Saudi Arabia
Ministry of Water and Electricity

United Nations Development Programme (UNDP)
&
World Bank (WB)

Assistance in the Development of an Integrated Water Resources Management Strategy – Preparatory Phase Programme Document

The objective of this Project is to provide direct support to the development of strategic water sector management policies through extensive in-country consultations of the MOWE-WB Cooperative Program. The overall objective are, the development Retrospective groundwater abstraction estimate and mapping across the Kingdom of Saudi Arabia; economic and financial assessment of the use of Water in Irrigated Agriculture; the assessment of the Capacity Building and Institutional Enhancement needs of the MoWE; the assistance to the Ministry in monitoring the progress of the two groundwater evaluation projects and the preparatory work for the development of a wells inventory data base (CADASTRE).

I- Situation Analysis:

During the past three decades the Kingdom of Saudi Arabia dedicated large efforts to improve its economic development, diversifying the sources of income and rural activities and boosting agricultural production to ensure a higher level of food security and rural standard of living. These national objectives were implemented through a series of policies that included a strong economic support to the development of the agricultural sector and important investments in the modernization of the irrigation infrastructure. Having reached the objectives sought, the government of Saudi Arabia is presently looking for ways to optimize the social and economic returns from these investments, particularly by sustaining the water resources base.

Despite the large number of water resources studies and plans that set the framework for the hydro geological understanding of the region1, the unrestrained use of groundwater and lack of information during the last two decades have given rise to serious concerns for the long-term viability of the non-renewable groundwater resources in the Kingdom. It is clear that the overall water resources potential is noticeably limited and inconsistent with current development practices to the extent that the following question has been posed: ...how long can the groundwater resource be used at the present level of abstraction?
The impossibility to provide a definite answer to that question is tied to the insufficient analytical base available of the water resources and lack of monitoring of water demands. To fully understand the extent of the impact of uncontrolled abstractions on groundwater resources, it will be necessary to substantially improve the basic knowledge of the different water sources and to further develop groundwater (mathematical) models that integrate water sources and water demands in a decision support system that will allow decision maker to evaluate ...what if scenarios.
The management of the water sector is another area of preoccupation. Many of the functions and activities of the sector were until recently highly fragmented among a myriad of central and regional organizations. The Seventh Development Plan recognized that institutional weakness and stated the need to reconsider the administrative organization of the water sector. The present government policy is to consolidate all water functions and activities under the tutelage of the newly created Ministry of Water and Electricity (MOWE). The challenge now is to design a streamlined organizational structure capable of defining and articulating sectoral policies, defining institutional responsibilities for implementing sectoral policies, regulating the provision of public services and the operation of the infrastructure, and the continuous assessment and protection of the base resource.

Due in part to the high fragmentation of the water sector and the lack of clear policies, there is a weak link between the planning stage and execution function in the sector. Several consecutive 5-year Development Plans, over the course of 10 to 15 years, have called for an increase in water supply and sanitation coverage, decrease in agricultural water consumption, water tariff reform, and refurbishment of desalination facilities.

Most of studies were conducted from the mid-1960s to the mid-late 1980s. The most relevant studies are: a) the preparation of the first ıational water plan by the British Arabian Advisory Company (BAAC), 1979; b) specific aquifer studies by the Bureau de Recherches Jeologiques et Minieres (BRGM) in the area of Al Hassa, 1977; c) study of the Umm er Rhaduma aquifer by the Groundwater Development Consultants (GDC), 1980; d) another national water plan by the German Agency for Technical Cooperation (GTZ), 1983;) a comprehensive study of the SAQ sandstone by BRGM, 1985.

But the development plans had little apparent effect on execution. The negative impact that past agricultural policies have had on the water resources of the Kingdom cannot be exaggerated. Considering that anywhere between 80 and 90 percent of the consumptive use of water is allocated to irrigated agriculture, and that the majority of that water is been extracted form non-renewable groundwater sources, it becomes imperative to build a strong coordination between any future agricultural policy and the possibilities that the water sector has to offer. The water scarcity condition of the Kingdom justifies a substantial shift in policy, from "food security" to "water security", where the sustainability of the Kingdom's water resources dictates its proper level of development.

II. Strategy

2.1 UNDP –World Bank Collaboration:

The Ministry of Water and Electricity (MOWE) of the Government of the Kingdom of Saudi Arabia (KSA) has requested World Bank (WB) support for the development of an Integrated Water Resources Management Strategy and Short/Long Term Action Plans for KSA. Such a scope of work, based on a comprehensive assessment of the water sector, will focus on the following: (a) broad-based water demand management rather than supply management policy; (b) a cross-sectoral program for reducing non-renewable groundwater withdrawal and more sustainable aquifer management; (c) a comprehensive program for reclaimed wastewater reuse in agriculture irrigation; and (d) reorganization of the legal and institutional framework.

The overall scope of the MOWE-WB Cooperative Program was agreed upon to include the following three phases: Phase I: Assessment of the current water resources management situation; Phase II: Development of strategic water sector management policies through extensive in-country consultations, and Phase III: Development of an action plan for implementation of the strategy.

In this context the UNDP and World Bank in consultation with MOWE have agreed that UNDP will provide direct assistance in delivering part of phase II of the programme as detailed in the following pages. UNDP will provide this support as part of its future involvement in the development and implementation phases of the National Water Strategy.

UNDP also sees this programme as a major contributor to the evolving strong partnership and collaboration with the World Bank in development programmes based on its comparative and competitive advantages as well as the added value it brings about to such a vital and strategic field.

2.2 Objective, outcomes and outputs of the

The objective of this PD is to provide direct support to the Phase II of the MOWE-WB Cooperative Program. The main outputs that are intended to be produced to achieve the overall objective are as follows: (see Annex1)

- The development Retrospective groundwater abstraction estimate and mapping across the Kingdom of Saudi Arabia. (see Annex 1-1)
- An Economic and Financial Assessment of the use of Water in Irrigated Agriculture. (See Annex 1-2)
- An Assessment of the Capacity Building and Institutional Enhancement needs of the MoWE Assistance to the Ministry in monitoring the progress of the two groundwater evaluation projects.

5. The preparatory work for the development of a wells inventory data base (CADASTRE).

III. Management Arrangements:

The project will be nationally executed by the Government represented by MOWE with support from UNDP and WB. The MOWE will be responsible on behalf of the Government for the overall management of the project and is primarily responsible for the planning and overall management of the project activities, reporting, accounting, monitoring and evaluation of the project and for the management and audit of the use of the Government resources for the project. It will be fully managed by the National Project Director (NPD) in accordance with the TOR provided in **Annex (2)** and will be subject to UNDP's Procedures for National Execution. All coordination arrangements will take place under the sanction of MOWE.
The primary aim for selecting such arrangement is to develop and enhance existing institutional capabilities whenever feasible as the fundamental step in assuring continuity and sustainability of project initiatives after project completion. UNDP may utilize the service of United Nations specialized agencies to provide technical support when necessary to be funded from the project budget. Should UNDP be requested to provide logistical and operational support to the project (recruitment, ads, etc...) relevant cost would also be charged to the project.

The amount estimated in the budget (**US $ 500,000**) will be deposited in instalments with UNDP as follows:

PAYMENT SCHEDULE

ATE	**AMOUNT**	**CONTRIBUTOR**
be paid November 2004	200,000	Kingdom of Saudi Arabia
be paid in January 2005	200,000	Ministry of Water and
be paid in March 2005	100,000	Electricity
TAL	500,000	

Cost Sharing is payable in US Dollars by:

1. Transfer to JP Morgan Chase, ABA No. 021000021, SWIFT Code: CHASUS33, Account No. 323138268, Account Name: UNDP Saudi Arabia Representative US Dollar Account, Reference: *SAU10/39149 – Water Resources Management*

Or

2. Cheques in English are to be made to the order of the United Nations Development Programme and forwarded to UNDP Office in Riyadh.

Thereafter, payments for items identified in the project matrix (budget) will be made by UNDP after receiving disbursement instructions from the MOWE. A financial report will be submitted to the MOWE at the end of the project for the purpose of review and endorsement. In the event that both parties decided to close this project and certain funds remained unutilized, UNDP will return the unutilized balance, after clearing all contractual commitments, to the MOWE or transfer to a full fledged project depending on the preference of the MOWE.

The budget is subject to review as needs arise and there is enough flexibility to transfer among project budget sub lines.

V. Monitoring and Evaluation

- The project will be subject to tripartite review (TPR, joint review by representatives of the Government of Saudi Arabia - MOWE, UNDP and WB) at least once every 12 months, the first such meeting to be held within the first 12 months of the start of full implementation. The National Project Director shall prepare and submit to each review meeting a Project Annual Report (APR). Such review meetings can also be arranged to coincide with the one of the project steering committee meetings. Progress reports can also be prepared to highlight specific components or to meet with reasonable frequency additional reporting requests.

- Following the initial joint review, the project may also be subject to additional, interim reviews of specific components or component progress toward selected outputs at six-month intervals, because of the innovative nature of the project. The need for such interim review, and its organization, terms of reference and precise timing will be decided after consultation between the parties to the project document. The World Bank will assist in reviewing all studies incurring from this project.

- The project shall be subject to a mid-term evaluation approximately 7 months after the start of full implementation. The purpose of the evaluation will be to capture results, lessons learnt and to reinforce project successes and partnership for the next phases. The organization, terms of reference and exact timing of the evaluation will be decided after consultation between the parties to the project document, plus any associated UN agency. Funds have been included in the budget for an international and national consultant team to perform the mid-term evaluation.

. Legal Context:

This project document shall be deemed to be the instrument referred to as such in Article 1, paragraph 1, of the Standard Basic Assistance Agreement between the Government of the Kingdom of Saudi Arabia and the United Nations Development Programme signed by the two parties on 3 Muharram 1396 (4 January 1976) copy attached. For the purposes of the Standard Basic Assistance Agreement, the Government executing agency will be the Government cooperating agency mentioned in that Agreement.

The following types of amendments may be made to the original Project Document, even if they be signed only by the UNDP Resident Representative, provided the latter is assured that all other signatories of the Project Document have no objections to the amendments:

a) Revisions in or additions to, any of the project outputs/activities or any of the Annexes of the Project Document.
b) Revisions which do not result in a major changes in the project's immediate objectives or outputs, and which are attributable to a reordering of the activities or inputs in order to improve the realization of the objectives or the outputs.
c) Mandatory annual revisions made to reorganize the provision of already scheduled inputs, re-phase the delivery of agreed project inputs, to reflect an increase in the cost of expert services or other services.

VI - RISKS

For this project, the most critical of risks would be:

Delays in recruitment - This project may not achieve the predicted results unless recruitment happens in a timely manner. This will require the availability of the staff needed in addition to meeting all the requirements needed for the tasks indicated.

Lack of coordination - The lack of overall coordination could result in key stakeholders not being informed of program plans and later slowing progress; mis-timing of critical events that need to be properly orchestrated, this risk can be addressed by the creation of the Project Coordination Committee, but also by the recruitment of a Project Management Officer. This person will be responsible for monitoring the progress of the programs to assure their coordination.

Inadequate performance on the part of the subcontractor – Due to the non-existence of a competitor to the company to be subcontracted, the risks of getting non-satisfactory result is one that will have to be mitigated by constant supervision of the work by the project manager.

UNDP

Annual Work Plan for 2004

EXPECTED OUTPUTS & MONITORING ACTIVITIES	KEY ACTIVITIES	TIMEFRAME				RESPONSIBLE PARTNER	PLANED BUDGET		
		Q1	Q2	Q3	Q4		Cost of activity	Budget Description	Amount US$
A Retrospective groundwater abstraction estimate and mapping across the Kingdom of Saudi Arabia	Development of annual water consumption maps					subcontractor			195,000
	Development of annual irrigated acreage maps								
	Development of maps with the annual irrigation intensity.								
	Conducting an on-farm irrigation efficiency analysis.								
	Development of a total accumulated groundwater abstraction elapsed map (1975-2004)								
	Development of a report containing tabular crop consumptive use and groundwater extraction								
The preparation of the economic and financial evaluation of present and alternative policy options	Selection of representative regions					subcontractor			150,000
	Economic and Financial Evaluation								
	Social Benefit								
	Economic Prices								
	Crop budgets								
	Farm Models								
SUB-TOTAL									**345,000**

EXPECTED OUTPUTS & MONITORING ACTIVITIES	KEY ACTIVITIES	TIMEFRAME				RESPONSIBLE PARTNER	PLANED BUDGET		
		Q1	Q2	Q3	Q4		Source of Funds	Budget Description	Amount
Develop an institutional strengthening and individual capacity building programme aiming at enhancing the abilities of institutions and people in the water sector towards a more efficient and effective decision making and job performance	Assessing and validating institutional strengthening and capacity building needs of MoWE on the ground and presenting the case to stakeholders					International consultant for a period 14 man/days			25,000
	Preparing a project document for a programme institutional strengthening and capacity building								
To assist the Ministry of Water and Electricity in monitoring the progress of the two groundwater evaluation projects listed below and report on any recommendations and conclusions	Updating of the Groundwater Model(s) of the Saq and Overlying Aquifers					International Consultant for a Period of 25 Days per year for three visits			60,000
	Updating of the Groundwater Models of the Umm er Rhadma and Overlying Aquifers								
SUB-TOTAL									**85,000**

EXPECTED OUTPUTS & MONITORING ACTIVITIES	KEY ACTIVITIES	TIMEFRAME				RESPONSIBLE PARTNER	PLANED BUDGET		
		Q1	Q2	Q3	Q4		Source of Funds	Budget Description	Amount
Inventory data base (CADASTRE) (including dug wells)	- Preparing Terms of Reference for the task to be performed in terms of: a. Planning office and field work (in coordination with retrospective satellite imagery study) b. Defining database architecture c. Conducting field work d. database completion e. Comparative and statistical analysis - Advertising in newspapers - Short listing candidates - Identifying candidates for bidding					Project manager			45,000
Monitoring, Evaluation and technical support	Conducting monitoring activity and a mid-term and final evaluation mission and reporting and providing technical support as required					National and International consultants for short terms to conduct monitoring and evaluation			10,000
COA (country office Fees)									15,000
GRAND TOTAL									**500,000**

PROJECT RESULTS AND RESOURCES FRAMEWORK*

Intended Outcome as stated in the Country Results Framework: *Goal 3 SubGoal 4* ***7)*** *Improved capacity of national authorities and private sector to plan and implement integrated approaches to environmental management and energy development including mechanisms for sustainable financing*			
Outcome indicator as stated in the Country Programme Results and Resources Framework, including baseline and target.			
Applicable MYFF Service Line:			
Partnership Strategy: *Providing needed technical expertise. A cooperation agreement will be established with the Private consulting houses, both national and international. UNDP plays a key coordinating role in ensuring integration of this multi-faceted outcome.*			
Project title and ID: *Assistance in the Development of an Integrated Water Resources Management Strategy*			
Intended Outputs	**Output Targets for (years)**	**Indicative Activities**	***Inputs***
1.1 A retrospective Groundwater abstraction estimate and mapping across the KSA.		1.1 The development of annual water consumption maps. 1.2 The development of annual irrigated acreage maps 1.3 The development of maps with the annual irrigation intensity 1.4 Conducting a non-farm irrigation efficiency analysis 1.5 The development of a total accumulated groundwater abstraction elapsed map (1975-2004). 1.6 The development of a report containing tabular crop consumptive use and groundwater extraction data (i) per year, (ii) per Governorate and (iii) per aquifer system.	US195,000

PROJECT RESULTS AND RESOURCES FRAMEWORK*

Intended Outcome as stated in the Country Results Framework: *Goal 3 SubGoal 4* ***7)*** *Improved capacity of national authorities and private sector to plan and implement integrated approaches to environmental management and energy development including mechanisms for sustainable financing*			
Outcome indicator as stated in the Country Programme Results and Resources Framework, including baseline and target.			
Applicable MYFF Service Line:			
Partnership Strategy: *Providing needed technical expertise. A cooperation agreement will be established with the Private consulting houses, both national and international. UNDP plays a key coordinating role in ensuring integration of this multi-faceted outcome.*			
Project title and ID: *Assistance in the Development of an Integrated Water Resources Management Strategy*			
Intended Outputs	**Output Targets for (years)**	**Indicative Activities**	**Inputs**
1.2 The preparation of the economic and financial evaluation of present and alternative policy options		2.1 Definition of representative regions (six to eight) 2.2 Definition of representative farm models for the selected regions 2.3 Visits to the selected regions for data collection in about 35 to 40 farms 2.4 Preparation of the representative crop and farm models for each region 2.5 Collection of market prices for inputs, products, labor, services, etc. 2.6 Estimation of economic prices for major agricultural products, water, electricity, diesel, main inputs, labor, social discount rates, etc 2.7 Building up the models and alternative scenarios using FARMOD software.	150,000*

*** Inclusive of fees of three-month full time expert and short-term consultants**

PROJECT RESULTS AND RESOURCES FRAMEWORK*

Intended Outcome as stated in the Country Results Framework: *Goal 3 SubGoal 4* ***7)*** *Improved capacity of national authorities and private sector to plan and implement integrated approaches to environmental management and energy development including mechanisms for sustainable financing*			
Outcome indicator as stated in the Country Programme Results and Resources Framework, including baseline and target.			
Applicable MYFF Service Line:			
Partnership Strategy: *Providing needed technical expertise. A cooperation agreement will be established with the Private consulting houses, both national and international. UNDP plays a key coordinating role in ensuring integration of this multi-faceted outcome.*			
Project title and ID: *Assistance in the Development of an Integrated Water Resources Management Strategy*			
Intended Outputs	**Output Targets for (years)**	**Indicative Activities**	***Inputs***
1.3 Develop an institutional strengthening and individual capacity building programme aiming at enhancing the abilities of institutions and people in the water sector towards a more efficient and effective decision making and job performance.		3.1 Discussing institutional strengthening and capacity building needs with stakeholders during a retreat held by the WB 3.2 Assessing and validating institutional strengthening and capacity building needs of MoWE on the ground and presenting the case to stakeholders 3.3 Preparing a project document for a programme of institutional strengthening and capacity building	25,000

PROJECT RESULTS AND RESOURCES FRAMEWORK*

Intended Outcome as stated in the Country Results Framework: *Goal 3 SubGoal 4* ***7)*** *Improved capacity of national authorities and private sector to plan and implement integrated approaches to environmental management and energy development including mechanisms for sustainable financing*			
Outcome indicator as stated in the Country Programme Results and Resources Framework, including baseline and target.			
Applicable MYFF Service Line:			
Partnership Strategy: *Providing needed technical expertise. A cooperation agreement will be established with the Private consulting houses, both national and international. UNDP plays a key coordinating role in ensuring integration of this multi-faceted outcome.*			
Project title and ID: *Assistance in the Development of an Integrated Water Resources Management Strategy*			
Intended Outputs	**Output Targets for (years)**	**Indicative Activities**	**Inputs**
1.4 To assist the Ministry of Water and Electricity in monitoring the progress of the two groundwater evaluation projects listed below and report on any recommendations and conclusions		4.1 Updating of the Groundwater Model(s) of the Saq and Overlying Aquifers 4.2. Updating of the Groundwater Models of the Umm er Rhadma and Overlying Aquifers	60,000
1.5 To assist the Ministry in the preparatory work leading to a wells inventory data base (CADASTRE)		5.1 Preparing Terms of Reference for the task to be performed 5.2 Advertising in newspapers 5.3 Short listing candidates 5.4 Identifying candidates for bidding	45,000

UNITED NATIONS DEVELOPMENT PROGRAMME
PROJECT OF MOWE-WB Cooperative Program
Assistance in the Development of an Integrated Water Resources Management Strategy
Project Document – Preparatory Phase

Country: **Kingdom of Saudi Arabia**

UNDAF Outcome(s)/Indicator(s):
(Link to UNDAF outcome. If no UNDAF, leave blank)

Expected Outcome(s)/Indicator (s):

(Those that are linked to the project, are extracted from the CP and are linked to the SRF/MYFF goal and service line)

Improved regional capacity to monitor and assess environmental conditions, and to coordinate and harmonize national policies and programmes for management of natural resources

Expected Output(s)/Indicator(s):
(Those that are linked to the project, are extracted from the CP and are linked to the SRF/MYFF goal and service line)

Preparation of Strategy Finalized

Implementing partner:
(designated institution)

Ministry of Water and Electricity

Other Partners:

The World Bank

mme Period: **1 Year**

mme Component:_____

t Title: **Assistance in the Development of Integrated Water :es Management Strategy – Preparatory Phase**

t Number: **SAU10-00039149**

: Duration: **1 Year**

Total budget: **$ 500,000**
Allocated resources:
- Ministry of Water and Electricity: $ 500,000
- Regular
- Other:*(including in-kind contributions)*
  - Donor
  - Donor
  - Donor

Unfunded budget:

Agreed by (Ministry of Water and Electricity):

Agreed by (UNDP):

Annex (1)

Outcome:
Improved capacity to monitor and assess environmental conditions, and to coordinate and harmonize national policies and programmes for management of natural resources and sustainable development

1- Output:
A Retrospective groundwater abstraction estimate and mapping across the Kingdom of Saudi Arabia, the objective of such an output is as follows:

(i) Determination of the annual consumptive use of entire KSA for 8 selected years (1979, 1982, 1986, 1990, 1993, 1996, 2000, and 2003).
(ii) Determination of the total accumulated groundwater abstraction elapsed map for the period 1975-2004
(iii) Assessment of the changes in irrigated acreages for winter and summer crops during the period 1975 to 2004 of entire KSA for 8 selected years (1979, 1982, 1986, 1990, 1993, 1996, 2000, and 2003).
(iv) Comparison of agricultural yearbook statistics, FAO data and remote sensing data on irrigated acreage.
(v) Presentation of data for all desirable geo-hydrological and administrative units in simple tabular forms.

It is expected that this information contributes to the longer term planning of hydrological and agricultural practices, and that it helps in the calibration of distributed groundwater flow models.

1. Activities
The following activities will be needed to achieve output 1:

1.1 The development of an annual water consumption maps for the period 1975 to 2004 covering entire KSA
1.2 The development of an annual irrigated acreage maps for the period 1975 to 2004, broken down for winter and for summer crops
1.3 The development of maps with the annual irrigation intensity
1.4 Conducting a relationship analysis between groundwater extraction, evapotranspiration and percolation to estimate the on-farm irrigation efficiency
1.5 The development of a total accumulated groundwater abstraction elapsed map since 1970 for entire KSA with an acceptable spatial resolution.
1.6 The development of a report containing tabular crop consumptive use and groundwater extraction data (i) per year, (ii) per Governorate and (iii) per aquifer system.

2- Output
The preparation of the economic and financial evaluation of present and alternative policy options towards its integration with the WB study and the subsequent definition - by the KSA authorities - of the water resources new strategy.

2. Activities

The following activities will be needed to achieve output 2:

2.1 Definition of representative regions (six to eight)
2.2 Definition of representative farm models for the selected regions
2.3 Visits to the selected regions for data collection in about 35 to 40 farms
2.4 Preparation of the representative crop and farm models for each region
2.5 Collection of market prices for inputs, products, labor, services, etc.
2.6 Estimation of economic prices for major agricultural products, water, electricity, diesel, main inputs, labor, social discount rates, etc
2.7 Building up the models and alternative scenarios using FARMOD software.

3 Output

Develop an institutional strengthening and individual capacity building programme aiming at enhancing the abilities of institutions and people in the water sector towards a more efficient and effective decision making and job performance.

3. Activities

The following activities will be needed to achieve output 3:

3.1 Discussing institutional strengthening and capacity building needs with stakeholders during a retreat held by the WB
3.2 Assessing and validating institutional strengthening and capacity building needs of MoWE on the ground and presenting the case to stakeholders
3.3 Preparing a project document for a programme of institutional strengthening and capacity building

4 Output

To assist the Ministry of Water and Electricity in monitoring the progress of the two groundwater evaluation projects listed below and report on any recommendations and conclusions

4 Activities

The following activities will be needed to achieve output 4

4.1. Updating of the Groundwater Model(s) of the Saq and Overlying Aquifers

4.2. Updating of the Groundwater Models of the Umm er Rhadma and Overlying Aquifers

5 Output

To assist the Ministry in the preparatory work leading to a wells inventory data base (CADASTRE) that contains data collected from shallow (including dug wells) and deep wells to generate a dependable database of groundwater abstractions, the objective of such an output is as follows:

5. Activities

The following activities will be needed to achieve output 5

5.1 Preparing Terms of Reference for the task to be performed in terms of:
   a. Planning office and field work (in coordination with retrospective satellite imagery study)
   b. Defining database architecture
   c. Conducting field work
   d. database completion
   e. Comparative and statistical analysis

5.2 Advertising in newspapers

5.3 Short listing candidates

5.4 Identifying candidates for bidding

Annex 1-1

A Retrospective groundwater

Objective:

A retrospective consumptive use and groundwater abstraction estimate and mapping across the entire Kingdom of Saudi Arabia

Scope & Sub-tasks:

1. Review and develop the annual consumptive use and water consumption maps for the period 1975 to 2004 covering entire KSA
2. Review and develop the annual irrigated acreage maps for the period 1975 to 2004, broken down for winter and for summer crops
3. Review and develop of maps with the annual irrigation intensity
4. Conducting a relationship analysis between groundwater extraction, evapotranspiration and percolation to estimate the on-farm irrigation efficiency
5. Review and develop the accumulated groundwater abstraction elapsed map since 1975 for entire KSA with an acceptable spatial resolution.
6. Draft a report containing tabular irrigated acreage, annual irrigation intensity crop consumptive use and groundwater extraction data (i) per year, (ii) per Governorate and (iii) per aquifer system.

Methodology

- Work in partnership with local counterpart and MOWE expert.
- Take lead in indicator analysis.
- Short paper developed in partnership with local counterpart.
- Work with MOWE expert in developing timetable of project.
- Define clear intended outcomes of project.
- Regular reporting to project coordinator on monthly basis.
- Initial results of the review should be presented at a consultation workshop.

Qualifications

1. Degree
   PhD or Master Degree in one of the following: Engineering, Environmental planning.
2. Professional experience
   More than 10 years experience in remote sensing applications for agricultural water management.
3. Language: fluent both in English, and Arabic

Time frame:
6 months in total

- Satellite image collection and pre-processing: 2 months
- Energy and Water balance modelling: 3 months

- Draft organization and reporting: 1 month

Output:

- GIS data layers on consumptive use and groundwater abstraction in 1975 to 2004.
- GIS data layers on irrigated acreage and annual irrigation intensity changes between 1975 and 2004.

Output breakdown per month

Item	Description
1	Collecting, geo-referencing and energy balance processing of 8 * 24 NOAA-AVHRR images
2	Meteorological data quality control, surface gridding and pre-processing of meteo data for energy balance input
3	Validation of remote sensing products against lysimeters
4	Derivation of irrigated area and annual irrigation intensity from the vegetation index time profiles
5	Reviewing existing databases and performing on farm discharge measurements
6	Processing groundwater abstraction and GIS data base organization
7	Workshop at MOWE on preliminary results
7	Reporting

Schedule of payment vs. deliverable products

Item	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
1	v	v	v	v	v	
2	v					
3					v	
4	v	v				
5			v			
6					v	
7					v	
8						v
Payment	25%[2]	25%		25%		25%

[2] The first 25% payment will be made soon after signature of the contract to cover image purchases

Annex 1-2

Economic and Financial Assessment of the use of Water in Irrigated Agriculture

1. Background.

1. Following the agreed World Bank (WB) support for the formulation of the water sector strategy and action plan (WSSAP) for the KSA a WB mission visited the KSA between May 11 – 26 2004. One of the key deliverables to Phase II of the proposed action plan is the preparation of the economic and financial evaluation of present and alternative policy options towards its integration with the WB study and the subsequent definition - by the KSA authorities - of the water resources new strategy. The mission defined –between other aspects, on defining the method to conduct the analysis; the way to identify representative regions and farm models for the economic analysis of existing and future policy options; the preparation of a questionnaire for farm data collection; the conformation of a interagency team of experts for the data collection and validation; and the initiation of the studies for shadow pricing.

2. Visits to two production units - together with representatives from the Ministries of Agriculture (MOA) and Water and Electricity (MOWE) - in the areas of Harad and Dirab in order to test and improve the questionnaire for data collection, and obtain initial contact with irrigated agriculture and connected activities in the KSA. The proposed project aims to advance in: (i) the selection of representative areas; (ii) data collection; and (iii) modelling exercise to be undertaken during the next three months, to allow for the construction of the scenarios by using FARMOD (a proprietary software developed by the World Bank and FAO) that would be worked out on a following WB mission during August 2004. Given the urgency in starting these tasks and that Dr. Mohammed Al-Saud, Professor of the King Saud University received the needed training to do the work, a single source procurement method is proposed for a three month contract as Coordinator of this work.

2. Description of activities

3. **Selection of representative regions.** The evaluation should cover a set of representative homogeneous regions in order to allow drawing conclusions from the use of water for irrigation under the diverse situations prevailing in the KSA. The regional selection criteria should consider at least the following factors: (i) concentration of irrigated and rainfed agriculture; (ii) source of water (non-renewable and rechargeable aquifers, surface water, treated wastewater, complementary rainfed-irrigated agriculture), (iii) soil use capacity and agricultural potential, and (iv) type of prevailing production systems (commercial or traditional agriculture, cereals and/or fodder crops, fruits, vegetables, dairy cattle, meat cattle, poultry, etc.). It would build over the excellent GIS being developed by the Ministry of Municipalities and Rural Areas (MOMRA), who is going to provide maps overlapping several layers of information, including actual irrigated land, soil capacity and existing aquifers. The regional selection work should be completed by the end of June 2004.

4. **Economic and Financial Evaluation.** The economic and financial analysis should: (i) help to analyze the actual costs and benefits of the present policy framework, identifying winners and losers under the current policies and help to quantify the current volume of water abstraction from groundwater aquifers and their expected longevity; and (ii) support the selection of the better policy options for water resources strategy by building future possible

scenarios to compare social costs and benefits of alternative policy frameworks, including the targeting of incentives. This implies the analysis of both, the economic and financial implications in terms of costs and benefits for the KSA economy and farmers' incomes respectively. It should be done through the estimation of the relevant social and private costs and benefits using the standard approach of shadow pricing in project evaluation, by comparing the flow of net returns under different scenarios: *with* alternative policy options and *without* those options, maintaining unchanged the present policy framework.

5. **Social Benefit** would be derived mainly from water savings valued at economic prices, as a result of the options to modify the present policy and subsidy menu, which at present, together with other distortions (through diesel and electricity prices and agricultural products import restrictions) is resulting in groundwater depletion with high economic costs for the KSA in the near future, as fossil aquifers would no longer be available. Other possible social benefits include those related to poverty alleviation in traditional agricultural areas with high potential, reducing the tendency to migrate to the overpopulated urban areas. The analysis requires the identification of activity and crop budgets, as well as farm budgets typical of representative agricultural areas, considering the prevailing farming patterns.

6. **Economic Prices.** For the economic analysis, costs and benefits are be adjusted to reflect opportunity costs, border and/or shadow prices net of transfers (subsidies). Border prices (import or export parities) should be estimated for the main tradable commodities (wheat, maize, barley, sorghum, dairy products, animal feed, fertilizers, etc.) deriving the pertinent farm-gate prices. Valuing the appropriate opportunity cost of labor will take into consideration nationality, local conditions, alternative employment opportunities, the seasonality of labor demand, etc... Since one of the main KSA objectives is to save water because of its scarcity and strategic importance, the economic cost of water should be also estimated. Considering the expected longevity of non-renewable water aquifers and future needs and cost of alternative sources once its availability is reduced or finished.

7. **Crop budgets.** Based on the data availability, crop budgets for each major crop, in each area should be defined, including technical parameters (yields and inputs), and the estimated amount of water currently used. The later will be the base for estimating water productivity, its opportunity cost and the water savings under different scenarios. Irrigation costs should be estimated for different areas, size of farm and water source alternatives. Two separate components are to be defined: (i) pumping costs (energy, depreciation of equipment, etc.); and (ii) volume of water used per crop or activity. With alternative policy scenarios, the water demand could shift to areas with renewable water resources and to higher value crops, resulting in an increased KSA agricultural production value and productivity of water on a sustainable basis.

8. **Farm Models.** The analysis at the farm level will allow to assess the impact of the project at the beneficiaries' family income level and by aggregation, at the regional level considering the national interest. In traditional farming, family labor availability should be incorporated to determine the monthly requirements for hired labor not covered by the household members. Self consumed production and typical off-farm income should be estimated, as well as all relevant family expenses in order to analyze social aspects related to traditional agriculture

through shadow pricing. The exercise – using FARMOD[3] software - will allow assessing the current situation of irrigated agriculture, including the costs and benefits (private and social) that are derived from the activities, the present water usage pattern and the transfer of payments between the actors involved. It will also allow for identifying winners and losers of the existing economic framework determined by the prevailing sector policies. Additionally, it will facilitate the analysis of alternative future policy options and their effect over water availability, sustainability and fiscal costs in each scenario.

3. Data collection and Analysis

9. The task will be performed by the WB team with the support of KSA counterparts during the next 3 months, and they will work under an agreed program with the Bank, MOA and MOWE. In this report, detailed activities are presented for the first three months. During the first two months (June and July, 2004), the counterpart team would perform the following activities:

(i) Definition of representative regions (six to eight);
(ii) Definition of representative farm models for the selected regions;
(iii) Visits to the selected regions for data collection in about 35 to 40 farms;
(iv) Preparation of the representative crop and farm models for each region;
(v) Collection of market prices for inputs, products, labor, services, etc.
(vi) Estimation of economic prices for major agricultural products, water, electricity, diesel, main inputs, labor, social discount rates, etc...

10. During the third month, the counterpart's consultant coordinator will work closely and support the mission's activities in building up the models and alternative scenarios using FARMOD software.

11. The counterpart team should include a full time expert in irrigation for three months with background and experience in Agro-economy and/or Engineering with experience in economic analysis. Additionally, two or three short term consultants for data collection will also be required for the first two months. Based on the GIS maps to be provided by the MONRA, the counterpart team will select the representative regions, and with the support of MOA and MOWE, the farm data would be collected at the defined representative farms. During August – the third month - once the data collection is completed, the WB consultant would return to support the modelling exercise using FARMOD, the farm data, and the conversion factors and shadow prices for the economic analysis. The construction of future scenarios for analyzing policy options would then be initiated. Counterparts from the MOA and the coordinator of the local consultants were familiarized with the general features of the FARMOD software and the type of information required for its use as a modelling tool and participated in the initial testing and format adjustment of the questionnaire to be used for the data collection.

[3] FARMOD was developed by the World Bank and FAO for evaluation of agricultural projects. It is also a useful tool for the analysis of alternative policy options.

12. Cost of the Proposed Project

Concept	Estimated Cost (in US$)	Description
Coordinator of the team	60,000	3 Consultant-month
Data collection consultants	60,000	6 consultant-months
Air tickets for visiting regions	7,000	10 trips, $ 700 each
Field Daily Allowances	9,000	13 days @ $500
Miscellaneous	14,000	support expenses
	150,000	

13. **Data Collection.** A draft questionnaire for data collection to be further adjusted and translated into Arabic has been prepared by the WB mission. Some of the information will be difficult to obtain for many farms. However, data collected should give some information to guide the proposed questions and alternative sources of data would be used to have representative estimations for all regions. MOA regional offices would support the data collection process by coordinating with the regional officers to provide technical and logistic support. MOWE and other stakeholders in the field should also be consulted and could help in having most of the information what could be difficult to obtain at the farmers' level.

Annex (2): Terms of Reference

1. National Project Director (NPD)

The National Project Director (NPD) is the executive director of the MOWE project and bears primary responsibility for the successful execution of all project activities. This person is expected to serve full time and shall be fully committed to the day-to-day tactical management of this project. He will manage closely all project work activities and shall be responsible for ensuring that all work remains consistent with project objectives and the project document. The NPD will report to the Steering Committee, and will carry out the following activities in coordination with UNDP and the World Bank.

Technical responsibilities

- provide overall technical leadership for project activities.
- Present/represent the project in high level events, policy discussions, etc
- identify national consultants to be used on the project.
- collaborate with UNDP and WB in evaluating short lists of all international consultants for the project.
- develop plans in coordination with UN DP and WB for all international study tours and training that will use international instructors.

Managerial responsibilities

- recruit and hire all senior staff to be devoted to the project. Review the qualifications of senior staff proposed to lead project activities by organizations outside of MOWE.
- establish regular communication procedures with the leaders of all work groups convened for the project.
- review and approve final TOR for all work activities with the respective work group leaders.
- review and approve all senior staff assignments and national consulting agreements, and to execute work agreements and contracts for all national project professional and administrative personnel.
- monitor all expenditures and ensure the project proceeds in compliance with UNDP budget and accounting guidelines.
- prepare the annual work plan and budget.
- prepare quarterly progress reports to the steering committee and UNDP.
- consult with the project advisors, individually or as a group, on technical matters.

Pre-Qualifications

- The NPD is expected to make a commitment to lead this project for its full term, approximately 1 year, on a full-time basis.
- the NPD must have a minimum of three years experience in a line management position where he has demonstrated the ability to lead teams of professionals from diverse backgrounds in non-routine activities.

Qualifications

- broad technical and management experience in executing new energy strategies and mobilizing collaborative efforts that involve energy end users and professionals who can influence energy use.
- minimum of 10 years experience in water issues, public policy, public communications, promotion of new technologies, and/or national level planning.
- Demonstrated leadership abilities.
- Excellent oral and written communication skills in both Arabic and English.

- Masters or Ph.D. degree in engineering, economics, public policy, or management.
- Demonstrated skill in working with multi-disciplinary teams of engineers, economists, designers technicians, and educators or communications specialists.

Duty Station and Duration

This position will be located in Riyadh at the project office assigned by MOWE and will have a one-yeai full-time term. Travel is expected both within Saudi Arabia and on occasion to international locations foi study tours. The NPD is expected to make a commitment to serve the full term.