budget on CWRH was significantly underspent. The expenditure was USD1.4 million against a budget of USD3.7 million

Figure 2 Expenditure outturns





135 This confirms earlier assertions that this project turned out to be a 'desalination first' with CRWH tagged on. Looking at these budget figures, there should have been scope to reduce the size of the RO plant and done something more substantial on rainwater harvesting. Developing output cost benchmarks and applying these to future costing exercises would help defend IWRM project design.

136. The expectation (or ambition) of the annual work plans and budgets did not materialise in practice and budget revisions had to be made in 2013 and 2014. The reasons behind why the annual work plans differed so widely from implementation progress are not entirely clear but a significant factor must have been regarding the procurement and retrofit processes which took longer than expected (see Section 3.1.3 for details).

Table 10 Annual work plan budgets compared to annual expenditures (USD)

Year and month of workplan and budget issuance	Budget	Expenditure
2012 (April)	4,662,391	289,944
2013 (Feb)	6,206,362	
2013 (Revised: Oct)	2,189,716	988,786
2014 (Jan)	5,698,550	5,883,303
2015 (March)	283,250	
2015 (Revised: Oct)	1,014,129	45,602

137. Project management costs were budgeted at USD660,602 which was around 8 percent of the project budget. Because of the mix-up in posting expenditures to the correct Activities

in the Atlas system, it is not possible to say at this point whether the PMU expenditures stayed within their allocated budget.

138. There is a three month delay between UNOPS posting of expenditures and these reflecting on the UNDP Atlas accounting system. Therefore it was not possible to verify the project balance at the time of writing this evaluation. According to UNDP CDRs to date (2015 CDR run 18 January 2016), the project budget spent amounts to USD 7,207,635 against the project budget of USD 8,285,000, meaning that at the time of writing there was USD1,077,044 to account for (13 percent of the project budget).

139 UNDP maintained a risk log but this was more a data entry exercise. The issues around technical leadership, coordination and cooperation were well known which had their roots in the implementation team expertise as well as the way the supervising team and reporting lines were structured.

3.3.5 Implementing Entity supervision and backstopping

140 The project can be characterized as a confused mesh of role and responsibilities which negatively affected accountability and results. The main elements of the management structure were as follows:

- UNDP came into the picture as an accredited entity to access international funding from the Adaptation Fund. Therefore it had the official role of Implementing Agency with overall quality assurance for the project and ultimate accountability for effective use of funds. MEE expected UNDP to exercise its quality assurance role and provide a supervisory function to UNOPS, but there were no reporting lines to UNDP from UNOPS nor from the Project Manager in the PMU, confounding any possible leverage that UNDP needed in order to exercise its quality assurance function.
- UNOPS had delegated responsibility for the management for Component 1 of the project, which was budgeted for almost all the project funds. It saw its role as a 'project partner' but has also described itself as an 'infrastructure implementer' and 'executor'. It was lacking IWRM expertise and drew on third parties for information and quality reviews on IWRM. This is one reason that was reported for the delays encountered in getting the systems installed. GoM expected a complete package of quality advice on how to implement an IWRM system on the three islands and saw UNOPS' role in a lead contracting role accountable for the quality of the final output and the pace and cost of implementation progress. Accountability requirements in the MOU between UNOPS and MEE were weak;
- MEE was the Implementing Partner for the project, with final accountability for the delivery of outputs and outcomes. MEE was also responsible for implementing Outcomes 2 and 3 on stakeholder participation in the design of the water supply system as well as the training of technicians and policy mainstreaming.
- The Project Manager was accountable to MEE and was responsible for coordinating UNOPS with the project, monitoring budgets and expenditures as well as tracking project progress but was not in control of spending decisions on the majority of the funds (UNOPS could access the funds directly from UNDP). The weak accountability requirements set out the MOU reduced the leverage of MEE to quality control implementation of Component 1. A senior, international IWRM expert joined the PMU on a part-time basis (due to funding constraints) in early 2013.

141. There were disagreements about the purpose, use and size of the General Management Fee and fees for Direct Technical Services which, together with slow delivery of the project and questionable capacity to deliver an IWRM system, may have affected the prospects for a working relationship based on trust. This, together with unclear roles and responsibilities, and a lack of cooperative management deriving from the grey areas in management responsibilities and lack of team spirit, was the unfortunate cocktail of ingredients that were major contributors to the implementation challenges the project was to end up facing. A lack of communication between UNOPS and MEE was particularly noticeable in the project reports on the question of Outcome 1.1: Aquifer recharge. MEE decided to take this output over in Q3 of 2014, under the expectation that funds would be transferred from the project budget to MEE, with repeated reminders to UNOPS to submit the requested information. One of the difficulties with the separation of responsibilities for Component 1 and Component 2 was that UNOPS did not have the authority to engage with the island communications directly since this was within the remit of MEE under Component 2, but separation of these functions may have weakened the prospects for an efficient and effective design and implementation process.

142. Quarterly progress meetings minutes were availed to the evaluators as well as the Project Board Meeting minutes. In addition there were site visit reports issued by the MEE Senior water resources engineer as well as the consultant to Stelco. These reports were a rich source of information on the challenges encountered by the project and the measures take to address the challenges as well as key decisions taken.

143. There are positive measures to report on strategies taken to improve team coordination in order to enable faster implementation progress. In Quarter 1 of 2013, due to slow progress of the project, a three-person taskforce to assist UNOPS overcome implementation blockages, was appointed consisting of the Project Director, the PM and one other. This intervention was reported as being instrumental in completing the design process during the first quarter 2013. Regular (bi-monthly) project coordination meetings took place between the three implementers from January 2013 which was reported to have helped in bringing about collaboration and communication between the parties.

144. Multiple changes in UNDP Resident Representative to sit on the Project Board which may have affected institutional oversight and diluted the pressure for effective supervision, notwithstanding the weaknesses in the lines of accountability to UNDP to start with. Monitoring visits were carried out by in 2012, mid-2013 and end 2013 by a Programme Analyst at UNDP together with MEE. There was a conspicuous absence of senior management visits to the islands by both UNDP and UNOPS.

3.3.6 Delays in programme start-up and implementation

145. The implementation process can be characterised by a strong start with plenty of activities being launched, but slowing down significantly in the later stages of the project due to procurement challenges, an incomplete implementation team at the island level and disbursement processes. The project started up in early 2012. Installation of the water supply systems on the three islands took place mostly in 2014 and 2015.

146. Project mobilisation started in January 2012, starting with some initial information gathering and development of the initial project design. The recruitment of the MEE Senior technical advisor started at that point too. Due to internal political changes, meetings and island visits were initiated only in Q2 of 2012. UNOPS initiated its project activities by

assembling a design team by March 2012 and sending an initial draft of the project initiation document in March 2012. The project inception seminar and later workshop were held in April and June 2012 respectively. Visits to the island and household surveys were undertaken in May to June 2012. The detailed design report was submitted to MEE in June 2012 and then November 2012. There ensured a period of nine months during which the detailed project design document was refined, for example the CRWH connection design was completed in 31 Jan 2013 and in March 2013 UNOPS were asked by EPA to alter the RO capacities. At the same time the EIA was carried out, starting in October 2012 and submitted by December 2012 and finalised in June 2013. The detailed design for the project was approved March 2013.

147. An EIA decision note had to be given for the initiation works at the islands. The decision note as approved in August 2013. Further revisions made to the EIA report to improve the quality and substance were made at the behest of the MEE Senior Technical Adviser.

148. Installation of the system started in August 2013 and completed in Feb 2015. By all accounts this is a long implementation period compared to similar experiences on other islands. There were procurement delays, mainly because of weak response to tenders which required re-tendering. Other delays were caused by the process of agreeing the retrofits needed to the island systems. For example, the UNOPS third party verification report, carried out in June 2015 to verify the retrofits needed, added 4 months to the implementation timelines. Then the process to address the replacement works for the house connections started which was expected to be completed in Gadhdhoo in December 2015. This means that it will have taken over two years to install a system which stakeholders across a range of ministries insisted should take not more than six months, though, it should be noted that a significant added complication in this project was parallel implementation on three islands.

149. Outcome 1 faced many procurement delays such as supply and installation of the RO plants. The contract was signed in April 2014 with a delivery period of 5 months which delayed completion of the project until October 2014. Other bids had to be re-tendered and contracts were signed as late as June 2014. Project monitoring reports noted the project being in reactive mode rather than proactive mode in addressing risks to implementation progress.

150. Fund availability posed delays on the project. Realisation of the cash advance took a minimum of three weeks, often longer, because of processing timeframes by UNDP and GoM. For example, in Q1 2013, the WTP survey had to be delayed as was a third mission by the MEE senior water consultant.

151. The EPA-led process of issuing test certificates for the systems on the three island in on-going currently but it was unclear to the evaluators whether this would include the CRWH component of the system given that there are no published EPA standards for this yet.

3.4 Contribution of project achievements to the AF targets, objectives, impact and goal

3.4.1 Contributions to AF goal and impact

152. The AF **Goal** that the project aimed to contribute to is to assist developing-country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change

in meeting the costs of concrete adaptation projects and programmes in order to implement climate-resilient measures. The AF **Impact** that the project aimed to contribute to is **i**ncreased resiliency at the community, national, and regional levels to climate variability and change.

153. The project did contribute to the AF Goal in the sense that it moved Maldives on a trajectory towards adaptation and self-sufficiency at the island level, starting from a baseline characterised by limited amounts of private supplies of rainwater water and expensive desalinated water. The island water supply systems installed represent a milestone on a critical path towards a communal management of water resources. If the water supply system can be made to work sustainably, the project experience could have created an important platform towards the eventual possibility of communal management of the aquifer (the third water source), which will be essential to reducing vulnerability to climate change. It is important to note that before the Tsunami of 2004 and outside of Male, islanders relied on the groundwater resource for all needs, but the resource was not managed as a communal resource. The Tsunami and the island over-topping and salinization of the aquifer that came with it, triggered a reaction against the groundwater resource and towards desalination and above-ground storage of rainwater. With higher amounts of rainfall projected, falling in heavier bursts, there is an opportunity to harvest more both in the aquifer and above ground. Combined with the small land surface area for siting of above ground rainwater harvesting tank, this means that a comprehensive adaptation strategy would need to encompass aquifer management.

154. This paradigm shift towards a communal management of water resources, rather than self-reliance at the household level, is critical towards the eventual possibility of communal management of the aquifer- a common resource which will be essential to reducing vulnerability to climate change.

155. The AF project helped Maldives meet the costs of concrete adaptation project in a wider sense too. This project has had a catalytic effect. A number of projects are being designed in MEE that are based on the AF concept. For example, the recently won investment funds from the Green Climate Fund and a USAID-funded project in Hinnavaru and Thoddoo, as was a 3-island concept design on Mulah, Dhiggaru and Maamigili. There is an intention by MEE to review all new water and projects on the basis of IWRM.

156. On AF Impact, the project, on current progress, is unlikely to be sustainable without the retrofits that are set out in the Recommendations section of this report. The CRWH system is inefficient in design; the poor quality of the materials used is another source of inefficiency. The operation and maintenance capacity gaps remain to be addressed substantially, and the desalination plant are not financially sustainable to run in small island populations without an additional, year-round source of water for mixing - or a subsidy. For year-round blended water production, retrofits to the system design will be needed.

157. The objective of the Maldives AF project was to ensure a reliable and safe freshwater supply for Maldivian communities in a changing climate. Ultimately, the project did not achieve its objective of water security *in the face of climate change* because ground water was omitted entirely from system integration, though documentary evidence and stakeholder views suggest that this project catalysed a shift in mind-set within GoM towards IWRM.

158. Without ever stating it in concrete terms in any of the project documents, the project was geared towards fixing the issue of drinking water supply during the dry season. This is a baseline vulnerability which exists with or without climate change. It is too soon to say whether

the investment will work for this purpose because, though the water supply systems have been installed, they are not yet operational, but there are significant risks to sustainability without applying some critical retrofits.

3.4.3 Contribution to AF targets

159. The project was aimed to contribute to 7 indicators in the AF results framework, corresponding to 3 Outcomes and 2 Outputs. These are reproduced here:

Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses
Output 2.2: Targeted population groups covered by adequate risk reduction systems

2.2. Number of people with reduced risk to extreme weather events
2.2.1. Percentage of population covered by adequate risk-reduction systems
2.2.2. No. of people affected by climate variability

Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level
Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities
3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses
3.1.1 No. and type of risk reduction actions or strategies introduced at local level
3.2. Modification in behaviour of targeted population

Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors
4.2. Physical infrastructure improved to withstand climate change and variability-induced stress

160. To the extent that the project created a paradigm shift from a singular reliance on rainfall supplemented by dry season desalinated water supplies to a functional combined two-water source water supply model, then the project has contributed to Output 2.2 and its indicators: 2.2, 2.2.1 and 2.2.2. The emphasis however is on the functionality of the water supply system. As paragraph 67 shows there are many risks to sustainability which will need retrofits to ensure that it delivers into the future.

161. The project did not deliver on its contribution to Outcome 3. The implementation experience in fact worsened the prospects for ownership of the installed systems. Overall, community relations have been tested because of the disruptive implementation process and the low quality of the system; and good will towards the project is at a low ebb which may affect the financial sustainability of the water supply systems on the three islands.

162. The project did not deliver its contribution to Outcome 4. The main climate change risks in Maldives are sea level rise, temperature increases, a rise in the intensity of tropical cyclones, changing patterns of seasonal rainfall, and potentially a large increase in average annual rainfall. Rainfall changes are expected to increase the risks of drier periods and floods. Sea-level rise, increased wave energy at the coast and increased frequency of tidal surges may increase island-overtopping events and coastal erosion, with possible saline water intrusion into the water lens, without adaptation measures – rainfall recharge is one.

163. The prospects for the infrastructure to withstand climate change stress or to capitalise from the opportunities that might come with climate change can be compromised as follows i) poor quality materials used for the CRWH conveyance pipeline which are showing signs of deterioration (increases in temperature will worsen this) ii) no recharge of drainage and overflow pipes to the aquifer (heavier rainfall events will worsen the road-flooding impacts of this) iii) smaller water storage capacity than the EPA standard due to lack of land availability (missing the opportunity for more rainwater harvesting from increased amounts of rainfall overall) iv) back-up pumps to circulate rainwater from the CRWH system in heavy rain events, when a single pump might be overwhelmed.

3.5 Monitoring and Evaluation Systems

3.5.1 M&E plans

164. The design of the M&E plan can be assessed in two dimensions. The first is the range of performance indicators and the second was the depth of the targets, both of which were unrealistic given the constrained budget and land size available in the islands. Targets were reduced in scope during project implementation but still the estimated capacity of the rainwater harvesting tanks were around three times larger than was possible in the design configuration. Outcome 1 target on provision of freshwater of 20 litres per day would not be amenable to a sustainable business model; to keep the system going year-round would require a complete water provision system. The target for recharge wells (in the hundreds on each of the three islands) proved to be the least achievable of all the targets as there was no agreed, proven method of recharging and the case for recharge (without abstraction management) is arguable in any case. The scope of the target seemed unrealistic in itself. An M&E plan can only be as good (achievable) as the ToC underpinning it, and evidence-based ToCs for each island were missing (see para 98 and 99).

165. 13 Outcome targets were established but these are arguably too many to keep a project focused. The Outcome targets were established for Outcome 1, but not so Outcome for Outcome 2 or 3 - either they are Outcome statements that are not easily measured or they are output targets. Establishing SMART indicators together with quantified targets can be an effective management tool by focusing the implementation strategy.

166. As detailed in Section 3.1, two of the outputs in Outcome 1 were not delivered and two of the outputs were delivered (with sustainability issues). The targets for one of the two outputs delivered (i.e. rainwater harvesting tank capacity) was much smaller than envisaged in the project Results Framework. For Outcome 2, it would be fair to say that the outputs were not delivered in a meaningful way (see para 41). For Outcome 3, the sustainability strategy for O&M needs further work, but the replication value of the project has been good.

167. Minutes of the Project Board meetings show that project progress using the project results framework was closely followed and conveyed by the PM/PMU. But only parts of the results framework was delivered because of the structural problems in the way the team was set up (see paragraphs 136), and the design of the system (summarised in paragraphs 98, 100-106).

168. Adaptive management is a process whereby the project strategy is adjusted to mitigate risks to implementation. The risks to implementation were correctly identified in the project

document but the responses were incorrectly identified or they were not followed through. Adaptive management could have been better with better planning and an overall vision and shared objective of the project. Table 6 provides the details. Adaptive management can also be seen at the level of the strategies undertaken to constitute the UNOPS project implementation team (see paragraphs 110 and 111) but with a better approach to the procurement and installation process, other, more effective ways of staffing the project were probably available.

3.5.3 Programme baselines

169. The project baseline was documented in the EIA though in a descriptive sense rather than a quantitative sense. None of the three islands had a piped water supply system and ground water was the only all purpose supply of water, with bottled water and rainwater used for drinking, supplemented by desalinated water during the dry season. Groundwater contamination and salinization cause various water-borne diseases. The dependence of polluted ground water and untreated rainwater was therefore a sub-optimal position for island communities. The EIA also established the main climate change risks for Maldives though not quantified at the island level.

170. The EIA did not establish water quality indicators; neither did the socio-economic assessment cover the impacts of groundwater on the health and livelihoods of the island communities. That was an omission, given that the ground water element of the project was so integral to an IWRM approach. The EIA did however suggest a monitoring framework with indicators that could be tracked during project implementation. As groundwater was jettisoned as an output, this monitoring framework was not needed.

3.6 Overall ratings

171. The ratings presented here draw on the discussion presented in previous sections. Following AF evaluation guidance, the overall Outcomes and Sustainability ratings may not be higher than the lowest rating criterion in each evaluation category. Box 1 provides the interpretation for the ratings. Annex 1 provides ratings at the disaggregated Output level.

172. It is important to note that these ratings reflect the snapshot of performance in present time. With the retrofits proposed in the next section, the prospects for sustainability and impact would improve significantly.

Table 11 Project ratings

Evaluation criteria	Rating	Comment
Outcome – overall rating	U	Two of the outputs in Outcome 1 were delivered though with sustainability issues and with less adherence to IWRM principles than was needed for full effectiveness. For Outcome 2, the outputs were not delivered in a meaningful way. For Outcome 3, the sustainability strategy for operation and maintenance needs further work, but the replication value of the project has been good.
Relevance	HS	All stakeholders and communities consulted regarded the project of critical importance. The islands of the Maldives face a serious issue of water shortage and it is important to provide fresh water supply at an

		affordable and reliable manner. Climate change presents risks and opportunities for water supply on the islands.
Effectiveness	U	Some of the project components were not delivered (Groundwater and waste water treatment). And the other components were not delivered to a good standard or not delivered at all.
Efficiency	U	The main inefficiencies can be categorized as financial and technical at the level of the rainwater collection efficiency. There were other inefficiencies in project design due to poor planning. The project cost more than it should have done, which could have been avoided with better planning and execution.
Likelihood of sustainability – overall rating	U	The main risks to sustainability are social, technical (efficiency of rainwater conveyance pipeline), O&M arrangements and a lack of a business model for financial sustainability.
Financial and economic	U	Without a business model to sustain the water supply systems on the three islands, the financial sustainability of the operation is at stake; additional retrofits are needed to make the systems sustainable over the next 30 years; Economic benefits are far lower that envisaged in the project proposal, mainly because of proper planning and execution.
Socio-political	ML	The construction and installation process created significant social costs among the community and eroded trust between the community and the island authorities at a crucial time when decentralization is still trying to take hold. The project was important to advance the Central Government political aim to provide water supply on all islands, which can only be achieved with retrofits.
Institutional framework and governance	ML	The main issue is whether the management systems have been put into place to ensure continuity of service into the future. They have not; this is urgently needed.
Environmental and climate change risks	ML	Once the water supply systems are operational, climate change risk have be partially mitigated as envisaged in the project proposal though documentary evidence and stakeholder views suggest that this project catalysed a shift in mind-set within GoM towards an IWRM approach.
Contribution to AF Goal	S	The project moved Maldives on a trajectory towards adaptation and self-sufficiency at the island level, starting from a vulnerable baseline. This paradigm shift towards a communal management of water resources, rather than self-reliance at the household level, is critical towards the eventual possibility of communal management of the aquifer, which is a common resource and essential to reducing vulnerability to climate change. The AF project helped Maldives meet the costs of concrete adaptation project because the project had a catalytic effect on follow-on investments.
Contribution to AF Impact	U	The project, on current progress, is unlikely to be sustainable without additional retrofits, as detailed in the recommendations.
Contribution to AF results indicators	U	The project partly delivered on Outcome 1 of the AF Results Framework, provided retrofits are undertaken. It did not deliver on Outcome 2 of the AF Results Framework and only partially delivered on Outcome 4 of the AF Results Framework.
M&E plans, indicators and baselines	U	The range of performance indicators and the depth of the targets were both unrealistic given the constrained budget and land size available in the islands. Indicators were not SMART and many of the targets were not quantified undermining the potential for the RF to guide project management more effectively. An M&E plan can only be as good (achievable) as the ToC underpinning it, and evidence-based ToCs for

		each island were missing. This also affected the quality of the risk mitigation plan.

The following rating scale has been applied in rating the evaluation criteria on Outcomes, contribution to the AF Results Framework; and the M&E Plan:

Highly satisfactory (HS)
There were no shortcomings in the achievement of the project criterion;
Satisfactory (S)
There were minor shortcomings in the achievement of the project criterion;
Moderately satisfactory (MS)
There were moderate shortcomings in the achievement of the project criterion;
Moderately unsatisfactory (MU)
There were significant shortcomings in the achievement of the project criterion;
Unsatisfactory (U)
There were major shortcomings in the achievement of the project criterion; or
Highly unsatisfactory (HU)
The project had severe shortcomings in the achievement of the project criterion.

The following rating scale will be applied to the criterion of sustainability:

Likely (L)
There are no or negligible risks that affect this dimension of sustainability;
Moderately likely (ML)
There are moderate risks that affect this dimension of sustainability/linkages;
Moderately unlikely (MU)
There are significant risks that affect this dimension of sustainability/linkages;
Unlikely (U)
There are severe risks that affect this dimension of sustainability/linkages.

4. Conclusions

The following five conclusions are made, based on the project findings:

1. A paradigm shift may have been catalysed by this project from a reliance on limited amounts of private supplies of rainwater water and expensive desalinated water towards a communal management system of water resources. This represents a milestone on a critical path towards the eventual possibility of communal management of the aquifer (the third water source), which will be essential to reducing vulnerability to climate change. Thus, despite implementation shortfalls, the project could well represent an important movement towards IWRM, adaptation and resilience to climate change.

2. The project had more success in its influence in changing mind-sets on how to 'do' integrated water resources management than in implementing a successful model. Implementation challenges were mainly institutional in nature, specifically the questionable capacity to deliver an IWRM system by the implementers, a fragmented, unstable and weak implementation team, and a lack of cooperative management between the three main parties, but the serious budget gap cannot be ignored; it was impossible to deliver on the three source water supply model on three islands as envisaged in the project document and choices had to be made on the outputs to deliver and which ones to jettison. Notwithstanding, better implementation choices could have led to stronger results within the budget envelope. On current progress, the project is unlikely to be sustainable without retrofits to ensure year-round blended water production.

2. Climate change adaptation did not drive the system design. What was envisaged to be an integrated three-source water system in the project proposal ended up being half an integrated system that is at great risk of becoming a one legged system of desalinated water provision with poor prospects for cost recovery. Focusing the project on a two-water source model rather than a three-water source model reduced the potential of the project to build island communities' resilience to changing patterns of rainfall and dry periods, and to capitalise from climate change regarding the expected increased amounts of rainfall and heavier bursts of rainfall, which would facilitate recharge, together with abstraction management.

3. Providing integrated water supply system that help communities to adapt to climate change in remote and fragile conditions is going to be an expensive operation. The distance between the islands and the small populations prevents much in the way of gains from economies of scale in procurement and installation of the systems. The unique island characteristics means that the transferability of one IWRM design to another island is likely to be low. Investments should be made on the basis of water resource assessments for each island. In this context, funders and planners need to be prepared to provide funds and the time for the development of technical advice because evidence-based planning is critical to the quality and sustainability of the installed systems and their resilience to climate change.

4. The aim of the project should have been to provide a climate resilient water service instead of a water supply system. This needs to include i) consistent water quality ii) affordable price iii) user-friendliness. The water quality and affordability depends on the ability to deliver a blended water system and on the system working consistently into the future. The user friendliness of the connected household and community system is doubtful. Furthermore, island communities have lost trust in the installed system to deliver consistent, quality, affordable water. This points to an important conclusion about the nature of integration, not

just at the level of sources of water, as indicated in the paragraph above, but also in the way that community ownership is developed to frame the technical design, and, with regards to choices made about system design, in the consideration of lifecycle costs between capital cost and operating costs, and the composition of costs in O&M and their effect on cost recovery.

5. Linked to conclusion 6, the evaluators noticed a difference in opinion among stakeholders about whether the project was supposed to deliver proven approaches to water supply or to inform GoM about the kind of system that *could* work to improve resilience to climate change (suggesting an experimental approach), perhaps reflecting the tension between the need to deliver a water supply project and the rationale for the project in the first place which was to adapt to climate change and which certainly does require experimentation and learning.

5. Recommendations

The following 18 recommendations are divided into three areas: i) those that are intended to improve the impact of the AF project (seven recommendations); ii) those that are intended to guide future investments of this nature regarding the policy framework (six recommendations) and regarding the investment structure (5 recommendations).

5.1 AF project

1. Replace PVC pipes in the rainwater harvesting system and fix all the connections so that they have a reasonable chance of last for a few years. This should be done urgently in all three islands as the year of defective liability in relation to the pipe supplies will be ending in October 2016.

2. Carry out a compliance check against materials specification and installation standards approved by EPA and replace the materials that do not comply. This is important to ensure sustainability over time.

3. Start up the desalinated water supply and get the system working. The system was designed to work with a 25% rainwater mix and without it the system will be more expensive but the additional costs could be covered by production of freshwater supplies to the surrounding islands. Apart from needing to use the system in order to keep the warranty on the plant, prevent damage to the pipes and to keep the trained personnel on the job, this is also a matter of public relations given the negative feelings among households about the project. A grace period may be needed to build confidence among households in the water supply system before charges can be applied

4. Retrofit the GRP tanks on the three islands to include more compartments which would increase rainwater storage capacity, benefitting the affordability of the combined system.

5. Carry out a risk assessment for the combined systems on the three islands and address the risks to sustainability, for example, the risk of accidental damage, the risk of vandalism, the risk of machine failure and the risk of heavy rainfall events.

6. Develop a business model and management plan for the water supply plant for recurrent and capital costs and cost recovery. This may require construction of additional rainwater harvesting infrastructure to ensure year-round affordability. Actively monitor whether the

communal rainwater harvesting system as it designed will be feasible to operate and maintain into the future and if not, a retrofitted automated system may be needed in future.

7. Provide resources for a staff development plan over the next year that should aim for continuous training and improvement. Develop a partnership agreement with University of Mauritius or MWSC to provide training and mentorship at regular points in time for the RO operators in the project islands.

5.2 Future investments

5.2.1 Policy development

1. Develop an IWRM definition for Maldives together published EPA standard and guidance documents for rainwater harvesting systems and other elements of the IWRM system. This would involve synthesizing the available evidence on groundwater in Maldives, gathering data on successful initiatives in the island in the realm of IRWM, synthesizing international best practice for island environments on sustainable ground water use and organizing a seminar to bring together experts and available research. It should be remembered that the Male model is not appropriate for the outer islands where population densities are much lower.

2. Develop cost estimates for the installation of an IWRM systems for different configurations of the elements of the IWRM based on materials and methods for different lifetime periods, for example: 10 years, 20 years and 30 years. These can then be used as reference points for budgeting of investment projects in the future and for comparison against performance results at the island level and in order to inform which investment timeframe is most cost effective.

3. Establish a lesson-learning process for the operation and maintenance of desalination plants in Maldives and feed into guidance on IWRM system design. Are there common factors to the failures of the 58 plants that were donated post-Tsunami and how can these weaknesses be rectified? What are the implications for EPA standards on the type and size of the desalination plants? Are the institutional arrangements working and if not, what institutional adjustments should be made (e.g roles and responsibilities, organizational change, performance management systems, good practice guidelines, training processes, continuous improvement processes) and what is the action plan for implementing these improvements?

4. Establish a water resource management division in MEE. This would champion the need to establish a water balance for each island. It would develop guidance on carrying out water resource assessments and develop information notes on successful ways of managing the rainwater and ground water resource – both supply and abstractions - and integrating their management based on Maldives experience. This should go hand in hand with a ground water monitoring programme that can be taken forward by the island authorities, with an emphasis on community awareness of the link between management effort and improvements in the quality of the groundwater. An agreement by GoM to experiment with different approaches is required. There may be proven technologies in Maldives which are not be known about but which should be better understood, especially considering climate change.

5. GoM needs to provide oversight and ensure compliance with EPA standards. Better awareness, better information about IWRM system design and regular updating of the guidance will help. It is recommended that the licensing process should including a check

against design requirements which should be completed by the contractor and checked by EPA. It is not just a question of the system working today but whether it will continue to work in the future.

6. Enforce regulations on the drainage systems recharging the groundwater. Government projects are powerful from the point of view of messaging and in setting the gold standard for design and implementation.

5.2.3 Investments

7. For future projects of this nature, it is recommended that GoM set up multi-disciplinary technical working group to jointly develop the business model and technical design as one piece. The group should include an IWRM specialist, a water resources engineer, a management specialist with experience in developing business models, a stakeholder engagement specialist who can take the deliberations undertaken in the technical working group to the island communities in a structured way; Island authorities, MEE and the utilities. This function of the group should also be to track progress and results across different islands, synthesize learning and, over time, feed into the updating of the IWRM policy and guidance.

8. Hiring a reputable contractor *firm* as a lead contractor internalizes delivery risks and minimizes costs of delivery failure to the government. Good project management is particularly important for investments implemented in parallel in various islands. A responsible legal entity can be contractually held to account for results and pursued for damages in the case of negligence. A large enough firm has experts it can draw on internally which saves time on small procurements and lead to a better overall output. Performance management processes would already be in place, as would management standards to minimize operational risks, which are more likely to be enforced because of the business need for risk management. Managing one contract rather than multiple contracts is easier for the GoM to oversee progress. There will probably be a greater management cost to this approach – call it the premium paid for risk management - but this should be worth paying for if the project runs smoothly and efficiently to deliver a water service that can be shown to work effectively and sustainably into the future. Preference can be given for a consortium arrangement between an international and national company with benefits for knowledge transfer and capacity development.

9. Design, build, operate and transfer contracts are best in the interests of efficiency and effectiveness. A lead contractor would be responsible for designing a system that they can install easily, and responsible for installing a system which is efficient to operate over an amount of time, which should include a dry and wet season in Maldives. The operation part of the contract should provide on the job training and mentorship for the RO plant operators.

10. Team structure: The project manager should be a senior water resources engineer experienced in working with IWRM principles, based in Maldives fulltime in order to manage relationships with GoM and to ensure that the team work in a coordinated and integrated fashion. One water engineer should be assigned to each island system. Systems should be put into place to draw on technical expertise for the various aspects of IWRM design advice, as needed. Quality control requires regular supervision from the senior project manager. Senior management working on the investment should be co-located. Reporting lines should be carefully set up to ensure accountability. A stable project team structured in this way should be able to deliver in a smoother, faster rate and save costs in the long-run.

11. Develop water supply projects as service delivery projects. The system should be more than the taps, valves and pipes, it is about affordability, convenience and developing public confidence in the service being supplied. In practical terms this means there should be no separation between the management system and the technical design of the system, they should be developed as one. The technical design should be led by service delivery needs. The service delivery model should be informed and enabled by a workable business model. The technical working group should agree what a workable lifetime for the business model should be (in the absence of experience, see Recommendation 2 in Policy Development). Capital and operating costs should be considered together in a financial model focusing on the lifecycle of the operation.

6. Lessons learned

Six main lessons learned have been derived from the findings and conclusions:

1. Put the water customer first. Island communities are not helpless recipients of gifted aid. A sea change is needed in how the investments funds are perceived, irrespective of the source of funding. If the project rests on the assumption that customers will pay for the service, design it so that it is user-friendly, affordable, it has quality materials and fittings, and it provides the quality of water that the customers are expecting.

2. These innovative, integrated types of projects will not be inexpensive to install. The projects must have the appropriate staff on the contractor team and the supervisory team, and be prepared to pay for the cost of the expertise in order to achieve for effective long-term results. Climate change implies a departure from the observed climate patterns and a departure from a business-as-usual is needed. Because climate change will impact on water resources, emphasis must be placed on understanding the water resources available to an island in order to design an appropriate solution.

3. Rainwater harvesting capacity above ground was much smaller than envisaged in the project Results Framework and too small to provide the water blend envisaged in the project document for affordability reasons. The lesson learned here is that alternative ways of rainwater harvesting should be investigated for small island environment in Maldives, including below ground options. All options should be explored. Adaptation to climate requires experimentation with different approaches. Climate change will bring unprecedented changes.

4. Mobilising households to determine the requirements for a service and developing the business model should frame the technical design, in the spirit of designing a sustainable, user-led system. Experience in Maldives has shown on many occasions that reverse osmosis plants have broken down in the past because of a lack of demand for desalinated water outside of the dry season.

5. Contracts must be appropriately packaged. Smaller packages means that reputed firms do not compete and the contractors are more costly to monitor and supervise. An efficient procurement strategy would establish a performance-based integrated supply, fitting and operation of the system to give contractors the incentive to install an effective system. A clear, agreed and single objective for the project will help to deliver the intended results.

6. Structure the implementation team in a manner than enhanced cooperation and accountability. Ensure that the appropriate mix of skills is represented and empowered to act in the team.

Annex 1 Matrix for assessment of progress towards results

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
Objective: To ensure reliable and safe freshwater supply for Maldivian communities in a changing climate	**End of project targets** Integrated water resource management systems on Ihavandhoo, Mahibadhoo and Gadhdhoo provide 24% of all Maldivians who are vulnerable to water shortages and degrading water quality in a changing climate with a reliable supply of safe freshwater. Replication of the project on 4 additional islands provides at least 50% of all Maldivians who are exposed to water shortages and degrading water quality in a changing climate with a reliable supply of safe freshwater.			Partially achieved Achieved	The project focused on a two-source water supply model instead of a three source water supply model, which does not deliver resilience against climate change as envisaged in the prodoc. Nevertheless is viewed as progression itself from the previous water supply model relying on desalination only as it moves the islands towards communal management of water resources and eventual management of the island aquifer. Some of the project components were not delivered (Groundwater and waste water treatment). And the other components were delivered to variable standards.	MS

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
					Replication has been good.	
Outcome 1: Ground water aquifer protected and freshwater supply ensured in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo to provide reliable, equitable and cost-effective access to safe freshwater in a changing climate	1.Number of people living on HA. Ihavandhoo, ADh. Mahibadhoo, and GDh. Gadhdhoo who have uninterrupted access to reliable and safe freshwater supply in extreme climatic conditions	6701 people living on HA. Ihavandhoo, ADh. Mahibadhoo, and GDh. Gadhdhoo are not able to meet their freshwater needs in a highly variable and changing climate. Water needs are met through unreliable supply of rainwater, which is frequently contaminated through insufficiently protected collection and storage systems. Total freshwater collection and storage capacity on each island is insufficient to address water needs during the dry season. Groundwater is highly saline and polluted and unfit for domestic use. Backup desalination systems do not supply the minimum humanitarian water requirements during climatic extremes and disaster events.	100% of the population living on HA. Ihavandhoo, ADh. Mahibadhoo, and GDh. Gadhdhoo will have uninterrupted access to reliable and safe freshwater supply of at least 20 litres per person per day at all times, including during extreme climate events	Unclear at this point. There are many risks to sustainability, including community dissatisfaction.	Water supply systems have been installed on the three islands but the longer-term sustainability of the operations are questionable with additional retrofits identified in the recommendations section of this report. Whether the systems will deliver affordable water is uncertain at the time of the evaluation.	MS
	2.Groundwater quality on each target island	Perception with target population of all	By the end of the project, the quality of groundwater in each	Not delivered	No IWRM expertise in the implementation team. Time and funds	U

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
		islands that due to salinity and pollution, groundwater is unfit for consumption and most household uses. No current data available on the quality of groundwater in target islands. Existing groundwater recharge capacity: • Ihavandhoo: 0 m3 • Mahibadhoo: 0 m3. Gadhdhoo: 0 m3	target island has improved to levels that are safe for hygiene and agricultural purposes • Ihavandhoo: 700 groundwater recharge pits and 30 community recharge wells developed • Gadhdhoo: 495 groundwater recharge pits and 30 community recharge wells developed; Mahibadhoo: 275 groundwater recharge pits and 30 community recharge wells developed		were too limited in UNOPS to follow through with the work.	
	3.Volume of rainwater collected and stored to supply safe and clean freshwater during dry periods	Existing rainwater harvesting capacity: Ihavandhoo: 1,289m3 (households) + 105m3 (communal) Gadhdhoo: no data (individual systems only) Mahibadhoo: no data (individual systems only) Most existing rainwater harvesting systems have insufficient capacities of 2,5 m3 per household and lack proper	Improved rainwater harvesting and storage capacity will be installed as follows: • Ihavandhoo: 9,000 m3 • Mahibadhoo: 6,300 m3. • Gadhdhoo: 6,300 m3 All new rainwater harvesting systems will be equipped with disinfection safeguards to ensure safety of water supply	Delivered but not to the planned capacities.	Operational sustainability is questionable without additional retrofits identified in the recommendations section of this report. Pipe quality and workmanship will compromise the rainwater collection efficiency. The rainwater storage tanks are not big enough to integrate with the desalinated water system for the full duration of the dry season	MS

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
		disinfection safeguards				
	4.Capacity of desalinated freshwater supply available during dry spells, drought and flooding.	Existing capacity to generate freshwater supply from desalination: • Ihavandhoo: 0m3 / day • Gadhdhoo: 10m3 / day Mahibadhoo: 10m3 / day	The following minimum amounts of desalination capacity will be installed on each target island: • Ihavandhoo: 90 m3 • Mahibadhoo: 60 m3. • Gadhdhoo: 60 m3 Potable water quality levels will be in conformity with WHO standard at all times	Delivered	Delivered but operational and financial sustainability is questionable	MS
	5.Number of planned wastewater management and sewage systems which integrate targeted measures to reduce groundwater pollution.	1 sewage treatment plant under construction by a contractor in ADh. Mahibadhoo 1 sewage treatment plant in design phase in HA. Ihavandhoo; 1 sewage treatment plant in design phase in GDh. Gadhdhoo Sea level rise and unsecured septic tanks pollute groundwater and render it unsafe for household uses	All sewage and wastewater management systems which are planned and/or constructed on the 3 target islands integrate targeted measures to reduce groundwater pollution. All septic tanks on each target island are cleaned at least twice per year to prevent groundwater pollution from flooding events.	Not delivered	Not enough budget to deliver. This output was deemed outside the scope of the budget in the detailed design report.	U

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
Outcome 2: Strengthened local awareness and ownership of integrated, climate-resilient freshwater management systems.	1.Number of integrated water management systems which are based on participatory planning between water users and water providers and can be sustained in line with actual willingness to pay for operation and maintenance. 2.Communal willingness to pay for continued operations and maintenance of freshwater supply on each target island.	Willingness to pay for integrated water management services is unknown. No participatory planning and design process for water supply and management schemes.	Integrated water resources management systems on each target island are designed and installed on the basis of community input, and their continued operation is aligned with actual willingness to pay for the operation and maintenance of the installed infrastructure.	Not delivered.	Stakeholder views solicited in the inception phase did not frame the technical design. The tariff has been centrally set by EPA, unclear how this compares with the WTP amounts given in the survey responses. The WTP survey could have been better tailored to the system design: The WTP survey did not explore the issue of lifeline tariffs nor the WTP (or willingness to accept) for different design configuration of a 2 or 3 water source model. Island communities have little faith in the system which shows signs of negatively affecting WTP for the service.	U
	3.Number of Maldivians which are aware about their rights, roles and responsibilities in the management of freshwater resources in a changing climate.	Limited awareness across all islands and atolls about the value of water as both an economic as well as social good, which is sensitive to climate-related shocks and stresses and therefore needs to be	At least 1 IWRM training campaign is conducted in each administrative region (7 total) to strengthen dialogue between water users and providers and increase sensitization about the economic,	Not delivered	An awareness campaign was planned for but a series of delays meant that it was never rolled out.	U

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
		managed responsibly.	social and environmental role of water in a changing climate.			
Outcome 3: Improved institutional capacity to promote and enforce climate-resilient freshwater management on all inhabited islands.	3.1.Number of fully financed follow-up projects which adopt the climate resilient, integrated water resources management approach demonstrated by the project	Maldives has no integrated water resources management project in place that is suitable for replication and upscaling	Project approach is replicated on at least 4 islands	Achieved.	A number of projects are being designed in MEE that are based on the AF concept. For example, the recently won investment funds from the Green Climate Fund and a USAID-funded project in Hinnavaru and Thoddoo, as was a 3-island concept design on Mulah, Dhiggaru and Maamigili. There is an intention by MEE to review all new water and projects on the basis of IWRM.	S
	3.2.Number of staff from water and sewage utility companies trained in	No staff of public or private utility companies in Maldives has	At least 5 staff from each water and sewage utility company currently	Partially achieved.	Some effort at providing O&M training to the RO plant operators is	MS

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating
	the technical principles and skills required to design, implement and maintain **climate-resilient and integrated water management systems.**	received targeted training on IWRM.	active in Maldives are trained in the technical principles of integrated water resource management and recognize basic design principles which make water supply and sewage systems adaptive to a changing climate.		being made, but the project should get beyond one-off training to develop a continuous staff development programme, which would also help to mitigate the risks of staff turnover.	
	3.3. Number of new water and sewage management projects which are reviewed and improved on the basis of lessons learned from the project.	Maldives has no adaptive and integrated water resources management project in place that is suitable for replication and upscaling.	Each new water and wastewater management project that is approved by the Government of Maldives is subject to technical reviews on the basis of IWRM and climate resilience principles.	Unclear.	Draft IWRM EPA guidelines are being developed through these could be strengthened significantly for IWRM content. A number of integrated water supply projects are in the pipeline. Knowledge among different government stakeholders is low. It is unclear the extent to which investment projects are being reviewed for IWRM principles.	MS
	3.4.Financing allocated to new water management projects which integrate climate resilient and integrated design and are approved by the government for implementation.	The government is not able to draw on best practices in the adaptive management of freshwater resources to enable systematic planning and financing of additional projects.	The government approves at least 4 new, fully financed freshwater and/or wastewater management projects on the basis of lessons learned and design principles replicated from the proposed project.	Achieved.	As per 3.1 above.	S

Objective/Outcome	Performance indicator	2011 Baseline level	2015 End of Project Target	2015 End of Project Status	FE comments	Rating

Annex 2 Mission agenda

MISSION AGENDA Stakeholder Meetings			
Stakeholder	**Date**	**Time**	
UNDP	15-Nov-15	0930hrs	
Minitsry of Environment and Energy (PMU)	15-Nov-15	1100hrs	
Ministry of Home Affairs	15-Nov-15	1200hrs	
Ministry of Environment Technical Consultant	15-Nov-15	1530hrs	
Ministry of Housing and Infrsastructure	16-Nov-15	0930hrs	
EPA Consultant	16-Nov-15	1100hrs	
MWSC	16-Nov-15	1430hrs	
FENAKA	16-Nov-15	1530hrs	
National Disaster Management Centre	17-Nov-15	1000hrs	
UNOPS	17-Nov-15	1400hrs	
Ha. Ihavandhoo Council	18-Nov-15	1100hrs	
Ha. Ihavandhoo Community	19-Nov-15	1000hrs	
Adh. Mahibadhoo Council	21-Nov-15	0900hrs	
Adh. Mahibadhoo Community	21-Nov-15	1300hrs	
Gdh. Gadhdhoo Council	22-Nov-15	1330hrs	
UNOPS engineer (Lahiru Perera)	22-Nov-15	1500hrs	
Gdh. Gadhdhoo Community	22-Nov-15	2100hrs	
Ministry of Environment and Energy consultant (Kalinga Pelpoa)	24-Nov-15	0800hrs	
Ministry of Finance and Treasury	24-Nov-15	1230hrs	
UNOPS PMU (Brendan and Lou)	24-Nov-15	1430hrs	
Ministry of Environment and Energy (Environment Section)	25-Nov-15	1100hrs	
Former Permenant Secretary of MEE (Ahmed Saleem)	25-Nov-15	1230hrs	
Field visit to the islands			
Male' to Ha. Ihavandhoo			
	Date	**Departure**	**Arrival**
Male' to Hdh.Hanimaadhoo	18-Nov-15	0750hrs	0850hrs
Hdh. Hanimaadhoo to Ha.Ihavandhoo	18-Nov-15	0900hrs	1030hrs
Ha. Ihavandhoo to Hdh. Hanimaadhoo	18-Nov-15	1300hrs	1430hrs
Hdh. Hanimaadhoo to Male'	19-Nov-15	1605hrs	1705hrs
Male' to Adh. Mahibadhoo			
	Date	**Departure**	**Arrival**
Male' to Adh. Mahibadhoo	21-Nov-15	0645hrs	0830hrs
Adh.Mahibadhoo to Male'	21-Nov-15	1730hrs	1845hrs
Male' to Gdh.Gahdhoo			
	Date	**Departure**	**Arrival**
Male' to Gdh. Kaadehdhoo	22-Nov-15	0900hrs	1010hrs
Gdh. Kaadehdhoo to Gdh. Gahdhoo	22-Nov-15	1030hrs	1145hrs
Gdh. Gahdhoo to Gdh. Kaadehdhoo	23-Nov-15	0600hrs	0730hrs
Gdh. Kaadehdhoo to Male'	23-Nov-15	0900hrs	1000hrs

Annex 3 List of people interviewed

Island Council Meeting list

Ha. Ihavandhoo Council			
	Date and Time		**18 Nov 2015 1100hrs**
#	**Name**	**Organization**	**Designation**
1	Mohamed Asif	Ihavandhoo council	President
2	Ali Rameez	Ihavandhoo council	Member
3	Ali Shaheem	Ihavandhoo council	Member
4	Abdul Mueed	Ihavandhoo council	Vice President
Adh. Mahibadhoo Council			
	Date and Time		**21 Nov 2015 0900hrs**
1	Ibrahim Khaleel	Mahibadhoo council	President
2	Adam Saleem	Mahibadhoo council	Member
3	Mohamed Faiz	Mahibadhoo council	Director
Gdh. Gadhdhoo Council			
	Date and Time		**22 Nov 2015 1330hrs**
1	Mohamed Ahmed	Gadhdhoo council	President
2	Abdullah Imad	Gadhdhoo council	Project Officer
3	Ahmed Yameen	Gadhdhoo council	Member

Stakeholder Meeting list

UNDP		
	Date and Time:	**15 Nov 2015 0930hrs**
#	**Name**	**Designation**
1	Mohamed Inaz	
2	Aminath Shooza	
3	Nasheeth Thoha	Assistant Resident Representative
4	Ahmed Fizal	Program Assistant

Ministry of Environment and Energy		
	Date and Time:	**15 Nov 2015 1100hrs**
#	**Name**	**Designation**
1	Abdul Matheen	State Minister
2	Shaheeda Adam Ibrahim	Director
3	Najfa Shaheem Razee	Program Manager

Ministry of Home Affairs		
	Date and Time:	**15 Nov 2015 1200hrs**
#	**Name**	**Designation**
1	Ahmed Shareef Nafees	Director General
2	Ibrahim Hameed	Permanent Secretary

MEE Technical Consultant		
	Date and Time:	**15 Nov 2015 1530hrs**
#	**Name**	**Designation**
1	Mohamed Rasheed	Technical consultant

Ministry of Housing and Infrastructure

	Date and Time:	16 Nov 2015 0930hrs
#	Name	Designation
1	Abdulla Ziyad	Deputy Minister

EPA Consultant		
	Date and Time:	16 Nov 2015 1100hrs
#	Name	Designation
1	Ali Mishal	Engineer

MWSC		
	Date and Time:	16 Nov 2015 1430hrs
#	Name	Designation
1	Mohamed Shaan	Assistant Manager
2	Hussain Ibrahim	Assistant Manager
3	Ibrahim Akram	Assistant Manager
4	Mohamed Shafiu	Deputy Manager

National Disaster Management Centre		
	Date and Time:	17 Nov 2015 1000hrs
#	Name	Designation
1	Hisan Hassan	Project Director

UNOPS		
	Date and Time:	17 Nov 2015 1400hrs
#	Name	Designation
1	Francois Jacob	Director
2	Aminath Nawaal	Project Support Officer

FENAKA		
	Date and Time:	**17 Nov 2015 1530hrs**
#	**Name**	**Designation**
1	Mohamed Ibrahim Jaleel	Assistant Director
2	Akhtar Haleem	Deputy Director

UNOPS Engineer		
	Date and Time:	**22 Nov 2015 1500hrs**
#	**Name**	**Designation**
1	Lahiru Perera	Engineer

MEE consultant		
	Date and Time:	**24 Nov 2015 0800hrs**
#	**Name**	**Designation**
1	Kalinga Pelpola	Consultant

Ministry of Finance and Treasury		
	Date and Time:	**24 Nov 2015 1230hrs**
#	**Name**	**Designation**
1	Mohamed Imad	Director General
2	Aminath Nashia	Director

UNOPS PMU		
	Date and Time:	**24 Nov 2015 1430hrs**
#	**Name**	**Designation**
1	Brendan Keirnan	Program Coordinator
2	Lou Luff	Program Coordinator

Ministry of Environment and Energy (Environment Section)		
	Date and Time:	**25 Nov 2015 1100hrs**
#	**Name**	**Designation**
1	Miruza Mohamed	Director
2	Ilham Atho Mohamed	Assistant Director

Former Permanent Secretary of MEE		
	Date and Time:	**25 Nov 2015 1230hrs**
#	**Name**	**Designation**
1	Ahmed Saleem	Managing Director of MEECO

Annex 4 Documents reviewed

1. ARUP (2013) Groundwater Desk Study, 21 March. For UNOPS Maldives.

2. ARUP (2013) Solar for Desalination in Maldives, Solar Photovoltaic Feasibility Study Report, 22 January. For UNOPS Maldives.

3. (2013) Groundwater proposal – Managed Aquifer Resources Assessment, letter dated 4 May. To UNOPS Maldives.

4.Bari, R., Report of Second Inspection visit of Stelco consultant, 13 November 2014; Summary of Mahibadhoo IWRM scheme commissioning issues as discussed in meeting of MEE – Stelco 21.12.14.

5. Government of Maldives, Ministry of Environment and Energy, Project Coordination Meeting minutes:

15 January 2013 4 February 2013 18 February 2013 2-8 July 2013 12 September 2013 4-7 November 2013 5-24 & 25 November 2013 9 December 2013 12 December 2013 26 December 2013 30 December 2013	20 April 2014 20 May 2014 28 May 2014 23 July 2014 6 August 2014 11 September 2014

6. Government of Maldives, Ministry of Environment and Energy, Task Team for Risk Mitigation and Transfer of Assets to Fenaka Corporation and STELCO; 9 September 2014 & 26 November 2014.

7. Government of Maldives, Ministry of Environment and Energy, Project Board Meeting minutes:

15 August 2012	23 September 2013 24 December 2013	24 August 2014	1 March 2015 1 September 2015

8. Riyan Private Ltd, (2013) Willingness to Pay Survey: Adh. Mahibadhoo, GDHG. Gadhoo, HA.Ihavandhoo. For Government of Maldives, Ministry of Environment and Energy, May.

9. Government of Maldives, Ministry of Environment and Energy (2013) Final Detailed Design Report, 28 October.

10. Government of Maldives, Ministry of Environment and Energy, Project Monitoring Form:

Qtr 2 2012, Qtr 3 2012, Qtr 4 2012,	Qtr 1 2013, Qtr 2 2013, Qtr 3 2013, Qtr 4 2013,	Qtr 2 2014, Qtr 3 2014,	Qtr 2 2015.

11. Government of Maldives, Environmental Protection Agency, Guidelines for IWRM projects – draft.

12. Hay, J.E (2006) Climate Risk Profile for The Maldives, for Government of Maldives.

13. Pelpola, K, Site visit reports, emails dated 28 August, 2013; 28 November 2013; 22 January 2014.

14. PriceWaterHouse Coopers (2013) Audit of Statement of Expenditure. For UNDP.

15. Saravannan, G. Mission report: 3 October 2013; 2 November 2013; 6-7 November 2013;

16. UNDP Project Performance Reports 2013 and 2015.

17. UNDP Project Resource Overviews 2012, 2913, 2014 and 2015.

18. UNDP Combined Delivery Report 2012, 2013, 2014 and 2015.

19. UNDP Annual Workplans: 17 April 2012; 2 February 2013; 28 October 2013 (revised); 19 January 201`4; 25 March 2015; 12 October 2015 (revised).

20. UNDP (2014) Mid-term Evaluation Report, 6 February.

21. UNDP (2014) Mission report, 17-22 August 2014

22. UNDP (2012) Project Inception report….

23. UNDP (2011) Project document: Increasing climate resilience through an integrated water resources management programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh.Gadhdhoo islands, signed 15 December.

24. UNOPS (2012) Basic Design Concept: Island for Ihavandhoo, Mahibadhoo and Gadhdhoo in Maldives, March.

25. UNOPS (2013) Project Initiation Document. Component 1: Establishment of an integrated, climate resilient water supply and management system in Mahibadhoo, Ihavandhoo and Gadhdhoo, 28 March.

26. UNOPS (xx) Environmental Impact Assessment for the proposed Water Resources Management Project in 3 selected islands.

27. UNOPS, Financial and Narrative Quarterly Progress Report – No 1, 2nd Qtr 2012

28. UNOPS (2015) Third Party Verification report, 1 June.

29. Waheed, A. Mahibadhoo Inspection visit report, 10 September 2014.

30. Waheed, A. Findings from site vist to Ihavandhoo Integrated Water Network Project, 25 September 2014.

31. Waheed, A. Ihanvandhoo Trip Report, 14-15 January 2015.

32. Waheed, A. Findings from site visit report to Mahibadhoo integrated water Network project, 29 January 2015.

33. Waheed, A. Site visit report to Gadhdhoo, 6-8 January 2015.

34. Mihad Mohammed. Rainwater Tanks handover trip to Gdh. Gadhdhoo, 25-26 December 2013.

Annex 5 Evaluation questions and data collection method

Evaluation questions	Indicators of success	Information source	Methodology
1. Achievement of outputs and outcomes, providing ratings for targeted project objectives and outcomes			
Relevance; Effectiveness; Efficiency			
Relevance: • Did the project remained relevant compared to what was planned and needs? Did it live up to expectations? Were there any missed opportunities? • What were the key needs the project was designed to address? Impacts on the household in the baseline (hh level solutions, impacts on economy, health and other indicators). • What are the views on the importance of groundwater to basic needs? If important, why?	• Project reduced vulnerabilities that are expected to worsen with climate change.	• Project M&E reports, PIRs, annual reports. • PB/steering committee minutes • Interviews with government, PMU and Utilities. • Focus group discussions.	• Documentary analysis, • Triangulation through interviews and focus groups.
Effectiveness: • Which aspects of the project were successful and which were not? • What were the main challenges in implementing the project? • With hindsight, how could the project have been designed for better effectiveness? • Were all important outputs delivered? Why were certain outputs not delivered and does it matter? (Underlying assumptions in the prioritisation process for different stakeholders). • What were the key factors contributing to effective performance? And the key factors leading to implementation weakness? • Have cost savings been achieved with respect to the system installed (e.g. assumption was that RE/RO plants and household connections to provide freshwater would be cheaper that what is currently spent on freshwater).	• Results framework targets delivered.	• Results framework: project and country level. • Project M&E reports, PIRs, annual reports. • Interviews with government, PMU and Utilities. • Focus group discussions.	• Documentary analysis • Triangulation through interviews and focus groups.
Efficiency: • How good was the project planning (AWPs and quarterly plans)? • How realistic was the project budget and how do expenditure outturns compare? • How could cost efficiencies have been made? • (For MWSC) how does this project compare to the cost-effectiveness of other similar investments in other islands? Good and bad points. Recommendations for future design.	• # of budget revision in a year & delivery rates. • Management costs as a percentage of total costs. • Comparable or better cost effectiveness with other similar projects.	• Project document budget • Project CDRs • Financial audits • AWPs and quarterly reports; • Interviews with MWSC, Feneka, PMU, government officials and implementing agencies.	• Documentary analysis, • Triangulation through interviews.

Evaluation questions	Indicators of success	Information source	Methodology
2. Likelihood of sustainability of Outcomes at project completion			
Financial and economic; Socio-political; Institutional framework and governance; Environmental risks; Uncertainties on climate change impacts – baselines			
Progress towards impacts: ▪ What impact do you think this project will/is delivering? ▪ What are the main elements in the design and implementation of this project that would deliver impact or make the programme unsustainable? ▪ What have been the steps taken to promote sustainability?	▪ Results framework targets delivered ▪ Sustainability strategy/exit plan in place	• Results framework: project and country level. • Project M&E reports, PIRs, annual reports. • Interviews with government, PMU and Utilities • Focus group discussions.	• Documentary analysis, • Triangulation through interviews and focus groups.
Financial and economic: ▪ Do households see an improvement in the freshwater supply service? Are they willing to pay the tariffs? Will they/are they drinking the water coming from the project infrastructure and service? How does the project affect their health, incomes (e.g from displacement of buying bottled water; health expenditures etc) and any other aspect of quality of life? ▪ How could the service be improved? ▪ Is the service expected to be financial sustainable? What would need to change to make it financially sustainable?	▪ Communities are paying for the regular water supply service.	• Progress reports • Focus group discussions. • Interviews with Utilities.	• Documentary analysis • Triangulation through interviews and focus groups.
Socio-political: • Will the government replicate this approach and/or what improvements might it make to the design? • Are there any policy barriers to replication of the approach? How could the project inform a national strategy for country-wide replication?	• Government will replicate the project approach to other islands.	• Interviews with Utilities, PMU and government.	• Interviews.
Institutional framework and governance: • What were/are the main institutional challenges affecting sustainability what could the project have done to address this? • Is there sufficient capacity and a management/capacity development plan in order to manage water services established by the project? • What solution could there be for future projects to address the issue of scarce capacity to run these types of projects?	• Institutional challenges are being addressed and should not pose a problem for sustainability or replication of the approach.	• Project M&E reports, PIRs, annual reports. • Interviews with Utilities and government and focus groups.	• Documentary analysis • Triangulation through interviews and focus groups.
Environmental risks: ▪ What environmental risks could threaten the effective functioning of the system?	▪ Environmental risks to the freshwater supply system are minimised.	• Project M&E reports, PIRs, annual reports. • Interviews with Utilities and government.	• Documentary analysis • Triangulation through interviews and focus groups.
Uncertainties on climate change impacts – baselines:	• Climate change risk and	• Project M&E reports,	• Documentary

Evaluation questions	Indicators of success	Information source	Methodology
• Did information about climate change risks and vulnerabilities affect the implementation strategy for the project? Could more have been done and if so, what?	vulnerability information was an important factor in the design and implementation strategy of the project.	PIRs, annual reports. • Interviews with Utilities, PMU and government.	analysis • Interviews Triangulation through interviews and focus groups.
3. Processes influencing achievement of Programme results			
Preparation and readiness; Country ownership; Stakeholder involvement; Financial management; Implementing Entity supervision and backstopping; Delays in programme start-up and implementation			
<u>Preparation and readiness</u> : ▪ Were you involved in the design process for this project? ▪ What were the good and weak points in the design of this project? Was it feasible time, capacity and money-wise from the outset? ▪ Good and bad points about the implementation model, and recommendations for future projects. ▪ What improvements would you like to see in future investments of this kind? ▪ Were lessons from past investments taken on board in the design of this project? What would those lessons be? What do you understand by IWRM? ▪ Who was part of the core team? ▪ How effective has Project management been in planning, organising and controlling the delivery of Project interventions in a cost-effective manner? ▪ Did the team work well and was the team composition adequate for the task? Was the distribution of responsibilities and reporting lines clear? ▪ Were the risks identified and the risk ratings applied comprehensive and appropriate? Did new/unexpected risks surface? What has been the quality of risk management? ▪ Have there been any management delays in implementing the project, what were the causes and were they resolved?	▪ Project design integrates the lessons learned from programming experiences ▪ A range of stakeholder views were considered in the project design ▪ An adequate complement of technical and administrative project staff recruited for all main project functions ▪ No staff turnover ▪ No administrative delays ▪ Staff happy with their roles ▪ Project management tools used for effective work planning ▪ Risk analysis and ratings were accurate ▪ No delays due to foreseen or unforeseen risks materializing Risk management system/tools applied	• Project M&E reports, PIRs, annual reports. • Interviews with Utilities and government. • Focus group discussions.	• Documentary analysis • Interviews Triangulation through interviews and focus groups.
<u>Country ownership:</u> • Is this project in line with national development priorities? Has the project contributed to progressing national development priorities? • Did the government contribute time, funds or in-kind resources to this project? • Has there been adequate ownership by government of the project? How could things have been done differently?	• The project is aligned to country priorities as stated in national policy documents. • GoM contributed time, other in-kind resources /or cash to the project. • The frequency of coordination meetings follows as planned	• Project document risk matrix • Risk management tool • Financial reports and CDRs • Project M&E reports, PIRs, annual reports. • Interviews with	• Documentary analysis • Triangulation through interviews and focus groups

Evaluation questions	Indicators of success	Information source	Methodology
• Have the coordination mechanisms worked well for the achievement of the Project objectives? • To what extent has the project promoted effective inter-sectoral collaboration?	• The range of representation in the coordination meetings (sector, stakeholder group) • Focus on results and timing maintained • Levels of stakeholder participation in coordination meetings	government and PMU.	
<u>Stakeholder involvement:</u> • What do you know about the project? What has it achieved? • How were you involved in the design and implementation? • Did you attend any meetings or consultations? Was this a deliberate decision and what were the reasons why? • Would you have liked to be more involved in the design and implementation? Would implementation have run better with better community involvement and why? • Could the project have made better use of the skills, experience and knowledge of a range of stakeholder groups/entities in the design and implementation of the project?	• Satisfaction among households, island authorities and national stakeholders over level of involvement in the project.	• Progress reports • Interviews with government. • Focus group discussions	• Documentary analysis • Triangulation through interviews and focus groups.
<u>Financial management:</u> • Did funds flow in a timely manner? • Were the funds used as planned? • Were appropriate financial controls applied effectively?	• Funding flowed as planned.	• Progress reports • Quality of AWP and quarterly financial reports. • Project CDRs • Interviews with implementing entities • Interviews with PMU and government.	• Documentary analysis • Triangulation through interviews.

<u>Implementing Entity supervision and backstopping:</u>
• Did IE staff identify challenges in good time and make a plan for addressing them?
• Did IE staff provide quality and timely support and advice to the project?
• Did IE staff provide the right staffing levels, continuity, skill mix and frequency of field visits for the project?
• How many of the MTR recommendations for project were implemented and if not, why not (follow up by IE):
  ○ Detailed written agreement on handover procedures;
  ○ Re-allocation of resources between outputs;
  ○ Finalisation of tariff structure by April 2014;
	IEs worked effectively to support project implementation.	• Progress reports
		• Quality of AWPs
		• Project manuals/guidance notes
		• Financial reports
		• Interviews with IE, PMU and Government
			• Documentary analysis
			• Triangulation through interviews.

Evaluation questions	Indicators of success	Information source	Methodology
○ Team-based risk assessment and strategy; ○ Immediate initiation of community information campaign; ○ Strengthen results-based and financial monitoring. • How did the partnership between the agencies and government work; what were the main challenges and how could they have been overcome? • Are there benefits to working together as a partnership on another project?			
<u>Delays in programme start-up and implementation:</u> • What were the main challenges and what could have been done to avoid them? Recommendations for future projects.	• Risks and delays managed effectively to reach delivery of the project results.	• Progress reports • Interviews with IE, PMU and Government.	• Documentary analysis • Triangulation through interviews.
4. Contribution of project achievements to the AF targets, objectives, impact and goal			
Contributions to AF goal; Impact; objective			
• What are the main vulnerabilities to climate change (main climate change risks)? Has this project helped to reduce vulnerability to climate change? • How has the project helped to develop capacity to manage water in a more efficient and effective way (adaptive capacity)?	• AF core indicators and standard indicators delivered.	• Country progress reports • Interviews with Utilities, PMU and government.	• Documentary analysis • Triangulation through interviews.
5. M&E systems			
M&E plans: Design; Implementation; Budgeting and funding for M&E activities			
• Are the project's logframe indicators and targets "SMART" and how could they have been improved? • Are the Project's objectives and outcomes or components practical, and feasible within its time frame? • Was the budget sufficient for effective monitoring and influencing? • What monitoring data used for management processes? E.g by PMU and in PB meetings to track progress. • Were PPRs complete and accurate, with well justified ratings? • Was the information provided in the PPRs used to improve performance and for adaptive management?	• SMART indicators established at project design and delivered. • Results tracking has informed project implementation strategy. • Project strategy integrates lessons learnt from previous projects and projects • Critical gaps addressed in the project design	• PPR reports • Annual reports • M&E reports • Other project documentation • Interviews with PMU and IEs.	• Documentary analysis • Triangulation through interviews.
Indicators; Programme baselines; Alignment of programme M&E frameworks to national M&E frameworks			
• Was there a climate vulnerability baseline established for the project? • Did the project make best use of existing national M&E systems or in some way contribute to them?	• Project M&E strategy strengthened national policy performance tracking systems.	• PPR reports • Annual reports • M&E reports	• Documentary analysis • Triangulation

Evaluation questions	Indicators of success	Information source	Methodology
• Did the project include plans for feedback of M&E data for dissemination of good practice to the wider community?		• Other project documentation • Interviews with PMU.	through interviews.

Annex 6: Terms of reference

BASIC INFORMATON

Location:	*Maldives*
Application Deadline:	7th September 2015
Type of Contract:	Individual Contract
Post Level:	*International Consultant*
Languages Required:	*English*
Starting Date: (date when the selected candidate is expected to start)	14th October 2015
Duration of Initial Contract:	14th October 2015 to 14th January 2016
Expected Duration of Assignment:	*35 working Days*

background

In accordance with United Nations Development Programme (UNDP) and Adaptation Fund (AF) M&E policies and procedures, all regular UNDP supported AF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the project titled Increasing climate resilience through an Integrated Water Resource Management Programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island (Maldives) (PIMS #4582).

The essentials of the project to be evaluated are as follows:
Project Title: Increasing climate resilience through an Integrated Water Resource Management Programme in HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island
AF Project ID: 00078494
UNDP Project ID (PIMS#): 4582
Executing Agency: *Ministry of Housing and Environment*
Other Partners involved: *Ministry of Environment and Energy/ UNOPS*
AF financing at endorsement (Million US$): 8,285,000
Total co-financing financing at endorsement (Million US$): *1,800,000*
ProDoc Signature (date project began): *15 December 2011*
(Operational) Closing Date (proposed): *31 December 2015*

OBJECTIVE AND SCOPE:

The project was designed to: demonstrate climate-smart freshwater management in the Maldivian context and establish integrated and resilient water supply systems on the densely populated islands of HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo, with a view on country-wide replication and upscaling. The project will increase total freshwater storage capacity on all target islands to buffer the effects of less reliable rainfall and freshwater shortages during longer dry periods. The amount of rainwater collected in the islands will be increased through rainwater collected from community buildings and connected households and additional production capacity for desalinated freshwater will be installed to provide sufficient capacity to provide potable water though out the year. The distribution network for the water be installed and sustainable operational mechanisms will be put in place through capacity building. Artificial groundwater recharge will be enhanced to improve the quality and quantity of water stored in the natural aquifer, and contamination of household effluents will be reduced to prevent damages to the sensitive reef ecosystem.

The TE will be conducted according to the guidance, rules and procedures reflected in the 'UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects' (2012), henceforth referred to as 'TE Guidance'.[10]

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

EVALUATION APPROACH AND METHOD:

An overall approach and method for conducting project terminal evaluations of UNDP supported AF financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact,** as defined and explained in the TE Guidance. A set of questions covering each of these criteria will be provided to the selected evaluator. The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the AF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders.

DUTIES AND RESPONSIBILITIES

The evaluator is expected to conduct a field mission to Maldives including the following project sites HA. Ihavandhoo, ADh. Mahibadhoo and GDh. Gadhdhoo Island Interviews will be held with the following organizations and individuals at a minimum:
Ministry of Environment and Energy
Ministry of Fisheries and Agriculture
Ministry of Tourism
Ministry of Finance and Treasury (Economic Development Policy Department (EDPD))
Ministry of Economic Development
National Disaster Management Center
Ministry of Education
Private Sector
Provincial Utility Companies
Members of Island Council and Atoll Council, island authorities
Environmental NGOs
UN Agencies, UNOPS, UNICEF, WHO

The evaluator will review all relevant sources of information, such as the project document, project reports – including Annual PPRs, project budget revisions, midterm review, progress reports, AF tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. The project team will provide these documents to the selected evaluator.

EVALUATION CRITERIA & RATINGS:

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework, which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact.** Ratings must be provided on the following performance criteria:

[10] The guidance document for UNDP-supported GEF financed projects can be used for AF financed projects as well. The document is available via this link.

- Monitoring and Evaluation design at entry
- Monitoring and Evaluation Plan Implementation
- Overall quality of M&E
- Relevance
- Effectiveness
- Efficiency
- Overall Project Outcome Rating
- Quality of UNDP Implementation – Implementing Agency (IA)
- Quality of Execution - Executing Agency (EA)
- Overall quality of Implementation / Execution
- Sustainability of Financial resources
- Socio-political Sustainability
- Institutional framework and governance sustainability
- Environmental sustainability
- Overall likelihood of sustainability

The completed Required Ratings table (as found in the TE Guidance) must be included in the evaluation executive summary. The obligatory rating scales can be found in the TE Guidance.

A full recommended report outline can be found in the TE Guidance.

PROJECT FINANCE AND CO-FINANCE:

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the Required Co-financing Table (as found in the TE Guidance), which will be included in the terminal evaluation report.

MAINSTREAMING:

UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender.

IMPACT:

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements [a useful tool for gauging progress to impact is the 2009 Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office].

CONCLUSIONS, RECOMMENDATIONS & LESSONS:

The evaluation report must include a chapter providing a set of conclusions, recommendations and lessons.

IMPLEMENTATION ARRANGEMENTS:

The principal responsibility for managing this evaluation resides with the UNDP CO in Maldives. The UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the

country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

EVALUATION TIMEFRAME:

The total duration of the evaluation will be 35 working days over a time period of 2 month according to the following plan:

- Start date: Wednesday 14 October. Review all documents; produce zero draft together with mission schedule and interview questions
- Mission: 4 weeks later
- 1st draft for review: 13 November 2015
- Final report: 14 January 2016

DELIVERABLES:

The evaluation team is expected to deliver the following:

- Inception Report: Evaluator provides clarifications on timing and method, Evaluator submits to UNDP CO no later than 2 weeks before the evaluation mission
- Presentation of Initial Findings: Evaluator submits to project management and UNDP CO at the end of evaluation mission
- Draft Final Report: Full report (per template provided in TE Guidance) with annexes, Evaluator submits to CO within 4 weeks of the evaluation mission, reviewed by RTA, PCU, AF OFPs
- Final Report: Revised report, Evaluator submits to CO within 2 week of receiving UNDP comments on draft

*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report.

PAYMENT MODALITIES AND SPECIFICATIONS:

- *10%- at* submission and approval of inception report
- *40%*- Following submission and approval of the 1ST draft terminal evaluation report
- *50%*- Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report

COMPETENCIES

CORPORATE COMPETENCIES:

- Demonstrates integrity by modelling the UN's values and ethical standards;
- Promotes the vision, mission and strategic goals of UN/UNDP;
- Displays cultural, gender, religion, race, nationality and age sensitivity and adaptability;

FUNCTIONAL COMPETENCIES:

- Ability to lead strategic planning, results-based management and reporting;
- Builds strong relationships with clients, focuses on impact and result for the client and responds positively to feedback;
- Consistently approaches work with energy and a positive, constructive attitude;
- Demonstrates good oral and written communication skills;

- Demonstrates ability to manage complexities and work under pressure, as well as conflict resolution skills.
- Capability to work effectively under deadline pressure and to take on a range of responsibilities;
- Ability to work in a team, good decision-making skills, communication and writing skills.

Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the UNEG 'Ethical Guideline for Evaluations.'

REQUIRED SKILLS AND EXPERIENCE

The evaluation team will be composed of *(1international).* (*If the team has more than 1 evaluator, one will be designated as the team leader and will be responsible for finalizing the report).* The evaluators selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

EDUCATION:

- An advanced degree in relevant field: Water Resource Management

EXPERIENCE:

- Minimum *5* years of relevant professional experience in area of integrated water resource management, with particular focus on water production and distribution technologies
- Knowledge of and experience with UNDP and/or AF (10%);
- Previous experience with results-based monitoring and evaluation methodologies (25%);
- Technical knowledge and experience in the area of integrated water resource management, with particular focus on water production and distribution technologies (20%);
- Evidence in providing technical assistance to and / or in evaluating water sector related projects (10%);
- Experience with evaluating similar AF financed projects is an advantage;

LANGUAGE:

- Fluency in written and spoken English is required.

APPLICATION REQUIREMENTS:

Qualified candidates are requested to apply online via this website. The application should contain:

- CV In English
- Financial Proposal*- (using the standard template) Costs related to missions will be paid separately as per UNDP rules and regulations;
- Incomplete applications will not be considered. Please make sure you have provided all requested materials.
- **Please note that UNDP jobsite system allows only one uploading of application document, so please make sure that you merge all your documents into one single file**.

*Please note that the financial proposal is all-inclusive and shall take into account various expenses incurred by the consultant/contractor during the contract period (e.g. fee, health insurance, vaccination and any other relevant expenses related to the performance of services...).

Payments will be made only upon confirmation of UNDP on delivering on the contract obligations in a satisfactory manner.

Individual Consultants are responsible for ensuring they have vaccinations/inoculations when travelling to certain countries, as designated by the UN Medical Director. Consultants are also required to comply with the

UN security directives set forth under dss.un.org

General Terms and conditions as well as other related documents can be found under: http://on.undp.org/t7fJs.
Qualified women and members of minorities are encouraged to apply.

Due to large number of applications we receive, we are able to inform only the successful candidates about the outcome or status of the selection process.

EVALUATION OF APPLICANTS:

Individual consultants will be evaluated based on a cumulative analysis taking into consideration the combination of the applicants' qualifications and financial proposal.

The award of the contract should be made to the individual consultant whose offer has been evaluated and determined as:

- Responsive/compliant/acceptable; and
- Having received the highest score out of a pre-determined set of weighted technical (desk reviews based on cv) and financial criteria specific to the solicitation.

Only the highest ranked candidates who would be found qualified for the job will be considered for the Financial Evaluation.
Technical Criteria - 70% of total evaluation
Financial Criteria - 30% of total evaluation