

lib

823 YE91

WATER RESOURCES ASSESSMENT YEMEN, PHASE 4

(WRAY-4)

MISSION REPORT

YEMEN OIL AND MINERAL CORPORATION
DIRECTORATE GENERAL OF INTERNATIONAL CO-OPERATION
ROYAL NETHERLANDS EMBASSY AT SANA'A, YEMEN
NOVEMBER 1991

Period : 29 October - 19 November 1991

Purpose of mission : (a) Project supervision
(b) Assistance Marib study

Report prepared for : Yemen Oil and Mineral Corporation (YOMINCO) of
the Ministry of Oil and Mineral Resources,
Sana'a, Yemen;
Directorate General of International Co-operation (DGIS), The Hague, the Netherlands;
Royal Netherlands Embassy at Sana'a, Yemen.

Report prepared by : Jac A.M. van der Gun,
hydrologist/ project supervisor,
TNO Institute of Applied Geoscience, Delft,
The Netherlands.

823-YE91-9176

1 INTRODUCTION

A mission to the WRAY-4 project in the Republic of Yemen was undertaken during the period 29 October - 19 November 1991. The purpose of the mission was twofold:

- (a) project supervision and discussing initiatives for future development of the GDH;
- (b) assisting in the Marib water resources management study.

Given the limited time available and the current priorities in the project's activities, the supervisory activities were somewhat selective. Activities or issues not dealt with or only briefly mentioned in this report will receive more attention during a next mission.

A mission diary is presented in appendix 1.

2 INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT

Personnel of the GDH

The personnel of the General Department of Hydrogeology consists at present of 39 persons. Among these, there are 15 university graduates, 5 technicians with advanced training, 13 ordinary technicians and 6 supporting staff members.

The graduates and the technicians with advanced training are the scientific-technical memory of the General Department. It is of interest to observe that members of this group are relatively steady: 13 of them were already employed during the first phase of the WRAY-programme (1982-1985), and 7 of them joined the GDH during WRAY-2/-3 (1986-1989). On the other hand, only approximately 10 graduates and higher technicians left the GDH since the WRAY-programme started.

Recently, the GDH has employed a number of young technicians, partly to replace older ones who left for another job within the Ministry of Oil and Mineral Resources.

Approach of WRAY-4 's human resources development plan

Preparing a human resources development plan for the GDH was preceded by inventory and planning activities summarized in the following reports:

- (a) Preliminary performance appraisal and human resources survey of the Department of Hydrogeology
- (b) Long-term planning National Water Resources Information Centre of the General Department of Hydrogeology.

Next, a methodology was developed for the human resources plan. It consists of a number of steps, each of them finalized with a file or a report. Inputs by the relevant directors of departments and heads of sections is essential in each of the steps. The components of the plan are the following:

- (a) **Personal histories of all employees of the GDH**
These have been prepared. Because of confidentiality, no report was written but the information is available in the files of the general director of the GDH and the CTA of WRAY-4.

(b) **Staffing plan and job descriptions**

This component is ready as well; a report is available ('Staffing Plan and Job descriptions of the general Department of Hydrogeology'). Appendix 2 shows the organization of the GDH (departments and sections); the already implemented staffing is indicated in appendix 3.

(c) **Individual development plan**

This component is developed on the basis of (a) and (b). It will focus on training events that are to take place during the WRAY-4 project, although -where possible- some attention will be paid to a more long-term outlook as well. Although most of the work has been done and has been discussed already, a report to complete it is not yet available.

Planned training events

During the preparation of the individual development plan, 'training events' were identified that are required to bridge the gap between personal qualifications and job qualifications. Based on this and taking into account the means of the WRAY-4 project, a list of planned human resources development modules was established (see appendix 4). Some of these 'training events' have taken place already.

It should be observed that the training aspects of several ongoing activities of WRAY-4 are not included in the list. In particular, reference should be made to the Marib water resources management study (the approach followed focuses on training of Yemeni counterparts in all steps of the study) and to the preparation of the human resources development plan (the managers involved are trained in aspects of personnel and institutional development).

3 MARIB WATER RESOURCES MANAGEMENT STUDY

Data collection and processing

During the last few months, data collection in the framework of the Marib water resources management was concluded. The last contributions were the reports on:

- (a) the socio-economic survey (subcontract to IWACO);
- (b) land use study based on satellite imagery (subcontract to GeoImage).

With all the data collected, cross-checking was done and minor adjustments or re-interpretations had to be made in case of conflicting information (e.g. on irrigation efficiencies and on hectares cultivated).

Software development and testing

Software development takes place with the assistance of Delft Hydraulics. After real data sets came available, testing of the modelling framework started and successively the need for debugging and for adjustments was inventoried. Many problems were encountered, in particular in the submodel developed to simulate reservoir storage, allocation of irrigation water and agricultural water use. This gave rise to a few months of delay in the study, in spite of continuously long working days of the Marib study team. Because

it became clear that communication problems played an important role in the contact between Yemen and The Netherlands, it was decided that the systems analyst of Delft Hydraulics would spend a second short mission in Yemen. This took place during the present supervision mission; at the moment of departure the outcomes looked satisfactory.

Methodological aspects

Although the methodology of the strategic analysis for regional water resources management in principle was developed in an earlier stage, attention for methodological aspects still was needed later on as well:

- (a) lack of data sometimes forced to define details of the analysis in another way than anticipated (e.g. 'equity criterion');
- (b) the scope of the analysis had to be adjusted a few times in order to keep the activities in tune with time and money available;
- (c) the study is a 'learning process': by carrying it out, the investigators become aware of 'weak' elements in the methodology.

Analysis of strategies

Twelve cases or strategies have been defined for preliminary analysis of water resources management options. Based on the outcomes of the analysis, a few more complex strategies will be developed and analyzed, as the suggested basis for the development of a water resources management policy for the Marib area.

Reporting

The study team has produced already more than two-thirds of the draft report on the Marib study. The missing parts are largely related to the analysis which is not yet concluded. According to the revised planning, a draft report on the Marib Water Resources Management Study will be ready by 5 December 1991. It is important to observe that the Yemeni counterparts involved do an essential part of the reporting.

Cooperation with ERADA

The activities of the Marib water resources management study are carried out in close cooperation with ERADA. This contributes to the progress of the study, smoothes conditions for field work, and promotes a good incorporation of ERADA's points of view in the study approach. To date, the cooperation consists mainly of two elements: periodic discussions and presentation of results (lastly in October 1991) and the full-time involvement of one employee of ERADA in the study. With regard to the latter, some practical problems have emerged related to remuneration and allowances; the project is investigating how to solve these problems.

4 ADJUSTMENT OF THE INPUT OF NETHERLANDS STAFF IN WRAY-4

For the fourth phase of the WRAY-programme the input of Netherlands staff was planned in a very restrictive way, in order to stimulate self-reliance under

the GDH staff. Due to administrative delays, however, both the Netherlands co-manager/CTA (Negenman) and the two associate experts (Kamphuis and Visser) arrived in Sana'a at a later date than anticipated. Furthermore, the continuity and progress of several of the project's activities suffered from the Gulf Crisis at the beginning of 1991. And as indicated above, the Marib study was delayed for a few months because of technical problems.

Because of these factors, adjustment of the input of Netherlands staff members was discussed. This has resulted in extending the contracts of the database expert (Brouwer) and the hydrogeologist (Mrs Gieske) by respectively 4 and 3 months, which was approved by the Royal Netherlands Embassy at Sana'a. The personnel cost related to these extensions is compensated by savings elsewhere in the Netherlands budget.

These adjustments do not yet take into consideration the implications of the unification of the former YAR and PDRY for the tasks of the General Department of Hydrogeology. A proposal in response to this event was preliminarily drafted last year and was updated and detailed during the present mission, as is reported in section 6.

5 DEVELOPMENTS IN THE YEMENI WATER SECTOR

Initiatives of the Ministry of Agriculture and Water Resources

Following the decision of the cabinet after the unification to bring all government agencies related to water under the Ministry of Agriculture and Water Resources (MAWR), this Ministry has in the mean time drafted a Water Law to enable these transfers to take place. The draft Water Law is said to have been submitted to Parliament for approval.

According to Dr Maktari, deputy minister of Water Resources, there will be an 'independent' Authority on Water Resources in the Ministry of Agriculture (like the situation in Saudi Arabia and Tunisia). This Authority will absorb all government agencies involved in studies, regulations, policies, etc regarding water. Implementing agencies (e.g. NWSA) will not be included.

It is not clear whether there has been done anything thusfar to develop within the MAWR at Sana'a already favourable conditions at the operational level (organisational, human resources, budget, etc.) for effectively assuming the new responsibilities regarding water resources.

As a support to the Ministry of Agriculture and Water Resources, the World Bank has drafted a proposal for a 'Land and Water Conservation Project' which includes elements of water resources assessment and management.

Some remarks on the proposed 'Land and Water Conservation Project'

The proposed 'Land and Water Conservation Project' covers four fields:

- (a) technical development in irrigation
- (b) technical development in forestry
- (c) institutional strengthening of MAWR agencies in the water resources sector and forestry
- (d) pilot activities

Reading the document and analyzing it for water-related aspects gives rise to a number of remarks:

- (a) The document mentions several activities that are at present under the responsibility of GDH and/or TS-HWC; e.g. hydrological monitoring and groundwater model studies. It is not made clear whether the LWC project aims for duplication (institutional competition) or assumes that these water-related activities remain under GDH and TS (after bringing them under the MAWR ?).
- (b) The project document is far too optimistic as regards the output of water-related activities: it seems not realistic to expect that in a few years, with limited manpower and in a new organisation an output will be obtained that could not be achieved by the GDH and TS during a much longer period.
- (c) Similarly, the plan is very optimistic on monitoring and control of agricultural water use (1992: implementation for pilot area Amran; 1993: nation-wide implementation). What is meant by control ?
- (d) The document does not pay attention to non-agricultural water use, but suggests at the same time that basin-wide planning (and control) of water resources use will be carried out. How will water allocation problems between different sectors of water use be settled ?
- (e) The economic benefits of the project are calculated on the basis of expected increase of irrigated areas (15%) and increase of yields (5%). Although some remarks are made on environmental impacts and on water conservation, it must be concluded that the proposed intensity of groundwater use is not sustainable. In this respect the words 'Water Conservation' in the title of the project seem misleading.

Other developments

Outside the Ministry of Agriculture and Water Resources, alternatives for the proposed Water Authority of MAWR are being developed; one of these is the proposal prepared by the TS (mr Haddadin). In general, there is a preference for an independent Water Authority, not under the MAWR, but more independent of any water user (e.g. under the Prime Minister, or under the Ministry of Oil and Mineral Resources). It is not clear yet how these proposals are received by the cabinet.

NWSA (Sana'a) and the PWC (Aden) have merged to a new organisation: the National Water and Sanitation Authority.

After the intensive discussions during the first half of 1991 on closer cooperation or even possible integration between TS-HWC and the GDH, very little has been done. It seems that the TS is not motivated at the moment to put any steps in this direction.

Given the persisting institutional confusion in the Water Sector and the obvious differences of opinion between donors (UNDP, WB, The Netherlands) on how to reorganise it, it would be worthwhile to field a broad, multipartite mission (Yemeni agencies and donors) to search for a good institutional bedding for the Yemeni Water Sector.

On request of mr Ali Gaber Alawi, chairman of the Mineral Exploration Authority of MOMR, a proposal for extension of WRAY-4 was drafted by the general director of the GDH (Mohamed Danikh) and the TNO project supervisor. The proposal is attached in appendix 5.

The unification between the former YAR and PDRY (May 1990) has significant implications for nationally operating agencies such as the GDH. In view of its responsibility for water resources data collection, water resources studies and water resources information services on a national scale, it is clear that the GDH has to develop activities to:

- (a) include in the national water resources information centre also the southern provinces of the country;
- (b) coordinate between north and south the man-power available and the methodologies used in water resources investigations;
- (c) carry out water resources studies where they are urgent in the southern territory;
- (d) establish and develop local branches to facilitate the work and the communication with third parties (e.g. for data retrieval services).

To carry out these tasks, additional assistance from The Netherlands is required. After several discussions in Sana'a and in Aden, a two-step approach was developed:

- (a) During an initial period of 18 months, activities are carried out that provide a solid basis for effective cooperation between north and south. Assistance to the GDH during this period is the subject of the proposal prepared (appendix 5).
- (b) A long-term strengthening programme will be required to establish in the southern part of the country an agency to develop capabilities similar to those of the GDH. This agency preferably will be or will become hierarchically linked to the GDH; e.g. in the form of a national agency for water resources with headquarters in Sana'a and branch offices in Aden and Seyun. This long-term strengthening programme needs to be carefully formulated, taking into account the latest developments in the institutional reorganisation of the Water Sector at the level of ministries.

The mentioned proposal was discussed -among others- with mr Ahmed Al Barakat, vice-minister of MOMR, with mr Hisham Al Sharafi, director general international projects of the Ministry of Planning, and with dr A.A. Bartelink, first secretary of the Royal Netherlands Embassy at Sana'a.

MISSION DIARY

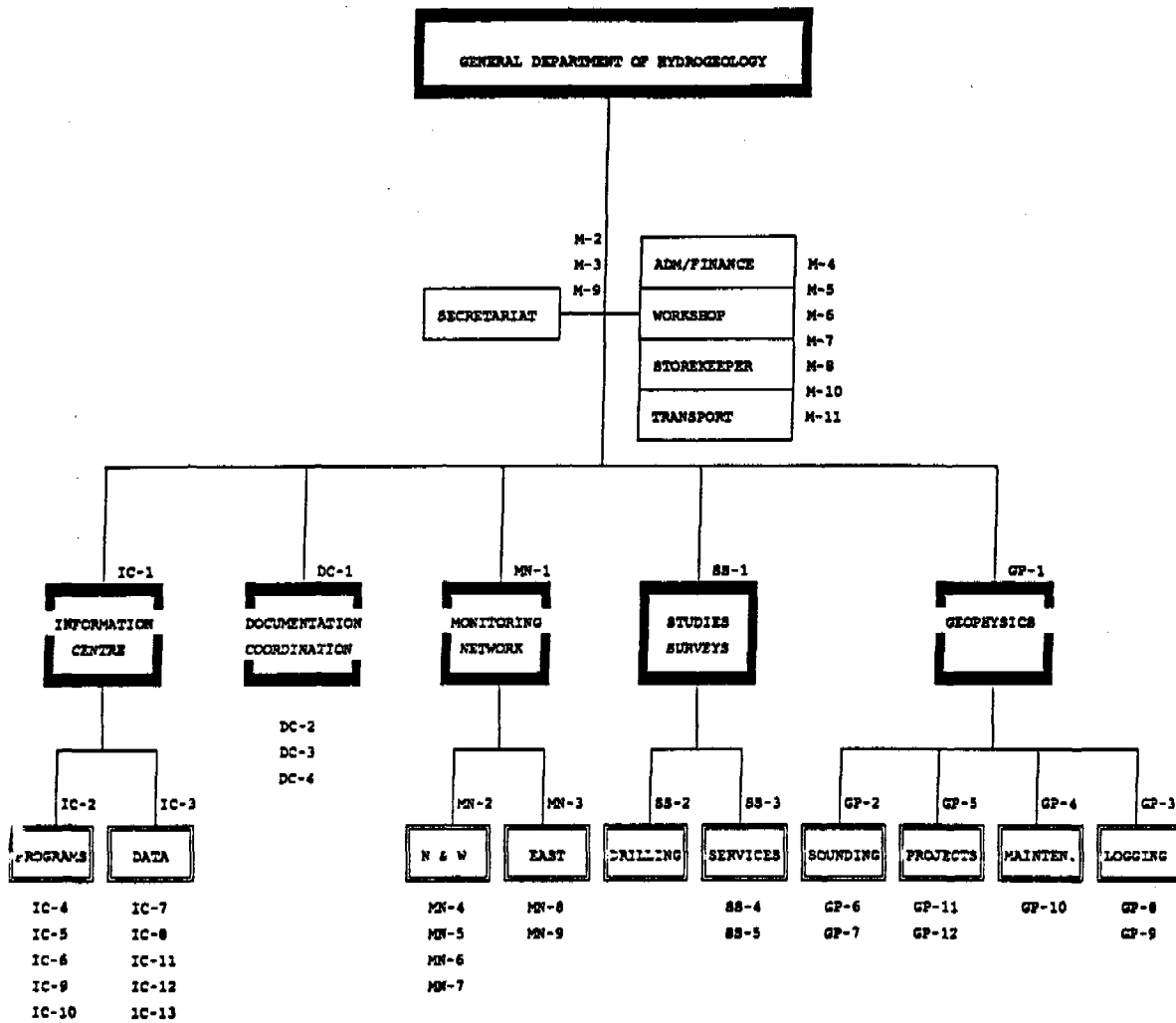
- 29 October Travel Amsterdam - Sana'a.
- 30 October General introductory discussions at the General Department of Hydrogeology (with CTA and Yemeni project manager and several other WRAY-4 team members).
Review of training and human resources development activities (with mr Ton Negenman and MOMR's training advisor mr Jack De Waard).
- 31 October Attending technical meeting Marib study (presented by mr Abdallah Saleh Saif and mr Thabet).
Monitoring progress and current problems in the Marib study and familiarization with the latest version of Marib study software.
- 1 November Friday. Reading technical reports contributing to the Marib study (irrigation, land use and socio-economic reports).
- 2 November Discussion with mr Ton Negenman on current project issues: co-operation with TS-HWC, training, Marib study, activities associate experts.
Discussion with TNO team on technical and organisational problems of the Marib study. Revision of planning and further definition of tasks.
Discussion with mr Mohamed Danikh on possible activities GDH in the southern provinces.
Review details of approach Marib study.
- 3 November Discussion with mr Ali Gaber Alawi, chairman of the Mineral Exploration Board, and mr Othman Ahmed Noman, deputy chairman, on the WRAY-4 project, the GDH and the MEB's aspirations for future activities in the Water Sector.
Meeting with dr A.A. Bartelink, Royal Netherlands Embassy, on WRAY-4 and on SAWAS-3.
Analysis of draft chapters of the Marib report.
- 4 November Discussion with mr Mohamed Danekh on future activity of the GDH in the southern provinces.
Briefing by mr Abdel Assis Ahmed on the organisation and activities of the Monitoring Department.
Discussion of technical problems Marib study. Editing chapter 4 of the Marib report.
- 5 November General Department of Hydrogeology. Briefing by mr Noory Gamal on the Documentation and Coordination Department.
Revision of the WB proposal for a 'Land and Water Conservation Project'.
- 6 November Discussion with dr A.A. Bartelink, Royal Netherlands Embassy, on current WRAY-4 matters.
Discussion with mr M.Nightingale (WB) on the Land and Water

Conservation Project and on MAWR and WB initiatives for the Water Sector in Yemen.

- 7 November Discussions at the GDH on matters concerning the Marib study. Discussion with mr Mohamed Danikh on GDH and the southern provinces. Discussions with mr Han Kamphuis on aspects of the monitoring programme within the GDH.
- 8 November Friday. Editing chapters 4 and 5 of the Marib report.
- 9 November Discussions at the GDH on preliminary strategies to be analyzed in the Marib study, and on other aspects of this study. Discussion with Ali Atrus, director of the Studies Department. Reception at mr Bartelink's residence in honour of the departure of mr J.G. Schouten, first secretary of the Royal Netherlands Embassy.
- 10 November Reviewing and discussing methodological aspects of the Marib study (description and application). Discussions with mr Abdul Latif Hassan, director of the Information Centre. Continuation of editing activities Marib report.
- 11 November Review of reports in the GDH library on the water resources of the southern provinces of Yemen. Discussions with dr Maktari, deputy minister of Water Resources (MAWR), mr Mohamed Danikh and mr Ton Negenman on the Water Sector in Yemen, and in particular on the MAWR's position in institutional matters.
- 12 November Discussions with Marib study team and software specialist mr Chris Sprengers (just arrived) on priorities and approaches in final trouble-shooting and amending the modelling software. Afternoon: departure for Aden (with mr Mohamed Danikh and mr Saleh Alcoal), arrival at night.
- 13 November Aden. Visit to the Geological and Mineral Exploration Authority. Discussions with the Director General, dr Ahmed Sheikh, and with mr Mansoor Jafar, hydrogeologist. Visit to the Public Water Corporation and discussions with its director General mr Khalid M. Bonami. Sight-seeing Aden, among others visit to the ancient water cisterns in Crater.
- 14 November Visit to the Department of Hydrogeology of the Geological and Mineral Exploration Authority. Discussions with its director dr Abdul Mageed on present staffing and activities, and on options for co-operation between Aden and Sana'a. Visit to the Irrigation Department of the Ministry of Agriculture and Water Resources. Discussions with mr Abdul Azzis Mohamed Seif, director general, and mr Mohamed Said, acting director Water Resources. Departure for field trip to Abyan and Schabwa regions; stayed over night at Ataq.

- 15 November Friday. Continuation of field trip : Ataq - Beihan - Harib - Marib and back to Sana'a.
- 16 November Discussions with mr Mohamed Danikh and mr Ton Negenman on proposal for extending WRAY-4.
Draft of proposal.
- 17 November Continuation of drafting proposal for extension of WRAY-4.
Discussions on the proposal at the GDH and with mr Hisham Al Sharafi, director general international projects of the Ministry of Planning.
Discussion with the Marib study team on progress and technical aspects of the Marib study.
- 18 November Discussion with mr Ahmed Al Barakat, vice-minister of Oil and Minerals, on the proposed extension of WRAY-4 and on the creation of a water resources authority in Yemen.
Concluding discussions with dr A.A. Bartelink, Royal Netherlands Embassy.
Discussions with mr G. Bos, The Netherlands' Ambassador at Sana'a, on TNO's activities in Yemen, in particular the WRAY-programme.
Final discussions with WRAY-4 team members.
Farewell dinner with a delegation of the Mineral authority (mr Othman Ahmed Noman and the director of public relations), mr Mohamed Danikh and mr Ton Negenman.
- 19 November Travel Sana'a - Amsterdam.

ORGANISATION OF THE GENERAL DEPARTMENT OF HYDROGEOLOGY



STAFFING OF THE GENERAL DEPARTMENT OF HYDROGEOLOGY

DESCRIPTION	FUNCTION	NAME	JOB CODE
MANAGEMENT	DIRECTOR GENERAL	Mohamed Danikh	M-1
SECRETARIAT	SECRETARY	Fatuma Al-Seyary	M-2
	ASSISTANT	Lutfi Saleh Abd.	M-3
	ASSISTANT	*****	M-9
ADMINISTRATION AND FINANCE	ADMINISTRATOR	*****	M-4
	LOGISTIC OFFICER	*****	M-5
WORKSHOP	MECHANIC 1	Rafiq Abdulk. Saif	M-6
	MECHANIC 2	*****	M-7
STORE	STOREKEEPER	*****	M-8
TRANSPORT	DRIVER 1	Saeed Abdul Wally	M-10
	DRIVER 2	Saleh Al Kohi	M-11

DESCRIPTION	FUNCTION	NAME	JOB CODE
INFORMATION CENTRE	DIRECTOR	Abdul Latif Hassan	IC-1
PROGRAMME SECTION	HEAD OF SECTION	Ali Abdul Kadr	IC-2
	PROGRAMMER 1	Khalil Gubran	IC-4
	PROGRAMMER 2	*****	IC-5
	PROGRAMMER 3	*****	IC-6
DATA SECTION	HEAD OF SECTION	Nabil Abdul Kadr	IC-3
	HYDROGEOLOGIST	*****	IC-7
	HYDROGEOLOGIST	*****	IC-8
	TECHNICIAN 1	Hassan Muthana	IC-9
	TECHNICIAN 2	*****	IC-10
	TYPIST 1	*****	IC-11
	TYPIST 2	*****	IC-12
	TYPIST 3	*****	IC-13

DESCRIPTION	FUNCTION	NAME	JOB CODE
STUDIES AND SURVEYS	DIRECTOR	Ali Atroos	SS-1
HYDROGEOLOGICAL SERVICES	HEAD OF SECTION	Abdallah Saleh	SS-3
	HYDROGEOLOGIST	Ali Kassim	SS-4
	TECHNICIAN 1	*****	SS-5
DRILLING	HEAD OF SECTION	Abdul Rahman Othm	SS-2

DESCRIPTION	FUNCTION	NAME	JOB CODE
GEOPHYSICS	DIRECTOR	Mohamed Assabahi	GP-1
LOCAL SOUNDINGS	HEAD OF SECTION	Abdallah Al-hafd	GP-2
	GEOPHYSICIST 1	Yahya Al Kibsi	GP-6
	TECHNICIAN 1	Abdah Ali	GP-7
WELL LOGGING	HEAD OF SECTION	Mohamed Al Faqi	GP-3
	TECHNICIAN 2	Kennedy Kassim	GP-8
	ASS. TECHNICIAN 1	Al-dahbaly	GP-9
MAINTENANCE	HEAD OF SECTION	Aidroos Ahmed Ali	GP-4
	ASS. TECHNICIAN 2	Al- Hawshabi	GP-10
PROJECTS	HEAD OF SECTION	Khaled Ashehari	GP-5
	TECHNICIAN 3	Feisan Qulam Khade	GP-11
	TECHNICIAN 4	Ihab Ahmed Al Azazi	GP-12

DESCRIPTION	FUNCTION	NAME	JOB CODE
MONITORING DEPARTMENT	DIRECTOR	Abdel Aziz Ahmed	MN-1
SECTION NORTH AND WEST	HEAD OF SECTION	*****	MN-2
	HYDROGEOLOGIST	Abdul Khalek Barak	MN-5
	HYDROGEOLOGIST	Amin Mahjub	MN-4
	TECHNICIAN 1	Mohamed Sharaf	MN-6
	TECHNICIAN 2	Mohamed Nassiri	MN-7
SECTION EAST	HEAD OF SECTION	Ahmed Ali Ashami	MN-3
	TECHNICIAN 3	Fuad Al Kabir	MN-8
	TECHNICIAN 4	Ahmed Abdul Rahib	MN-9

DESCRIPTION	FUNCTION	NAME	JOB CODE
DOCUMENTATION AND COORDINATION	DIRECTOR	Noori Gamal	DC-1
	CARTOGRAPHER	Feisal Hazza	DC-2
	LIBRARIAN	Mohamed Abdul Kad	DC-3
	TECHNICIAN 1	Feghel Abd. Moh.	DC-4

PLANNED HUMAN RESOURCES DEVELOPMENT MODULES. WRAY-4

NO	MODULE	METHOD	INTENSITY	NO. PART.	INST./COACH
1	English	1	3 days/wk	15	Br. Council
2	WP 5.1	1	3 days/wk	10	Sana'a
3	Lotus	1	3 days/wk	10	Sana'a
4	DBase	1	3 days/wk	3	Sana'a
5	General management	1	full time	6	Abroad
6	General management	3			WRAY
7	General management	4			WRAY
8	Organ./instit. devlpmt	1	full time	2	MDF, NL
9	Geophysics (EM/seismics)	1	full time		TNO, Sana'a
10	Geophysics: EM	3			WRAY, Sana'a
11	Geophysics: seismics	3			WRAY, Sana'a
12	Instrumentation	1	full time		TNO, Sana'a
13	Geograph. Info Systems	1	full time		TNO, Sana'a
14	Geograph. Info Systems	3			WRAY, Sana'a
15	Hydrogeology (Intro)	3	full time	3	Abroad/RoY
16	Hydrogeology (Advanced)	2	full time	1	IHE, NL
17	Database management	1			
18	DBMS	3		1	WRAY, Sana'a
19	Systems Management	1		2	
20	Systems management	3			WRAY, Sana'a
21	Training techniques	1		8	
22	Training techniques	3			WRAY, Sana'a
23	Report writing	3			WRAY, Sana'a
24	Data processing	3			GDH, Sana'a
25	Omnidata installation	3			GDH, Sana'a
26	Eprom collection	3			GDH, Sana'a
27	Mainten. mon. equipment	3			GDH, Sana'a
28	Wadi disch. measurement	3			GDH, Sana'a
29	Rating curves	1			WRAY, Sana'a
30	Evapotranspiration	3			WRAY, Sana'a
31	GW contour maps	3			WRAY, Sana'a
32	Isohyet maps	3			WRAY, Sana'a
33	Interpr. pumping tests	3			WRAY, Sana'a
34	Autocad	3			GDH, Sana'a
35	Data archives	3			GDH, Sana'a
36	Secretarial services	1	full time	1	UK
37	Administration/Finance	1	full time	1	Region

Key to 'method': 1 - short courses (2-8 wks); 2 - fellowship (6-12 months);
 3 - on-the-job training (assignment for defined period);
 4 - coaching (during presence of expert).

WATER RESOURCES ASSESSMENT YEMEN, PHASE 4
(WRAY-4)

PROPOSAL FOR THE EXTENSION
OF WRAY - 4

in response to the unification
of the northern and southern parts of Yemen

Prepared for : Ministry of Planning, Republic of Yemen;
Royal Netherlands Embassy, Republic of
Yemen;
Directorate General of International Co-
operation, The Netherlands.

Prepared by : Mohamed Danikh, Director General GDH, MOMR;
Jac A.M. van der Gun, project supervisor,
TNO Institute of Applied Geoscience.

November 1991

SUMMARIZED INFORMATION ON THE PROPOSED EXTENSION OF WRAY-4

OBJECTIVES :

- improving the conditions for successful integration of the hydrologically and hydrogeologically active agencies from the northern and southern provinces of Yemen;
- additional strengthening of the GDH in its endeavours as a nationally operating agency to extend its activities to the southern provinces of The Republic of Yemen.

ACTIVITIES :

- preparation of a summary report on the hydrology and hydrogeology of The Republic of Yemen;
- organization of workshops on hydrological and hydrogeological issues for professionals from the northern and southern provinces;
- training;
- establishing coordination and exchange of information between the GDH and agencies in the southern part of Yemen;
- formulating a programme for water resources assessment in the southern part of the country.

EXECUTING AGENCIES :

- General Department of Hydrogeology of MOMR;
- TNO Institute of Applied Geoscience.

PERSONNEL :

- General Department of Hydrogeology, Sana'a : 4 man-years
- Department of Hydrogeology, Aden : 4 man-years
- TNO (including formulation mission) : 12 man-months
- DGIS (associate experts) : 6 man-months

DURATION OF THE EXTENSION:

- The proposed additional activities will require the WRAY-4 project to be extended by 6 months. It is assumed, however that the activities will be initiated at the beginning of 1992 and be carried out parallel to the ongoing activities of the WRAY-4 project.
- The extended WRAY-4 project will expire on June 30, 1993.

ESTIMATED BUDGETS NEEDED FOR THE EXTENSION :

(complementary to the current budgets for WRAY-4 and the GDH)

- The Republic of Yemen : YR 1.09 million
- The Netherlands : NLG 0.61 million.

1 INTRODUCTION

The General Department of Hydrogeology (GDH) of the Ministry of Oil and Mineral Resources has developed under the WRAY-Programme its capabilities in the fields of water resources investigations and related database development. Main achievements of this WRAY-programme are :

- an operational and capable GDH;
- the studies carried out in the Sadah, Wadi Surdud and Marib areas;
- a freely accessible database on water resources in the country.

These achievements have resulted to a large extent from the efforts done by the Yemeni counterparts in the WRAY-programme.

A fourth phase of the WRAY programme (WRAY-4) started January 1, 1990, for the duration of three years. It was designed as a final phase, with two long-term objectives: self-reliance of the GDH as an institution, and consolidation of the achievements of the previous WRAY-phases.

The General Department of Hydrogeology is an institute with nation-wide responsibilities regarding water resources studies and related data collection. By the time it was established (1978), the national territory was confined to the former Yemen Arab Republic. Accordingly, the national boundaries of the YAR were point of departure in the formulation of the successive WRAY project phases, including the fourth one.

After the unification of the Yemen Arab Republic and the People's Democratic Republic of Yemen, in May 1990, the geographic reference for the GDH's duties became the much larger territory of the new Republic of Yemen. Playing the role of a centralized national hydrological agency, the GDH should not restrict itself to the northern provinces, but has to develop initiatives related to the southern provinces as well. To do this adequately, however, officials of the Ministry of Oil and Mineral Resources consider additional support from The Netherlands highly desirable.

The unification has also triggered plans for reorganization of the Water Sector within the national government. In particular, it is aimed to concentrate the agencies involved in water resources studies and data collection, e.g. under a new 'water authority'. Institutional aspects are still under discussion and it still may take some time before such a new organization for national water resources studies be effective. It is hoped that the unique value of the GDH is taken into account, by preserving integrally its technical and operational capabilities, whatever its institutional setting in the future will be. Depending on the outcomes of this reorganization, the needs for external support may be assessed in due time.

In the mean time, however, it is appropriate to initiate on the short term already some activities that prepare for an integrated functioning at a national level in the future. A few of these are already being undertaken, such as visits to agencies and water projects in the southern part and exchanging information with them (reports, maps, data).

In addition, it is proposed to widen the scope of the WRAY-4 project and to extend its duration slightly to enable the GDH to make a few other very significant steps. A preliminary proposal for such an additional support to the GDH was submitted to Yemeni-Netherlands Bilateral Consultations Meeting of November 1990. The agreed minutes of that meeting mention that this proposal would be considered by the Netherlands mission fielded to advise on potential involvement of The Netherlands in the southern part of the country. This mission commented positively on it. The present document is an updated and more detailed version of the earlier preliminary proposal.

2 OBJECTIVES

- (1) Improving the conditions for successful integration of hydrologically and hydrogeologically active agencies from the northern and southern parts of The Republic of Yemen.
- (2) In particular, support the GDH in its endeavours as a nationally operating agency to extend its activities to the southern provinces of The Republic of Yemen.

It should be noted that these objectives are a logical extension of the long-term objectives of the ongoing WRAY-4 project. Furthermore, the benefits of meeting these objectives will remain effective also if it would be decided to transfer the GDH to another ministry or organization.

3 ACTIVITIES

3.1 Preparation of a summary report on the hydrology and hydrogeology of The Republic of Yemen.

A summary report on the hydrology and hydrogeology of the former Yemen Arab Republic was prepared already in 1984. The report -of which several hundreds of copies were distributed over the past seven years- describes the water resources of the country in a national context and gives an overview of studies done and information available at the time of writing it. It proved to be very helpful to Yemeni and expatriate professionals to develop their knowledge on the surface water and groundwater resources of the YAR, to locate sources of information for problems that require more regional or local detail, and to detect patterns and

trends that may give guidance for adequate development and management of the water resources.

For the southern provinces of the country no similar report does exist. Reports on several regional studies are available, hydrogeological maps are in preparation, and scattered data on surface water and groundwater may be located in different offices, but the lack of unified compilation results in a rather difficult access to available information.

The activity envisaged will produce a summary report on the hydrology and hydrogeology of the entire territory of the Republic of Yemen. For the southern part of the country it means that a first compilation of information will be made and incorporated in the report, for the northern part of the country the information presented in 1984 will be thoroughly updated. In this way a complete and up-to-date reference work on surface water and groundwater resources of the Republic of Yemen will be produced, which will benefit the entire Water Sector.

3.2 Organization of workshops

A number of informal workshops will be organized in Sana'a and Aden (and other cities if this seems useful). These workshops are intended for professionals from the northern and southern provinces to discuss together important hydrological and hydrogeological issues.

The objectives are that hydro(geo)logists from north and south should learn from each other's experiences, that opportunities for cooperation will be identified, and that a certain degree of uniformity concerning methods and equipment will be achieved. All this may promote a smooth coordination or perhaps even integration in the near future. Although the GDH at Sana'a and its 'sister' organization in Aden (the Mineral Authority's Department of Hydrogeology) are the organisers of these workshops, also colleagues from other organizations will be invited to attend.

Each workshop may take a few days and be attended by some 15 to 30 participants. Proposed subjects are the following:

(a) Hydrological networks

This workshop will discuss objectives and approaches in groundwater and surface water monitoring, design of networks, monitoring equipment, network operation, data processing and use of the data. Particular attention should be paid to standardization. If possible, existing networks will be inventoried and evaluated, and major difficulties identified.

(b) Databases for hydrological and hydrogeological information

Objective of different types of databases (public or

internal, national/ regional or local, etc.) in relation to design and organization. Hardware- and software for database centres. Staffing and operation. Acquisition of data from other agencies. Data entry, data processing, quality control, retrieval services and publicity.

(c) Regional water resources studies

On the basis of studies carried out in the northern and in the southern provinces, discussion of objectives (reconnaissance, assessment, design, water resources management), techniques, outcomes, presentation, etc.

(d) Hydrogeological maps

The hydrogeological map of the southern part of Yemen (1:500,000), prepared by a USSR team, and the hydrogeological maps of the Republic of Yemen (1:250,000 and 1:1,000,000), prepared by Robertson Ltd. are expected to be concluded end of 1991 or beginning of 1992. The former one will be discussed in draft form with the Department of Hydrogeology (MOMR) in Aden, the latter one will be delivered in final printing.

The workshop will pay attention to these maps and their significance for groundwater resources development and management in Yemen. The option to combine the workshop with the presentation of one of the maps should be considered.

3.3 Training

The current operational capabilities of the General Department of Hydrogeology allow to provide useful on-the-job training to colleagues of the Department of Hydrogeology at Aden. In principle, both departments are in favour of an arrangement to have hydrogeologists from Aden stationed for a certain period in Sana'a in order to make them familiar with ongoing activities in the GDH. This may include activities such as regional studies, hydrological network operation and database activities. Within the remaining period of WRAY-4 (including extension), this on-the-job training is assumed to cover a total of 12 man-months of stay at Sana'a of southern hydrogeologists.

It goes without saying that the activities described under 3.1 and 3.2 are also highly effective from the training point of view. They provide excellent opportunities for professionals from north and south to develop their professional level and experience. Hence, the planning and monitoring of these activities should pay particular attention to on-the-job training.

3.4 Establishing coordination and exchange of information between the GDH and agencies in the southern part of Yemen

The GDH has established networks of coordination and data exchange with agencies active in the Water Sector in the northern

part of the country. Although there is still scope for further improvement, important achievements have been made, e.g. in the field of database development, standardization of software and measuring equipment used, services provided and information exchanged.

It is envisaged to develop similar relations in the southern part of the country, in particular to promote the efficient and consistent collection, storage and retrieval of information on water resources of the entire territory of Yemen.

3.5 Formulating a water resources assessment programme for the southern provinces

Compared to the northern provinces, the water resources of many regions of the southern part of the country are relatively unexplored. For instance, the groundwater potential of the vast areas of Tertiary and Mesozoic sediments in the east (provinces of Schabwa, Hadramawt and Al Maharah) is still largely unknown. Declining groundwater levels elsewhere (Wadi Tuban and Abyan delta) call for attention in order to preserve the vital resource. In other regions lack of water exists, but the regional water resources are insufficiently explored and monitored to find satisfactory solutions for urgent water needs.

Many hydrogeologists and water engineers in charge of siting water abstractions and supervising implementation works are active in the southern part of the country. But a programme for systematic water resources assessment, including centralized data collection and a publicly accessible data base, is still missing. Given the scarcity of water and the role water is playing also in this part of the country, initiating a water resources assessment programme is considered to be extremely important. For this reason, the extension of the WRAY-4 project includes the formulation of a water resources assessment project for the southern provinces by a joint Yemeni-Netherlands mission.

A suggested approach for such a project or programme, based on the analysis of reports and on discussions in Sana'a and Aden, is presented in appendix 1.

4 MEANS TO BE MADE AVAILABLE

An estimate of the means required for the execution of the activities mentioned above is presented in table 1. It assumes the availability of cars, equipment, facilities and overall management support which is already there in the present WRAY-4 project. Budget estimates are presented in appendix 2.

Table 1 : Summary of the means to be made available

	assigned to activity					TOT
	3.1	3.2	3.3	3.4	3.5	
YEMENI CONTRIBUTION						
Personnel (man-months)						
GDH hydro(geo)logists	33	10	2	2	1	48
DH hydro(geo)logists	33	2	12	-	1	48
Per diem (days)	20	20	-	20	20	80
Travel expenses	p.m	p.m	p.m	p.m	p.m	p.m
Office accommodation	p.m	p.m	p.m	p.m	p.m	p.m
NETHERLANDS CONTRIBUTION						
Personnel (man-months)						
TNO hydro(geo)logists	6	3	1	1	-	11
DGIS associate experts	-	2	2	2	-	6
NL proj.form.expert(s)	-	-	-	-	1	1
Travel cost & allowances	p.m	p.m	p.m	p.m	p.m	p.m
Computers (number)	2	-	-	-	-	2
Report costs	p.m	p.m	-	-	p.m	p.m
Operational cost	p.m	p.m	p.m	p.m	p.m	p.m
Allowances Aden fellows	-	-	p.m	-	-	p.m

5 EXPECTED OUTPUTS AND BENEFITS

Main measurable outputs will be :

- (a) An up-to-date summary report on the hydrology and hydrogeology of the Republic of Yemen;
- (b) Reports on the workshops held;
- (c) Update of the GDH's information centre with data and reports on water resources of the southern provinces;
- (d) A project formulation document for a water resources assessment programme in the southern part of the country.

Together with these outputs, less tangible but important benefits for water resources development and management in the Republic of Yemen will be produced. The activities envisaged will enhance the knowledge of the country's water resources; very interesting on-the-job training opportunities for hydrogeologists from the northern and southern part of the country will be provided; and - last but not least- a favourable climate is expected to develop for efficient assessment and documentation of the water resources of the entire country. The latter is indispensable for a good utilization and management of the vital resource water.

**DRAFT OUTLINE OF
A SYSTEMATIC WATER RESOURCES ASSESSMENT PROGRAMME
FOR THE SOUTHERN PART OF THE REPUBLIC OF YEMEN**

NAME: Water Resources Assessment Southern Provinces (WRASP)

FORM: Cooperation programme between The Republic of Yemen
and The Kingdom of The Netherlands

EXECUTING PARTNERS:

- * Department of Hydrogeology, Aden
- * General Department of Hydrogeology, Sana'a
- * Netherlands consultant to be nominated (e.g. TNO)

OBJECTIVES:

- * Improving the national institutional infrastructure with regard to water resources studies and data collection, by supporting the GDH to establish regional branches in the southern provinces.
- * Initiating and carrying out a systematic programme of water resources studies and data collection in the southern part of the Republic of Yemen, to promote adequate water resources management in this region.

DURATION, APPROACH AND PHASING:

- * By analogy of the WRAY programme in the northern part of the Republic of Yemen, it is expected that the objectives can only be met in a programme of relatively long duration (approximately 10 years). The input required from The Netherlands will be in the order of 20 - 25 millions of guilders.
- * The first phase (three years) will focus on the cooperation with the Department of Hydrogeology (DH) of the Mineral Exploration Authority at Aden. Experienced professionals and technicians of the GDH may be transferred temporarily or permanently to Aden - where the project is based- in order to contribute to a efficient development of the DH.
- * Depending on the experiences obtained during the first phase and on the geography of activities that deserve priority, establishing a second branch (e.g. in Seyun) may be considered for subsequent phases, parallel to continuing support to the Aden branch.

MAIN ACTIVITIES OF THE FIRST PHASE:

- * Human resources and institutional development
- * Regional water resources study (assessment or management study) of a selected area
- * Establishing a water resources database linked to the centralized database of the GDH at Sana'a
- * Hydrological network activities in selected areas.

REMARKS:

- * Water is one of the main 'fuels' for development. Increasing water demands and water resources development require planning and control based on complete, reliable and up-to-date information on the water resources.
- * Institutional reorganization in the Water Sector in Yemen is in progress. At the time of project formulation, the practicalities of the project should be adjusted to the status-quo in this respect. The basic concept, however, seems largely independent of the institutional setting.
- * During the formulation it should also be investigated to what extent additional adjustments of the WRAY-4 phase may be required to promote a smooth transition from the WRAY programme to the WRASP programme.

BUDGET ESTIMATESA. **YEMENI CONTRIBUTION :**

Personnel costs:	GDH:	KYR	480
	DH :	KYR	480
Allowances:	GDH:	KYR	32
	DH :	KYR	16
Operational cost & travel:	GDH:	KYR	54
	DH :	KYR	27
Total:			KYR 1,090

B. **NETHERLANDS CONTRIBUTION:**

211 Personnel costs			
211.4 The Netherlands		KNLG	45
211.5 Yemen - short missions		KNLG	137
211.6 Yemen - residents		KNLG	128
212/213/215 Allowances, travel, living		KNLG	104
216 Report costs		KNLG	20
400 Equipment		KNLG	20
500 Operational cost (incl.workshops)		KNLG	37
600 Training costs (on-the-job)		KNLG	42
- Formulation mission		KNLG	47
- Contingencies		KNLG	30
TOTAL		KNLG	610