

Chapter 2 : The Integrated Water Resource Management (IWRM) Programme

A. Subsector Issues and NWSSIP I

NWSSIP I identified the problem of water resources scarcity, over-exploited aquifers and low access to safe water and sanitation as amongst Yemen's most serious problems, and saw improved water resources management and coverage of safe water and sanitation as a priority. Reforms since the mid-1990s had brought many changes, including the creation of NWRA, the setting up of MWE, the passing of a water law, the introduction of basin planning, and many field experiences designed to tackle the problem of water demand and supply management. However, NWSSIP I underlined the continuing deterioration of groundwater aquifers, and the growing problem of meeting the needs of water using sectors sustainably.

In the light of this diagnostic, NWSSIP I set five objectives for water resources management:

- Ensuring a greater degree of sustainability
- Giving priority to domestic needs of rural and urban populations
- Improving water allocation, while mindful of equity, social norms, meeting the domestic needs and maximizing economic benefits
- Creating a realistic and holistic water vision among the general population
- Contributing to poverty alleviation by promoting efficient water use and equity in water allocation.

The water resource management policies adopted in NWSSIP I were essentially to provide suitable institutional interventions, particularly through forging of partnerships with local communities for co-management, taking the basin and local levels as the basic management unit.

The NWSSIP I action plan provided for nine sets of actions grouped under four strategic heads:

- Strengthening the institutional framework by: institutional strengthening and sector coordination (including delegation to local authorities); strengthening community-based organizations; water resources management planning (especially basin planning); and human resource development.
- Improving sector governance through information and awareness by: strengthening the water resources information base; strengthening the water resources monitoring system; and national and regional information, education and awareness campaigns.

- Rationalizing water sector investments and public goods by: piloting water resources management infrastructure for terrace rehabilitation, recharge and wastewater reuse.
- Guaranteeing property rights and creating a conducive macroeconomic environment by: monitoring, implementation and enforcement, including setting up social mobilization teams, implementing basin plans, implementing licensing, and piloting groundwater rights and rights-based transfers.

During the implementation of NWSSIP I, some progress was made in strengthening the institutional framework. Considerable resources have been devoted to building NWRA capacity and to providing training and incentives. JAR III reported that NWRA had 333 staff. However, more than one third of these were contractual staff, paid by donors. An active decentralization programme is ongoing, and several NWRA branches (including Taiz, Sana'a and Aden) are fully staffed and quite effective. However, the decentralization remains incomplete in terms of empowerment: resource flows to the branches are allocated and committed from the government budget and through programme aid, but operationalization of the programme aid through related agencies (Ministry of Finance, Ministry of Civil Service etc.) has been slow.

Basin level governance has been strengthened, with five basin committees (Sana'a, Taiz, Sa'ada, Tuban and Abyan) now in place. Basin plans have been adopted for Sana'a, Taiz and Sa'ada and are in preparation for Amran, Hadramawt, Tehama and Tuban-Abyan. Public awareness campaigns are being conducted by all NWRA branches. There has been some impact on regulation at the basin level, but the committees are not fully empowered to implement the plans due to limited political will (enforcement of laws), capacity and maturity of the organizations.

At the local level, six social mobilization teams have been established and a number of water user associations are in existence (see Table 2.1). However, to be effective, the local water management agenda and institutions need to be

Table 2.1: Number of water user organizations NWRA is working with

	2006	2007	Target 2008
Water User Associations	79	100	145
Water User Groups	614	961	1,278

Source: JAR III

better coordinated with MAI and its projects under a common strategy and policies to achieve sustainable integrated resource management, as irrigation is the predominant factor in groundwater management.

Regarding regulation, JAR III recorded that 60,200 wells have been inventoried nationwide. By 2007, 326 automatic monitoring stations had been set up. Static groundwater levels are being monitored in most critical basins. JAR III records a steady increase in the wells subject to licensing, and a rise in the number of drilling rigs licenced.¹ In 2007, a satellite monitoring system was introduced to track the movement

¹ JAR III reported that 853 well drilling applications were submitted in 2007, of which half (414) were approved. Of the 409 drilling rigs known to operate in Yemen, 155 have so far been licensed.

of rigs. There has been some progress in recording violations, but there has been a low prosecution rate, due in part to the lack of clear by-laws for the water law, and due also to lack of cooperation between departments, particularly the security and judicial authorities.² On the legal front, the amendments to the water law have been ratified, but the by-laws have still not been issued. Water protection zones have been established around the main cities. An inter-agency Water Quality Committee was set up in November 2007.

Public awareness and education campaigns have been conducted. Gauging stations and monitoring wells have been set up, and the information system is operational. A water rights and transfer pilot proposal has long since been prepared (Wadi Dhabab project, Taiz), but there has not yet been implementation of the suggested approach. A study on incentives in groundwater use has been completed and policy recommendations will be presented during 2008 which will be the basis for a sustainable groundwater management national strategy with appropriate regional policies.

Overall, there has clearly been some progress but implementation has been slow. Investment and recurrent budgets have fallen short of levels proposed under NWSSIP I, and institutional problems have kept actual disbursements below

authorized budgets (67% in 2007 – see Table 2.2). Capacity building has been intensive but often donor-driven and without the required long term institutional sustainability perspective.

Table 2.2: NWRA budget allocations and disbursements 2006-7

	NWSSIP I Target	Approved	Disbursed
2006	8.06	4.96	4.44
2007	9.45	5.71	3.83
Average 2006-7	8.75	5.33	4.13

Source: JAR III

In terms of results, despite the considerable institutional gains, there has been little impact on water resources from the programmes so far, and the water resource management challenges remain the same: rapid groundwater drawdown and quality deterioration in most areas, weak institutional basis for resource management at the basin and local level due to a shortage of experienced staff, low staff incentives and insufficient political support from local authorities, absence of an equitable basis for water transfer to thirsty settlements, and fragmented projects that do not correlate with the overall IWRM strategy.

² JAR III reports that 387 violations were recorded in 2007, and 88 were prosecuted through the courts.

B. The NWSSIP Update

Programme overview

The objectives set in the NWSSIP Update are broadly similar to those of NWSSIP I, reordered and strengthened. The goal is *sustainable water resources management and economically efficient and equitable water resources development and use*. Three objectives are targeted: (1) strengthening capacity and implementation for integrated water resources management; (2) managing environmental impacts; and (3) efficient water development and use, including mechanisms for inter-sectoral transfer. The attached Results Chain shows how the outputs and outcomes of the Update contribute to these objectives.

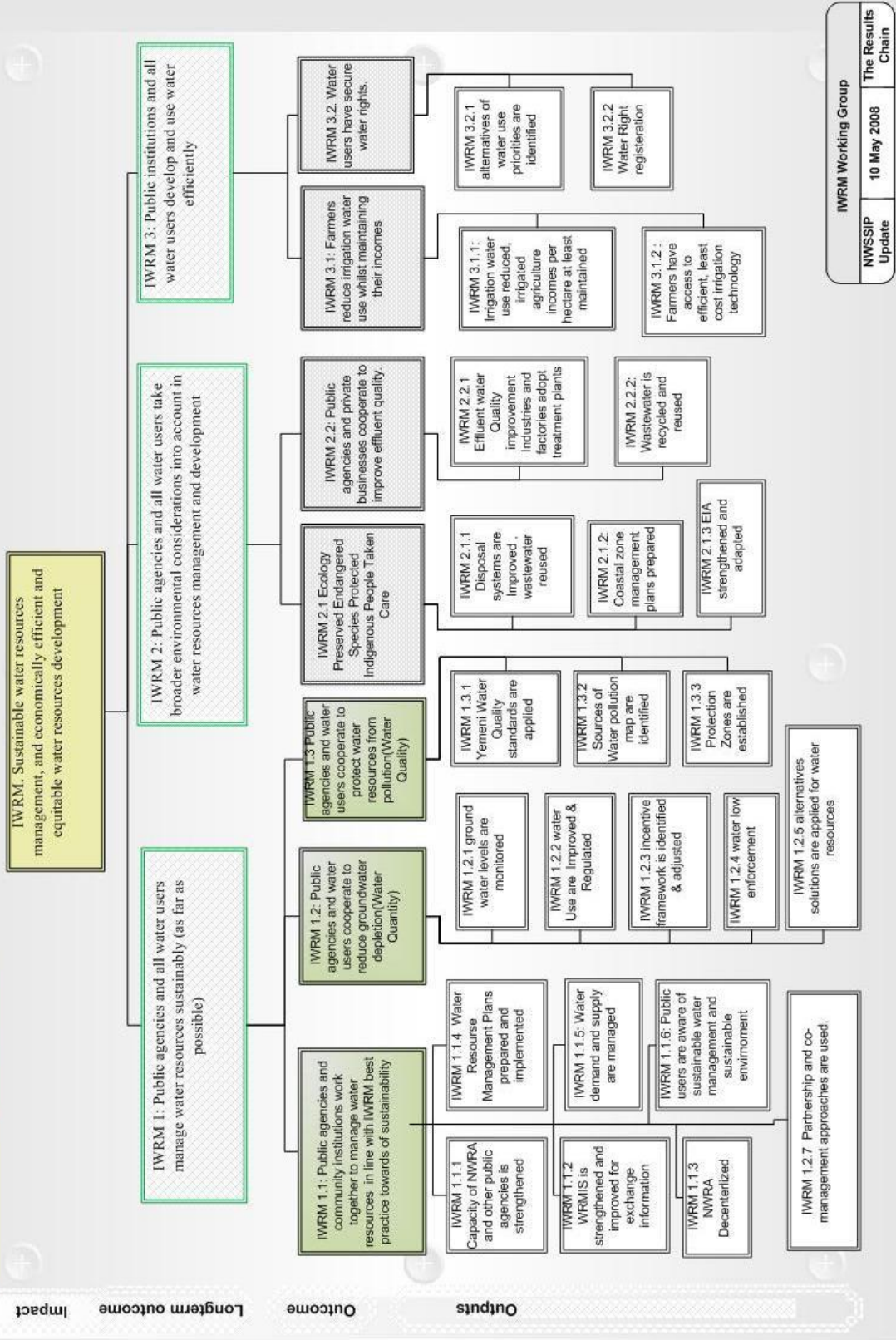
The central pillar of the NWSSIP Update for water resources management will continue to be the creation of a suitable enabling environment for the decentralization of appropriate responsibilities (social, political/legal, financial and institutional) at the basin and local levels, with empowerment of basin committees and local water users to act responsibly in their own interests. The NWSSIP Update will essentially focus resources on operationalizing this paradigm, giving priority to decentralized, community-based solutions and to the establishment of water rights, and flowing financial resources increasingly to the basin, NWRA branch and local levels. In the first half of 2009, the paradigm will be reviewed and refocused through a *National Conference on Community Water Management and Water Rights*, a forum in which all current Yemeni and international experience on decentralized water management, establishment of water rights as the basis for water resources management, water user associations for IWRM etc would be shared and a clear agenda for pursuing this approach under NWSSIP would be agreed, ready for implementation.

With this background, the main themes and changes in the Update are as follows:

- Increased investment in building the capacity of NWRA headquarters, which will focus on NWRA's mandate according to the Water Law which includes undertaking water resource evaluations and studies on the technical level, raising social awareness and participation on the social level, developing basin management plans and giving recommendations to decision makers on the policy level, and enforcing the Water Law and ensuring equitable water rights on the legal level. With regards to Water Resource Management Action Plans (WRMAPs), the implementation of technical, legal and regulatory measures is not the responsibility of NWRA alone, but is the responsibility of water users and other relevant institutions on the national and local levels. Accordingly, NWRA will continue to organize and facilitate periodical meetings, seminars and workshops with these institutions. At the local level, the coordination process is organized through NWRA's branch offices. The precise institutional development needs of NWRA will be determined by the institutional development study (see Chapter 1B and Table 1.4 above).

- Decentralization of effective responsibilities, resources and capacity to the branches. The precise institutional development needs of the NWRA branches will be determined by the institutional development study, which will take as its starting point the existing institutional development studies.
- Further investment in knowledge building and monitoring in order to provide better support to planning and monitoring.
- Building on the existing basin plans to empower local agencies (basin committees, NWRA branches, local authorities, water user associations) to implement them more effectively. Subject to the conclusions of the *National Conference*, the basin committees will be empowered through: (a) political support on regulation and (b) supervising relevant elements of IWRM such as basin management plans and implementation and enforcement of the Water Law. The by-laws to the Water Law will clearly specify the mandate for the basin committees.
- Extending basin planning to several new high priority areas.
- Improved partnership and joint work with EPA on wastewater, coastal zone management and the application of Environmental Impact Assessments (EIAs) in the water sector.
- Improved partnership and joint work with MAI and its programmes and projects, particularly the proposed National Irrigation Programme which will reflect the findings and recommendations from the Groundwater Economic Incentive Study (GWEIS), and be based on water resources management at the local level, on water user association (WUA) development and responsibilities, on cooperation in basin planning and the basin committees, and on joint work on water use efficiency and groundwater management for irrigation.
- Reinforced efforts on water rights, on prioritization of water uses, and on the development of equitable transfer mechanisms according to the available basin management plans.

IWRM – The results Chain(10th May)



Investment in IWRM

A sizable investment of \$40.7 million 2008-2015 in integrated water resources management is proposed. Most of this investment (\$37.5 million, 97% of the total) would go to the water resource management component. Of this, the largest share (\$26.3 million, 65% of the total, 1.1) goes to developing and using the tools, institutions and capacities for integrated water resource management. The facilities and staff of NWRA will be strengthened and developed, and the role and capacity of the branches will be reinforced. Water resources planning, management and regulation will be strengthened.

A very substantial investment (\$10.2 million, 25% of the total, 1.2) is also proposed for the key activities of monitoring and controlling groundwater abstraction. The recommendations of the incentives study will be adopted and implemented. Groundwater monitoring and control will be strengthened and programmes will be undertaken with the close cooperation of all relevant stakeholders to identify and develop measures for water use efficiency and non-conventional water sources.

Actions on water quality (\$1.1 million, 1.3) will be carried out in conjunction with EPA and other partners. The actions include the setting and enforcement of quality standards, monitoring of pollution, and the establishment of protection zones in five new areas.

The other two components – environmental protection and water efficiency – receive relatively very small allocations of about \$1.5 million each over the eight year period. The responsibility and financing for these two components effectively lies with other institutions (EPA and MAI), and the resources in the IWRM programme are provided simply to finance NWRA's essential participation in work on these two issues.

Actions on environmental protection (2.1) include evaluation of wastewater disposal systems, cooperation on coastal zone management plans, and work with the EPA on the application of Environmental Impact assessments in water. NWRA will also work with the private sector (2.2) on effluent management and on wastewater recycling and reuse.

Actions on water efficiency include cooperation with MAI on irrigation water use efficiency (3.1) and studies and pilot programmes on prioritization of water uses and water rights registration, in conjunction with the basin committees and plan, the water utilities and rural water agencies, with a view to establishing better mechanisms for inter-sectoral transfer.

The average annual investment would be about \$5.1 million. This is lower than proposed under NWSSIP I and in line with the average budget approved for NWRA 2005-7, although about 20% higher than actual disbursements in recent years (see Table 2.2 above). NWRA should thus be able to absorb the proposed level of resources.

The proposed rate of investment during the first three year period 2008-2010 (\$18.5 million, or \$6.2 million a year) is higher than in the subsequent five year period 2011-

2015 (\$22.1 million, or \$4.4 million a year). This reflects the need for investment in policy and institutional development in the earlier period.

Table 2.3: Proposed investment in integrated water resource management 2008-2015 (\$ 000s)

Outcome	Costs (\$ '000s)		
	2008-10	2011-15	2008-15
1. Strengthening capacity and implementation for integrated water resources management			
1.1 IWRM capacity development	12,361	14,090	26,451
1.2 Groundwater monitoring and control	4,716	5,477	10,193
1.3 Water quality	435	643	1,078
<i>Subtotal</i>	<i>17,532</i>	<i>20,009</i>	<i>37,541</i>
2. Managing environmental impacts			
2.1 Environmental protection	212	238	450
2.2 PPP on effluent and wastewater	281	608	889
<i>Subtotal</i>	<i>493</i>	<i>846</i>	<i>1,339</i>
3. Efficient water development and use			
3.1 Irrigation efficiency	191	392	583
3.2 Protection of user rights	329	694	1,023
<i>Subtotal</i>	<i>520</i>	<i>1,086</i>	<i>1,606</i>
Total	18,526	22,142	40,668

Source: EAYRB

The outputs and leading indicators of the proposed programme are summarized in Table 2.4 below, and discussed in detail in Part C.

Table 2.4: NWSSIP Update of the integrated water resource management programme

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
<i>Objective 1: strengthening capacity and implementation for integrated water resources management</i>					
1.1 IWRM capacity development	<p>NWRA capacity development (1.1.1)</p> <p>National Water Resources Information System (1.1.2)</p> <p>NWRA decentralized (1.1.3)</p> <p>National Conference on Community Water Management and Water Rights (1.1.4)</p> <p>Basin plans prepared and implemented (1.1.4)</p> <p>Licensing and regulation (1.1.5)</p> <p>Water resources exploration (1.1.5)</p> <p>Public awareness (1.1.6)</p> <p>Basin committees (1.1.7)</p> <p>Partnerships with WUAs (1.1.7)</p>	<p>Institutional development goals set and organizational development program underway by 2010</p> <p>Number of branches fully decentralized reaches 8 by 2015</p> <p>Decentralized management agenda agreed and implemented from mid-2009</p> <p>Number of plans operational reaches 8 by 2015.</p> <p>Communications strategy operational by 2009.</p> <p>New committees in Abyan/Ahwar, Tuban, Hadramawt, Tehama, Dhamar</p>	12,361	14,090	26,451
1.2 Groundwater monitoring and control	<p>Groundwater monitoring (1.2.1)</p> <p>Water use improved (1.2.2)</p> <p>Economic incentives study recs. adopted and implemented (1.2.3)</p> <p>Water law enforcement (1.2.4)</p> <p>Alternative water sources (1.2.5)</p>	<p>Pilot prog. on water saving</p> <p>Number of licensed wells metered</p> <p>Water by-laws effective by first quarter of 2009</p> <p>% of licensed rigs monitored by the fleet tracking system</p> <p>Rainwater harvesting mandated in urban areas</p>	4,716	5,477	10,193

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
Groundwater monitoring (1.2.1)	Quality standards set and enforced (1.3.1)	Water quality policy legally adopted	435	643	1,078
Water use improved (1.2.2)	Water pollution checked (1.3.2)	Monitoring programme operational			
Economic incentives study recs. adopted and implemented (1.2.3)	Protection zones established (1.3.3)	New protection zones in Mokha, Hodeidah, Dhamar, Hadramawt, Abyan			
Water law enforcement (1.2.4)					
Alternative water sources (1.2.5)					
Objective 2: managing environmental impacts					
2.1 Environmental protection	Improvement of disposal systems (2.1.1)	Evaluation conducted	212	238	450
	Coastal zone management plans (2.1.2)	Plans in place for Hodeidah, Mukalla, Mokha			
	EIA strengthened and adopted (2.1.3)	Number of EIAs implemented			
2.2 PPP on effluent and wastewater	Effluent water programme (2.2.1)	Vulnerability map Programme on industrial waste treatment	281	608	889
	Wastewater recycling and reuse (2.2.2)	Extension programme operational			
Objective 3: efficient water development and use, including mechanisms for inter-sectoral transfer.					
3.1 Irrigation efficiency	Reduced irrigation water use, incomes maintained (3.1.1)	Studies and monitoring carried out	191	392	583
	Efficient irrigation technology (3.1.2)	Study conducted			
3.2 Protection of user rights	Prioritization of water uses (3.2.1)	Basin level studies	329	694	1,023
	Water rights registration (3.2.2)	Pilots in Taiz, Sana'a, Tuban, Abyan, Hadramawt			
Total			18,526	22,142	40,487

Source: Log Frame, Action Plan, EAYRB

Actions that will need to be jointly planned and implemented

As discussed in Chapter 1 (Section 1B), a massive challenge in water resources management is to integrate planning and implementation amongst subsectors and agencies. For the NWSSIP Update, considerable effort has been made to identify areas of joint responsibility and implementation where joint planning will be needed. For many of these topics, NWRA will need to take the initiative to lead and coordinate an integrated effort (Table 2.5):

Table 2.5: Inter-agency approaches in integrated water resource management programme (lead agency in bold)

Cross cutting topic	Agencies	Joint actions	Reference
1. IWRM at the basin level	NWRA , basin committees, local authorities, MAI, users	<ul style="list-style-type: none"> ▪ studies of priorities at basin level ▪ preparation and implementation of basin plans ▪ support to basin committees ▪ establishment of protection zones ▪ development of water users associations as the lower level building blocks of water resources management ▪ water rights registration and water transfer 	3.2.1 1.1.4 1.1.7 1.3.3 1.1.7 3.2.2
4. Developing alternative water sources	NWRA , MAI, urban utilities, private sector, NGOs	<ul style="list-style-type: none"> ▪ developing desalination, rainwater harvesting and other options 	1.2.5
5. Improving water use efficiency	NWRA , MAI, rural water agencies, urban utilities	<ul style="list-style-type: none"> ▪ technology and pilot programmes in water use efficiency ▪ irrigation water management ▪ irrigation technology 	1.2.2 3.1.1 3.1.2
6. Water quality	NWRA , EPA, Water Quality Committee, urban utilities	<ul style="list-style-type: none"> ▪ updating water quality standards and finalizing water quality policy ▪ water pollution monitoring ▪ establishment and enforcement of protection zones 	1.3.1 1.3.2 1.3.3
7. Water reuse	NWRA , MAI, urban utilities	<ul style="list-style-type: none"> ▪ cost effective and safe treatment/reuse of irrigation drainage water ▪ urban wastewater treatment and reuse 	2.1.1 2.1.1
8. Policy environment	NWRA , MAI, MWE, other government agencies	<ul style="list-style-type: none"> ▪ the policy framework for groundwater management 	1.2.3
9. EIA	NWRA , EPA, MAI, all water agencies	<ul style="list-style-type: none"> ▪ updating and improving the EIA mechanism ▪ ensuring consistent application of EIAs to water programmes, including dams 	2.1.3 2.1.3

C. The Action Plan

Outcome 1.1 IWRM capacity development

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
1.1 IWRM capacity development	NWRA capacity development (1.1.1)	Institutional development goals set and organizational development program underway by 2010	12,361	14,090	26,451
	National Water Resources Information System (1.1.2)				
	NWRA decentralized (1.1.3)	Number of branches fully decentralized reaches 8 by 2015			
	National Conference on Community Water Management and Water Rights (1.1.4)	Decentralized management agenda agreed and implemented from mid-2009			
	Basin plans prepared and implemented (1.1.4)	Number of plans operational reaches 8 by 2015.			
	Licensing and regulation (1.1.5)				
	Water resources exploration (1.1.5)				
	Public awareness (1.1.6)	Communications strategy operational by 2009.			
	Basin committees (1.1.7)	New committees in Abyan/Ahwar, Tuban, Hadramawt, Tehama, Dhamar			
Partnerships with water user associations (1.1.7)					

Two thirds of total financial resources requested for IWRM would be to achieve this outcome of capacity development. The action plan provides for *capacity development at NWRA headquarters and branches* (1.1.1), including a training programme, post-graduate studies, and equipment of offices and laboratories. The plan also provides for support to completion of the administrative and budgetary *decentralization* to NWRA branches (1.1.3).

At the decentralized level, a *National Conference on Community Water Management and Water Rights* will be held in the first half of 2009 (1.1.4) in which Yemeni and

international experience on decentralized water management, establishment of water rights as the basis for WRM, water user associations etc would be shared and a clear agenda for pursuing this approach under NWSSIP would be agreed, ready for implementation.

The action plan also supports the preparation and implementation of three new *basin plans* (Amran, South Tehama, Rada'a) and the implementation of the existing plans (1.1.4). The work of the *basin committees* would be supported in three existing basin committees and five new committees (1.1.7). Links to *WUAs* at the local level would be strengthened and NWRA would work in partnership with MAI to evaluate through a study how to work with *WUAs* on local level groundwater management, on the model piloted by CWMP (1.1.7).

Water resource planning and management would be supported by the *strengthening of the National Water Resources Information System* (1.1.2), and by the finalization and implementation of NWRA's *communications and public awareness strategy* (1.1.6). Finally, resources would be put into strengthening the *well licensing* system and enforcing *regulation* (1.1.5).

Outcome 1.2 Groundwater monitoring and control

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
1.2 Groundwater monitoring and control	Groundwater monitoring (1.2.1)		4,716	5,477	10,193
	Water use improved (1.2.2)	Pilot programme on water saving Meters on licensed wells			
	Economic incentives study recommendations adopted and implemented (1.2.3)				
	Water law enforcement (1.2.4)	Water by-laws effective by 1 st quarter 2009 % of licensed rigs monitored by the fleet tracking system			
	Alternative water sources (1.2.5)	Rainwater harvesting mandated in urban areas			

One quarter of the total financial resources for IWRM would be allocated to strengthening groundwater monitoring and control. The action plan provides for *groundwater monitoring*, with the strengthening and formalization of the national network of monitoring and exploratory wells (1.2.1).

Resources are provided to *improve water use efficiency* through joint work on technology and pilot programmes with MAI, rural water agencies and the urban utilities. Flow meters will also be installed on licensed wells (1.2.2).

The *economic incentives study* will be presented in a workshop, and an action plan to adopt and implement agreed recommendations will be developed (1.2.3).

On *water law enforcement*, the by-laws will be promulgated in 2008. The rig tracking system will be expanded, and water police will be established (1.2.4).

Finally, *alternative water sources* will be promoted. Rainwater harvesting will be promoted under the basin plans, and a feasibility study of desalination will be conducted in conjunction with the interested utilities (1.2.5).

Outcome 1.3 Water quality

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
1.3 Water quality	Quality standards set and enforced (1.3.1)	Water quality policy legally adopted	435	643	1,078
	Water pollution checked (1.3.2)	Monitoring programme operational			
	Protection zones established (1.3.3)	New protection zones in Mokha, Hodeidah, Dhamar, Hadramawt, Abyan			

The action plan provides for running the committee on *water quality*, updating the standards and finalizing water quality policy (1.3.1). On *water pollution*, an inventory and monitoring programme will be carried out (1.3.2). The action plan also provides for the establishment and management of 11 *protection zones* around critical urban settlements by 2015 (1.3.3).

Outcome 2.1 Environmental protection

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
2.1 Environmental protection	Improvement of disposal systems (2.1.1)	Evaluation conducted	212	238	450
	Coastal zone management plans (2.1.2)	Plans in place for Hodeidah, Mukalla, Mokha			
	EIA strengthened and adopted (2.1.3)	# of EIAs implemented			

Under this outcome, *sewage disposal* would be assessed (2.1.1) jointly with the utilities and MAI. NWRA will contribute to the EPA's *coastal zone management plans* for Hadramawt, Mukalla and Mokha (2.1.1), and will also work with the EPA to update and improve the existing *Environmental Impact Assessment (EIA)* policy and system and to adapt it to practical cases in the water sector (2.1.3). In the case of dams, NWRA will also work jointly with MAI.

Outcome 2.2 PPP on effluent and wastewater

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
2.2 PPP on effluent and wastewater	Effluent water programme (2.2.1) Wastewater recycling and reuse (2.2.2)	Vulnerability map Programme on industrial waste treatment Extension programme operational	281	608	889

The action plan provides for an *effluent water programme*, including a vulnerability map of risks at the basin level, and a programme on individual wastewater treatment (2.2.1). On *wastewater recycling and reuse*, a study will be conducted and a monitoring and extension programme will be prepared (2.2.2).

Outcome 3.1 Irrigation efficiency

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
3.1 Irrigation efficiency	Reduced irrigation water use, incomes maintained (3.1.1) Efficient irrigation technology (3.1.2)	Studies and monitoring carried out Study	191	392	583

In order to have better leverage on the question of groundwater for irrigation, NWRA will have modest resources to study, monitor and pilot innovations in *irrigation water management and reuse* (3.1.1, 3.1.2). It will be very important that these actions are conducted jointly with MAI and are integrated with the much larger MAI programme on the same topic.

Outcome 3.2 Protection of user rights

Outcome	Key outputs	Leading indicators	Costs (\$ '000s)		
			2008-10	2011-15	2008-15
3.2 Protection of user rights	Prioritization of water uses (3.2.1)	Basin level studies	329	694	1,023
	Water rights registration (3.2.2)	Pilots in Taiz, Sana'a, Tuban, Abyan, Hadramawt			

On the critical topic of inter-sectoral allocation and NWSSIP I's underlying principle of "giving priority to domestic needs of the rural and urban population", the action plan provides for *studies of priorities* at the basin level (3.2.1) and for conduct of several pilot programmes to identify and confirm *water rights* (3.2.2).

IWRM Sub Sector: Log Frame

Goal: Sustainable water resources management, and economically efficient and equitable water resources development and use

Hierarchy of Results	Performance Indicators
Overall Impact	
Sustainable water resources management, and economically efficient and equitable water resources development	<ul style="list-style-type: none"> ▶ Basin integrated water management plans developed and implemented
Long Term Outcome 1:	
Public agencies and all water users manage water resources sustainably (as far as possible)	<ul style="list-style-type: none"> ▶ Water quality policy is agreed and approved ▶ New incentive structure finalized (Sep 2008); discussed (end 2008) recommendation adopted (mid 2009); implemented (end 2010). ▶ NWRA decentralization completed.
Outcome 1.1	
Public agencies and community institutions work together to manage water resources in line with IWRM best practice of sustainability	<ul style="list-style-type: none"> ▶ Number of IWRM plans prepared by NWRA ▶ Number of IWRM plans operational
Outputs	
IWRM 1.1.1 Capacity of NWRA and other public agencies is strengthened	<ul style="list-style-type: none"> ▶ Human resources assessment ▶ Number of NWRA staff trained and number of training days on legal, social, administrative and financial tasks (local; on the job training; external) ▶ Number of NWRA staff trained on technical tasks (database; GIS, etc) (local; on the job training; external) ▶ Number of NWRA staff trained in English language (local) ▶ New basin committees in Abyan/Ahwar, Tuban, Hadramawt, Tehama, and Dhamar
IWRM 1.1.2 WRMIS is strengthened and improved for exchange information	<ul style="list-style-type: none"> ▶ Number of staff professionally qualified in data collection; analysis; processing; and reporting ▶ Number of rainfall+meteo +stream +groundwater monitoring stations operational ▶ Percent of rainfall monitoring stations installed ▶ Percent of stream/wadi flow monitoring stations installed ▶ Percent of the ground water monitoring wells established ▶ Number of wells inventoried (cumulative: NWSSIP target of 90.000 for 2009; further targets will be set for 2010 and 2015)
IWRM 1.1.3 NWRA Decentralized	<ul style="list-style-type: none"> ▶ Number of branches, and number of coordination units categorized A, B, C, D ▶ Number of established branch offices (cumulative) ▶ Percentage of established branches offices according to NWSSIP target level of capacity per branch (A=very good; B=Good; C=Fair) ▶ Percentage of NWRA budget disbursed for community mobilization activities

Hierarchy of Results	Performance Indicators
IWRM 1.1.4 Water Resource Management Plans (WRMP) prepared and implemented	<ul style="list-style-type: none"> ▶ Number of plans under preparation in critical basins (Sana'a; Amran, Hadramout; Tuban and Abyan) ▶ Number of basin plans prepared by NWRA ▶ Number of basin plans under implementation
IWRM 1.1.5: Water demand and supply are managed	<ul style="list-style-type: none"> ▶ Number of drilling rigs licensed ▶ Number of well drillings licensed ▶ Number of submitted applications for well drilling, and percentage of permitted wells ▶ Total area covered with improved irrigation systems ▶ Resources identified(conventional& non-conventional) ▶ Crop water requirements identified (study). ▶ Salinity & drought resistant crops identified (study conducted)
IWRM 1.1.6: Public users are aware of sustainable water management and sustainable environment	<ul style="list-style-type: none"> ▶ National policy for awareness program prepared ▶ Number of established Social Mobilization Teams. ▶ Percent disbursed from planned public awareness budget ▶ Number of basin/branches level public awareness campaigns under implementation ▶ Awareness campaign on environment water issues conducted
IWRM 1.1.7 Partnership and co-management approaches are used.	Same as for 1.1.6
Outcome 1.2	
Public agencies and water users cooperate towards reducing groundwater depletion	<ul style="list-style-type: none"> ▶ Number of issues on IWRM are discussed and solutions adapted ▶ NWRA groundwater policy in effect. ▶ Number of wells monitored and controlled by WUAs ▶ Rig tracking system fully operational by NWRA ▶ Pilot program on water saving
Outputs	
IWRM 1.2.1 Ground water levels are monitored	<ul style="list-style-type: none"> ▶ Water level decline is recorded through water level observations (minimum, average, maximum) ▶ Average drop in ground water level for all basins (minimum, average, maximum). ▶ Stabilized or reduced abstraction in Sana'a, Upper Wadi Rasyan, and Amran basins recorded by NWRA information system. ▶ Number of meters on licensed wells.
IWRM 1.2.2 Water use improved & regulated	<ul style="list-style-type: none"> ▶ Number of water quality protection zones established in public well fields in each basin ▶ Amount of water saved through use of modern irrigation technology ▶ amount of water saved in water supply networks
IWRM 1.2.3 Incentive framework is identified & adjusted	<ul style="list-style-type: none"> ▶ Incentive study completed and approved ▶ Recommendations incorporated in incentive reform action plan
IWRM 1.2.4 Water law enforcement	<ul style="list-style-type: none"> ▶ By laws to the Water Law finalized ▶ Number of violations recorded and prosecuted through courts ▶ Total fines collected from all violations (directly by NWRA and through the courts) ▶ Percentage of drilling regulations contractors functioning with licenses/under process ▶ Water police proposed for the Ministry of Interior. ▶ Mechanism adopted for controlling illegal drilling & movement of rigs

Hierarchy of Results	Performance Indicators
IWRM 1.2.5 Alternatives solutions are applied for water resources	<ul style="list-style-type: none"> ▶ Number of roof water harvesting structures implemented in pilot basins ▶ Study of non-conventional water source and use alternatives completed (desalinization, gray water use, low saline(brackish) water)
Outcome 1.3	
Public agencies and water users cooperate to protect water resources from pollution (water quality)	<ul style="list-style-type: none"> ▶ Number of issues on IWRM are discussed and solutions adapted ▶ Water quality policy legally adopted. ▶ NWRA monitoring program for water pollution operational
Outputs	
IWRM 1.3.1 Yemeni water quality standards are applied	<ul style="list-style-type: none"> ▶ Yemen water quality standards are updated & applied, water quality group/committee activated ▶ Water quality policy submitted to the Council of Ministers.
IWRM 1.3.2 Sources of water pollution are identified	▶ Location map of the pollution resources is prepared including type of pollution (vulnerability map).
IWRM 1.3.3 Protection Zones are established	<ul style="list-style-type: none"> ▶ Number of protected well fields. ▶ Number of groundwater protection zones and well fields established in public well fields in the basins
Long Term Outcome 2	
Public agencies and all water users take broader environmental considerations into account in water resources management and development	<ul style="list-style-type: none"> ▶ Water law enforced ▶ Illegal drilling stopped
Outcome 2.1	
Ecology preserved, endangered species protected, and indigenous people taken care of	<ul style="list-style-type: none"> ▶ Number of protected areas established ▶ Number of EIAs conducted and reviewed
Outputs	
IWRM 2.1.1 Disposal systems are improved , wastewater reused	<ul style="list-style-type: none"> ▶ Number of wastewater treatment plants (in three areas: Sana'a, Taiz, and Aden) operating as per the water quality standards and effectively monitored, including monitoring the neighbouring wells, ▶ Number of oil companies applying effluent & disposals treatment systems in two focus areas (Marib and Hadramout)
IWRM 2.1.2: Coastal zone management plans prepared	<ul style="list-style-type: none"> ▶ Coastal zones plan (for nine governorates) by EPA/NWRA/MEW submitted to the Cabinet ▶ Plans in place for Hodeidah, Mukalla, Mokha
IWRM 2.1.3 EIA strengthened and adapted	<ul style="list-style-type: none"> ▶ Existing EIA policy and system updated and improved ▶ Number of agencies considering EIA process in the work plan. ▶ Number of agencies implementing EIAs (including the private sector)
Outcome 2.2	
Public agencies and private businesses cooperate to improve effluent quality.	<ul style="list-style-type: none"> ▶ Number of monitoring reports are published ▶ Implementation started on program on industrial waste treatment
Outputs	
IWRM 2.2.1 Effluent water Quality improvement Industries and factories adopt treatment plants	▶ Number of treatment plants at the locations of industries and factories monitored (6).
IWRM 2.2.2: Wastewater is recycled and reused	▶ Quantity of treated waste water outflow, quantity of treated waste water reused (in agriculture, industry etc..), effluent quality to comply with BOD monitored

Hierarchy of Results	Performance Indicators
Long Term Outcome 3	
Public institutions and all water users develop and use water efficiently	▶ Water quality coordination group has been established and meets four times per year. ▶
Outcome 3.1	
Farmers reduce irrigation water use whilst maintaining their incomes	▶ Number of productivity assessments conducted in critical basins
Outputs	
IWRM 3.1.1: Irrigation water use reduced, irrigated agriculture incomes per hectare at least maintained	▶ Number of improved irrigation systems ▶ Total area irrigated by improved systems. ▶ Traditional water management systems studied, and the best selected for rehabilitation (study and pilot program jointly with MAI)
IWRM 3.1.2 : Farmers have access to efficient, least cost irrigation technology	See irrigation sub-sector indicators
Outcome 3.2	
IWRM 3.2. Water users have secure water rights.	▶ Taiz pilot project is implemented
Outputs	
IWRM 3.2.1 Water use priorities in key basins are identified	▶ Three basin level studies conducted to set priorities for water use (domestic, industrial, irrigation etc) ▶ Results of pilot project study in Taiz on tradable water rights (completed in 2005) disseminated and actions
IWRM 3.2.2 Water Right registration	▶ Number of areas where water rights are registered (proposed areas: Aden, Tuban-Lahj, and Abyan)

NWSSIP Update

IWRM Sector: Action Plan and Budget

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015	Additional Comments and clarifications
IWRM 1.1.1 Capacity of NWRA and other public agencies is strengthened					
Activity 1.1.1.1 Institutional development study conducted, institutional development goals set, and ID development program agreed	Step 1.1.1.1.1 Institutional development study completed	2009	NWRA and consultant		100
	Step 1.1.1.1.2 Institutional goals set and organization development program agreed	2009			
Activity 1.1.1.2 HR assessment to identify the needs of staff & to evaluate existing training programs	Step 1.1.1.2.1 Review and compile existing HR assessment/training needs	2009	NWRA and consultant		15
	Step 1.1.1.2.2 Develop 3 year plan 2010-12	2009	NWRA and consultant		
	Step 1.1.1.2.3 Program review and update for another 3 years 2013-15	2012	NWRA and consultant		
Activity 1.1.1.3 Integrate temporary staff	Step 1.1.1.3.1 Negotiate with MoF and MCS	2009	MWE, NWRA, MoF and MCS		671
	Step 1.1.1.3.2 Develop 4 year staff integration plan including payments	2009	MWE, NWRA, MoF and MCS		
	Step 1.1.1.3.3 Annual follow up	2009-2012	MWE, NWRA, MoF, MCS and donor partners		

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.1.1.4 Staff incentives	Step 1.1.1.4.1 Staff conduct self assessments	Annual	NWRA		0	
	Step 1.1.1.4.2 Assessments are reviewed and evaluated by a representative committee	Annual	NWRA			
Activity 1.1.1.5 Conduct program of study tours (internal/external)	Step 1.1.1.5.1 Identify institutional needs and deficiencies	Annual	NWRA			
	Step 1.1.1.5.2 Produce annual plans	Annual	NWRA			
	Step 1.1.1.5.3 Implement annual plans					
Activity 1.1.1.6 Construction of HQ and Branches	Step 1.1.1.6.1 Land purchased, designs prepared and construction to begin for Aden and Taiz offices	2008	NWRA		4,000	
	Step 1.1.1.6.2 Construction completed for Aden and Taiz offices	2009	NWRA			
	Design for NWRA HQ completed	2009	NWRA			
	Construction of NWRA HQ completed	2011	NWRA			
	Land purchased for Sana'a and Al-Hodeida offices	2010	NWRA			
	Designs prepared for Sana'a and Al-Hodeida offices	2010	NWRA			
	Construction completed for Sana'a and Al-Hodeida offices	2011	NWRA			
	Land purchased for Hadramout office	2011	NWRA			
Design prepared for Hadramout office	2012	NWRA				

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Construction completed for Hadramout office	2013	NWRA			
	Land purchased for Dhamar office	2013	NWRA			
	Design prepared for Dhamar office	2014	NWRA			
	Construction completed for Dhamar office	2015	NWRA			
Activity 1.1.1.7 Field equipment assessment	Step 1.1.1.7.1 Conduct equipment inventory and needs assessment	2009	MWRA		810	
	Step 1.1.1.7.2 /Procurement	Annual	NWRA			
	Step 1.1.1.7.3 Review equipment inventory and needs	2012	NWRA			
Activity 1.1.1.8 Conduct study on establishing water & environment laboratory	Step 1.1.1.8.1 Develop TOR for consultant	2009	NWRA		1,500	Assumption: laboratory construction is pending the construction of a new NWRA HQ. Consultant should take into account the new facilities
	Step 1.1.1.8.2 Consultant conducts evaluation, holds workshop and produces a report	2010	NWRA and consultant			
	Step 1.1.1.8.3 Laboratory is built according to outlined specifications	2011	NWRA			
Activity 1.1.1.9 Organizing meetings of the NWRA board of directors, branch directors, and IWRM working group	Step 1.1.1.9.1 BOD meetings held	4 times annually	NWRA		357	Includes meetings/field visits to branch offices
	Step 1.1.1.9.2 IWRM meetings held	4 times annually	NWRA			
	Step 1.1.1.9.3 Meetings held with branch directors regarding planning, reporting and progress	2-3 times annually	NWRA			
Activity 1.1.1.10 Financial auditing	Step 1.1.1.10.1 COCA audit prepared	Annually	NWRA and COCA		280	
	Step 1.1.1.10.2 Private audit prepared	Annually	NWRA and private auditor			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.1.1.11 Work to create coordination mechanisms with Ministry of Agriculture & irrigation	Step 1.1.1.11.1 Workshop is held	2009	NWRA and MAI		50	
	Step 1.1.1.11.2 Negotiations between NWRA and MAI held	2009	NWRA and MAI			
	Step 1.1.1.11.3 Coordination offices established	2010	NWRA and MAI			
	Step 1.1.1.11.4 Common ag. water management policy developed and adopted	2011	NWRA and MAI			
	Step 1.1.1.11.5 Coordination with other relevant agencies (MoF, MPIC, MoI etc.)	Annual	NWRA			

IWRM 1.1.2 WRMIS is strengthened and improved for exchange of information						
Activity 1.1.2.1 Expand publishing and the internet website	Step 1.1.2.1.1 Reports and studies published	Annual	NWRA		355.5	
	Step 1.1.2.1.2 Translation of some items	Annual	NWRA			
	Step 1.1.2.1.3 Website updated with new information	Annual	NWRA			
Activity 1.1.2.2 Strengthening NWRIS the national network of the water resources information system	Step 1.1.2.2.1 New equipment procured	Annual	NWRA		630	
	Step 1.1.2.2.2 Database is linked between HQ and all branch offices	2013	NWRA			
	Step 1.1.2.2.3 Continued coordination with other databases of agencies and projects	Annual	NWRA, other relevant agencies and projects			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.1.2.3 Regular data collection of the hydro-metrological monitoring stations	Step 1.1.2.3.1 Regular field visits to collect data from monitoring stations	Annual	NWRA		1,010	
	Step 1.1.2.3.2 Data analysis, interpretation and reporting	Annual	NWRA			
Activity 1.1.2.4 Study, review and evaluate water resources	Step 1.1.2.4.1 Review previous studies in Tihama, Ahwar and Dhamar-Rada'	2010			2,600	
	Step 1.1.2.4.2 Identify gaps in previous studies and needed future studies					
	Step 1.1.2.4.3 Office preparation (TOR)					
	Step 1.1.2.4.2 Implementation of studies					
	Step 1.1.2.4.5 Data entering, analysis and interpretation					
	Step 1.1.2.4.6 Final reporting					

IWRM 1.1.3 NWRA decentralized						
Activity 1.1.3.1 Branch evaluation (staff, equipment other capabilities)	Step 1.1.3.1.1 Conduct annual equipment inventories and evaluations	Annual	NWRA		0	
	Step 1.1.3.1.2 Create detailed branch capacity evaluation	2010	NWRA			
	Step 1.1.3.1.3 Implement branch office evaluation	Bi-annual	NWRA			
Activity 1.1.3.2 Integrate temporary staff (branch level)	Step 1.1.3.2.1 Hire consultants (local and international) as needed				515	

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.1.3.3 Establish water laboratories in 7Branchs	Step 1.1.3.3.1 Conduct needs assessment	2009-2013	NWRA		255	According to completion of new premises.
	Step 1.1.3.3.2 Equipment procurement	2010-2014	NWRA			
	Step 1.1.3.3.3 Installation of equipment/architectural modification if necessary	2010-2014	NWRA			
Activity 1.1.3.4 Support the units of the branches	Step 1.1.3.4.1 Unit equipment and staff needs evaluation	2009, 2011,2013			227	
	Step 1.1.3.4.2 Support equipment provision	Annual				
	Step 1.1.3.4.3 Open new unit in Mukalla	2009-2010				
	Step 1.1.3.4.4 Unit training program	Annual				
	Step 1.1.3.4.5 Hire new staff	As necessary				
Activity 1.1.3.4 Support the basin committees	Step 1.1.3.4.1 Organize and coordinate meetings	Annual			690	
	Step 1.1.3.4.2 Training program	Annual				
	Step 1.1.3.4.3 Independent evaluation of committee output and efficacy	2010, 2012, 2014				
Activity 1.1.3.5 Support social mobilization activities	Step 1.1.3.5.1 Implementation equipment and logistical support	Annual			662	
	Step 1.1.3.5.2 New units established/staff hired	2010-2012				
	Step 1.1.3.5.3 Training for SMTs	Annual				

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015	Additional Comments and clarifications
IWRM 1.1.4 Water resource management plans prepared and implemented					
Activity 1.1.4.1 Expand the monitoring network	Step 1.1.4.1.1 Maintenance of monitoring network	Annual	NWRA		1,000
	Step 1.1.4.1.2 Procurement for expansion of monitoring network	Annual	NWRA		
	Step 1.1.4.1.3 Evaluation of monitoring network for maintenance and expansion- reports produced	2010 and 2013	NWRA		
Activity 1.1.4.2 Finalize the action plan of Sana'a, Tuban-Abyan, and Hadramout	Step 1.1.1.1.1 Workshop to present Hadramout BMP	2009			250
	Step 1.1.1.1.2 Review result of workshops including previous workshops in Sana'a and Tuban-Abyan				
	Step 1.1.1.1.3 Finalize the action plan				
	Step 1.1.1.1.3 Present action plan to Cabinet for approval				
Activity 1.1.4.3 Prepare water resources basin management plans for Ahwar, Amran, Socotra, Ramlat Sabatayn, South Tihama and Dhamar-Rada'a.	Step 1.1.4.3.1 Complete draft plan for Amran	2008	NWRA and GTZ		300
	Step 1.1.4.3.2 Participatory workshop for Amran plan validation/plan ratified	2009	NWRA, GTZ and local authorities		
	Step 1.1.4.3.3 Begin implementation of Amran BMP	2009	NWRA and local authorities		
	Step 1.1.4.3.4 Complete draft plan for Tihama	2010	NWRA and consultant		
	Step 1.1.4.3.5 Participatory workshop for Tihama BMP validation/BMP ratified	2011	NWRA and local authorities		

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.1.4.3.6 Begin implementation of Tihama BMP	2012	NWRA and local authorities			
	Step 1.1.4.3.7 Complete draft plan for Dhamar-Rada'	2011	NWRA and consultant			
	Step 1.1.4.3.8 Participatory workshop for Dhamar-Rada' BMP validation/BMP ratified	2012	NWRA and local authorities			
	Step 1.1.4.3.9 Begin implementation of Dhamar-Rada' BMP	2013	NWRA and local authorities			
	Step 1.1.4.3.10 Complete draft plan for Ahwar	2011	NWRA and consultant			
	Step 1.1.4.3.11 Participatory workshop for Ahwar BMP validation/BMP ratified	2012	NWRA and local authorities			
	Step 1.1.4.3.12 Begin implementation of Ahwar BMP	2013	NWRA and local authorities			
	Step 1.1.4.3.13 Complete draft plan for Socotra	2012	NWRA and consultant			
	Step 1.1.4.3.14 Participatory workshop for Socotra BMP validation/BMP ratified	2013	NWRA and local authorities			
	Step 1.1.4.3.15 Begin implementation of Socotra BMP	2014	NWRA and local authorities			
	Step 1.1.4.3.16 Complete draft plan for Ramlat Sabatayn	2013	NWRA and consultant			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.1.4.3.17 Participatory workshop for Ramlat Sabatayn BMP validation/BMP ratified	2014	NWRA and local authorities			
	Step 1.1.4.3.18 Begin implementation of Ramlat Sabatayn BMP	2015	NWRA and local authorities			
Activity 1.1.4.4 Implement water resources management plans	Step 1.1.4.4.1 Continue implementation of Taiz, Sana'a and Sa'da BMPs	2009-2015	NWRA and local authorities		3,540	
	Step 1.1.4.4.2 Implement of Amran BMP	2009-2015	NWRA and local authorities			
	Step 1.1.4.4.3 Implement Hadramout BMP	2009-2015	NWRA and local authorities			
	Step 1.1.4.4.4 Implementation of new BMPs	2012-2015	NWRA and local authorities			
Activity 1.1.4.5 Construct pilot projects on water harvesting as per the basin plans	Step 1.1.4.5.1 Under implementation in Sana'a, Taiz, Aden and Sa'da	2009	NWRA		1,490	
	Step 1.1.4.5.2 Implementation expanded to Hadramout and Hodeida	2010	NWRA			
	Step 1.1.4.5.3 Implementation expanded to Dhamar	2011	NWRA			
Activity 1.1.4.6 Agree and implement decentralized management agenda	Step 1.1.4.6.1 National Conference on Community Water Management and Water Rights	2009	MWE, NWRA and partners		200	
	Step 1.1.4.6.2 Decentralized management agenda agreed	2009	MWE, NWRA and partners			
	Step 1.1.4.6.3 Agenda implemented	2010	MWE, NWA and partners			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015	Additional Comments and clarifications
IWRM 1.1.5: Water demand and supply are managed					
Activity 1.1.5.1 Strengthen the licensing system of the wells and water structures	Step 1.1.5.1.1 Continue licensing wells and drilling rigs	Annual	NWRA		202
	Step 1.1.5.1.2 Continue metering wells	Annual	NWRA		
Activity 1.1.5.2 Conduct surveys and studies of water use in agriculture, urban and rural water sub-sectors.	Step 1.1.5.2.1 Identify survey areas (basins and sub-basins)	2009	NWRA		110
	Step 1.1.5.2.2 Office preparation (TOR)	2010	NWRA		
	Step 1.1.5.2.3 Prepare questionnaire and work plan	2010	NWRA		
	Step 1.1.5.2.4 Field work	2010	NWRA		
	Step 1.1.5.2.5 Data entering, analysis, interpretation	2011	NWRA		
	Step 1.1.5.2.6 Final reporting	2011	NWRA		
Activity 1.1.5.3 Exploring new water resources	Step 1.1.5.3.1 Geo-physical work completed	2010	NWRA		100
	Step 1.1.1.1.2 Map of Ramlat Sabatayn study sub-basin complete; test drilling well field site identified	2011	NWRA		
	Step 1.1.1.1.3 Observation and test wells identified; drilling begins	2011-2012	NWRA		
Activity 1.1.5.4 Law enforcement in demand management	Step 1.1.5.4.1 Continue regular patrols for violators	Annual	NWRA		770
	Step 1.1.5.4.2 Continue special investigations of illegal drilling	Annual	NWRA with police, security forces and MoI		

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.1.5.4.3 Continue follow up with the prosecutor/courts including hiring more legal staff	Annual	NWRA, MoJ, local prosecutor and courts			

IWRM 1.1.6: Public users are aware of sustainable water management and sustainable environment

Activity 1.1.6.1 Finalize the public awareness strategy	Step 1.1.6.1.1 Strategy finalized and presented	2008-9	NWRA		5	
Activity 1.1.6.2 Prepare & implement public awareness programs at the HQ and branches levels.	Step 1.1.6.2.1 NWRA HQ and branches prepare annual plans according to the strategy	Annual	NWRA		730	
	Step 1.1.6.2.2 Direct support of implementation	Annual	NWRA and related donor projects			
	Step 1.1.6.2.3 Follow up visits to the branches' units and related projects	2009	NWRA			
Activity 1.1.6.3 Produce awareness films/ashes	Step 1.1.6.3.1 Prepare TOR to produce films and flashes	2009-2013	NWRA		80	Several films and flashes to be produced over several years
	Step 1.1.6.3.2 Evaluate proposals and select production company	2009-2014	NWRA			
	Step 1.1.6.3.3 Produce and broadcast films and flashes	2010-2015	NWRA and production company			
Activity 1.1.6.4 Produce awareness other hard materials	Step 1.1.6.4.1 Prepare technical specifications for awareness materials	Annual	NWRA		20	
	Step 1.1.6.4.2 Invite companies to bid	Annual	NWRA			
	Step 1.1.6.4.3 Tendering and analysis	Annual	NWRA			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.1.6.4.4 Produce and distribute items	Annual	NWRA			
Activity 1.1.6.5 Conduct workshops	Step 1.1.6.5.1 Review National Public Awareness Strategy	Annual	NWRA		420	
	Step 1.1.6.5.2 NWRA submits proposals to partner agencies and donors	Annual	NWRA			
	Step 1.1.6.5.3 Implement workshops	Annual	NWRA			
Activity 1.1.6.6 Regular evaluation of the awareness campaigns	Step 1.1.6.6.1 Conduct bi-annual evaluations	Bi-annual	NWRA HQ and branches		150	
	Step 1.1.6.6.2 Stakeholder evaluation and validation of NWRA mascot	2009	NWRA			

IWRM 1.1.7 Partnership and co-management approaches are used.						
Activity 1.1.7.1 work to establish water basin committees (WBC) in Tuban-Abyan, Hadramout Tehama and Dhamar	Step 1.1.7.1.1 WBC established in Tuban and Abyan deltas	2008	NWRA, GTZ and local authorities		45	
	Step 1.1.7.1.2 WBC established in Hadramout	2009	NWRA, UNDP and local authorities			
	Step 1.1.7.1.3 WBC established in Tihama	2011	NWRA and local authorities			
	Step 1.1.7.1.3 WBC established in Dhamar	2013	NWRA and local authorities			
Activity 1.1.7.2 Work to establish basin water users groups/associations in Abyan-Ahwar, Tuban and adroit	Step 1.1.7.2.1 Establish WUAs and WUGs in Tuban-Abyan and Hadramout	2009	NWRA, GTZ and UNDP		45	According to NWRA logical framework through 2009
	Step 1.1.7.2.2 Continue establishing WUAs and WUGs in all critical regions	2010-2015	NWRA and donor partners			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.1.7.3 Work to establish & support water & environment friends at schools.	Step 1.1.7.3.1 Continue implementation by providing logistical support, equipment and awareness materials	Annual	NWRA		70	
Activity 1.1.7.4 Coordinate with existing environmental groups and associations.	Step 1.1.7.4.1 Coordination with groups continues	Annual	NWRA		6.5	
	Step 1.1.7.4.2 NWRA designates an official focal point for coordination	2009	NWRA			

IWRM 1.2.1 Ground water levels are monitored

Activity 1.2.1.1 Regular monitoring for the water level changes/vibrations	Step 1.2.1.1.1 Conduct regular field visits	Annual	NWRA		342	
	Step 1.2.2.2.2 Data analysis, interpretation and reporting	Annual	NWRA			
Activity 1.2.1.2 Establish the national monitoring network of the monitoring and exploratory wells	Step 1.2.1.2.1 Conduct inventory of wells and status	2009 and 2012	NWRA		7,500	
	Step 1.2.1.2.2 Procure new monitoring stations	Annual	NWRA			
	Step 1.2.1.2.3 Installation of new stations and maintenance	Annual	NWRA			

IWRM 1.2.2 Water use is improved & regulated

Activity 1.2.2.1 Work to coordinate with MAI to implement programs on improving traditional irrigation and introduce modern irrigation techniques	Step 1.2.2.1.1 Survey to determine suitability of modern irrigation based on recommendations from the incentives study (GWEIS)	2010	NWRA and MAI		10	
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Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.2.2.1.2 Coordination activities including field visits	Annual	NWRA and MAI			
	Step 1.2.2.1.3 Upgrade traditional irrigation systems- conveyance pipes and leveling	Annual	NWRA and MAI			
Activity 1.2.2.2 Work to coordinate with NWSA & LCs to reduce the network water loses	Step 1.2.2.2.1 Study to identify network losses	2010	NWRA, NWSA and LCs		10	
	Step 1.2.2.2.2 Coordination activities including field visits	Annual	NWRA, NWSA and LCs			
	Step 1.2.2.2.3 Implement identified water saving activities	2011-2015	NWRA, NWSA and LCs			
Activity 1.2.2.3 Prepare & implement pilot programs to expand water saving devices	Step 1.2.2.3.1 Under implementation in all branches except Dhamar	2009	NWRA		390	
	Step 1.2.2.3.2 Implementation expanded to Dhamar	2010	NWRA			
Activity 1.2.2.4 Coordinate with municipalities in Sana'a & the governorates to reuse treated waste water and recycle grey water	Step 1.2.2.4.1 Conduct feasibility study	2010	NWRA and consultant		135	
	Step 1.2.2.4.2 Coordination with relevant authorities and agencies	Annual	NWRA			
	Step 1.2.2.4.2 Hold regional workshops	2011	NWRA and regional authorities and agencies			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.2.2.4.3 Implement several pilot projects- continue expansion	2012-2015	NWRA and regional authorities and agencies			
Activity 1.2.2.5 Work to install water flow meters for the registered & licensed wells	Step 1.2.2.5.1 Conduct workshops explaining the procedure	2009-2015	NWRA and regional authorities and agencies		315	
	Step 1.2.2.5.2 Procure and install meters	2009-2015	NWRA and regional authorities and agencies			

IWRM 1.2.3 Incentive framework is identified & adjusted

Activity 1.2.3.1 Implement study on the economic incentives of the ground water uses	Step 1.2.3.1.1 Study completed	2008	NWRA		105	
Activity 1.2.3.2 Conduct workshop on the results/outcomes of the incentives study	Step 1.2.3.2.1 National workshop held	2009	NWRA and MAI		40	
	Step 1.2.3.2.2 Regional workshops held at the branch level	2009	NWRA and MAI			
	Step 1.2.3.2.3 Recommendations presented to Cabinet	2010	NWRA			
Activity 1.2.3.3 Prepare action plan of the outcomes the economic incentives study.	Step 1.2.3.3.1 Plan developed based on participatory validation workshops	2010	NWRA, MAI and donors		30	Donors need to play a facilitating role to deal with this sensitive political issue
	Step 1.2.3.3.2 Plan ratified	2011	NWRA, MAI, and Cabinet			
	Step 1.2.3.3.3 Several coordination meetings between NWRA and MAI	Annual	NWRA and MAI			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.2.3.4 Initiate implementation of recommendations from GWEIS and workshop findings	Step 1.2.3.4.1 Implementation to begin	2011-2015				

IWRM 1.2.4 Water law enforcement						
Activity 1.2.4.1 Work to finalize the water bylaw	Step 1.2.4.1.1 Hold several more meetings with technicians, institutional and donor partners	2009	NWRA, other relevant agencies and donors		0	
Activity 1.2.4.2 Conduct workshop to discuss the water bylaw and submit to the cabinet	Step 1.2.4.2.1 Final validation workshop held for last draft of the by-law	2009	NWRA		2.5	
	Step 1.2.4.2.2 Submit by-law to Cabinet	2009	NWRA			
Activity 1.2.4.3 Continue work to eliminate the random drilling	Step 1.2.4.3.1 Regular field patrols	Annual	NWRA, police, security forces, MoI		425	
	Step 1.2.4.3.2 Special case investigation	Annual	NWRA, police, security forces, MoI			
Activity 1.2.4.4 Expand & develop fleet tracking systems to control random drilling	Step 1.2.4.4.1 Continue field visits and coordination with companies	Annual	NWRA		200	
	Step 1.2.4.4.2 Procurement and installation	Annual	NWRA			
	Step 1.2.4.4.3 150-200 units installed	2015	NWRA			
Activity 1.2.4.5 Work to establish water police	Step 1.1.1.1.1 National workshop held proposing the concept	2010	NWRA, MWE, MoI, and MoJ		15	MoJ= Ministry of Justice

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 1.1.1.1.2 High level negotiations and coordination	2011-2012	NWRA, MWE, MoI, and MoJ			
	Step 1.1.1.1.3 Draft official proposal	2013	NWRA, MWE, MoI, and MoJ			

IWRM 1.2.5 Alternatives solutions are applied for water resources

Activity 1.2.5.1 Expansion of rain water harvesting extension AS per WRM Plans	Step 1.2.5.1.1 Hire consultants to prepare regionally appropriate plans	2010	NWRA		195	
	Step 1.2.5.1.2 Present techniques and models at workshops	2011	NWRA			
	Step 1.2.5.1.3 Implement at branch level	2011-2015	NWRA			
Activity 1.2.5.2 Study feasibility of desalinization/individual and central plants	Step 1.2.5.2.1 Conduct feasibility study in Hodeida, Aden and Mukalla	2011	NWRA		300	
	Step 1.2.5.2.2 Draft proposal with recommendations based on study	2012	NWRA			
	Step 1.2.5.2.3 Pilot program under implementation	2014	NWRA			

IWRM 1.3.1 Yemeni water quality standards are applied

Activity 1.3.1.1 Activate the coordination committee of the water quality (water quality group)	Step 1.3.1.1.1 Continue facilitating meetings of water quality group	2009-2010	NWRA		25	
Activity 1.3.1.2 Review and update the water quality Yemeni standards	Step 1.3.1.2.1 Develop final draft of updated standards	2010	NWRA and WQ group		10	

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
Activity 1.3.1.3 Finalize and legalize water quality policy	Step 1.3.1.3.1 Hold workshop for decision makers	2010	NWRA and WQ group		5	
	Step 1.3.1.3.2 Present final updated water quality standards to cabinet	2010	NWRA and WQ group			

IWRM 1.3.2 Sources of water pollution map are identified

Activity 1.3.2.1 Conduct pollution sources inventory	Step 1.3.2.1.1 Conduct field work	2010	NWRA		145	
	Step 1.3.2.1.2 Final report and pollution type, location and vulnerability maps prepared	2011	NWRA			
Activity 1.3.2.2 Periodical water quality monitoring	Step 1.3.2.2.1 Produce annual monitoring plans incorporating findings from well inventories	Annual	NWRA		560	
	Step 1.3.2.2.2 Field work, analysis and reporting	Annual	NWRA			
Activity 1.3.2.3 Prepare and execute monitoring program on the pollution from oil abstraction activities	Step 1.3.2.3.1 Field survey to inventory pollution and identify sources	2009	NWRA and UNDP		120	Should be incorporated with Hadramout BMP
	Step 1.3.2.3.2 Design monitoring program	2009	NWRA and UNDP			
	Step 1.3.2.3.3 Implementation of monitoring	2010	NWRA			
Activity 1.3.2.4 Prepare management strategy for hazardous wastes(oil, industrial, medical and agricultural)	Step 1.3.2.4.1 Initial consultation by expert	2010	NWRA and consultant		100	
	Step 1.3.2.4.2 National workshop held	2011	NWRA and consultant			
	Step 1.3.2.4.3 Strategy developed and incorporated into existing BMPs	2012	NWRA			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015	Additional Comments and clarifications
IWRM 1.3.3 Protection zones are established					
Activity 1.3.3.1 Prepare studies to identify and declare protected areas in Mukha, Hodeidah Dhamar, Hadrmout and Abyan	Step 1.3.3.1.1 Studies undertaken	2009-2012	NWRA, UNDP, GTZ and BGR	55	Abyan study completed by 2009 Hadramout and Mukha study completed by 2010 Hodeida study completed by 2011 Dhamar study completed by 2012
	Step 1.3.3.1.2 Potential protected areas delineated	2009-2012	NWRA, UNDP, GTZ and BGR		
	Step 1.3.3.1.3 Proposals submitted to cabinet	2010-2013	NWRA		
Activity 1.3.3.2 Protection of the surface water sources	Step 1.3.3.2.1 Identify watersheds in coordination with MAI	2010-2011	NWRA	32	
	Step 1.3.3.2.2 Implement study to identify pollution sources (industrial, agricultural, etc.)	2011-2012	NWRA		
	Step 1.3.3.2.3 Identify major pollution issues	2012	NWRA		
	Step 1.3.3.2.4 Prepare draft decree to submit to the Cabinet	2013	NWRA		
Activity 1.3.3.3 Protection of drinking water well fields in Mukha, Hodeidah Dhamar, Hadramout and Abyan	Step 1.3.3.3.1 Identify the well fields	2010-2013	NWRA	35	
	Step 1.3.3.3.2 Office preparation including mapping activities around well fields	2010-2013	NWRA		
	Step 1.3.3.3.3 Implement studies	2011-2014	NWRA		
	Step 1.3.3.3.4 Present draft decree to Cabinet	2012-2015	NWRA		
IWRM 2.1.1 Disposal systems are improved , wastewater reused					
Activity 2.1.1.1 Assess & evaluate sewage systems and solid waste sources	Step 2.1.1.1.1 Survey of solid and liquid waste	2013	NWRA and NWSA	55	
	Step 2.1.1.1.2 Identify priority intervention sites	2014	NWRA and NWSA		
	Step 2.1.1.1.3 Identify the necessary interventions	2014	NWRA and NWSA		

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
IWRM 2.1.2: Coastal zone management plans prepared						
Activity 2.1.2.1 Finalize the integrated management plans of the coastal areas in Hodeidah Mukala and Mukha						Activity according to EPA work plan
IWRM 2.1.3 EIA strengthened and adapted						
Activity 2.1.3.1 update & improve the existing EIA policy & system						EPA activity
Activity 2.1.3.2 work with no of agencies to consider the EIA in their work plans	Step 2.1.3.2.1 Hold meeting with EPA related to WRM	Annual	NWRA and EPA			EPA activity
Activity 2.1.3.3 work with number of agencies including private sector to implement the EIA	Step 2.1.3.3.1 Hold meeting with EPA related to WRM	As needed	NWRA and EPA			EPA activity
IWRM 2.2.1 Effluent water quality improvement - industries and factories adopt treatment plants						
Activity 2.2.1.1 Prepare vulnerability map of the contamination of basins	Step 2.2.1.1.1 Conduct field work at industrial sites	2010-2011	NWRA and technical support from donors		25	
	Step 2.2.1.1.2 Produce basin vulnerability and contamination maps	2011	NWRA and technical support from donors			
Activity 2.2.1.2 Implement program on industrial wastes treatment	Step 2.2.1.2.1 Recruit short term experts to identify priority activities and interventions	2010	NWRA and consultants		220	

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 2.2.1.2.1 Strategy is developed	2011	NWRA and consultants			
	Step 2.2.1.2.3 Implement pilot projects	2012	NWRA			

IWRM 2.2.2: Wastewater is recycled and reused						
Activity 2.2.2.1 Monitor treated and by-pass waste water from the STPs	Step 2.2.2.1.1 Collect data from treatment	2011	NWRA		395	
	Step 2.2.2.1.2 Take samples, conduct analysis and produce report	2012	NWRA			
	Step 2.2.2.1.3 Conduct environmental audit	2013	NWRA and EPA			
Activity 2.2.2.2 Prepare extension programs on the safe uses of the treated waste & grey water of the grey water	Step 2.2.2.2.1 Identify extension concepts	2010	NWRA		125	
	Step 2.2.2.2.2 Identify target groups and related agencies	2010	NWRA			
	Step 2.2.2.2.3 Prepare strategy, materials and documents	2011	NWRA			
	Step 2.2.2.2.4 Hold workshops and conduct field visits	2012-2015	NWRA			
Activity 2.2.2.3 Study potentiality of the waste water recycling and reuse	Step 2.2.2.3.1 Prepare TOR	2011	NWRA		10	
	Step 2.2.2.3.2 Select consultant	2011	NWRA			
	Step 2.2.2.3.3 Conduct study	2012	NWRA with consultant			
	Step 2.2.2.3.4 Hold workshops	2013	NWRA			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 2.2.2.3.5 Adopt recommendations and best practices	2014-2015	NWRA			
Activity 2.2.2.4 Waste water awareness workshops	Step 2.2.2.4.1 Hold workshops according to the National Strategy	2009-2015	NWRA		195	
	Step 2.2.2.4.2 Incorporate study findings into additional workshops	2013-2014				

IWRM 3.1.1: Irrigation water use reduced, irrigated agriculture incomes per hectare at least maintained

Activity 3.1.1.1 Studies on irrigated agriculture, Socio-economic assessment	Step 3.1.1.1.1 Develop TOR for consultant	2009	NWRA		230	Socio-economic assessment in Zabid and Radea' based on existing information gaps and planning priorities
	Step 3.1.1.1.2 Contract consultant and undertake study	2009	NWRA			
	Step 3.1.1.1.3 Final report produced	2009	NWRA and consultant			
Activity 3.1.1.2 Monitor the No of irrigation systems (Areas irrigated by improved	Step 3.1.1.2.1 Develop survey	2010	NWRA		215	
	Step 3.1.1.2.2 Field work	2011	NWRA			
	Step 3.1.1.2.3 Produce final report	2011	NWRA			
Activity 3.1.1.3 Survey traditional water management system,	Step 3.1.1.3.1 Develop survey	2010	NWRA		425	
	Step 3.1.1.3.2 Conduct field work	2011	NWRA			
	Step 3.1.1.3.3 Produce final report	2011	NWRA			
Activity 3.1.1.4 Rehabilitate the best traditional water management systems	Step 3.1.1.4.1 Develop plan to make regional investigations	2011	NWRA		1,100	

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 3.1.1.4.2 Conduct field work	2011	NWRA			
	Step 3.1.1.4.3 Identify most efficient and socially acceptable systems in final report	2012	NWRA			
	Step 3.1.1.4.4 Begin rehabilitation projects based on report findings	2013-2015	NWRA			

IWRM 3.1.2 : Farmers have access to efficient, least cost irrigation technology

Activity 3.1.2.1 Studies on irrigation techniques, feasibility and Monitoring	Step 3.1.2.1.1 Develop field survey	2010	NWRA and MAI/GDI		305	
	Step 3.1.2.1.2 Conduct field work	2011	NWRA and MAI/GDI			
	Step 3.1.2.1.3 Assess techniques and feasibility and identify monitoring program	2012	NWRA and MAI/GDI			
	Step 3.1.2.1.4 Begin monitoring irrigation	2012	NWRA and MAI/GDI			

IWRM 3.2.1 Alternatives of water use priorities are identified

Activity 3.2.1.1 Conduct study to Identify the needs and specify the priorities at basin level	Step 3.2.1.1.1 Select consultant	2009	NWRA		305	
	Step 3.2.1.1.2 Field work	2009	NWRA and consultant			
	Step 3.2.1.1.3 Final report	2010	NWRA and consultant			
Activity 3.2.1.2 Sub-sector water use assessments	Step 3.2.1.2.1 Develop TOR and select consultant	2010	NWRA		135	
	Step 3.2.1.2.2 Collect existing data, field research	2011	NWRA and consultant			
	Step 3.2.2.2.3 Final report	2011	NWRA and consultant			

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015	Additional Comments and clarifications
IWRM 3.2.2 Water right registration					
Activity 3.2.2.1 Prepare and implement water resources social mobilization program	Step 3.2.2.1.1 Develop plan	Annual	NWRA and SMTs	295	
	Step 3.2.2.1.2 Produce materials	Annual	NWRA		
	Step 3.2.2.1.3 Field visits	Annual	NWRA and SMTs		
Activity 3.2.2.2 Conduct pilot programs to establish water rights	Step 3.2.2.2.1 Conduct field visits and workshops introducing the concept along with expert	2010	NWRA and SMTs	300	
	Step 3.2.2.2.2 Identify regionally appropriate water rights	2011	NWRA and SMTs		
	Step 3.2.2.2.3 Implement several pilot projects	2011	NWRA and SMTs		
Activity 3.2.2.3 Identify water rights in Taiz, Sana'a, Tuban-Abyan and Hadrmout	Step 3.2.2.3.1 Conduct field surveys	2012	NWRA	310	
	Step 3.2.2.3.2 Hold regional workshops with all stakeholders	2013	NWRA , WBC, WUA/Gs, other relevant local authorities, donors		
	Step 3.2.2.3.3 Identify realistic water rights based on feedback	2013	NWRA		
	Step 3.2.2.3.4 Conduct local validation workshops	2014	NWRA , WBC, WUA/Gs, other relevant local authorities, donors		

Activities	Monitorable steps	Due date	Key actor	Budget and Source of funding (000 US\$) 2009-2015		Additional Comments and clarifications
	Step 3.2.2.3.5 Hold national workshop to present idea to decision makers	2014	NWRA			
	Step 3.2.2.3.6 Develop a formal proposal	2014	NWRA			
Activity 3.2.2.4 Finalize water rights decree	Step 3.2.2.4.1 Minister of Water and Environment finalize decree based on result of studies and proposal	2015			5	
	Step 3.2.2.4.2 Present decree to cabinet					

Yemen
NWSSIP
Expenditure Accounts by Years -- Base Costs
Water Resource Management (US\$ '000)

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>Total</u>
3. IWRM Capacity Development	2,295	5,812	4,254	3,564	3,146	2,888	2,240	2,253	26,451
4. Groundwater Abstraction Monitoring	70	2,601	2,045	1,749	1,739	1,739	151	101	10,193
5. Water Quality Improvement	-	294	141	143	116	141	108	136	1,078
6. Environment Protection	-	124	88	58	58	58	58	5	450
7. Public/Private Partnership On Water Quality	-	95	186	152	112	152	90	101	889
8. Reduction of irrigation Water Use	-	80	111	93	83	83	83	50	583
9. Protection of Water Users Rights	-	146	183	161	151	131	131	121	1,023
Total Investment Costs	<u>2,365</u>	<u>9,152</u>	<u>7,009</u>	<u>5,920</u>	<u>5,404</u>	<u>5,191</u>	<u>2,861</u>	<u>2,765</u>	<u>40,668</u>

Yemen
NWSSIP
Project Components by Year -- Base Costs
Water Resource Management (US\$ '000)

Base Cost

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>Total</u>
1. IWRM Capacity Development 1.1									
a. NWRA Capacity Development 1.1.1	1,835	2,422	1,914	1,021	706	664	664	664	9,891
b. IWRM Information Exchange System 1.1.2	164	788	722	834	847	867	274	292	4,788
c. NWRA Decentralization 1.1.3	106	271	276	312	312	312	312	312	2,211
d. Preparation of Water Resource Management Plans 1.1.4	191	1,538	1,055	1,055	955	704	704	603	6,804
e. Supply and Demand Water Management 1.1.5	-	354	126	126	166	126	126	166	1,188
f. Public Awareness 1.1.6	-	261	161	216	161	216	161	216	1,392
g. Promotion of Partnership and Co management 1.17	-	177	-	-	-	-	-	-	177
Subtotal IWRM Capacity Development 1.1	<u>2,295</u>	<u>5,812</u>	<u>4,254</u>	<u>3,564</u>	<u>3,146</u>	<u>2,888</u>	<u>2,240</u>	<u>2,253</u>	<u>26,451</u>
2. Groundwater Abstraction Monitoring and Control 1.2									
a. Groundwater Monitoring 1.2.1	-	1,560	1,548	1,558	1,558	1,558	50	50	7,882
b. Water Use Improvement and Regulation 1.2.2	70	437	161	101	101	101	50	-	1,020
c. Incentive Framework 1.2.3	-	40	136	-	-	-	-	-	176
d. Water Law Enforcement 1.2.4	-	166	126	90	80	80	50	50	643
e. Identification of Alternative Water Resources 1.2.5	-	397	75	-	-	-	-	-	472
Subtotal Groundwater Abstraction Monitoring and Control 1.2	<u>70</u>	<u>2,601</u>	<u>2,045</u>	<u>1,749</u>	<u>1,739</u>	<u>1,739</u>	<u>151</u>	<u>101</u>	<u>10,193</u>
3. Water Quality Improvement and Monitoring 1.3									
a. Enforcement of Yemeni Water Quality Standards 1.3.1	-	25	15	-	-	-	-	-	40
b. Mapping of Water Pollution Sources 1.3.2	-	246	101	131	101	126	95	126	925
c. Establishment of Protection Zones 1.3.3	-	23	25	13	15	15	13	10	113
Subtotal Water Quality Improvement and Monitoring 1.3	<u>-</u>	<u>294</u>	<u>141</u>	<u>143</u>	<u>116</u>	<u>141</u>	<u>108</u>	<u>136</u>	<u>1,078</u>

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>Total</u>
4. Environment Protection 2.1									
a. Improvement of Disposal Systems and Water Reuse 2.1.1	-	20	10	5	5	5	5	5	55
b. Coastal Zone Management Plans 2.1.2	-	50	25	-	-	-	-	-	75
c. EIA Capacity Development 2.1.3	-	53	53	53	53	53	53	-	320
Subtotal Environment Protection 2.1	-	124	88	58	58	58	58	5	450
5. Pubic/Private Partnership on Water Quality 2.2									
a. Improvement of Industrial Effluent Quality 2.2.1	-	25	96	62	52	52	30	-	317
b. Wastewater Recycling and Reuse 2.2.2	-	70	90	90	60	101	60	101	573
Subtotal Pubic/Private Partnership on Water Quality 2.2	-	95	186	152	112	152	90	101	889
6. Reduction of Irrigation Water Use 3.1									
a. Irrigation Water Efficiency 3.1.1	-	30	50	33	33	33	33	-	211
b. Promotion of Efficient Irrigation Technologies 3.1.2	-	50	60	60	50	50	50	50	372
Subtotal Reduction of Irrigation Water Use 3.1	-	80	111	93	83	83	83	50	583
7. Protection of Water Users Rights 3.2									
a. Identification of Water Use Priorities 3.2.1	-	40	33	10	10	10	10	-	113
b. Water Rights Registration 3.2.2	-	106	151	151	141	121	121	121	910
Subtotal Protection of Water Users Rights 3.2	-	146	183	161	151	131	131	121	1,023
TOTAL	2,365	9,152	7,009	5,920	5,404	5,191	2,861	2,765	40,668

Yemen
NWSSIP
Expenditure Accounts by Financiers
Water Resource Management (US\$ '000)

	Foreign		Foreign gap		Budget GoY		Other local		The Government		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
IWRM Capacity Development	1,446	5.5	22,460	84.9	845	3.2	-	-	1,700	6.4	26,451	65.0
Groundwater Abstraction Monitoring	-	-	10,193	100.0	-	-	-	-	0	-	10,193	25.1
Water Quality Improvement	-	-	1,078	100.0	-	-	-	-	0	-	1,078	2.7
Environment Protection	-	-	450	100.0	-	-	-	-	0	-	450	1.1
Public/Private Partnership On Water Quality	-	-	889	100.0	-	-	-	-	0	-	889	2.2
Reduction of irrigation Water Use	-	-	583	100.0	-	-	-	-	0	-	583	1.4
Protection of Water Users Rights	-	-	1,023	100.0	-	-	-	-	0	-	1,023	2.5
Total Investment Costs	1,446	3.6	36,677	90.2	845	2.1	-	-	1,700	4.2	40,668	100.0

Yemen
NWSSIP
Components by Financiers
Water Resource Management (US\$ '000)

	Foreign		Foreign gap		Budget GoY		Other local		The Government		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1. IWRM Capacity Development 1.1												
a. NWRA Capacity Development 1.1.1	986	10.0	6,360	64.3	845	8.5	-	-	1,700	17.2	9,891	24.3
b. IWRM Information Exchange System 1.1.2	164	3.4	4,624	96.6	-	-	-	-	0	-	4,788	11.8
c. NWRA Decentralization 1.1.3	106	4.8	2,106	95.2	-	-	-	-	0	-	2,211	5.4
d. Preparation of Water Resource Management Plans 1.1.4	191	2.8	6,613	97.2	-	-	-	-	0	-	6,804	16.7
e. Supply and Demand Water Management 1.1.5	-	-	1,188	100.0	-	-	-	-	0	-	1,188	2.9
f. Public Awareness 1.1.6	-	-	1,392	100.0	-	-	-	-	0	-	1,392	3.4
g. Promotion of Partnership and Co management 1.17	-	-	177	100.0	-	-	-	-	0	-	177	0.4
Subtotal IWRM Capacity Development 1.1	1,446	5.5	22,460	84.9	845	3.2	-	-	1,700	6.4	26,451	65.0
2. Groundwater Abstraction Monitoring and Control 1.2												
a. Groundwater Monitoring 1.2.1	-	-	7,882	100.0	-	-	-	-	0	-	7,882	19.4
b. Water Use Improvement and Regulation 1.2.2	-	-	1,020	100.0	-	-	-	-	0	-	1,020	2.5
c. Incentive Framework 1.2.3	-	-	176	100.0	-	-	-	-	0	-	176	0.4
d. Water Law Enforcement 1.2.4	-	-	643	100.0	-	-	-	-	0	-	643	1.6
e. Identification of Alternative Water Resources 1.2.5	-	-	472	100.0	-	-	-	-	-	-	472	1.2
Subtotal Groundwater Abstraction Monitoring and Control 1.2	-	-	10,193	100.0	-	-	-	-	0	-	10,193	25.1
3. Water Quality Improvement and Monitoring 1.3												
a. Enforcement of Yemeni Water Quality Standards 1.3.1	-	-	40	100.0	-	-	-	-	0	-	40	0.1
b. Mapping of Water Pollution Sources 1.3.2	-	-	925	100.0	-	-	-	-	0	-	925	2.3
c. Establishment of Protection Zones 1.3.3	-	-	113	100.0	-	-	-	-	0	-	113	0.3
Subtotal Water Quality Improvement and Monitoring 1.3	-	-	1,078	100.0	-	-	-	-	0	-	1,078	2.7
4. Environment Protection 2.1												
a. Improvement of Disposal Systems and Water Reuse 2.1.1	-	-	55	100.0	-	-	-	-	0	-	55	0.1
b. Coastal Zone Management Plans 2.1.2	-	-	75	100.0	-	-	-	-	0	-	75	0.2
c. EIA Capacity Development 2.1.3	-	-	320	100.0	-	-	-	-	-	-	320	0.8
Subtotal Environment Protection 2.1	-	-	450	100.0	-	-	-	-	0	-	450	1.1

	Foreign		Foreign gap		Budget GoY		Other local		Government		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
5. Pubic/Private Partnership on Water Quality 2.2												
a. Improvement of Industrial Effluent Quality 2.2.1	-	-	317	100.0	-	-	-	-	0	-	317	0.8
b. Wastewater Recycling and Reuse 2.2.2	-	-	573	100.0	-	-	-	-	0	-	573	1.4
Subtotal Pubic/Private Partnership on Water Quality 2.2	-	-	889	100.0	-	-	-	-	0	-	889	2.2
6. Reduction of irrigation Water Use 3.1												
a. Irrigation Water Efficiency 3.1.1	-	-	211	100.0	-	-	-	-	0	-	211	0.5
b. Promotion of Efficient Irrigation Technologies 3.1.2	-	-	372	100.0	-	-	-	-	0	-	372	0.9
Subtotal Reduction of irrigation Water Use 3.1	-	-	583	100.0	-	-	-	-	0	-	583	1.4
7. Protection of Water Users Rights 3.2												
a. Identification of Water Use Priorities 3.2.1	-	-	113	100.0	-	-	-	-	0	-	113	0.3
b. Water Rights Registration 3.2.2	-	-	910	100.0	-	-	-	-	0	-	910	2.2
Subtotal Protection of Water Users Rights 3.2	-	-	1,023	100.0	-	-	-	-	0	-	1,023	2.5
	1,446	3.6	36,677	90.2	845	2.1	-	-	1,700	4.2	40,668	100.0