Annexe E Sociology and Institutional Development

# Annexe E Sociology and Institutional Development

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## Table

 Table
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 Organizational Capacity (F/S Area)

# Figure

Figure E.3.1 Problem Tree

## E.1 Socio-economic survey

## E.1.1 Introduction

(1) Objectives of socio-economic survey

The objectives of socio-economic survey, in this context, are:

- To understand the present condition of socio-economy and agricultural activity in the communities using water from Khettara in Tafilalet area, and
- To identify problems and needs of the communities for agriculture and rural development.

### (2) Survey Area

The survey area is the communities using water from Khettara in Tafilalet area shown in the table below.

Zone	Province	Rural Commune	No. of Khettara	No. of Community (with irrigated area using Khettara water)	Irrigated Area (ha)	Population
Α	Errachidia	Mellab, F. Soufli, Ferkia oulia, Assoul, Ait hani, Amellago, Tadighouste, Ghris soufli, Aghbalou,	71	60	1,460	31,543
В	Figuig	Beni-Tadjit, Bouanane, Chouater	16	12	435	7,520
С	Errachidia	Municipality of Boudnib	8	8	367	5,221
D	Errachidia	Fezna, Jorf, A.S. Gheris,	59	19	4,342	34,880
Е	Errachidia	A.S. Ziz, Sifa	25	2	538	5,110
F	Errachidia	Beni-M'hamed, Sfalat, Rissani, Taouz	33	18	2,193	20,345
G	Errachidia	M'Cissi, Alnif, Hsia	96	61	3,412	30,750
		Total	308	180	12,747	135,369

#### Survey Area

#### (3) Methodology

The socio-economic survey consists of four (4) components, as mentioned below.

- Collection of existing information/data on socio-economic condition and agriculture activity
- Collection of additional information/data by carrying out interview and questionnaire surveys
- Compilation and analysis of information/data, and
- Preparation of survey reports.

#### E.1.2 Fact Findings

The main findings of the socioeconomic study regarding the situation under review are made by adopting the systemic approach with holistic reasoning. The whole set of elements making up the Khettara-Community system was taken into account, as well as the components which influence and make part of the natural, institutional and socioeconomic environment.

(1) Khettaras

Regarding the key element which is the khettara, the following conclusions are underlined :

- Khettaras have been increasingly deteriorated at a considerable pace for the last decade and most adults still remember several khettaras that have dried up now. This deterioration process was confirmed by the follow-up data of the ORMVA/TF which underline that the total number of khettaras in the zone stands at 570 khettaras (2,900 km), of which only 250 are now operational. This means therefore that more than 50% of khettaras no longer function.
- The khettaras which are still operating have an average flow rate of 6 l/s, a length of 4 km and about 200 wells, irrigating some forty ha and providing a living to a hundred households.
- The major problems facing khettaras are the <u>decreasing water volume</u>, <u>upkeep and landslides</u> in the galleries.
- <u>The upkeep of a khettara requires about fifteen workers per day</u> and hence large costs of about DH 300,000/year or DH 1.50/m<sup>3</sup>; a cost that the populations can no longer bear. Despite the use of supplementary irrigation using small motor pumps, the deficit remains high.
- The causes of the khettaras decline are multiple. As there are no scientific data drawn from specific research and in waiting for the results and confirmations under the present project, the same questions may be asked :
  - Is it the result of the negative effects of large dams construction which limited floods, reducing thus water sheet reloading ?
  - Is it the direct effects of the multiplication of pumping stations ?
  - Is it the temporary effects of drought ?
  - Is it a natural trend of the piezometric level drop in the watersheet ?
  - Is it the types and nature of water resources which are potentially limited and over-exploited ?
  - Does the lack of khettara upkeep and maintenance contribute to the water volume decline, because of the lack of qualified labor, the situation of neglect and the excessively high upkeep and restoration costs ?
- Water depth which used to amount to less than 6 meters exceeds 20 meters now. This is the cause of the drying of khettaras which are fed by the intermediary level.

- The rehabilitation of old oases has become a must due to both their socioeconomic role and their environmental and strategic function in fighting :
  - poverty
  - marginalization
  - migration
  - illegal emigration
  - sand silting
  - desertification
- (2) Experience in khettara rehabilitation

According to the SWOT method (Strengths, Weaknesses, Opportunities & Threats Analysis), we have studied the rehabilitation experiences of some khettaras in the zone, using the participatory evaluation approach.

According to this evaluation, the first lessons must be drawn in order to avoid past errors. To this end, it is necessary to :

- Involve the populations as early as the first stage of design, in addition to implementation and upkeep;
- Design mobile elements with a bottom shaped like a reversed "U", so as to enable their adjustment according to the lowering of the khettara water flow;
- Enlarge the sizes of galleries to enable the passage and movements of workers during cleaning and upkeep operations;
- Have the association of agricultural water users organized at a size and a basic scale that matches exactly the zone of the area irrigated by each khettara separately. This is useful in that it makes it possible to secure the commitment, involvement and participation of a homogeneous group with a shared interest around their khettara, rather than one or two representatives per khettara gathered since the beginning with other foreign members ...
- (3) Population

The population may be characterized by the three following features :

- Berber-speaking populations in two-thirds of cases and Arabic-speaking population mainly in plains. In general, the former have tribe names starting with "*Ait*..." (folk of...), while the names of the latter's tribes start with the prefix "*Oulad*..." (Sons of ...).
- Populations pertaining to various ethnic origins, namely :
  - The Amazigh or the tribes of the ancient nomads and warriors: Aït Atta; Aït Marghad; Aït H'diddou;...

- The Arab tribes: Arab Sabbah ;...Oulad Ghanam ; Oulad H'ssine ;... (Residents of oases and sedentary farmers) ;
- Chorfa ; Mourabitine ;... (Religious) ;
- Jews; (traders and craftsmen);
- Negroes; *Hartani* or former slaves who constituted the main work force during the digging and upkeep of khettaras.
- The *douar* as a social unit representing either the lineage or extended family, or meaning the name of a locality that is less significant than the *ksar* which is the housing unit or agglomeration of gathered houses. Besides, there are other important units, such as the irrigated perimeter which may coincide with the name of the khettara or not. It is worth recalling that there may be various situations : a *ksar* possessing several khettaras and several perimeters; one perimeter with several khettaras and several *ksars*, and one khettara with several perimeters that may belong to several *ksars*...

The majority of heads of agricultural holdings are aged above 50. Two thirds of them are illiterate and one third practice a related activity or a mixture of activities.

Most unschooled young boys (2 to 3 per family) leave their community and go to a city for a short duration to seek a seasonal job opportunity. One of ten of them emigrates to a foreign country.

Agricultural work and khettara upkeep is unvalued by the youth who see their future rivaled by other systems such as pumping stations which are affordable for families who benefit by remittances from their relatives abroad. They are more interested in working in other cities of Morocco. The same applies to school because of unemployment among degree holders.

The population explosion was confirmed by the official statistics (see annexes). The survey and the participatory diagnoses revealed that even with rural migration, these regions witness an accelerated population growth. The improvement of health conditions have reduced child mortality, while the birth rate is maintained at levels which exceed the national average (0.3%). Accordingly, nomad and semi-nomad populations are increasingly settling, often near oasis agglomerations.

(4) Organization, water rights & khettara management

The traditional management system of khettaras, formerly well-established through customary laws refereed to as « water rights », provided for the distribution of the obligations to supply services.

Those entitled to or owners of the khettara water are the co-inheritors or descendants of the families who have dug the khettara initially and whose share of water corresponds to the share of participation to the works, depending on the size of labor involved. Others have acquired water rights by purchasing or renting them.

The management of this irrigation water is carried out by referring to the customary law (*orf*) of which the main principles remain similar all over the zone but which show some specific features from a locality to another.

The basic share is the *nouba* or turn which amounts to 12 or 24 hours. Each lineage is owner of a certain number of turns depending on their significance and their wealth, especially the number of working arms.

Within the turn and among the co-inheritors and acquirers of water rights by purchase or rent, water is distributed into a number of hours which generally represents a multiple of 3 hours called *tagourte* in Berber or « water hand ».

The organization and management of irrigation and upkeep works are the tasks vested with the committee made up of four members called *m'zarig* and chaired by the *cheikh* of the khettara (leader) who holds this position for one year in general. Each basic lineage is represented by a member. A water guardian supervises the distribution of the water turns : the beginning, the end, the duration and the succession in the use of water for irrigation.

The participation to upkeep works is distributed according to the significance of water hours possessed by each owner of the khettara water. It is made in kind by contributing a number of « arms » to the works and by providing a weekly money contribution.

This law and organization is respected by the parties involved under the supervision of the khettara leader (*cheikh*). Any violation or breach is redressed by a penalty determined according to the extent of the breach (*n'zoul* or *n'saf* meaning « sentence » or « justice »).

Khettaras are more than just a technique for water acquisition. Their importance is social, cultural and economic, all at the same time. The *ksar* populations grant a sacred value to khettaras, comparable to that of koranic schools, religious brotherhoods and mosques. The destruction of a khettara or profanation is unacceptable.

Social relations are heavily marked by the relations with this resource : water owners, non-owners and users. The economic role of khettaras is a vital one.

The distribution of khettara water is subject to a number of traditions and customary laws. It is sold and bought. It is subject to accurate and delicate measures entrusted with specialists (*keyyal el-ma, el hassab, chouhoud* [respectively water harvester, appraiser, witnesses]). It has its own instruments, measurement units and archives (*zemam el Khttatiter*). Vocabulary is rich with technical, legal and agronomic terms related to khettaras. All this socio-cultural heritage, subject to the pride of oasis societies, is disappearing along with the technique of khettaras.

This technique is indeed efficient but its social cost is a high one. It is based on the exploitation of a servile and hard labor. It is also fragile : landslides, harms caused by floods, the decrease in water volume... The system of water allotment is very complex and causes losses in the network. Water is very coveted and causes conflicts.

## (5) Land ownership patterns

The most important land ownership pattern is the *melk*. This status which originates from the Moslem law corresponds to the private property in Roman law with only the two first levels which are *fructus*, *usus* but not the third one *abusus*. This means that the owner posses the right of use, selling and inheritance but can never abuse, i.e. not to destroy the resource of which the true owner is God while man is only the person who should look after its good exploitation and sustainability, its reproduction and development in general.

Land plots irrigated with lasting waters have generally the *melk* status. Water can be associated or the property may be separated from the land ownership, as well as the ownership of palm trees.

The registration of the *melk* rights is traditionally carried out in documents by a notary of Moslem law or recognized and preserved according to the customary law with an oral deed based on the testimony of twelve men.

The lands which are not irrigated in a perennial way but only through floods spreading two to three times per season are generally part of collective lands depending on the work capacity of each household.

Owned irrigated and exploited lands amount to an average of 0.8 ha with a margin that ranges from a few square meters to some hectares. The non-irrigated area may be two to three times larger.

(6) Agriculture production system

Diagram of the pattern of a typical holding with the main flows



### (7) Marketing and supplies purchasing

The three main functions of the market which are marketing, procurement and employment show a malfunction which hampers any economic dynamics. Among the main constraints identified during the study, it is worth mentioning the following :

- Difficulties of access and land locking ;
- Lack of transportation means ;
- Lack of organization of producers/sellers ;
- Negligence with respect to quality ;
- Lack of packaging and storage facilities ;
- Lack of capital ;
- Lack of opportunities and dynamics ;
- Low level of promoting local and regional specific features (biological agriculture; agritourism; label; fairs; exhibitions; advertisement campaign; information; social mobilization;...)

### E.1.3 Recommendations

- Working out priority eligibility criteria for khettara rehabilitation by integrating socioeconomic criteria, based on the indicators of the situation described under the present study. Among such criteria, it is worth mentioning the following :
  - The significance of water volume evolution ;
  - The size of the area irrigated by the waters of khettaras essentially ;
  - The number of beneficiaries of the khettara waters ;
  - The use of khettara waters, besides irrigation, for purposes of human and animal drinking ;
  - The non existence of other irrigation systems ;
  - The dynamism and operation of traditional irrigation management organizations ;
  - The willingness to contribute to the costs : investment and rehabilitation works ;
  - The willingness to set up water users associations locally and networks thereof regionally ;
  - The commitment and involvement for upkeep, the handling of management of the implemented works and equipments.
- Integrating other community development and supportive measures in order to succeed the revitalization of the community life around the rehabilitation of khettaras, through the following :

- Actions regarding women's development by attempting to meet their needs and practical problems with the view to improve their material conditions, especially the promotion of activities likely to better their socioeconomic situation through empowerment;
- Integrating other categories of people who do not benefit directly from khettara waters but who have other interests related to the development of community life, such as the category of young unemployed people. Other measures in this respect may include the setting up of associations, the training of youth, access to micro-credit for the promotion of other production activities, para-agricultural trade and agritourism (cooperatives for the genetic improvement of the *Daman* sheep species, bee-keeping cooperatives, cottage industry cooperatives, self-catering cottages in oases, cooperatives for inputs procurement, product packaging cooperatives, transportation cooperatives, equipment maintenance cooperatives, rural facilitation and assistance cooperatives, literacy, agro-industrial sub-contracting for oil, mills, textile...).
- Regarding the facilities and khettara rehabilitation, it is advisable to take into account the failures and successes of previous experiences and to draw lessons by :
  - Involving the population in the early stages of problems identification, using the participatory diagnosis approach;
  - Promoting the water users associations per khettara and subsequently encouraging the networking of such associations into a regional federation;
  - Taking into account, regarding development works, the size of galleries needed for upkeep works and the possibility of adjusting to change and lowering the level from upstream toward downstream;
  - Setting up groups of young people and promoting qualified work in the area of khettara upkeep, as well as subsidized enterprises for related works such as digging, construction of wells, cleaning, coating of seguias...
- Concerning the institutional framework and water rights, customary laws must be reviewed and negotiations should be supported by involving and mobilizing officials and representatives as valid interlocutors for the amendment of the said laws and rights governing the exploitation and management of khettara waters and their environment :
  - Negotiate and manage conflicts arising between neighboring communities in order to consider the possibility of digging wells at the lateral level and upstream;
  - Ban the digging of boreholes and pumping stations within the feeding and drainage area of khettaras (locally, it is admitted that the influence radius be about 50 to 100 meters, but studies in Algeria have proved that the influence aureole has a radius of about 500 m;

Harmonize the deepening of wells located within the same zone of influence in order to avoid the race to deepening which may cause the drainage of the neighboring khettaras water (see the case of the Siffa

khettara).

## E.2 Rapid Rural Appraisal (RRA)

## E.2.1 Introduction

(1) Objective

The objective of RRA is to understand actual life style and social system in a village using Khettara. Main issues be observed are as follows.

- Daily life of people and seasonal change
- Movement of people
- Main actors in a village and their relations
- Gender difference
- (2) Method

RRA is a survey method which is applied to collect general information on life style of people and also social system in a village (usually in a short time period). The priority is given to observe reality of people rather than collect detailed data or information. It is composed of several different tools including interviews and group works (drawing chart, diagram, etc.). Several tools are selected and used according to the survey objectives.

- (3) Tools (Group works by male and female)
  - (i) Daily Routine Chart and Seasonal Calendar
    - Draw chart of typical daily schedule of people (male and female)

Observe daily life cycle and difference in gender

- Draw chart of typical one year schedule of people (male and female)

Observe important events and yearly cycle, difference in gender

- (ii) Mobilization Map
  - Draw diagram showing places where people go, and also distance between places, transportation means and frequency of visit (male and female)

Observe people 's movement in daily life, difference in gender

- (iii) Venn Diagram
  - Draw diagram showing main actors in a village and their relations

Identify main actors (organization, association, cooperative and leader of any other community groups)

- (iv) Discussion with participants with using above mentioned outputs
  - Different roles by gender
  - Decision making process (in a village and at home)
- (4) Place

Kssar : Tizougaghine - Commune rurale : Ferkla Essouflia

### E.2.2 Fact Findings

Following gender difference is observed in the outputs (Daily Routine, Seasonal Calendar, Mobilization Map) of RRA in Tizougaghine Village.

- (1) Daily Routine
  - Men are mainly engaged in agriculture works and livestock feeding
  - Women are engaged in various works including preparation of meals, cleaning of house, laundry, drawing water, collecting of firewood, adult education etc., and burden of agriculture work is less than that of men.
- (2) Seasonal Calendar
  - Women made very simple Seasonal Calendar concerning agriculture activity and festival as important events.
  - Men made Seasonal Calendar with more activities such as maintenance work of khettara, seasonal work in a big city and schooling.
  - Women also pointed out that wool spinning is one of the important activity in summer.
- (3) Mobilization Map
  - Biggest difference between men and women in Mobilization Map is seasonal work in big city for men.
  - Both men and women go to town nearby (Tinejdad) for souk, post office, hospital, etc., but frequency of visit is less for women since women usually need permission from her husband to go out and visit town.
  - Men draw school in Tinejdad but women did not include this on the map. According to a hearing at primary school in a village, no women go to secondary school in Tinejdad because of the far distance.
- (4) Other information obtained by interview to women
  - Women can only go out from home when husband allows.
  - Parents usually decide husband for daughter and daughter cannot make any objection.

- Only men have a right to use money.

Women usually think present condition is a little sad but basically accept it, since it is the tradition and normal in the village.

## E.3 Project Cycle Management (PCM) Workshop

#### E.3.1 Introduction

In cooperation with ORMVA/TF, JICA Study Team held Project Cycle Management (PCM) seminar and workshop in order to facilitate understanding on the technique.

#### (1) What is PCM?

PCM (Project Cycle Management) is a project management method developed by USAID (U.S.A), GTZ (German) and FASID (Japan). It is composed with three component, "Participatory Planning", "Implementation", and "Evaluation".

PCM uses Project Design Matrix (PDM) as a core tool for continuous project management.



(2) Participants for the seminar and workshop

Counter part of JICA Study Team:

Mr. Mohammed HARRAS, Mr. Hssain RAHAOUI, Mr. Moulay Lhssan SOSSEY, Mr. Mohamed SAADA, Ms. Bouchra MOUMEN, Mr. Hassan MAAROUF, Mr. Abdeslam KHARDI, Mr. Ali OUBERHOU, Ms. Zahra AIT BELLA, Mr. Brahim AAKOUB.

#### **E.3.2** Presentation Material

See Databook (PowerPoint file).

#### E.3.3 Workshop Outputs

Participants discussed and prepared "Problem Tree" on Khettara village as an output of the workshop. Problem Tree prepared by participants is attached hereinafter (*See Figure E.3.1*).

## E.4 Institutional Development/ Organizational Strengthening (ID/OS)

#### E.4.1 Introduction

The ID/OS workshop was organized on 19-20 February 2004, with the participation of 15 members of

ORMVA/TF<sup>1</sup> and 4 members of JICA Study Team. The objectives of the workshop were:

- 1. To share the know-how of the ID/OS method,
- 2. To apply the method in the participative way to analyse the master plan:
  - The external factors and institutions other than ORMVA/TF, which play an important role for the implementation of the master plan (ID)
  - The organizational capacity of ORMVA/TF to implement the master plan (OS)

The explanation of the consecutive parts of method and discussions were done in the plenary sessions; participants worked in 2 groups of 7 people to apply the method.

The workshop included four parts, as follows:



#### E.4.2 Results – contents & basic findings

#### I – Basic question

The method and its basic concepts were explained:

The «Institutional Development/ Organizational Strengthening » is a method for analysing the organizations in the context of their operations.

The working definition of <u>institutional development</u> is: the creation or reinforcement of a network of organizations to effectively generate, allocate and use human, material and financial resources to attain specific objectives on a sustainable basis. <u>Organizational strengthening</u> are the measures to improve the organization's capability to execute selected activities while striving to achieve the objectives of the development project.

<u>Basic question</u> - is a starting point of analysis, defines major problem, shows relations with the performance of the organization.

After discussion, participants decided to work on the following "basic question"

How can ORVMA/TF – with its present resources and organization - manage the most efficiently possible the implementation of the Master Plan for the sustainable development of local communities through khettaras rehabilitation?

<sup>&</sup>lt;sup>1</sup> Services: Extension (6 people), Rural Equipment (4), Irrigation Network Management (2), Agriculture Production (2)

## II - Institutional analysis (opportunities & threats) - ID

The aim of the institutional analysis is to identify opportunities and threats:

- (i) By analysing factors existing in the external environment, important for implementation of the project; participants applied the tool "quick scan".
- (ii) External institutions, which potentially play an important role for the implementation of the project; participants applied the tool "institutiogramme".



### (i) « Quick scan »

# (ii) Institutiogramme

ID/OS theory	Workshop outputs
The institutiogramme is the image/map of the relations between institutions active in a field of project intervention. The steps for analysis are: - Identify the institutions/actors important from the point of view of the implementation of master plan - Draw the map indicating the actors involved, using different types of lines for different types of relations - Indicate the intensity of the relations (frequency/ volume/ importance). - Analyse the network (in terms of <u>opportunities</u> and <u>threats</u> in relation to the implementation of the master plan: (i) opportunities to improve relations between actors in order to improve quality, effectiveness, efficiency of services; (ii) threats to the present quality, effectiveness, efficiency of services.	Institutions considered: local authorities, rural communities, Agriculture Chamber, Habous, Public Works, local NGOs, AUEA, donors, Social Development Agency, CLCA (Crédit Agricole), Microfinance, Institute for Applied Technology, Faculty of Technical Sciences of Errachidia University, Ministry of Health, Youth & National Education, DHR (Regional Water Resources authority), ONEP, ONE, CRRAS (Regional Center for Agronomic & Sahara Research), local media, JMAA (traditional organizations). Conclusions: (i) O: good relations between farmers and ORMVA, good relations with CMV (ii) T: local communities should be mobilised, lack of involvement of <i>DRH</i> for exploitation of resources, the relations with FSTE, ITA – are still weak and must be strengthened, relations with: donors, Social Development Agency, Crédit Agricole, Microcfinance – still need to be developed, negative relations between local authorities and local communities

# III - Organizational Analysis (strengths & weaknesses) - OS

The organizational analysis concentrates on identifying <u>strengths</u> and <u>weaknesses</u> of the organization actually implementing the project.

ID/OS theory	Workshop outputs
INPUTS STRATEGY MISSION STRUCTURE SYSTEMS ORMVATF MANAGEMENT EMPLOYEES ORGANIZATIONAL CULTURE OUTPUTS	Image: State of the state o
To identify the strengths (blue cards) and	Inputs: (i) S: resources available, sufficient
weaknesses (yellow cards) of ORMVA/TF to	specialized staff; W: insufficient financial
introduce the master plan. Participants referred	resources, insufficient coordination
to the check list for each component:	<b>Outputs:</b> (i) S: appropriate services offered
Mission: « Successful implementation of master	Strategy: (1) S: adapted in the annual plan (11)
plan ».	W: lack of integrated strategy
<b>Inputs:</b> all the available resources for the	<b>Structure:</b> (1) S: presence in the field, reliable
budget infrastructure natural environment etc.)	Structure,
<b>Outputs:</b> products of the organization (in terms	<b>Employees:</b> (i) S: know how: (ii) W: unclear job
of satisfying the demand quality quantity	descriptions
geographical coverage etc.)	Management style: (i) S: participative: (ii) W:
<b>Strategy:</b> a way of achieving objective:	mismanaged resources, insufficient motivation
long-term action plan for the organization.	<b>Culture:</b> (i) S: willingness to work and improve;
Structure: division and coordination of	(ii) lack of staff initiative, insufficient external
activities and responsibilities.	communication, "oral culture" (lack of
Systems: the flow of internal procedures	documents), weak coordination with services
(communication, decision making), which guide	
the operations of the organization; a way of	
transforming the resources into products.	
<b>Employees:</b> all the issues related to the people :	
motivation, capacity development, selection,	
evaluation, training of the staff.	
<b>Management style:</b> behaviour of the	
how the organization is conducted ( controlled)	
now the organization is conducted/ controlled;	
Organizational culture: the values and norms	
shared by the members of the organization.	

# (i) Integrated Organization Model (IOM)

### IV - SWOT

ID/OS theory	Workshop outputs
OPPORTUNITIES         THREATS           1         2         3         1         2         3           STRENGTHS         -         -         -         -         -           1         -         -         -         -         -         -           2         -<	And
<ul> <li>Referring to the (I) basic question, (II) institutional analysis, and (III) organizational analysis participants select three most important: opportunities, threats, strengths and weaknesses, and fill in the SWOT matrix. Than, analyse using following criteria:</li> <li>Can this strength help to use the opportunity or fight the threat;</li> <li>Can this weakness hamper the use of opportunity or make the threat more serious.</li> </ul>	<ul> <li>S: (1) strong organization in the field (CMV) and know-how, good reputation, group spirit//</li> <li>(2) good organization structure, know-how of employees, available resources</li> <li>W: (1) lack of financial resources, lack of coordination and weak planning, lack of monitoring &amp; evaluation system// (2) lack of integrated strategy, bad distribution of tasks, mismanaged resources.</li> <li>O: (1) Diversified agriculture production, existing traditional organizations, existing formal associations// (2) good relations ORMVA-beneficiaries, farmers organizations, possibility for valorization of production</li> <li>T: (1) Scarce water resources, weak coordination and involvement of donors, weak involvement of people (weak revenue, life standards)// (2) draught, financing, poverty.</li> </ul>

### **E.4.3** Conclusion

From the SWOT analysis the participants drew following conclusions for institutional development/organizational strengthening:

- (1) Through utilizing ORMVA/TF's competences and reputation to mobilize the civil society (with different forms of organizations) and to sustain the diversification of agriculture production in order to overcome existing threats and consolidate implementation of master plan for khettaras rehabilitation.
- (2) ORMVA must develop integrated strategy.
- (3) ORMVA must capitalize its know-how, optimize the use of available resources through better tasks/job-descriptions.
- (4) Necessity for better management of scarce resources (water in particular) in the region.
- (5) Necessity to attract donors for the improvement of farmers' income.

It must be stressed that the main aim of the workshop was to transfer the know-how on the method – therefore the time for and the quality of analysis were naturally limited.

According to the evaluation questioners – the participants found the method of ID/OS useful for their work, simple and effective, and appreciated participative "learning by doing" approach. They appreciated opportunity for the debate and exchange of ideas in the structured and logical way.

The participants judged all the introduced tools of ID/OS method as useful – and mostly appreciated the IOM, regarding it as a means to improve the management of the organization.

Most expressed the interest in organizing the ID/OS workshop for the analytic purpose – but suggested inviting the participants from other parts of the organization (not only Study Team counterparts).<sup>2</sup>



# E.5 Organizational Capacity (F/S Area)

See Table E.5.1

 $<sup>^2\,</sup>$  Detailed materials on ID/OS were transferred to one person, who might eventually take a role of facilitator for the internal workshops for ORMVA/TF

Tables

# Table E..5.1 Organizational Capacity (F/S Area)

Study Item	Unit/ Classification	1)Ait Ben Omar	. 2)Diba	3)Lambarkia	4)Oustania	5)Lagrinia	6)Timarzit	7)Jdida Taomart
General Information								
ORMVA/TF Sub-division		Gouli	mima			Erfoud		
ORMVA/TF CMV		Tine	jdad		Jorf		Al	nif
Name of Commune		Ferkla	Soufla	Jorf (Municipality)	Arab Sb	ah Ghris	Alı	nif
Name of Ksar		Ait Ben Omar	Ksiba	Mounkara	Hanr	nabou	Timarzit	Taoumart
Composition of Ethnic Group (Arab/Berber/Others)	%	95/ 5/ 0	100/ 0/ 0	95/ 5/ 0	100/	0/0	0/100/0	0/100/ 0
Population of Ksar	people	1,200	1,500	1,824	5,1	130	782	800
No. of Household / Ksar	Household	110	120	304	51	60	52	75
No. of Khettara inside Ksar (with water)	No.	2	2	4	1	0	1	3
No. of household using target khettara water for irrigation (No. of water right)	No. of household (HH) (%)	95HH (86%)	186HH (124%)	Inside Ksar 81HH (26%) (+ outside Ksar 47HH= Total 128HH)	75HH (13%)	92HH (16%)	64НН (123%)	52HH (69%)
Maintenance Works								
Dredging of khettara gallery	(people/year)	294 people/year (3.5times/yearX7days/ timex12people/day)	245people/year (3.5times/yearX17.5days /timex4people/day)	1,800 people/year (3times/yearX20days/ timex30people/day)	1,248 people/year (12times/yearX4days/ timex26people/day)	960 people/year (10times/yearX8days/ timex12people/day)	576people/year (2times/yearX24days/ timex12people/day)	162people/year (3times/yearX3days/ timex18people/day)
Workload for khettara gallery dredging per km	(people/year/km)	188people/year/km (Total length 1.5km)	139people/year/km (Total length 1.7km)	295people/year/km (Total length 6.1km)	162people/year/km (Total length 7.7km)	147people/year/km (Total length 6.5km)	288people/year/km (Total length 2.0km)	261people/year/km (Total length 0.6km)
Problem on khettara maintenance		Shortage of fund	None	Collapse of vertical shafts, sand sedimentation, soft layer	Shortage of fund, desertification, hard layer, flood damage	Submerged vertical shaft (2 Km), collapse of gallery, collapse of 6 vertical shafts	None	None
Dredging of main irrigation canal	(people/year)	336 people/year (3.5times/yearX8days/ timex12people/day)	15 people/year (2.5times/yearX1day/ timex6people/day)	200 people/year (5times/yearX2days/ timex20people/day)	72 people/year (12times/yearX1day/ timex6people/day)	120 people/year (15times/yearX1day/ timex8people/day)	168 people/year (2times/yearX7days/ timex12people/day)	54 people/year (3times/yearX1day/ timex18people/day)
Workload for main irrigation canal dredging per km	(people/year/km)	336 people/year/km (Total length 1.0km)	150 people/year/km (Total length 0.1km)	500 people/year/km (Total length 0,4km)	36 people/year/km (Total length 2.0km)	40 people/year/km (Total iength 3.0km)	1,050 people/year/km (Total length 0.16km)	540 people/year/km (Total length 0.1km)
Monetary penalty for absence on group work	DH/day	50	No payment to traditional organization	80	70	80	100	100

ET - 1

Study Item	Unit/ Classification	1)Ait Ben Omar	2)Diba	3)Lambarkia	4)Oustania	5)Lagrinia	6)Timarzit	7)Jdida Taomart
Rehabilitation Works								
Lining and covering of khettara gallery		2times in the past (1 time by people, 1 time by ORMVA) People= 112days/timex12people/ day=1,344people/time ORMVA= 24days/timex14people/d ay=336people/time	1time in the past (ORMVA)	3times in the past (2 times by people, 1 time by outside organization) by people= 20days/timex30people/d ay=120people/time outside organization= 90days	None	2 times in the past (1time by people, 1 time by Japanese Embassy) by people=32days/time x8people/day= 256people/time Japanese Embassy= 365days	3,240 people/year (3times/yearX60days/ti mex12-24people/day)	1 time in the past (by people) =30days/timex18people/ day=540people/time
Expense for above mentioned work	DH	DH 21,000(by people) DH ? (ORMVA)	Do not know	DH 51,500(by people) DH ? (outside organization)	None	DH 12,800(by people) DH 500,000 (Embassy of Japan)	DH50/people•day	DH50/people-day
Rehabilitation of vertical shafts		None	245people/year (3.5times/yearx17.5days /timex4people/day)	20 vertical shafts were rehabilitated in 10years (7days/timex 5people/day)	2 times per year (4days/timex 6people/day)	4 times in the past (4days/timex 7people/day)	24people/year (3times/yearX2days/ timex4people/day)	1 time in the past (by people: 3days/timex18people/ day=54people/time)
Expense for above mentioned work	DH	None	DH50/people day	DH 28,000	DH1,000	DH5,000	DH50/people•day	DH50/people•day
Way of money collection		Collected from water users (on every work)	Collected from water users (on every work)	Collected from water users (on every work)	Collected from water users (on every work)	Collected from water users and rental water rights (on every work)	Collected from water users (on every work)	Collected from water users (on every work)
Problem on rehabilitation of khettara gallery		Shortage of fund and equipments	Shortage of fund	Shortage of fund	Shortage of fund and technology	Shortage of fund	Shortage of fund and equipments	Shortage of fund and equipments
Rehabilitation of main irrigation canal		1 time in the past (ORMVA)	None	1 time in the past (by people= 10days/timex10people/ day=100people/time)	1 time in the past (by people = 8days/timex14people/ day=112people/time)	1 time in the past (by people = 11days/timex13people/c ay=143people/time	1 time in the past (ORMVA)	None
Expense for above mentioned work	DH	None	None	DH 7,500	DH11,200	DH13,100	Do not know	None
Way of money collection		Collected from water users (on every work)	Collected from water users (on every work)	Collected from water users (on every work)	Chief of khettara decides	Collected from water users (on every work)	Collected from water users (on every work)	Collected from water users (on every work)
Problem on rehabilitation of main irrigation canal		None	Shortage of fund	Shortage of fund	Shortage of fund	Shortage of fund	Shortage of fund for extension of canal	Shortage of fund for extension of canal

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	Study Item	Unit/ Classification	1)Ait Ben Omar	2)Diba	3)Lambarkia	4)Oustania	5)Lagrinia	6)Timarzit	7)Jdida Taomart
	Money collection by Traditional Khettara Water Users Group								:
	Income from rental water right		None	DH1,400/year (DH15/hr、 1day/3months)	DH2,000/year (DH40/hr, 2days/year)	DH2,400/year (DH50/hr、2days/year)	DH2,000/year (DH20/hr、2days/year)	DH3,000/year (DH250/hr、1day/year• 12hr)	None
ET	Other money collection system		Collection on demand (Few times per year) Base rate:DH20~100 for a user with 1hr water right = Approximately DH37,440/year	Collection on demand (Few times per year) Base rate: DH20~170 for a use with 1hr water right =Approximately DH43,200/year	Collection of demand (about 4 times per year) Base rate: DH200 for a user with 1hr water right =Approximately DH24,000/year	Collection on demand (Once per year) Base rate: DH40~50 for a user with 1hr water right =Approximately DH14,000/year	Collection of demand (about 4 times per year) Base rate: DH200~300 for a user with 12hr water right =Approximately DH30,000/year	Collection of demand (Once per year) Base rate : DH100~500 for a user with 6hr water right =Approximately DH14,400/year	Collection of demand (Few times per year) Base rate:DH50~500 for a user with 6hr water right =Approximately DH19,800/year
	Purpose of money collection		Maintenance of khettara	Maintenance of khettara	_	Maintenance and rehabilitation of khettara	Rehabilitation of khettara	Maintenance of khettara and payment to <i>Fkih</i> (clergyman?)	Maintenance of khettara and payment to <i>Fkih</i> (clergyman?)
	Balance of money collection	DH	DH-2,500 (Deficit)	DH-3,800 (Deficit)	DH-10,000 (Deficit) (Back pay for labor)	DH-3,000 (Deficit) (Back pay for labor)	DH~9,000 (Deficit) (Back pay for labor)	0	0
ω.	Expectation of people for external supports	%	1. Dredging(0%) 2. Rehabilitation(100%) 3. Extension(100%)	1. Dredging(0%) 2. Rehabilitation(100%) 3. Extension(100%)	1. Dredging (50%) 2. Rehabilitation (90%) 3. Extension (90%)	1. Dredging(Labor) 2. Rehabilitation(100%) 3. Extension(100%)	1. Dredging (20%) 2. Rehabilitation (95%) 3. Extension (100%)	1. Dredging (0%) 2. Rehabilitation (100%) 3. Extension (100%)	1. Dredging(0%) 2. Rehabilitation(100%) 3. Extension(100%)
	Association which traditional khettara water users groups belonging to (vear of establishment)		Khettara Ass, Ferkla Soufla (2002)	Association Monkara (2001)	Associat (20	ion Ghriss 101)	Ass, Timarzite (2003)	Ass. Agdai Taoumart (2003)	
	Type of association		AL	JEA	Khettara Association	Khettara Association		Rural Development Association	Rural Development Association
	No. of khettara belonging to the association		26 Kh	ettaras	4 Khettaras	8 Khe	attaras	1 Khettara	· 2 Khettaras
	Main activity of association		Maintenance of khettara		Formulation of khettara rehabilitation project, Coordination with other associations, Supporting extension of agriculture techniques	Considering countermeasure for khettara problems, Appealing necessity of khettara rehabilitation, Formulation of rehabilitation project, Increasing agriculture production		Maintenance of khettara, Education and Environment, Management of water use, Representing Ksar on development issue	Formulation and application of rural development projects (include khettara, road, environment etc.)
	Meetings		Regular meeting: once per year Extra meeting: few times per year		Problem on pump station (10 times), Problem on flood (15 times), Construction plan on dam (3 times)	n About 24 times per year (water problem, rehabilitation plan, application fo support by outside organization, construction pla on dam etc.)		General Assembly Once per year Extra meeting: about 3 times per year	General Assembly Once per year Extra meeting: about 3 times per year

Study Item	Unit/ Classification	1)Ait Ben Omar	2)Diba	3)Lambarkia	4)Oustania	5)Lagrinia	6)Timarzit	7)Jdida Taomart
General Assembly held		Only on establishment		On establishment and Feb. 2004	Only on establishment		Only on establishment (less than 1 year since establishment)	Only on establishment
Money collection by association		On establishment (already paid by all Annual membership t (only 6 khe	: DH100/kehttara   member khettara) fee:DH960 /kehttara ttaras paid)	None	one None		None	None
Problem on operation		None		Shortage of fund, migration of members	Shortage of fund, illiteracy of members		None	None
Training experience of bureau members	-	Association management and financial management (many times)		Training by ORMVA/IFAD (5people)	Training by ORMVA/IFAD (5people)		None (There is a training demand on association management and financial management.)	None (There is a training demand on association management and financial management.)
Other associations in the same Ksar		Rural development (1)	Rural development (1)	Rural Development (1), P.T.A (1)	Khettara (2), Rural development(1), P.T.A (2), Environment (1)		Potable water(1)	Potable water(1)
Cooperative in the same Ksar		None	None	Olive and dates processing (1)	Olive and dates processing (1)		None	None

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Figures



Annexe F Rural Infrastructures

# Annexe F Rural Infrastructures

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# F.1 Administration of ORMVA/TF

Administrative jurisdiction of the ORMVA/TF is as follows:

Province	Cercle	Municipality	Rural Commune	Sub-Division/ CMV of ORMVA/TF
Errachidia	rachidia Goulmima - Ouli Agh		Melaab, Ferkla Soufla, Ferkla El Oulia, Tadighoust, Gheris Essoufli, Aghbalou N'Kerdous	Sub-Division: Goulmima CMV: 704 712 713 720 720 722
	Assoul	-	Assoul, Ait Hani, Amellagou	CMV: 714
Figuig	Beni-Tadjit	-	Beni-Tadjit, Bouanane, Ain Chouater	Sub-Division: Beni Tadjit CMV: 707 710 709
Errachidia	-	Boudenib	-	Sub-Division: Errachidia CMV: 702 706 711 719
Errachidia	Erfoud	Jorf	Fezna, Arab Sebbah Gheris Sifa, Arab Sebbah Ziz Alnif, M'ssici, H'ssyia	Sub-Division: Erfoud CMV: 703 705 716 717 718 (Alnif)
Errachidia	Rissani	-	Rissani, Essfalat, Bni M'Hamed Sijilmassa, Taouz	
Errachidia	Imilchil			CMV: 715
Errachidia	Rich			Sub-Division: Rich CMV: 701 708 721

## Administrative jurisdiction of the ORMVA/TF

The jurisdictional boundary mentioned above is shown on Figure F.1.1. Socio data, such as population, education, economic parameter (type of economic activity, unemployment rate) are tabulated in Table F.1.1 to F.1.7, with drawing a clear distinction between khettara zone and others.

## F.2 Roads

The Ministry of Equipment and Transports is mainly responsible for the road construction and maintenance in the country.

The Rural Roads Project for Morocco aims to increase rural populations' access to roads, especially in the more disadvantaged provinces, by supporting a national program of road improvements and through strengthening institutional capacity. The two components of this project are: (1) rehabilitation and/or upgrading of about 625 kilometers of rural roads, and (2) institutional development to: (a) develop monitoring and evaluation (M&E) of accessibility targets and execution of the Second National Program of Rural Roads (and roads improved outside this program) at the provincial and communal level, and disseminate the M&E information to further sectoral integration of rural development programs and strengthen local participation; (b) formulate recommendations for improving management of local rural roads to help the communes and provinces prepare to take over their maintenance; and (c) strengthen the capabilities of the Directorate of Roads for social and environmental assessments. This component will also include identification by the Provincial Directorates of Public Works (DPEs) together with specialized agencies, of local development opportunities stemming from improved accessibility, and assistance to the local communities.

Morocco extended rural roads network to reach 9,276 km in 2004, comprising of construction of 5,209 km and revamped 4,067 km of rural roads as part of the National Program of Rural Roads (PNRR). The following are the road inventiory in the Province of Errachidia:

	Total lemgth	Paved road (%)	Feeder road (%)
National roads	593.9 km	534.9 km (90 %)	59.0 km (10 %)
Provincial roads	491.3 km	306.8 km (62 %)	184.5 km (38 %)
Rural roads	802.0 km	78.2 km (10 %)	723.8 km (90 %)

Road Inventory in the Province of Errachidia

Source: Information from Delegation de l'équippement, Errachidia

Road network in and around the Province of Errachidia is enumerated in Table F.2.1 and illustrated in Figure F.2.1.

## F.3 Water Supply

The ONEP is responsible for potable water supply in the Province of Errachidia. At present, the ONEP supplies water to 13 villages, Errachidia, Erfoud, Goulmima, Rich, Rissani, El Kheng, Aoufous, Tinejdad, Jorf, Boudenib, Gourrama, ksars located at the Ziz valley and the Tafilalet plain. Total service population

is about 400,000 in which about 180,000 has water supply service through common faucets. The service covers all urban areas in which 84 % is individual service connection and remaining 16 % is through common faucets. In the rural areas, the service area has extended to 83 % in the Province of Errachidia. More than 280 ksars have a service by the ONEP, in which 20 % is individual service connection and remaining 80 % is through common faucets.

Service areas	Administrations	Commune rurals	
Connection in urban areas	ONEP	Errachidia - Erfoud - Goulmima	
(Population 153,725 habitants in 1994)			
	Administrative center	Rich - Jorf - Boudenib - Tinejdad and My Ali Chérif	
Connection in rural areas (Population 194 862 habitants in 1994)	ONEP	Ziz valley (Commune rural: Aoufous - Errteb - M'daghra - LKheng)	
		Tafilalet plain (Commune rural: Essfalet - Essifa - Beni M'hamed Sijilmassa, Aârab Sebbah Ziz - Aârab Sebbah Ghriss)	
		Goulmima (Commune rural: Ghriss Ouloui, Ghriss Essoufli	
	Administrative center	Ksars: El Kheng - Gourrama - Aoufous (center) Tinejdad (Commune rural: Ferkla Oulia, Ferkla Essoufla, Mellaab) Tadighoust	
		Jorf (Commune rural: Fezna)	
		Merzouga (Commune rural: Ettaous)	
		Boudenib (Commune rural: Oued Naâm)	

#### Service Area for Potable Water Supply

Source: ONEP (Errachidia province)

In the frame work for the water resources development, various governmental agencies have intervened for the potable water supply scheme, such as the DGH (Direction Générale de l'Hydraulique), the ONEP (office National de l'Eau Potable).

The water supply network has significantly extended during the period of 1985 to 2001 in the Errachidia province. The total amount of the investment was 430 MDH with 146 MDH during 2000 to 2001. The following two large scale projects were realized in the recent decade:

<u>First project</u>: Pilot project in the national level, potable water supply for the urban and rural areas, Errachidia, Erfoud, Aoufous, Rissani and neighboring villages. Total investment cost was 180 MDH from 1985 to 1989 by financial assistance of the IBRD<sup>1</sup> and PNUD<sup>2</sup>.

<sup>&</sup>lt;sup>1</sup> IBRD (International Bank for Reconstruction and Development)

<sup>&</sup>lt;sup>2</sup> PNUD (Programme des National Unies pour ke Developpment)

1 st phase:		AEP <sup>3</sup> (PWS) of Errachidia and Erfoud (operated in 1985)
	-	Two (2) well sites in the Hassan Addakhil dam with yield of 200 lit/sec.
	-	Installation of 78 km pipe line
	-	Reservoir construction (Storage volume: 5,000 m <sup>3</sup> )
2 nd phase:		AEP (PWS) of Rissani from the reservoir of Erfoud (operated in 1987)
	-	Installation of 21 km pipe line
	-	Reservoir construction (Storage volume: 5,000 m <sup>3</sup> )
3 rd phase:		Connection to 237 villages (operated in 1989)
	-	Installation of 190 km channeling
	-	Construction of 6 reservoirs (Volume: 200 m <sup>3</sup> each)
	-	Construction of 205 public faucets
Second proj	<u>ect</u> :	Water supply for Goulmima, Tinejdad and neighboring villages. Total amount of 75 MDH financed by the Europian Union and KFW <sup>4</sup> from 1993 to 2001.
1 st phase:		AEP (PWS) of Goulmima (operated in 1993)
	-	One (1) well site with yield of 50 lit/sec.
	-	Installation of 18.5 km pipe line
	-	Construction of two (2) reservoirs (Storage volume: $500 \text{ m}^3$ and $1,000 \text{ m}^3$ )
2 nd phase:		AEP (PWS) of Tinejdad (operated in 1996)
	-	One (1) well site with yield of 30 lit/sec.
	-	Installation of 20 km pipeline
	-	Construction of one (1) reservoir (Storage volume: 2,000 m <sup>3</sup> (50% completion))
3 rd phase:		AEP (PWS) population of 44 ksars in rural and riverside zone of Goulmima and Tinejdad (operated in 2001)
	-	Installation of 90 km pipeline
	-	Construction of two (2) reservoirs (Storage volume: 2,000 $\text{m}^3$ (completion) and 120 $\text{m}^3$ )
In addition	to t	he above, some rehabilitation projects were launched during 1990s in Rich, Goulmima,

Tinejdad as well as an ectension of the distribution network in Errachidia, Erfoud, Aoufous and Rissani. The ONEP holds up his project target, "water for everybody", and further projects in Tadighoust,

 <sup>&</sup>lt;sup>3</sup> AEP (Alimentation en Eau Potable), PWS: (Potable Water Supply)
 <sup>4</sup> KFW (German Cooperation Agency)

Merzouga - Taous and Alnif have been launched since 2002. The project in Tadighoust was started in 2002 with financial assistance of USAID. The project consists of rehabilitation of wells, existing reservoir and distribution network for 20 km long and 750 connections. The project in Merzouga financed by the BID consists of pipeline installation for 57 km long and construction of 300 m<sup>3</sup> reservoir.

Water supply network is shown on Figure F.3.1, and present situation of the water supply plan is in Table F.3.1.

#### F.4 Electric Power Supply

Electrification in the rural areas is one of the most important policies. The ONE is responsible for electric supply in nation wide since 1963. The main missions of the ONE consist:

- 1) to answer the needs of the electricity in the country,
- 2) to manage and develop the power transportation,
- 3) to plan, intensify and generalize the extension to the rural areas,
- 4) to work for the promotion and the development of the renewable enegies, and of a more general way,
- 5) to manage the global demand of the electric energy.

The ONE controls 26 electric hydro plants (1,265 MW), 5 thermal stations (2,574 MW), 7 power stations with gas and diesel engines (784 MW) and wind power generation (54 MW), and their total generated output is estimated at about 4,508 MW in September 2004. Among these electric generation, the thermal power plant of Jorf Lasfar of 1,320 MW as well as wind power generation of 50 MW are exploited by private concession.

The transportation network covers large part of the country with power lines of 400 kV, 225 kV, 150 kV and 60 kV. The total length is about 17,107 km, otherwise power line is interconnected with the Algerian network by two lines 225 kV and the Spanish network by 400 kV two submarine cables. The distribution network of the ONE consists of 36,955 km tension and 92,130 km low tension cables.

The Decentralized Energy National Program (PNED), which aimed at electrification via renewable energy sources, was launched in 1993. In addition, the Global Regional Electrification program (PERG: Programme d'Electrification Rurale Global), which integrated efforts under the aforementioned PERG, was approved by the Council of the Government in August 1995 and has implemented in 1996. The PERG aimed at electrification of 35,000 villages and 12 millions citizens in the rural areas by the year 20007 and it targets the completion of the rural electrification in the whole nation, 91 % to the existing grid networks and 7 % mainly by means of photovoltaic (solar generation).

By the end of 2004, 17,208 villages have been electrified since the launching of the PERG in 1996, which opened the accessibility to 1,176,954 houses and 7,650,000 inhabitants. The rate of the electrification has satisfactorily proceeded since 18 % in 1995, 50 % in 2001 and 72 % 2004.

Table F.4.1 shows electrification records under the PERG in the Province of Errachidia.

## F.5 Telecommunications

## (1) Telephone

The Maroc Telecom operates exclusively both the domestic telephone and the international long-distance telephone in the country as a state-operated public corporation under the Ministry of Post, Telephone and Telegraph.

The Maroc telecom provides various services kinds of telecommunication services to the public, such as normal telephone, internet as well as domestic satellite communication. The normal telephone networks are digitized nearly nation-wide and the Maroc telecom is expanding digital high speed communication networks such as ISDN (Integrated Service Digital Network), which has been already available in Errachidia.

## (2) Mobile telephone service

Three groups, the Maroc telecom, meditel and a consortium of several enterprises, operate mobile telephone service on Morocco. The Maroc telecom is the largest operator among those enterprises, selling 111,371 of the GSM (Global system of mobile communications) hand hold terminals as of end of 1998.

## F.6 Facilities for Health and Hygiene

Health and hygiene facilities located in the Province of Errachidia are listed in Table F.6.1, and summarized below:

Category	Places	Category	Places
Provincial General Hospital	1	Urban Health Center (without maternity)	8
Local Hospital	5	Urban Health Center (with maternity)	2
Polyclinic	3	Communal Health Center (without maternity)	52
		Communal Health Center (with maternity)	12

## Facilities for Health and Hygiene

Source: Information de la Sante, Errachidia

General hospitals and regional hospitals which have completed up-to-date medical facilities are limitedly located at the Municipalities. Clinics and health centers has been facilitated in each rural commune, however inhabitants in the khettara villages can not receive adequate medical care because of a rather long distance between these khettara villages and clinics and health centers.

## F.7 Education

The following are schools located at the Province of Errachidia.

1)	Preliminary school	:	566	schools	98,158	pupils
2)	Secondary school	:	49	schools	32,407	students
3)	High school	:	19	schools	13,566	students

Preliminary schools have established in almost all ksars in the Province of Errachidia. While, secondary schools have established one to two schools in the commune rural in average. As the distance to the secondary schools are too far, especially in the rural areas, it causes decline of the rate of entering to the secondary schools.

Rate of entering to the high schools was declined to 30 % of that of the secondary schools. Information on education is shown on Table F.7.1 to F.7.3.

Tables
# Table F.1.1Socio Data (Summary of Whole Study Area)

#### SUMMARY Whole Area

Whole Area		Number of Household				Population				Marriage S old)	Status (over	15 yrs	Ave.	Age for Ma	rriage	Ave. Birth per female
			Number	% of Male	% of Female	% of under 15	% of 15 yrs to 59	% of over 60 yrs	% of Student (6	Single	Married	Widow / divorced	Total	Male	Female	
						yrs	yrs		to 14 yrs)							
TOTAL / A	VERAGE	80,464	546,328	50.01	49.99	41.00	52.63	6.36	24.31	34.10	56.60	9.30	24.84	27.59	22.22	4.25

Ī	Whole	Illiter	acy Rate (%	5)	School Att	tendance	(%) (8 to	Economic	cally Active	e Rate (%)	Unemp	ployment R	ate (%)	Туј	pe of Econo	mical Activ	vity
	Area					13 yrs)											
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried	Independ	House	Others
		Population												Employee	ent	Keeping	
		(over 10 yrs)													Business		
Ī	TOTAL / AVERAGE	54.10	36.02	71.46	69.71	81.24	57.65	26.40	43.96	9.05	16.20	15.59	26.40	48.10	31.69	17.68	2.30

1	Whole		Num	ber of Roor	n in a Hous	e		Own	ership of H	ouse		Type of	House		Availab	ility of	Home I	Facility
	Area														Util	lity		
			1 to 2	3	4	more than	Number	Privately	Rented	Public	Apartmen	Traditiona	Frugal	Rural	Electricity	Water	Bath /	Toilet
				5 0			of People	Owned		House	t	l/Contem	House	House	_	Supply	Shower	
							in One			(Rent		porary						
							Room			Free)		House						
	TOTAL / A	AVERAGE	27.02 26.91 22.16 23.91		1.89	79.80	10.76	9.44	1.88	25.14	1.05	68.54	52.03	35.48	14.63	57.70		
			27.02 26.91 22.16 23.91															

Table F.1.2	Socio Data (Summary of Khettara Zone)

SUMMARY	Khettara Zone	e			140101		2		(20011110			,				
Khettara	Zones	Number of Household				Population				Marriage Statu	is (over 15 yrs	old)	Ave	e. Age for Mar	riage	Ave. Birth per female
			Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female	
	ZONE A	12,951	91,081	49.25	50.74	42.89	49.77	7.31	24.97	32.22	56.54	11.24	24.51	27.36	21.95	4.81
	ZONE B	3,986	24,211	48.87	51.13	38.89	53.78	7.34	23.11	35.29	54.88	9.83	25.85	28.37	23.67	3.47
	ZONE C	1,411	8,294	48.63	51.37	37.09	57.56	5.34	22.44	39.63	51.75	8.62	26.55	29.05	24.52	2.32
	ZONE D	3,043	21,323	48.53	51.47	43.05	50.41	6.54	26.27	31.75	58.85	9.39	24.00	27.27	20.98	3.48
	ZONE E	3,463	27,681	50.29	49.71	43.38	51.32	5.30	25.17	31.43	60.00	8.57	23.35	25.59	20.60	4.28
	ZONE F	6,528	54,197	50.45	49.54	43.06	51.67	5.27	25.77	29.61	61.84	8.55	22.79	25.35	20.03	4.54
	ZONE G	3,822	36,010	49.39	50.61	50.63	43.21	6.15	27.89	25.73	66.22	8.05	22.20	24.47	20.25	6.59
TOTAL /	AVERAGE	35,204	262,797	49.52	50.48	43.50	50.09	6.40	25.41	31.19	59.21	9.61	23.86	26.51	21.34	4.63

Khettara	Zones	Illite	racy Rate (%)		School Attend	ance (%) to 13 yrs)	(8	Econon	nically Active F	Rate (%)	Unen	nployment Rat	e (%)		Type of Econo	omical Activity	
		Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
	ZONE A	61.11	39.19	81.18	65.32	80.87	48.76	26.75	41.54	12.75	16.67	18.87	9.90	35.19	36.48	26.23	2.10
	ZONE B	53.41	40.10	65.60	69.67	77.66	60.65	26.28	47.24	6.40	21.79	20.58	31.03	46.86	30.32	21.08	1.74
	ZONE C	34.01	18.73	46.96	93.26	95.23	91.40	22.08	39.15	6.86	25.79	20.49	52.72	65.00	31.29	2.43	1.29
	ZONE D	54.61	34.25	73.25	69.31	80.05	58.42	21.55	40.03	3.99	22.53	22.95	20.78	57.04	31.72	9.13	2.11
	ZONE E	60.86	38.33	83.52	65.49	87.16	43.90	23.10	45.54	0.41	12.46	11.93	58.40	62.27	26.23	9.04	2.46
	ZONE F	61.53	40.78	82.71	64.78	78.77	50.59	23.54	45.73	0.90	10.18	9.67	47.56	57.64	31.46	8.55	2.35
	ZONE G	67.61	45.38	87.71	60.81	83.35	36.76	21.04	35.27	7.19	20.04	19.38	29.05	45.94	30.82	21.60	1.64
TOTAL / A	AVERAGE	59.97	39.31	79.48	66.22	81.53	50.21	24.31	42.29	6.76	16.58	16.85	29.58	47.93	32.47	17.53	2.07

Khettara	Zones	N	umber of Room	in a House			Ow	nership of Ho	ise		Type of	f House		Availability	of Utility	Home F	acility
		1 to 2	3	4	more than 5	Number of	Privately	Rented	Public House	Apartment	Traditional/C	Frugal House	Rural House	Electricity	Water	Bath /	Toilet
						People in	Owned		(Rent Free)		ontemporary				Supply	Shower	
						One Room					House						
	ZONE A	31.68	23.39	21.15	23.78	2.03	88.67	1.02	10.31	0.45	14.84	0.28	84.10	18.16	22.52	6.49	23.14
	ZONE B	31.92	31.11	20.64	16.33	1.81	73.48	13.18	13.34	0.46	35.33	1.80	60.11	62.72	40.49	10.27	47.85
	ZONE C	19.10	34.19	29.33	17.38	1.62	64.25	28.28	7.48	2.14	92.66	5.06	0.00	97.10	92.43	35.67	95.40
	ZONE D	22.80	27.45	22.49	27.26	1.76	83.98	7.11	8.91	0.69	18.99	0.24	79.65	51.00	40.64	18.28	87.38
	ZONE E	19.11	27.19	26.59	27.11	2.01	89.38	0.44	10.18	0.00	5.03	0.00	94.69	54.64	0.59	3.95	99.53
	ZONE F	26.62	22.77	24.80	25.82	2.19	92.50	0.27	7.23	0.15	5.08	0.03	94.71	81.15	59.07	8.64	91.07
	ZONE G	18.82	18.82	21.28	41.09	2.12	90.27	1.12	8.61	0.37	12.94	0.63	85.65	66.60	9.40	8.37	11.49
TOTAL /	AVERAGE	26.45	24.42	22.81	26.32	2.01	87.20	3.29	9.51	0.40	16.21	0.53	82.39	50.89	31.28	9.15	53.37

## Table F.1.3

# Socio Data (Summary of Communes excluding Khettara Zone)

SUMMARY	Communes						,	2			0		,			
Communes		Number of Household				Population				Marriage Statu	is (over 15 yrs	old)	Ave	e. Age for Marr	iage	Ave. Birth per female
with No Khe	tara		Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female	1
TOTAL / AV	ERAGE	23,317	150,243	49.86	50.14	39.16	52.94	7.90	23.57	34.72	54.97	10.30	25.43	28.31	22.64	4.36

Communes	Illite	eracy Rate (%)		School Atter	ndance (%)	(8 to 13 yrs)	Econon	nically Active I	Rate (%)	Unen	nployment Rat	e (%)		Type of Econo	omical Activity	
with No Khettara	Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
TOTAL / AVERAGE	62.75	46.81	78.35	58.41	71.20	44.85	31.12	48.12	14.09	13.74	13.53	14.60	28.78	37.43	31.33	1.60

Communes	Nu	mber of Room	in a House			Ov	vnership of Ho	use		Type of	f House		Availabilit	y of Utility	Home	Facility
with No Khettara	1 to 2	3	4	more than 5	Number of People in One Room	Privately Rented Public House (Rent Free)			Apartment	Traditional/C ontemporary House	Frugal House	Rural House	Electricity	Water Supply	Bath / Shower	Toilet
TOTAL / AVERAGE	30.18	24.66	21.28	23.88	1.86	89.45	2.75	7.80	0.23	5.43	1.07	92.95	23.54	7.76	7.97	34.02

## Table F.1.4

# Socio Data (Summary of Municipalities excluding Khettara Zone)

SUMMARY Minicipality									1	U		,			
Minicipality	Number of Household				Population				Marriage Statu	is (over 15 yrs old)		Ave	e. Age for Marr	iage	Ave. Birth per female
with No Khettara		Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married Wido divor	w / ced	Total	Male	Female	
TOTAL / AVERAGE	21,943	133,288	51.15	48.85	38.13	57.29	4.58	22.97	39.13	53.31	7.56	26.10	28.91	23.48	3.39

Minicipality	Illite	eracy Rate (%)		School Atter	ndance (%)	(8 to 13 yrs)	Econor	nically Active I	Rate (%)	Uner	mployment Rat	e (%)		Type of Econo	omical Activity	
with No Khettara	Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
TOTAL / AVERAGE	32.78	17.37	47.88	89.32	91.98	86.74	25.19	42.54	7.88	18.24	15.43	33.41	70.19	23.67	2.60	3.54

Minicipality	Nu	umber of Room	in a House			Ov	vnership of Ho	ise		Type of	f House		Availabilit	y of Utility	Home !	Facility
with No Khettara	1 to 2	3	4	more than 5	Number of People in One Room	Privately Owned	Rented	Public House (Rent Free)	Apartment	Traditional/C ontemporary House	Frugal House	Rural House	Electricity	Water Supply	Bath / Shower	Toilet
															1	
TOTAL / AVERAGE	24.57	34.37	21.88	19.18	1.66	54.32	34.52	11.16	6.67	64.98	2.04	13.74	86.40	75.02	32.97	92.94

# Socio Data (By Khettara Zoning)

Zone A										` <b>`</b>		0/					
Province	Cercle	Commune	Number of Household				Population				Marriage Stat	us (over 15 yrs	old)	Ave	. Age for Mar	riage	Ave. Birth per female
				Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female	
Errachidia	Goulmima	Melaab	1,929	14,604	48.88	51.12	47.74	44.89	7.37	26.93	28.09	60.19	11.72	23.20	26.35	5 20.50	5.84
		Ferkla Essoufla	1,558	12,653	48.42	51.58	42.60	51.94	5.46	23.81	33.49	58.24	8.27	24.17	26.51	21.75	4.19
		Ferkla El oulia	2,586	18,889	49.08	50.92	42.73	50.49	6.78	25.81	33.90	55.25	10.86	24.95	27.70	22.35	4.85
	Assoul	Assoul	1,239	8,062	49.46	50.53	41.11	50.47	8.40	24.31	32.04	53.95	14.01	24.42	27.56	5 21.35	4.72
		Ait Hani	1,482	9,054	49.72	50.27	45.02	47.47	7.22	25.10	28.47	58.29	13.24	24.50	28.05	5 21.45	5.28
		Amellagou	812	5,090	51.57	48.43	36.34	54.86	8.79	22.70	37.14	49.98	12.87	25.78	28.51	22.90	3.39
	Goulmima	Tadighoust	1,265	7,959	46.10	53.90	38.18	51.48	10.32	22.78	35.27	52.71	12.02	26.26	28.56	5 24.75	4.44
		Gheriss Essoufli	935	6,521	48.46	51.54	39.78	52.83	7.40	24.88	37.50	52.42	10.09	26.05	28.39	23.80	4.05
		Agh. N'Kerdous	1,145	8,249	53.13	46.87	45.55	48.03	6.41	25.41	27.90	62.01	10.09	22.76	26.09	20.30	5.25
	TOTAL	L / AVERAGE	12,951	91,081	49.25	50.74	42.89	49.77	7.31	24.97	32.22	56.54	11.24	24.51	27.36	5 21.95	4.81
		•				-									-		
Province	Cercle	Commune	I	literacy Rate (9	6)	School Attend	dance (%)	(8 to 13 yrs)	Econor	nically Active l	Rate (%)	Une	mployment Rat	e (%)		Type of Econo	omical Activity

Province	Cercle	Commune	1	Interacy Rate (9	6)	School Atten	dance (%)	(8 to 13 yrs)	Econon	neally Active I	Rate (%)	Uner	nployment Rate	e (%)		Type of Econo	mical Activity	
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried	Independent	House	Others
			(over 10 yrs)												Employee	Business	Keeping	
Errachidia	Goulmima	Melaab	64.80	42.58	84.60	58.62	75.72	38.46	18.77	33.42	4.76	21.44	20.70	26.38	46.58	38.68	14.32	0.43
		Ferkla Essoufla	48.63	20.57	74.57	72.04	86.29	58.00	23.25	43.30	4.44	20.23	21.32	10.34	55.06	30.35	8.75	5.84
		Ferkla El oulia	55.07	35.13	73.33	79.14	86.90	70.49	22.28	38.58	6.57	22.43	24.13	12.77	41.60	37.07	18.33	3.00
	Assoul	Assoul	61.70	37.41	85.97	65.28	82.67	44.96	33.97	45.96	22.23	8.92	13.03	0.60	18.00	35.04	46.34	0.62
		Ait Hani	82.31	68.56	95.50	37.62	57.56	17.57	34.02	50.06	18.16	7.97	10.43	1.25	15.78	42.63	40.60	1.00
		Amellagou	61.95	40.00	84.38	63.49	82.38	40.86	41.04	45.51	36.27	9.69	16.77	0.22	14.90	40.50	44.29	0.31
	Goulmima	Tadighoust	60.74	40.18	77.96	74.16	90.29	55.27	22.05	39.71	6.94	16.41	19.42	1.71	38.17	43.41	17.10	1.33
		Gheriss Essoufli	52.37	28.80	73.57	73.56	86.50	61.64	25.73	42.71	9.77	22.67	23.69	17.36	30.82	40.07	24.73	4.38
		Agh. N'Kerdous	70.49	47.32	89.95	51.77	77.25	29.42	37.99	44.71	32.07	6.49	11.78	0.00	21.02	23.30	55.68	0.00
	TOTAL	/ AVERAGE	61.11	39.19	81.18	65.32	80.87	48.76	26.75	41.54	12.75	16.67	18.87	9.90	35.19	36.48	26.23	2.10

Province	Cercle	Commune		Number of Ro	om in a House			Owr	ership of Ho	ise		Type of	f House		Availabilit	y of Utility	Home	Facility
			1 to 2	3	4	more than 5	Number of	Privately	Rented	Public House	Apartment	Traditional/C	Frugal House	Rural House	Electricity	Water	Bath /	Toilet
							People in One Room	Owned		(Rent Free)		ontemporary House				Supply	Shower	
Errachidia	Goulmima	Melaab	27.72	23.06	22.28	26.94	2.07	88.57	2.08	9.35	0.00	13.51	0.00	86.49	26.42	59.84	5.70	29.02
		Ferkla Essoufla	22.73	18.51	23.70	35.06	1.96	89.61	0.00	10.39	0.00	27.51	0.32	71.84	2.26	0.97	4.19	27.42
		Ferkla El oulia	17.60	22.00	26.00	34.40	1.73	87.10	0.40	12.50	2.00	28.80	0.00	69.20	25.50	32.27	13.15	37.05
	Assoul	Assoul	48.85	27.65	14.75	8.75	2.30	86.51	3.26	10.23	0.00	3.69	0.00	96.31	36.24	23.85	8.26	9.17
		Ait Hani	49.79	25.31	16.60	8.30	2.12	88.84	0.41	10.74	0.00	2.47	0.00	97.53	6.58	0.41	1.23	5.35
		Amellagou	46.70	25.13	16.50	11.68	2.18	91.33	1.02	7.65	0.00	1.52	2.03	96.19	25.76	8.08	8.84	12.63
	Goulmima	Tadighoust	32.39	25.91	19.43	22.27	1.73	88.21	1.22	10.57	0.00	9.27	0.00	90.32	0.40	36.55	5.62	15.26
		Gheriss Essoufli	10.50	25.11	26.94	37.44	1.67	89.77	0.93	9.30	0.45	11.82	0.00	87.73	18.92	0.90	3.15	31.53
		Agh. N'Kerdous	54.75	23.53	15.38	6.33	2.82	90.83	0.46	8.72	0.00	6.22	1.33	89.78	17.98	2.63	2.19	14.91
	TOTAL	/ AVERAGE	31.68	23.39	21.15	23.78	2.03	88.67	1.02	10.31	0.45	14.84	0.28	84.10	18.16	22.52	6.49	23.14

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Zone B																	
Province	Cercle	Commune	Number of Household				Population				Marriage State	us (over 15 yrs o	old)	Ave.	Age for Marri	age	Ave. Birth per female
				Number	% of Male	% of Female	% of under	% of 15 yrs	% of over 60	% of Student	Single	Married	Widow /	Total	Male	Female	
							15 yrs	to 59 yrs	yrs	(6 to 14 yrs)	-		divorced			i.	
FIGUIG	Bni Tadjite	Bni Tadjite	2,265	12,316	48.09	51.91	35.39	56.42	8.19	21.23	37.65	49.77	12.58	26.60	29.34	24.35	3.11
	Bouanane				49.98	50.02	42.81	50.81	6.38	25.06	32.28	60.89	6.83	24.90	27.20	22.80	3.94
		Ain Chouater	190	1,332	47.21	52.79	40.11	52.87	7.02	25.00	37.33	54.48	8.20	26.40	28.70	24.35	3.06
	TOTAL / AVERAGE 3,				48.87	51.13	38.89	53.78	7.34	23.11	35.29	54.88	9.83	25.85	28.37	23.67	3.47

Province	Cercle	Commune	Illiteracy Rate (%)           Total Population (over 10 yrs)         Male         Female           44.10         28.48         58.11           64.03         53.21         74.34           55.27         43.66         65.51			School Atte	ndance (%)	(8 to 13 yrs)	Econor	nically Active I	Rate (%)	Une	mployment Rate	(%)		Type of Econo	omical Activity	
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried	Independent	House	Others
			Population (over 10 yrs)												Employee	Business	Keeping	
FIGUIG	Bni Tadjite	Bni Tadjite	44.10	28.48	58.11	82.29	91.93	70.29	26.20	45.22	8.57	23.11	22.09	28.08	56.62	28.16	12.24	2.98
		Bouanane	64.03	53.21	74.34	55.58	61.91	49.60	26.64	49.34	4.45	19.85	18.13	38.39	34.93	32.96	31.59	0.52
		Ain Chouater	55.27	43.66	65.51	64.73	70.64	59.13	24.24	49.28	1.85	24.92	25.97	0.00	51.19	29.37	19.44	0.00
	TOTAL	/ AVERAGE	53.41	40.10	65.60	69.67	77.66	60.65	26.28	47.24	6.40	21.79	20.58	31.03	46.86	30.32	21.08	1.74

Province	Cercle	Commune		Number of Ro	om in a House			Ow	nership of Ho	use		Type o	f House		Availabilit	y of Utility	Home I	Facility
			1 to 2	Number of Room in a House           1 to 2         3         4         more than 5           35.95         32.66         16.97         14.4           29.27         32.08         18.86         19.7			Number of	Privately	Rented	Public House	Apartment	Traditional/C	Frugal House	Rural House	Electricity	Water	Bath /	Toilet
							People in One Room	Owned		(Rent Free)		ontemporary House				Supply	Shower	
FIGUIG	Bni Tadjite	Bni Tadjite	35.95	32.66	16.97	14.42	1.81	76.56	11.90	11.54	0.35	49.38	1.05	45.34	52.53	30.02	6.81	40.49
		Bouanane	29.27	32.08	18.86	19.79	1.81	69.60	15.06	15.34	0.56	21.34	2.89	74.46	69.99	45.20	12.49	53.12
		Ain Chouater	15.69	9.15	68.63	6.54	1.77	75.84	10.07	14.09	0.66	16.45	0.00	82.89	99.35	100.00	24.68	74.03
	TOTAL	/ AVERAGE	31.92	31.11	20.64	16.33	1.81	73.48	13.18	13.34	0.46	35.33	1.80	60.11	62.72	40.49	10.27	47.85

Zone C																	
Province	Cercle	Municipality	Number of				Population				Marriage Statu	is (over 15 yrs	old)	Ave	. Age for Mar	riage	Ave. Birth
			Household		r.	r.			r			r	T.		1	1	per temate
				Number	% of Male	% of Female	% of under	% of 15 yrs	% of over 60	% of Student	Single	Married	Widow /	Total	Male	Female	
							15 yrs	to 59 yrs	yrs	(6 to 14 yrs)			divorced				
Errachidia		Boudnib	1,411	8,294	48.63	51.37	37.09	57.56	5.34	22.44	39.63	51.75	8.62	26.55	29.05	24.52	2.32
	TOTAL / AVERAGE 1				48.63	51.37	37.09	57.56	5.34	22.44	39.63	51.75	8.62	26.55	29.05	24.52	2.32

Province	Cercle	Municipality	П	lliteracy Rate (	%)	School Att	endance (%)	) (8 to 13 yrs)	Econon	nically Active F	Rate (%)	Une	mployment Rate (	(%)		Type of Econo	omical Activity	у
			Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male F	Female	Salaried Employee	Independent Business	House Keeping	Others
Errachidia		Boudnib	34.01	18.73	46.96	93.26	95.2	3 91.40	22.08	39.15	6.86	25.79	20.49	52.72	65.00	31.29	2.43	3 1.29
	TOTAL	/ AVERAGE	34.01	18.73	46.96	93.26	95.2	3 91.40	22.08	39.15	6.86	25.79	20.49	52.72	65.00	31.29	2.43	3 1.29

Province	Cercle	Municipality		Number of Roor	n in a House			Ov	nership of Ho	ise		Type o	f House		Availabilit	y of Utility	Home I	Facility
			1 to 2	3	4	more than 5	Number of People in One Room	Privately Owned	Rented	Public House (Rent Free)	Apartment	Traditional/C ontemporary House	Frugal House	Rural House	Electricity	Water Supply	Bath / Shower	Toilet
Errachidia		Boudnib	19.10	34.19	29.33	17.38	1.62	64.25	28.28	7.48	2.14	92.66	5.06	0.00	97.10	92.43	35.67	95.40
	TOTAI	L / AVERAGE	19.10	34.19	29.33	17.38	1.62	64.25	28.28	7.48	2.14	92.66	5.06	0.00	97.10	92.43	35.67	95.40

(2/4)

Zone D																		(3/4)
Province	Cercle	Commune	Number of Household				Population				Marriage Stat	us (over 15 yrs	old)	Ave	2. Age for Marri	iage	Ave. Birth per female	
				Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female		
Errachidia	Arfoud	fezna	560	4,12	3 46.94	53.06	43.40	49.95	6.65	25.71	33.63	58.32	8.05	23.76	25.90	21.50	3.06	1
		Jorf (municipality	1,864	12,14	3 48.09	51.91	43.10	50.25	6.65	26.32	31.04	58.73	10.22	24.32	28.15	21.11	3.10	Í
		Arab. Se. Ghriss	619	5,06	) 50.88	49.12	42.65	51.15	6.18	26.59	31.91	59.57	8.51	23.41	26.26	20.26	4.74	Í
	TOTAI	. / AVERAGE	3,043	21,32	3 48.53	51.47	43.05	50.41	6.54	26.27	31.75	58.85	9.39	24.00	27.27	20.98	3.48	1
Province	Cercle	Commune	Г	lliteracy Rate (	(%)	School Atte	ndance (%)	(8 to 13 yrs)	Econor	nically Active 1	Rate (%)	Une	mployment Rat	te (%)		Type of Econ	omical Activity	
			Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
Errachidia	Arfoud	fezna	57.70	40.0	2 73.01	66.13	80.12	53.57	24.02	39.27	10.53	17.35	19.08	11.63	45.08	34.14	18.38	2.4
		Jorf (municipality	50.96	29.7	2 69.56	72.21	79.25	65.34	19.65	37.68	2.95	28.68	28.86	26.59	56.70	34.33	6.36	2.6
		Arab. Se. Ghriss	60.85	40.4	1 82.31	64.95	81.93	45.77	24.11	46.28	1.15	11.97	11.91	14.28	67.60	23.47	8.23	0.7
	TOTAI	/ AVERAGE	54.61	34.2	5 73.25	69.31	80.05	58.42	21.55	40.03	3.99	22.53	22.95	20.78	57.04	31.72	9.13	2.1

Province	Cercle	Commune		Number of Ro	om in a House			Ov	nership of Hou	ise		Type o	f House		Availabilit	y of Utility	Home l	Facility
			1 to 2	3	4	more than 5	Number of	Privately	Rented	Public House	Apartment	Traditional/C	Frugal House	Rural House	Electricity	Water	Bath /	Toilet
							People in	Owned		(Rent Free)		ontemporary				Supply	Shower	
							One Room					House						
Errachidia	Arfoud	fezna	17.87	23.19	27.76	31.18	1.69	86.31	3.04	10.65	1.52	9.89	0.00	88.21	55.30	2.65	10.61	96.59
		Jorf (municipality	21.96	28.59	21.74	27.72	1.53	81.83	10.77	7.40	0.43	25.79	0.43	73.02	70.25	69.92	25.56	80.34
		Arab. Se. Ghriss	28.85	28.20	20.00	22.95	2.35	87.25	1.63	11.11	0.65	10.10	0.00	88.60	1.29	1.29	7.07	96.78
	TOTAL	/ AVERAGE	22.80	27.45	22.49	27.26	1.76	83.98	7.11	8.91	0.69	18.99	0.24	79.65	51.00	40.64	18.28	87.38

Zone E																	
Province	Cercle	Commune	Number of				Population				Marriage Statu	is (over 15 yrs	old)	Ave	e. Age for Mar	riage	Ave. Birth
			Household				-				-	-			-	-	per female
				Number	% of Male	% of Female	% of under	% of 15 yrs	% of over 60	% of Student	Single	Married	Widow /	Total	Male	Female	
							15 yrs	to 59 yrs	yrs	(6 to 14 yrs)			divorced				
Errachidia	Arfoud	Arab. Se. Ziz	2,436	18,522	50.74	49.26	42.95	51.85	5.20	24.81	31.84	59.15	9.01	23.76	26.14	20.70	3.98
		Essifa	1,027	9,159	49.39	50.61	44.24	50.26	5.49	25.91	30.60	61.73	7.67	22.53	24.48	20.40	4.89
	TOTAL	/ AVERAGE	3,463	27,681	50.29	49.71	43.38	51.32	5.30	25.17	31.43	60.00	8.57	23.35	25.59	20.60	4.28

Province	Cercle	Commune	I	literacy Rate (9	%)	School Atten	dance (%)	(8 to 13 yrs)	Econon	nically Active I	Rate (%)	Uner	nployment Rate	e (%)		Type of Econo	omical Activity	
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried	Independent	House	Others
			Population												Employee	Business	Keeping	
			(over 10 yrs)															
Errachidia	Arfoud	Arab. Se. Ziz	58.52	34.10	83.86	66.64	89.91	42.12	23.12	45.08	0.51	13.42	12.60	87.28	64.81	23.84	8.18	3.16
		Essifa	65.59	46.89	82.82	63.17	81.61	47.50	23.07	46.48	0.22	10.52	10.57	0.00	57.13	31.05	10.78	1.04
	TOTAL	/ AVERAGE	60.86	38.33	83.52	65.49	87.16	43.90	23.10	45.54	0.41	12.46	11.93	58.40	62.27	26.23	9.04	2.46

Province	Cercle	Commune	1	Number of Roo	m in a House			Ov	nership of Ho	ise		Type o	f House		Availability	of Utility	Home	Facility
			1 to 2	3	4	more than 5	Number of	Privately	Rented	Public House	Apartment	Traditional/C	Frugal House	Rural House	Electricity	Water	Bath /	Toilet
							People in One Room	Owned		(Rent Free)		ontemporary				Supply	Shower	
							One Room					nouse						
Errachidia	Arfoud	Arab. Se. Ziz	20.75	29.05	25.31	24.90	1.97	87.45	0.42	12.13	0.00	5.39	0.00	94.19	39.00	0.41	3.32	100.00
		Essifa	15.79	23.44	29.19	31.58	2.08	93.27	0.48	6.25	0.00	4.29	0.00	95.71	86.26	0.95	5.21	98.58
	TOTAL	/ AVERAGE	19.11	27.19	26.59	27.11	2.01	89.38	0.44	10.18	0.00	5.03	0.00	94.69	54.64	0.59	3.95	99.53

Zone F																		(4/4)
Province	Cercle	Commune	Household				Population				Marriage Stat	us (over 15 yrs	old)	Ave	e. Age for Marri	age	Ave. Birth	
				Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female	per female	
Arrachidia	Errissani	Bni M. Sijelmassa	2,713	22,600	51.44	48.55	42.55	51.96	5.48	25.92	29.85	62.33	7.82	23.00	25.40	20.30	4.66	
		Essfalat	2,549	22,258	49.67	50.33	43.60	51.77	4.63	25.93	28.48	62.39	9.13	22.30	25.00	19.50	4.83	1
		Errissani	598	4,673	50.88	49.12	42.59	51.47	5.94	24.08	31.87	59.00	9.13	22.80	25.18	20.25	5.07	Ι
		Ettaous	668	4,666	48.99	51.01	43.43	49.96	6.60	25.96	31.58	59.67	8.76	24.05	27.00	21.00	2.09	
	TOTAL	/ AVERAGE	6,528	54,197	50.45	49.54	43.06	51.67	5.27	25.77	29.61	61.84	8.55	22.79	25.35	20.03	4.54	
Province	Cercle	Commune	П	literacy Rate (%	b)	School Atte	ndance (%)	(8 to 13 yrs)	Econor	nically Active I	Rate (%)	Uner	nployment Rat	e (%)		Type of Econo	mical Activity	
			Total Population	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
Arrachidia	Errissani	Bni M. Sijelmassa	56.31	31.98	82.26	71.35	86.00	56.02	24.06	46.51	0.26	10.41	10.28	33.33	57.01	28.98	11.52	2.49
		Essfalat	65.12	45.84	83.85	63.54	77.56	49.74	22.65	44.89	0.69	9.44	8.41	75.00	70.08	26.40	1.44	2.08
		Errissani	63.37	46.43	80.79	57.78	71.15	44.96	23.68	45.55	1.02	7.28	7.08	16.66	44.27	33.46	17.43	4.85
		Ettaous	67.81	53.64	81.35	45.94	57.10	34.03	25.08	46.17	4.83	15.47	15.35	16.52	14.79	65.58	19.13	0.49
	TOTAL	/ AVERAGE	61.53	40.78	82.71	64.78	78.77	50.59	23.54	45.73	0.90	10.18	9.67	47.56	57.64	31.46	8.55	2.35
			•				1				•						+	
Province	Cercle	Commune		Number of Ro	om in a House			Ov	nership of Ho	use		Type o	f House		Availabilit	y of Utility	Home	Facility
			1 to 2	3	4	more than 5	Number of People in One Room	Privately Owned	Rented	(Rent Free)	Apartment	Traditional/C ontemporary House	Frugal House	Rural House	Electricity	Water Supply	Bath / Shower	Toilet
Arrachidia	Errissani	Bni M Sijelmassa	26 30	19.63	26 30	27.78	2.12	93.26	0.00	6.74	0.37	10.00	0.00	89.63	87.04	45 19	14.81	100.00
/ intachidia	Lillosan	Essfalat	20.30	23.81	25.40	28.57	2.12	95.62	0.00	4 38	0.00	1 98	0.00	98.02	90.08	96.03	4 76	99.60
		Errissani	39.62	31.54	17.69	11.15	2.10	89.96	0.00	10.04	0.00	0.76	0.00	99.24	45 19	7.78	4.70	70.74
		Ettaous	36.14	24.21	21.75	17.89	2.05	76.49	3.16	20.35	0.00	0.70	0.00	98.95	45.99	1.70	1.05	27.53
	TOTAL	/ AVERAGE	26.62	22.21	24.80	25.82	2.05	92.50	0.27	7 23	0.15	5.08	0.03	94 71	81.15	59.07	8 64	91.07
Zone G			•	I			I			1			1					
Province	Cercle	Commune	Household				Population				Marriage Stat	us (over 15 yrs	old)	Ave	e. Age for Marri	age	Ave. Birth per female	1
				Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female		
Errachidia	Arfoud	M'ssici	754	6,836	50.14	49.86	48.83	45.15	6.01	25.34	24.67	66.86	8.47	22.85	25.60	20.90	4.94	]
		Alnif	2,045	19,023	48.44	51.56	52.31	41.57	6.11	29.05	27.08	64.79	8.13	22.42	24.43	20.65	6.78	
		H'ssyia	1,023	10,151	50.65	49.34	48.69	44.97	6.32	27.44	23.91	68.46	7.63	21.35	23.80	19.08	7.35	
	TOTAL	/ AVERAGE	3,822	36,010	49.39	50.61	50.63	43.21	6.15	27.89	25.73	66.22	8.05	22.20	24.47	20.25	6.59	J
	1	I													1			
Province	Cercle	Commune	11	literacy Rate (%	ó)	School Atte	ndance (%)	(8 to 13 yrs)	Econor	nically Active I	Rate (%)	Unei	nployment Rat	e (%)		Type of Econo	mical Activity	
			Total Population	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
Errachidia	Arfoud	M'ssici	74.06	52.56	93.48	49.28	74.02	18.54	26.88	39.42	14.27	5.75	7.53	0.83	35.64	25.77	37.46	1.14
		Alnif	63.49	40.28	83.26	64.29	86.47	44.16	15.90	31.23	1.49	23.51	22.73	38.85	49.60	36.11	11.82	2.47
		H'ssyia	70.98	50.10	92.16	62.07	83.80	35.18	26.75	40.04	13.10	23.16	21.08	29.69	46.00	24.30	29.26	0.43
	TOTAL	/ AVERAGE	67.61	45.38	87.71	60.81	83.35	36.76	21.04	35.27	7.19	20.04	19.38	29.05	45.94	30.82	21.60	1.64
Description	Grants		r	Newbork	· · · · · · · · · · · ·		i	0			1	<b>T</b>	e 11		A	- CIULIA	TT	P. dlive
Province	Cercie	Commune	1 to 2	Number of Ro	om in a House	more then 5	Number of	Drivotalu	Dented	use	Amontreamt	Traditional/C	Francel House	Dural House	Availabilit	y of Utility	Both /	Facility
			1 to 2	3	4	more than 5	Number of People in One Room	Owned	Kented	(Rent Free)	Apartment	ontemporary House	Frugal House	Rural House	Electricity	Supply	Shower	I oilet
Errachidia	Arfoud	M'ssici	23.03	23.60	21.91	31.46	2.33	89.33	1.69	8.99	0.55	0.55	0.55	98.35	41.76	13.19	2.20	6.04
		Alnif	21.11	16.58	22.11	40.20	2.04	88.94	1.51	9.55	0.50	23.50	1.00	74.50	68.00	12.00	9.50	18.00
		H'ssyia	11.68	19.80	19.29	49.24	2.12	93.40	0.00	6.60	0.00	1.51	0.00	97.99	80.69	1.98	10.40	2.97
	TOTAL	/ AVERAGE	18.82	18.82	21.28	41.09	2.12	90.27	1.12	8.61	0.37	12.94	0.63	85.65	66.60	9.40	8.37	11.49

Table F.1.6	Socio Data (Municipality excluding Khettara Zone)
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Minicipality								(	j								
Province	Minicipality		Number of Household				Population				Marriage State	is (over 15 yrs	old)	Ave	e. Age for Marr	riage	Ave. Birth per female
				Number	% of Male	% of Female	% of under 15 yrs	% of 15 yrs to 59 yrs	% of over 60 yrs	% of Student (6 to 14 yrs)	Single	Married	Widow / divorced	Total	Male	Female	
Errachidia	Errich		2,577	13,952	49.80	50.20	38.80	56.51	4.68	23.41	39.12	52.52	8.36	26.75	29.74	24.20	2.93
	Errachidia		10,454	62,542	52.68	47.32	35.08	60.79	4.13	21.27	43.46	49.94	6.60	27.10	29.64	24.60	3.25
	Tinejdad		908	5,755	48.57	51.43	40.17	54.57	5.26	24.15	36.68	53.93	9.38	25.22	28.30	22.57	4.39
	Goulmima		2,392	14,026	48.10	51.90	39.69	54.32	5.99	23.49	37.21	52.66	10.12	26.29	29.27	23.75	3.41
	Arfoud		2,813	18,563	49.82	50.18	39.83	54.73	5.45	24.49	35.17	56.46	8.37	25.17	28.44	22.30	3.68
	Moulay Ali Cherif		2,799	18,450	51.47	48.53	44.44	51.72	3.84	26.11	30.65	62.49	6.86	23.26	26.21	20.40	3.58
	TOTAL / AV	/ERAGE	21,943	133,288	51.15	48.85	38.13	57.29	4.58	22.97	39.13	53.31	7.56	26.10	28.91	23.48	3.39

Province	Minicipality		П	literacy Rate (?	%)	School Att	endance (%) (	(8 to 13 yrs)	Econor	nically Active l	Rate (%)	Uner	nployment Rat	e (%)		Type of Econo	omical Activity	
			Total Population (over 10 yrs)	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried Employee	Independent Business	House Keeping	Others
Errachidia	Errich		34.17	18.97	48.75	87.72	90.80	84.81	23.39	41.15	5.77	20.39	17.79	38.80	69.19	25.84	2.30	2.67
	Errachidia		28.74	15.71	41.76	91.69	92.77	90.61	27.70	44.86	10.43	18.87	15.06	35.34	76.90	18.91	0.96	3.22
	Tinejdad		33.92	15.28	51.05	87.26	89.55	84.84	21.60	38.47	5.66	16.86	15.11	28.14	63.16	30.33	2.14	4.37
	Goulmima		36.52	17.60	54.06	89.27	93.27	85.35	22.93	39.09	7.95	20.06	17.68	30.90	65.43	26.94	6.11	1.51
	Arfoud		33.79	16.78	49.92	87.74	91.53	84.02	23.07	40.27	6.01	17.92	16.08	30.18	66.47	25.37	3.57	4.60
	Moulay Ali Cherif		41.20	22.87	60.20	84.77	90.46	79.45	23.02	41.89	3.37	13.85	12.64	29.60	57.78	31.86	4.89	5.47
	TOTAL / A	VERAGE	32.78	17.37	47.88	89.32	91.98	86.74	25.19	42.54	7.88	18.24	15.43	33.41	70.19	23.67	2.60	3.54

Province	Minicipality			Number of R	oom in a Hous	e		Owr	ership of Hou	se		Type of	f House		Availabilit	y of Utility	Home F	acility
			1 to 2	3	4	more than 5	Number of People in One Room	Privately Owned	Rented	Public House (Rent Free)	Apartment	Traditional/C ontemporary House	Frugal House	Rural House	Electricity	Water Supply	Bath / Shower	Toilet
Errachidia	Errich		28.04	35.90	22.31	13.75	1.65	56.03	29.78	14.18	2.11	66.56	0.23	30.08	79.50	59.16	26.40	83.70
	Errachidia		26.77	36.23	23.01	13.99	1.72	48.68	40.32	11.00	9.71	79.86	3.29	5.27	89.78	77.26	34.21	94.63
	Tinejdad		12.79	24.35	25.93	36.92	1.30	65.47	23.43	11.10	4.92	70.06	0.34	24.13	65.16	78.94	33.30	80.94
	Goulmima		24.19	32.77	20.29	22.75	1.64	60.82	24.70	14.48	3.88	71.84	3.29	20.24	83.04	66.08	36.84	87.64
	Arfoud		17.17	30.17	22.84	29.81	1.50	62.57	27.44	9.99	7.68	9.46	0.72	0.22	86.55	81.00	45.77	97.58
	Moulay Ali Cherif		25.87	35.47	16.72	21.95	1.77	55.39	36.52	8.09	1.44	62.39	0.07	35.52	89.20	78.97	17.81	97.28
	TOTAL / AVERAGE		24.57	34.37	21.88	19.18	1.66	54.32	34.52	11.16	6.67	64.98	2.04	13.74	86.40	75.02	32.97	92.94

## Table F.1.7

Socio Data (Communes excluding Khettara Zone)

Province	Carala	Communa	Household	1			Population				Morriago Stat	us (over 15	ald)	A	A go for Marri		Avo Dirth	(
riovince	Cercie	Commune	riousenoid	Number	% of Malc	% of Fomala	r opulation	94 of 15 yrs 40	% of over 60	% of Student	Single	us (over 15 yrs	Widow /	AV	Mala	age Formalo	Ave. Difui	
				rainper	70 OI IVIAIE	70 OI Feiliale	vrs	59 vrs	vrs	(6  to  14  vrs)	Single	marrieu	divorced	TOTAL	widle	remaie	per temate	
Errachidia	Goulmima	Ghr. El Ouloui	1,438	10,958	50.07	49.93	40.45	53.02	6.52	24.36	37.76	52.41	9.82	25.65	28.78	22.27	4.21	
	Errachidia	Errteb	1,748	12,131	49.77	50.23	35.75	56.29	7.96	22.90	36.41	55.93	7.66	25.51	28.12	22.76	3.09	
		Aoufous	1,955	12,946	49.88	50.12	36.51	54.14	9.34	23.92	36.45	53.51	10.04	26.23	29.15	23.11	2.68	
		Lkheng	2,026	13,075	48.32	51.68	37.58	53.86	8.56	24.72	39.47	51.96	8.57	27.17	30.05	24.74	3.57	
		Ouad Naam	1,041	6,729	47.16	52.84	35.98	53.51	10.51	21.73	38.83	49.92	11.25	26.63	28.77	24.82	2.88	
		Chorfa M'Daghra	1,667	12,207	50.03	49.97	37.49	56.04	6.47	23.55	39.23	53.98	6.79	26.55	28.60	24.75	3.67	
Errachidia	Errich	Ennzala	644	3,675	50.87	49.13	37.58	53.02	9.40	20.32	34.58	52.73	12.69	25.63	28.49	22.70	5.01	
		Gourrama	1,987	11,216	50.77	49.22	38.13	53.34	8.53	21.68	35.98	53.79	10.23	26.28	28.83	23.65	4.27	
		Guers Tiallaline	1,619	9,718	50.15	49.85	39.17	52.84	8.00	23.49	34.01	54.58	11.41	25.40	28.73	22.20	4.54	
		Guir	857	4,716	48.41	51.59	35.91	54.05	10.03	20.83	34.86	54.39	10.76	26.04	28.93	23.53	4.19	
		M'Zizel	963	6,309	47.92	52.08	39.55	52.65	7.80	25.81	38.16	50.21	11.63	26.60	29.85	23.30	2.95	
		Sidi Aayad	980	6,372	50.02	49.96	42.02	51.92	6.05	25.08	34.39	55.18	10.44	24.08	26.63	21.38	4.67	
		Za. Sidi Hamza	1,024	6,624	52.60	47.40	41.09	52.28	6.63	21.87	30.30	60.97	8.73	24.82	27.09	22.15	6.26	
Errachidia	Imilchil	Imilchil	1,245	7,253	49.55	50.45	41.04	50.73	8.22	23.34	23.05	61.35	15.60	22.55	25.90	19.75	6.37	
		Amouguer	741	4,787	51.29	48.71	42.04	50.96	7.00	23.79	33.93	54.85	11.21	24.89	27.60	22.85	5.02	
		Outerbat	993	5,898	49.61	50.37	42.10	50.07	7.80	23.29	28.89	58.81	12.30	23.88	27.39	20.75	7.83	
		Ait Yahya	672	4,219	51.42	48.58	44.95	48.77	6.27	25.75	30.42	57.67	11.91	23.95	27.00	21.06	6.31	
		Bou Azmou	1,311	7,838	50.38	49.62	40.64	51.08	8.46	23.79	29.27	56.73	14.00	23.53	27.96	19.18	5.28	
Errachidia	Errissani	Sidi Ali	406	3,572	50.97	49.03	51.16	44.03	4.81	28.83	25.09	67.41	7.51	21.95	24.52	19.54	5.97	
	TOT	AL / AVERAGE	23,317	150,243	49.86	50.14	39.16	52.94	7.90	23.57	34.72	54.97	10.30	25.43	28.31	22.64	4.36	
Province	Cercle	Commune	П	literacy Rate (	%)	School Attendan	ce (%)	(8 to 13 vrs)	Econor	nically Active	Rate (%)	Une	mplovment Rat	e (%)		Type of Econ	omical Activity	
			Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Salaried	Independent	House	Others
			Population												Employee	Business	Keeping	
Errachidia	Goulmima	Ghr. El Ouloui	51.31	30.33	71.80	80.89	95.32	67.56	26.41	43.83	8.95	16.41	17.92	9.00	51.03	24.31	19.05	5.6
	Errachidia	Errteb	56.69	35.61	77.82	70.50	85.12	54.49	25.24	48.01	2.69	17.39	17.01	24.24	40.73	39.09	19.45	0.7
		Aoufous	43.65	19.34	67.19	81.26	93.06	69.85	20.83	35.53	4.21	21.57	23.38	5.55	49.89	36.60	1.11	2.4
		Lkheng	43.46	26.70	58.79	83.58	90.49	76.44	26.95	42.25	12.65	15.79	13.97	21.46	41.24	33.63	20.80	4.3
		Ouad Naam	56.02	37.56	71.91	68.62	76.93	59.95	25.64	45.20	8.19	25.07	28.21	9.62	23.64	41.66	34.70	0.0
		Chorfa M'Daghra	41.78	21.02	62.49	80.09	93.02	65.47	27.67	44.40	10.93	25.30	11.75	80.42	50.90	35.43	9.55	4.1
Errachidia	Errich	Ennzala	76.55	64.37	89.38	44.19	59.60	27.58	37.50	57.62	2 16.66	11.23	12.82	5.57	13.62	43.66	42.10	0.6
		Gourrama	63.89	52.36	75.56	53.13	58.11	47.33	30.96	51.52	9.74	16.58	18.86	4.13	22.90	43.16	33.62	0.3
		Guers Tiallaline	56.95	38.54	75.12	75.66	90.52	59.06	30.46	45.81	15.03	11.94	15.61	0.67	26.01	41.88	32.08	0.0
		Guir	70.30	62.75	77.01	43.11	52.16	33.12	37.55	54.54	21.62	10.85	10.78	11.02	11.05	42.13	46.44	0.3
		M'Zizel	58.11	35.56	79.47	55.78	78.03	35.61	28.62	47.33	11.41	10.93	12.11	6.45	19.26	40.74	39.26	0.7
		Sidi Aayad	59.44	42.08	76.79	63.85	80.46	46.28	33.02	45.44	20.59	7.88	9.45	4.43	23.89	35.43	39.23	1.4
		Za. Sidi Hamza	86.21	75.99	97.10	24.42	37.75	7.77	42.04	55.79	26.78	3.24	3.30	3.10	7.75	40.29	51.82	0.1
Errachidia	Imilchil	Imilchil	89.18	82.77	95.39	20.18	27.27	12.62	34.42	60.90	8.42	8.29	7.15	16.39	14.59	42.49	42.49	0.4
		Amouguer	76.36	59.62	93.38	37.56	56.56	15.69	40.08	52.72	26.77	5.09	5.85	3.51	12.75	33.44	53.16	0.6
		Outerbat	88.24	78.52	98.28	16.85	31.27	3.34	39.08	56.30	22.12	6.52	7.94	2.97	14.16	39.63	46.07	0.1
		Ait Yahya	85.50	73.76	97.76	40.17	65.38	12.19	50.42	53.02	47.66	1.49	2.76	0.00	5.19	27.74	66.98	0.0
		Bou Azmou	94.00	88.92	99.27	19.58	36.80	0.86	44.78	57.07	32.30	2.69	3.76	0.79	6.25	35.32	58.28	0.1
Errachidia	Errissani	Sidi Ali	91.75	87.43	96.19	23.43	30.94	14.80	23.80	45.34	1.41	6.88	6.85	8.00	13.14	44.96	41.77	0.1
1	TOT	AL / AVERAGE	62.75	46.81	78.35	58.41	71.20	44.85	31.12	48.12	14.09	13.74	13.53	14.60	28.78	37.43	31.33	1.6

Commune

			-															(2/2)
Province	Cercle	Commune		Number of R	oom in a House	e		Owr	ership of Hou	se		Type of I	Iouse		Availabilit	y of Utility	Home Fa	acility
			1 to 2	3	4	more than 5	Number of	Privately	Rented	Public House	Apartment	Traditional/C F	rugal House	Rural House	Electricity	Water	Bath /	Toilet
							People in One	Owned		(Rent Free)		ontemporary				Supply	Shower	
-							Room					House						
Errachidia	Goulmima	Ghr. El Ouloui	22.11	28.77	18.60	30.53	1.94	89.08	0.70	10.21	0.35	33.33	1.05	64.91	18.25	0.35	9.82	29.12
	Errachidia	Errteb	8.33	29.31	28.74	33.62	1.64	95.10	1.15	3.75	0.00	1.15	0.00	98.57	12.00	2.00	12.00	69.43
		Aoufous	10.91	20.00	27.79	41.30	1.42	84.33	4.96	10.70	0.26	4.68	0.26	94.55	21.74	17.90	13.81	72.38
		Lkheng	25.54	32.80	22.58	19.09	1.75	82.56	6.27	11.17	1.60	12.03	0.00	85.83	68.09	27.93	12.77	65.16
		Ouad Naam	21.05	25.44	24.56	28.95	1.59	90.43	0.00	9.57	0.00	0.87	0.00	99.13	20.43	0.00	2.17	45.65
		Chorfa M'Daghra	11.82	24.85	28.79	34.55	1.70	89.57	5.52	4.91	0.00	0.60	0.00	99.40	28.83	1.50	12.91	77.18
Errachidia	Errich	Ennzala	51.69	18.22	16.95	13.14	2.05	82.20	3.39	14.41	0.00	1.69	10.13	87.76	6.75	1.27	2.95	8.86
		Gourrama	16.24	26.09	22.62	35.05	1.30	84.91	6.89	8.20	0.34	10.47	1.03	88.02	54.30	33.59	15.69	42.05
		Guers Tiallaline	39.12	17.67	22.40	20.82	1.79	90.60	1.25	8.15	0.00	1.25	0.00	98.44	13.13	6.56	5.31	12.19
		Guir	60.00	20.00	11.67	8.33	2.17	91.25	0.83	7.92	0.00	0.41	0.82	97.53	40.74	0.82	13.99	17.28
		M'Zizel	29.88	21.99	20.33	27.80	1.67	91.70	1.24	7.05	0.00	0.00	0.41	99.59	13.28	1.24	2.07	5.39
		Sidi Aayad	49.17	24.38	19.42	7.02	2.43	87.14	1.24	11.62	0.00	4.88	0.00	93.50	26.02	4.07	4.07	7.72
		Za. Sidi Hamza	34.19	30.32	21.94	13.55	2.06	89.81	3.18	7.01	0.00	0.64	0.00	99.36	5.70	0.63	1.27	2.53
Errachidia	Imilchil	Imilchil	35.66	20.90	22.95	20.49	1.72	94.24	0.82	4.94	0.00	1.62	12.15	85.02	11.29	2.42	3.63	4.03
		Amouguer	50.95	26.16	15.80	7.08	2.41	88.83	4.90	6.27	0.27	1.91	0.00	97.82	1.35	1.08	3.24	8.11
		Outerbat	32.91	26.07	13.68	27.35	1.55	94.37	0.43	5.19	0.00	1.71	0.00	98.29	1.70	1.70	3.83	3.83
		Ait Yahya	62.95	23.49	9.04	4.52	2.62	96.72	0.00	3.28	0.30	0.00	0.60	99.10	0.00	0.00	0.89	0.60
		Bou Azmou	72.41	17.24	6.90	3.45	2.82	98.08	0.38	1.53	0.00	0.00	0.00	100.00	0.38	0.00	0.76	1.15
Errachidia	Errissani	Sidi Ali	38.34	24.11	20.16	17.39	2.79	84.13	0.00	15.87	0.00	0.39	0.00	99.61	52.73	0.78	0.00	1.56
	TOTAL /	AVERAGE	30.18	24.66	21.28	23.88	1.86	89.45	2.75	7.80	0.23	5.43	1.07	92.95	23.54	7.76	7.97	34.02

# Table F.2.1List of National and Regional Roads in Errachidia Province

	Ide	ntification			Road Leng	th (km)		Pavement	Width of	Road	Connection
Route No.	Location	Road Length in Province	Road Length from Province	Pavement	No Pavement	Track Road	Total Length	Area m <sup>2</sup>	Roadway m	Class	
10	AGADIR A BOUARFA	545.642	762.900	217.258			217.258	869.032	4.00	A - B	RP 32, RP21
12	SIDI.IFNI A RISSANI	712.000	623.386 de la N13	131.000			131.000	733.600	5.60	A - B	CT3458, CT3454
13	SEBTA A TAOUZ	441.081	686.818 (Taouz)	186.700		59.037	245.737	1,120.200	6.00	A - B	RP21, NC, CT3461
		Total Length (National)		534.958			593.995	2,722.832			
113	TINGHIR A ALNIF	30.000	747.85 de la N12			17.239	17.239				CT 3458
317	EL KSIBA A IMILCHIL	107+500	0+000 de la R703	17.000		15.500	32.500	68.000	4.00	B - C	CT1903, CT3443
601	MISSOUR A BOUDNIB	182+262	712+958 de la N10			25.000	25.000				CT3466
702	TINJDAD A MERZOUGA	562+226 de la N10	662+76 de la N13	102.597		35.453	138.050	533.504	5.20	B - C	CT3451, CT3461
703	IMILCHIL A TINGHIR	140.000 de la R317	76+000			76.000	76.000				CT3445, CT34483
704	IMILCHIL A BOUMALNE	15.500 de la R703	15+360			15.360	15.360				CT6905
706	IMILCHIL A RICH	140.000 de la R317 487+166 de la N13		120.000			120.000	480.000	4.00	B - C	CT3443-3442. RP21B
708	RICH A TALSINT	494+392 de la N13	67.200	67.200			67.200	268.800	4.00	С	CT3468
		494+392 de la N13 67.200 Total Length (National)		306.797		126.813	491.349	1,350.304			

(1/2)

#### DPE, ERRACHIDIA

#### (2/2)

		Identification			Road Length (km)			Pavement	Width of	Road	Connection	
Route No	Province	Location	Road Length in Province	Road Length from Province	Pavement	No Pavement	Track Road	Total Length	Area m <sup>2</sup>	Roadway m	Class	
7100		Gourrama à N'zala	0.000	99.000			99.000	99.000			С	CT3478-NC
7101		Gculmima à Amellago	0.000	53.000	18.230		34.770	53.000	72920	4.00	B - C	CT3447
7102		N'zala à Amouguer	0.000	56.000			56.000	56.000			С	CT3438-NC
7103		M'zizel à Ait Hani	0.000	109.000	20.000	20.000	69.000	109.000	80000	4.00	B - C	CT3442-3444
7104	Taroudannt	Tamtatouchete à M'semrir	0.000	20.000			20.000	20.000			С	NC-CT3444
7105		Gouimima à Tourcug	0.000	26.000	26.000			26.000	104000	4.00	А	CT3453
7106		Gouimima à Ait Hani	0.000	84.000			84.000	84.000			С	CT3450-3449-NC
7107		Circuit Touristiquede Rissani	0.000	20.000	14.000		6.000	20.000	56000	4.00	С	CT3464
7108		Aachich – Ait Yazza PAR Tissemoumine – Oum Jran	0.000	48.000			48.000	48.000			ND	CT3460
7109		Toutal à Tazouguarte	0.000	47.000			47.000	47.000			С	CT3469
7110		Moissi à Tissemoumine	0.000	80.000			80.000	80.000			С	CT3456-NC
7112		Taouz à Oum Jrane	0.000	135.000			135.000	135.000			ND	NC
7319	Khenifra	Itzer / Imilchil, Tounfit	139.560	164.560			25.000	25.000			С	CT3425
			То	otal	78.230	20.000	703.770	802.000	312920			

PROVINCE	CERCLE	COMMUNE	POPULATION (hab)		POPULATION TOTALE	Taux de desserte
			1994	2002	DESSERVIE PAR L'ONEP	
		ERRACHIDIA	62542	79226	79226	100%
		BOUDNIB	8294	10507	10507	100%
		LKHENG	13075	14158	12499	88%
	ERRACHIDI A	M'DAGHRA	12207	13218	13218	100%
		AOUFOUS	12946	14019	14019	100%
		ERRTEB	12131	13136	13136	100%
		OUED NAAM	6729	7287	1726	24%
	TOTAL DUCE	RCLE	127924	151551	144332	95%
	ERFOUD	ERFOUD	18563	23515	23515	100%
		JORF	12143	15382	15382	100%
		ESSIFA	9159	9918	9918	100%
		AARAB SEBBAH ZIZ	18522	20057	20057	100%
ERRACHIDIA		OUD AARAB SEBBAH RHRIS		5479	5479	100%
		FEZNA	4120	4461	1703	38%
		ALNIF	19023	20599	0	0%
		H'SSYIA	10151	10992	0	0%
		M'SSICI	6836	7402	0	0%
	TOTAL DU CE	RCLE	103577	117806	76054	65%
		MOULAY ALI CHERIF	18450	23372	23372	100%
		BENI MHAMED SIJILMASS	22600	24473	24471	100%
	EDDICCANI	ESSFALAT	22258	24102	24102	100%
	ENNISSAINI	ERRISSANI	4673	5060	2726	54%
		ETTAOUS	4666	5053	4500	89%
		SIDI ALI	3572	3868	0	0%
	TOTAL DU CE	RCLE	76219	85927	79171	92%

PROVINCE	CERCLE	COMMUNE	POPULATION (hab)		POPULATION TOTALE DESSERVIE PAR L'ONEP	Taux de desserte
		ERRICH	13952	17674	17674	100%
		ENNZALA	3675	3979	0	0
		GUERS TIALLALINE	9718	10523	0	0
	DICIL	GOURRAMA	11216	12145	4054	33%
	RICH	GUIR	4716	5107	0	0%
		M'ZIZEL	6309	6832	0	0%
		SIDI AYAD	6372	6900	0	0%
		ZAOUIT SIDI HAMZA	6624	7173	0	0%
	TOTAL DU CE	62582	70333	21728	31%	
		GOULMIMA	14026	17768	17768	100%
		TINEJDAD	5755	7290	7290	100%
		CHRISS EL OULOUI	10958	11866	11866	100%
		GHRISS ESSOUFLI	6521	7061	7061	100%
	GOULMIMA	TADIGHOUST	7959	8618	5430	63%
ERRACHIDIA		FERKLA OULIA	18889	20454	20454	100%
		FERKLA ESSOUFLA	12653	13701	13701	100%
		AGHBALOU N'KARDOUS	8249	8932	0	0%
		MELLAAB	14604	15814	887	6%
	TOTAL DU CE	RCLE	99614	111506	84458	76%
		IMILCHIL	7253	7854	0	0%
		AIT YAHYA	4219	4569	0	0%
	IMILCHIL	AMOUGUER	4787	5184	0	0%
		BOUAZMOU	7838	8487	0	0%
		OUTERBAT	5898	6387	0	0%
	TOTAL DU CE	RCLE	29995	32480	0	0%
		ASSOUL	8062	8730	0	0%
	ASSOUL	AIT HANI	9054	9804	0	0%
		AMELLAGOU	5090	5512	0	0%
	TOTAL DU CE	RCLE	22206	24046	0	0%
TOTAL URBAIN	1		153725	194734	194734	100%
TOTAL RURAL			368392	398916	211008	53%
TOTAL PROVIN	TOTAL PROVINCE				405742	-

Office Nationale de L'Eau Potable, Province of Errachidia

Commune must	V	Vern	G1	V	V
Commune rurai	Ksar	Year	Commune rural	Ksar	Year
AARAB SEBBAH GHERIS	EL BOUIYA	1998	AIT HANI	AIT DAOUD OU	2004
				AZZI	
AARAB SEBBAH GHERIS	HANNABOU+	1998	AIT HANI	AIT HANI+	2004
AARAB SEBBAH GHERIS	KHATARA	1998	AIT HANI	AIT LAHCEN	2004
AARAB SEBBAH GHERIS	KRAIR	1998	AIT HANI	ASSINEG	2004
AARAB SEBBAH ZIZ	CHIYAHNA+	1997	AIT HANI	IKADMANE	2004
AARAB SEBBAH ZIZ	CHLALFA	1998	AIT HANI	TAADADAT	2004
AARAB SEBBAH ZIZ	ELKHANDEG	1998	AIT HANI	TAMATATOUCHTE	2004
AARAB SEBBAH ZIZ	KSAKIS	1998	AIT HANI	TAYAJOUT +	2004
AARAB SEBBAH ZIZ	KSAR KSIBA	1997	AIT HANI	TIIDRINE	2004
	KSBAT				
AARAB SEBBAH ZIZ	BELLAHCEN	1998	AIT HANI	TIMOULA	2004
AARAB SEBBAH ZIZ	KT BEN ALI	1997	AIT HANI	TIZOUGAGHINE	2004
AARAB SEBBAH ZIZ	LEBROUJ	1998	AIT HANI	TOUMLILTE	2004
AARAB SEBBAH ZIZ	LHAINE	1997	ALNIF	ACHBAROU	2001
AARAB SEBBAH ZIZ	L'HSASNA+	1998	ALNIF	AIT EL HABIB	2004
AARAB SEBBAH ZIZ	MYBRAHIM	1998	ALNIF	AIT BEN SAID	2004
AARAB SEBBAH ZIZ	ODALI	1997	ALNIF	AIT HAMMOU	2004
AARAB SEBBAH ZIZ	OD FI HACHMI	1999	AI NIF	AIT SARROUD	2004
	OD MAATALLAH	1007	ALNIE	AIT ZEGGANE	2004
	OD M'PAPEK	1997	ALME	ALNIE	2004
AARAD SEDDAH ZIZ		1999	ALME		2001
AARAB SEBBAH ZIZ	OD:MOULOUD+	1997	ALNIF	AMMAR	2001
AAKAB SEBBAH ZIZ	OULAD ABDENBI	1998	ALNIF	AZEKUUR	2001
AARAB SEBBAH ZIZ	OULAD BOUZIANE+	1998	ALNIF	MAGHNIA	2001
AARAB SEBBAH ZIZ	OULAD OGBA+	1997	ALNIF	TAALLALT	2004
AARAB SEBBAH ZIZ	OULAD ZAHRA	1998	ALNIF	TABOURIKT	2004
AARAB SEBBAH ZIZ	OULED BHAR(EXT	1997	ALNIF	TAGALGOULTE	2004
		1008	AT NIE	TIZI N'TEDEIC	2001
	DULED TALED	1998	ALNIF	TOUCHZA	2001
AARAD SEDDAH ZIZ	AIT ADDSMAD	2002	ALMIT		2001
AGUDALO NIKERDOUS		2002	AMOUGUER	AMOUGUEUK	2005
AGHBALO NIKERDOUS	IGOUDMANE	2002	AMOUGUER	TAGUENDOUST	2005
AGHBALO N'KERDOUS	IRBIBENE	2002	AOUFOUS	EL GARA	1997
AGHBALO N'KERDOUS	IZAKARENE	2002	AOUFOUS	JRAMNA	1997
AGHBALO N'KERDOUS	OULN'TAMAYOUST	2002	AOUFOUS	KSAR JDID	1997
AGHBALO N'KERDOUS	TAGHIA+	2002	AOUFOUS	OULAD AISSA	1997
AGHBALO N'KERDOUS	TAGHNBOUT	2002	AOUFOUS	OULAD CHAKER (II)	1997
AGHBALO N'KERDOUS	TAOUDAATE	2002	AOUFOUS	OULAD CHAKER(I)	1997
AGHBALO N'KERDOUS	TAOURIRT N'AIT MIMOUN	2002	AOUFOUS	ZAOUIT AMELKIS	1997
AGHBALO N'KERDOUS	TARGUIOUT	2002	AOUFOUS	ZAOUIT AOUFOUS	2000
AGHBALO N'KERDOUS	TASAKHTE	2002	AOUFOUS	ZOUALA+	1997
AGHBALO N'KERDOUS	TIMKITE	2002	AOUFOUS	ZOUIOUA	1997
AGHBALO N'KERDOUS	TOURTITE	2002	ARFOUD	HBIBAT	1997
			ARFOUD	JRANA+	1997
			ARFOUD	RMILA	1997

Commune rural	Ksar	Year	Commune rural	Ksar	Year
BNI M'HAMED SIJELMASSA	DAHBI	1998	BNI M'HAMED SIJELMASSA	OD SAADANE+	2001
BNI M'HAMED SIJELMASSA	MY TALEB	1998	BNI M'HAMED SIJELMASSA	OD:LMOUDEN+	2001
BNI M'HAMED SIJELMASSA	ABEHAR	1999	BNI M'HAMED SIJELMASSA	OULAD ABDERRAHMANE	1999
BNI M'HAMED SIJELMASSA	ABHIHIR	2001	BNI M'HAMED SIJELMASSA	OULED AICHA	1999
BNI M'HAMED SIJELMASSA	AMARA	1999	BNI M'HAMED SIJELMASSA	S.MEHDI	1998
BNI M'HAMED SIJELMASSA	AMSCIFI	1999	BNI M'HAMED SIJELMASSA	SIDI OMAR	2004
BNI M'HAMED SIJELMASSA	BENI FRAH+	2000	BNI M'HAMED SIJELMASSA	TAGHOGGA	1999
BNI M'HAMED SIJELMASSA	BNI MIMOUN CHORFA	1999	BNI M'HAMED SIJELMASSA	TAHSNOUNTE+	2001
BNI M'HAMED SIJELMASSA	BNI MIMOUN LAHRAR	1999	BNI M'HAMED SIJELMASSA	TAMSKANTE	2001
BNI M'HAMED SIJELMASSA	CHBILI	2000	BNI M'HAMED SIJELMASSA	TAOURAGHT	1999
BNI M'HAMED SIJELMASSA	CHKARNA	2001	BNI M'HAMED SIJELMASSA	TIGHDOUINE	1999
BNI M'HAMED SIJELMASSA	DAR EL BEIDA	2001	BNI M'HAMED SIJELMASSA	TIOUJDIT	2001
BNI M'HAMED SIJELMASSA	EL FARKH+	1998	BNI M'HAMED SIJELMASSA	TIRISTE	2001
BNI M'HAMED SIJELMASSA	EL FIDA	1998	BNI M'HAMED SIJELMASSA	ZAIDA	2000
BNI M'HAMED SIJELMASSA	GADDARA	1998	BOU-AZMOU	AGOUDAL	2002
BNI M'HAMED SIJELMASSA	GHORFA:ASSERGHINE +	1999	BOU-AZMOU	AIT ALI OUIKKOU+	1997
BNI M'HAMED SIJELMASSA	HAMMOUDA	2001	BOU-AZMOU	BOUZMOU	2002
BNI M'HAMED SIJELMASSA	JIR	2001	BOU-AZMOU	TACHTABENT	1997
BNI M'HAMED SIJELMASSA	JNANAE EL KADI	1999	CHORFA M'DAGHRA	BOUSAID	1999
BNI M'HAMED SIJELMASSA	KASBAT	1999	CHORFA M'DAGHRA	EL KENZ	1999
BNI M'HAMED SIJELMASSA	KASBAT MY M'BAREK+	1999	ER-RICH	ILLIGHNE	1998
BNI M'HAMED SIJELMASSA	KASBAT MY TAHAR	1998	ER-RICH	TAHINOUSTE	2004
BNI M'HAMED SIJELMASSA	KASBAT OULED YOUSSEF	1998	ER-RISSANI	BOBKER	1998
BNI M'HAMED SIJELMASSA	KSABI MY CHERIF (EXT-BT)	2001	ER-RISSANI	EL HAROUNE	2001
BNI M'HAMED SIJELMASSA	KSAR EL FOUGANI+	1999	ER-RISSANI	MEZGIDA+	1998
BNI M'HAMED SIJELMASSA	KSAR JBIL+	2000	ER-RTEB	BTATHA	1996
BNI M'HAMED SIJELMASSA	KSARJDID	1999	ER-RTEB	DOUIRA	1996
BNI M'HAMED SIJELMASSA	KSSIRTE	1999	ER-RTEB	EL BLGHMA	1996
BNI M'HAMED SIJELMASSA	LABTARNI	1999	ER-RTEB	SI ALI AGOUMI(EXT-BT)	1996
BNI M'HAMED SIJELMASSA	LAMRANI (EXT-BT)	2004	ER-RTEB	ZAOUIA JDIDA	1996
BNI M'HAMED SIJELMASSA	LOUJARCHA	2000	ER-RTEB	ZAOUIT KDIMA+	1996
BNI M'HAMED SIJELMASSA	MANOUGA+	1999	ES-SFALAT	ABADOU	2000
BNI M'HAMED SIJELMASSA	MANSOURIYA	1998	ES-SFALAT	AMMAR	2004
BNI M'HAMED SIJELMASSA	MARZOUGA	2001	ES-SFALAT	BOUZMELA	2000
BNI M'HAMED SIJELMASSA	O.ADDOU	1998	ES-SFALAT	-BRAHIM	2000
BNI M'HAMED SIJELMASSA	O.RAHOU+	1998	ES-SFALAT	GAOUZ	2000
BNI M'HAMED SIJELMASSA	O.YOUSSEF+	1998	ES-SFALAT	GUIAZ	2004
BNI M'HAMED SIJELMASSA	OD ABDELHALIM+	1999	ES-SFALAT	HAOUARA	2000
BNI M'HAMED SIJELMASSA	OD ABDELKADER	1999	ES-SFALAT	IRARA	2000
BNI M'HAMED SIJELMASSA	OD BIDALLAH	1999	ES-SFALAT	LAGRAWA+	2000
BNI M'HAMED SIJELMASSA	OD GAID	2000	ES-SFALAT	LAMTAHRA	2000
BNI M'HAMED SIJELMASSA	OD LIMAME+	2001	ES-SFALAT	MY ABDELLAH DAKAK	2001

Commune rural	Ksar	Year	Commune rural	Ksar	Year
ES-SFALAT	OD:MSALEM	2004	FERKALA ES-SOUFLA	AIT BA MAATI(EXT-BT)	1999
ES-SFALAT	OD:SIDI BRAHIM+	2000	FERKALA ES-SOUFLA	AIT BEN OMAR	1999
ES-SFALAT	OUCHEN	2004	FERKALA ES-SOUFLA	AIT M'AMMER AKDIM	1999
ES-SFALAT	OUIGHLANE	1997	FERKALA ES-SOUFLA	AIT MOULAY EL MAMOUN	1999
ES-SFALAT	OULAD BOUALI+	2000	FERKALA ES-SOUFLA	EL KSIBA	1999
ES-SFALAT	OULAD JMIAA	2000	FERKALA ES-SOUFLA	QTAA EL OUED	1999
ES-SFALAT	OULED OUILAL	2000	FERKALA ES-SOUFLA	TALALT+	1999
ES-SFALAT	OULED YAHIA	2000	FERKALA ES-SOUFLA	TAYARZA LAKDIM	1999
ES-SFALAT	SARET BAHAJ	2000	FERKALA ES-SOUFLA	TIGHFFART	1999
ES-SFALAT	TABOUASSAMT	1997	FERKALA ES-SOUFLA	TIZOUGGAGHINE	1999
ES-SFALAT	TABOUBRIKTE(	2000	FERKALA ES-SOUFLA	Z.S.EL HOUARI+	1999
ES-SFALAT	TAGHANJAOUTE	2000	FEZNA	KSAR JDID	1997
ES-SFALAT	TAZEGZOUT(ZT SIDI BOU-	2000	FEZNA	LAKSIBA	1997
ES-SFALAT	TINRHRAS	2000	FEZNA	O.CHERKI	1997
ES-SFALAT	ZAOUIAT SIDI ALI	2000	FEZNA	O.JELLAL+	1997
ES-SFALAT	ZAOUIT EL MATI	2000	FEZNA	OULAD GHANEM	1997
ES-SFALAT	ZT EL HAJ BOUZINA (EXT-BT)	2001	GHERIS EL OULOUI	AIT KETTOU	1998
ES-SFALAT	ZT ELKADI	2000	GHERIS EL OULOUI	HRT JDID	1998
ES-SFALAT	ZT ER RMAL	2000	GHERIS EL OULOUI	TIAONIN+	1998
ES-SFALAT	ZT MELAYKHAF)	2000	GHERIS EL OULOUI	TIMAHRACHT II	1998
ES-SFALAT	ZT SIDI ELGHAZI BEL KACEM	2000	GOULMIMA	IGHRAME N'OUGOUMMAD	2000
ES-SFALAT	ZT SIDI ELGHAZI BEN ARBI	2000	GOURRAMA	LAHRI +	2000
ES-SIFA	AL MOUNGRA	1998	GOURRAMA	MOUGUEUR	2001
ES-SIFA	DOUAR	1998	GOURRAMA	TAFENDAST	2000
ES-SIFA	K.ZT.S.ABDELLAH BOUBKER	1998	GOURRAMA	TAGRIRT	2000
ES-SIFA	KSAR GLAGLA	1998	GOURRAMA	TALHARITE	2000
ES-SIFA	KSAR OD.YAHYA(KT EL KAID+	1998	GOURRAMA	TIOUZAGUINE	2000
ES-SIFA	KT OD MOUMEN)	1998	GOURRAMA	TIT N'ALI	2000
ES-SIFA	OULED HSAINE	1998	GUERS TIAALLALINE	A.LEFKIH+	2000
ES-SIFA	SIFA	1998	GUERS TIAALLALINE	AIT AOUDA	2000
ET-TAOUS	HASSI LABIED	1998	GUERS TIAALLALINE	AIT TIKERT	2000
ET-TAOUS	KHMLIA	1998	GUERS TIAALLALINE	AMALOU	2000
ET-TAOUS	TABOUMIAT	1999	GUERS TIAALLALINE	BOULILI	2001
ET-TAOUS	TANAMOST +	1998	GUERS TIAALLALINE	BOUNIGAREF	2000
ET-TAOUS	TIHARINE+	1999	GUERS TIAALLALINE	HAMT M.ALICHRIF	1998
FERKALA EL OULIA	AMALAL	1999	GUERS TIAALLALINE	KHARZOUZA+	2000
FERKALA EL OULIA	ASRIR	1997	GUERS TIAALLALINE	LHAINE	2000
FERKALA EL OULIA	AZAG NOUCHEN	2002	GUERS TIAALLALINE	TAZMAMART	2005
FERKALA EL OULIA	EL KHORBATE	1999			
FERKALA EL OULIA	KSOURS ASSAT	1999			
FERKALA EL OULIA	TAMARDOUTE	1999			

Commune rural	Ksar	Year	Commune rural	Ksar	Year
GUIR	IRARA	2005	M'ZIZEL	ZT SIDI BOUKIL (II)	1998
GUIR	AACHIR	2005	M'ZIZEL	ZT.SIDI BOUKIL (I)+	1998
GUIR	AIT FERGANE	1999	OUED NAAM	BNI OUZIM	1998
GUIR	AIT MOUMOU	1999	OUED NAAM	KSAR TAOUS	1996
GUIR	AIT OUSSAL	1999	OUED NAAM	OULAD ALI	1998
GUIR	AIT YAHIA OU KHLIFA	1999	OUED NAAM	SAHLI	1998
GUIR	ASSEHB	1999	RHRIS ES-SOUFLI	AL BOUR TILLIOUINE	1998
GUIR	BAKNOU	2004	RHRIS ES-SOUFLI	ANFAR	1998
GUIR	MECHTAK	1999	RHRIS ES-SOUFLI	BOUTANFIT	1998
GUIR	MELLAHA	2004	RHRIS ES-SOUFLI	CHORFA +	1998
GUIR	TAKHLIFAT	2005	RHRIS ES-SOUFLI	EL AOUINA	1998
GUIR	TAMZILTE	1999	RHRIS ES-SOUFLI	GAWAZ	1998
GUIR	TAOUSSERT	2005	RHRIS ES-SOUFLI	KHLIL +	1998
GUIR	TOULAL:	1999	RHRIS ES-SOUFLI	KSAR BOUCHIHA+	1998
IMILCHIL	OUEDDI	2002	RHRIS ES-SOUFLI	KSAR JDID	1998
IMILCHIL	TAGHIGHACHTE	2002	RHRIS ES-SOUFLI	MLYHYA	1998
LKHENG	AIT MANZOU	1999	RHRIS ES-SOUFLI	TOUGHZA	1998
LKHENG	AIT YOUSSEF	1999	SIDI AAYAD	BOUKHLOUF+	1998
LKHENG	AT.ATMAN+	1999	SIDI AAYAD	IJOURAR	1998
LKHENG	IFRI	2005	SIDI AAYAD	IRHEJD	1998
LKHENG	TASMAALT	2005	SIDI AAYAD	TADRAKLOUT	1998
MELAAB	EL GUELTA)	2004	SIDI AAYAD	TAGRSIFT OUEST (EX BT)	1998
MELAAB	KHATART N'OUGHROD(TIGUIDA +	2004	SIDI AAYAD	TAHMIDANTE	2004
MOULAY ALI CHERIF	GRINFOUD	1998	SIDI AAYAD	TALAATMANITE	2004
MOULAY ALI CHERIF	KASBAT LAHDEB	1998	SIDI AAYAD	TASSALAHT +	2004
M'ZIZEL	OUALLAL	2003	SIDI AAYAD	TAYARA	2000
M'ZIZEL	A.MOSSA OUALI	1998	SIDI ALI	AKKAN TOURGA	2002
M'ZIZEL	AIT BEN YAHIA	2000	SIDI ALI	IGHIF N'GHIR	2002
M'ZIZEL	AIT HADJ SAID(EXT-BT)+	2000	SIDI ALI	OUDIKA	2002
M'ZIZEL	AIT HAMMOU EL HAJ	2004	SIDI ALI	TAFRAOUT+	2002
M'ZIZEL	AIT SAID	2004	TADIGHOUST	AIT BRAHIM	2004
M'ZIZEL	BALIT	2004	TADIGHOUST	ASEFLA	2004
M'ZIZEL	BOUCHIHA	2001	TADIGHOUST	AWRIR+	1998
M'ZIZEL	GAFAI(RIVE.D+	2000	TADIGHOUST	CHRIF	1998
M'ZIZEL	KSAR AIT.MY.MAATI+	2001	TADIGHOUST	IRHREM AMEKRANE	2004
M'ZIZEL	MZIZEL TILICHT	1997	TADIGHOUST	KSAR ELHARA	1998
M'ZIZEL	RIVE.G)(EXT-BT)	2000	TADIGHOUST	KSAR MOUY (I)+	1999
M'ZIZEL	TABERKITE (EXT-BT)	2004	TADIGHOUST	KSAR MOUY (II)	1999
M'ZIZEL	TABIAT	1998	TADIGHOUST	LBORJ JDID	1999
M'ZIZEL	TACHICHATE	2004	TADIGHOUST	LBORJ LAQDIM	1999
M'ZIZEL	TIGHEJDET	1998	TADIGHOUST	TAHAMDOUNTE	2004
M'ZIZEL	TIGHRMATINE :(TALAHMOUMT	2004	TADIGHOUST	TALTAFRAOUT	2002
			TADIGHOUST	TIMIZGUIT	2004
			TADICUOUST	TIRHREMT	2004
			IADIGHUUSI	N'IGRANE+	2004
			TADIGHOUST	ZIMBA	1999

Source: ONE

Commune rural	Ksar	Year	Commune rural	Ksar	Year
AIN CHOUATER	AIN CHOUATER	2000	FIGUIG	SIDI ABDELKADER MOHAMED	1999
BNI GUIL	GARE FERROVIERE	1999	TALSINT	AIT IDIR	1999
BNI TADJITE	SBAIK	1999	TALSINT	AIT OMAR	1999
BOUANANE	BENT EL KHATTAB	1999	TALSINT	AIT SAID OU OTHMANE	1999
BOUANANE	OULAD ABBES	1999	TALSINT	LAGRABA (EXT BT)	1999
BOUANANE	TAKOUMITE	1999	TALSINT	ZAOUIA SOUFLA	1998
BOUARFA	TOBA 2	1999	TALSINT	ZAOUIA+	1999
BOUARFA	ZELLAKA	1999			

Source: ONE

						-	(1/3)
Cercles	Communes		Population		Formations	Category	Project
		Urban	Rural	Total			
Assoul	Assoul		8,189	8,189	Assoul	HL	
					Tirga	DR	
	Ait Hani		9,500	9,500	Ait Hani	CSCA	
					Tamtatoucht	DR	
	Amellagou		5,166	5,166	Amellagou	CSC	Extension of CSCA
Erfoud	Erfoud	21,875	13,343	35,218	H. Edakhil	CSU	
					Sghiri Houmani Belmaati	PSP	
	Alnif		8,825	8,825	Alnif	CSCA	
			5,972	5972	Ait Zegane	DR	
			5,619	5619	Azekor	DR	Reconstruction
	Jorf	12,651		12651	Jorf	CSUA	
	M'cissi		4,889	4889	M'cissi	CSC	
	Нсіуа		2,367	2367	Fezou	DR	Reconstruction
			11,083	11083	Ait Saadane	DR	
					Mejrane	DR	
	Arab S. Ziz		4,954	4954	Maadid	DR	
					Oulad Maatallah	CSC	Construction
	Essifa		9,374	9374	Essifa	CSCA	
	Arab. S. Ghriss		5,272	5272	Hannabou	CSC	
	Fezna		4,292	4292	Fezna	CSC	
Rissani	M. A. Cherif	22,769	14,625	37394	Sijilmassa	HL	
	Rissani		3,941	3941	Mezguida	CSC	
	B. M. Sijimassa		2,241	2241	O. Abdelhalim	DR	
					Mansouria	CSC	Construction
			4,698	4698	El Ghorfa	DR	
					Jbil	DR	
	Sfalat		21,966	21966	Sfalate	CSC	Extension
	Taouz		3,565	3565	Merzouga	CSCA	
			4,555	4555	Taouz	DR	
	Sidi Ali				Tafraout	CSC	

# Table F.6.1 Sanitary Infrastructures and Projects in the Province of Errachidia

Cercles	Communes		Population		Formations	Category	Project
		Urban	Rural	Total			5
Errachidia	Errachidia				My Ali Cherif	HGP	
					Houmane El Fatwaki	HSP	
		17874		17874	Abder. Sahra	CSU	
		14826		14826	M. Maani	CSU	
		12421		12421	A. B. Abdellah	CSU	
		11334		11334	Oulad Bounaji	CSU	
		28648		28648	Med Zerk	CSU	
	Aoufous		7095	7095	Aoufous	CSCA	
			6852	6852	Z. Amelkiss	DR	
	Rteb				Oulad Chaker	DR	
					Zaouia Jdida		Construction d'un CSC
			7050	7050	Zrigate	DR	Reconstruction
			5311	5311	Douira	DR	Reconstruction
	Boudenib	9342	4767	14109	Boudenib	HL	
	Oued Naam				Sahli	CSC	
			1987	1987	Tazougart	DR	Reconstruction
					beni Ouzieme	DR	
	Mdaghra		6388	6388	M'Daghra	DR	Reconstruction
					Kasba		Construction
			1787	1787	Meski	DR	
	Kheng		5974	5974	Kheng	CSC	
			1478	1478	Ait Atmane	DR	
Goulmima	Goulmima	16912	6867	23779	Goulmima	CSU	
					20 Aout	PSP	
	Aghbalou		4161	4161	Aghbalou	CSCA	
			1491	1491	Igoudmane	DR	Reconstruction
			3208	3208	Ifegh	DR	
	Gh. Essoufli				Ouakka		Construction
			2941	2941	Tilouine	DR	
	Gh. Ouloui		8133	8133	Ait Ihya	CSC	

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Cercles	Communes		Population		Formations	Category	Project
		Urban	Rural	Total			
Goulmima	Tadighoust		7982	7982	Tadighoust	CSC	Extension of CSCA
	Mellaab		9520	9520	Mellaab	CSCA	
			4901	4901	Touroug	DR	Reconstruction
					Igli	DR	
	Tinejdad	6467	11093	17560	Amraoui B.	CSUA	
	Ferkla Soufla				Ktaa El Ouad	CSC	
			4663	4663	Tizougagine	DR	Reconstruction
	Ferkla Oulia		18851	18851	Asrir	CSC	Reconstruction
Imilchil	Amougeur		5628	5628	Amougeur	CSCA	
					Ait Yaacoub	DR	
	Ait Ihya		4592	4592	Tazarine	CSC	
	Imilchil		8902	8902	Imilchil	HL	
	Bouzmou		4398	4398	Bouzmou	CSC	
			3251	3251	Agdal	DR	
	Outerbat		6317	6317	Outerbat	CSCA	
Rich	Rich	17150	1138	18288	Tahmidante	CSU	
					Rich	HL	
	Guers		6364	6364	Kerrandou	CSCA	
			3260	3260	Ait Attou	DR	Reconstruction
	Nzala		3922	3922	N'zala	CSC	
	Mzizel		4448	4448	M'zizel	CSC	
			5704	5704	Ait M. Ou Ali	DR	
	S. Ayad		3172	3172	Sidi Ayad	CSC	
	Z. S. Hamza		6696	6696	Z. S. Hamza	CSCA	
	Gourrama		9570	9570	Gourrama	CSCA	
	Guir		4688	4688	Toulal	CSC	

Rural dispensary DR:

Local hospital

Public health polyclinic

HL:

PSP:

Communal health center CSC:

HGP:

CSCA: Urban health center with maternity

CSCA: Communal health center with maternity

Urban kealth center CSU:

Provincial general hospital

Provincial specialty hospital HSP:

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Commune Rural	No. of Prelirinary school	No. of pupils	Commune Rural	No. of Prelirinary school	No. of pupils
Errachidia	18	10,280	Oued N'ame	8	788
Erfoud	7	4,359	Chorfa M'daghra	11	2,262
Goulmima	6	2,918	El Kheng	19	2,158
Rich	4	3,191	Aghbalou	14	1,944
Jorf	5	2,282	Ghris Soufli	7	1,227
My Ali Cherif	8	4,271	Ghris Al Ouloui	6	2,288
Boudenib	4	1,782	Tadighoust	14	1,367
Tinejdad	4	1,333	Mellaab	25	3,617
Ait Hani	11	1,400	Ferkla Soufla	11	2,645
Amellago	12	863	ferkla Al Oulia	16	3,875
Assoul	11	1,177	Ait Yahya	10	613
M'cissi	17	1,694	Amouguere	11	836
H'sya	20	2,760	Imilchil	15	925
Alnif	34	5,140	Bouzmou	12	1,316
Sifa	6	1,794	Outerbate	12	775
Arab Sebbah Ziz	18	4,446	Guers Tiallaline	16	1,765
Arab Sebbah Gheris	3	749	N'zala	14	570
Fezna	3	683	M'zizal	7	1,016
Beni M'Hamed Sijilm	24	2,901	Sidi Ayad	13	1,346
Rissani	13	841	Z. Sidi Hamza	7	680
S'falat	25	3,830	Guir	9	437
Taouz	12	845	Gourrama	13	871
Sidi Ali	6	545	Cenre Gourrama	2	1,107
Aoufous	14	1,652			
R'teb	9	1,994			
			Total	566	98,158

# Table F.7.1Socio-Data (Preliminary School)

Source: Deligation, Errachidia (2003/2004)

# Table F.7.2Secondary and High Schools

Secondary schools	No. of secondary school	No. of students	
Secondary school	49	32,407	
High school	19	13,556	

Source: Deligation, Errachidia (2003/2004)

# Table F.7.3Proportion of Students

Schools	No. of Male No. of Female	
High school	8,880	4,676
Proportion	66 %	34 %

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Annexe G Environmental Assessment and Evaluation

# Annexe G Environmental Assessment and Evaluation

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## G.1 Introduction

Tafilalet area is located in the South of Morocco, in north of Sahara. The area includes four basins: Ziz, Gheris, Guir and Maider, and situate in the southern side of the high Atlas. The area spreads on a total surface of 77,250 km<sup>2</sup> covering the Province of Errachidia and the Circle of Beni-Tadjit in the Province of Figuig. The south area of the Tafilalet is extremely dry condition, and water resource is very limited.

Major environmental issues in Tafilalet area are farmland devastation and salinity of soil and water. The following surveys were carried out to investigate the situation of those issues by the JICA Study Team.

- Water Quality survey: 32 items, 35 locations
- Interview survey for fluctuation of water flow through khettara, as a part of the Inventory Survey
- Interview survey for influence of encroaching sand, as a part of the Inventory Survey

Initial Environment Examination (IEE) was undertaken to determine the environmental impacts that might be created by the proposed project in the Master Plan based on existing data and information to the related projects, the comments and judgments of specialists who are familiar with the environmental impacts of past similar projects, and the above 3 surveys.

## G.2. Environmental Conditions and Problems in Tafilalet Area

## G.2.1 General Environmental Situations

Major environmental issues in Tafilalet area are farmland devastation, high concentration of salt in soil and groundwater, and so on. General situations of those issues are as follows,

- South area of the Tafilalet is extremely dry condition, and annual precipitation is about 50 mm in that area. For that reason, the water volume gained thorough khettara has been decreased. The number of farmers who abandon their cultivation is increased, because of lack of water source. Abandoned farmland invaded by encroaching sand, and farmland devastation is advanced. This farmland devastation occurs dominantly from Jorf to Taouz (Merzouga).
- The area in which the soil is highly damaged by salinity is also concentrated the area from Jorf to Taouz (Merzouga). The highly damaged area by salinity shares about 20 % ((c)+(d) in the following table) of total area as shown in the following table.

(a) No damaged area by salinity	38.2%
(b) The slightly damaged by slightly, which is possible to be improved	44%
(c) The hardly damaged area by salinity, which is difficult to be improved	10.2%
(d) The abandoned area caused by salinity	7.6%

The Evaluation of Salinity A	rea in Tafilalet Area
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(Source: the soil survey in 1982 by the ORMVA/TF)

- The water gained through khettara, where located in the area from Jorf to Taouz (Merzouga), contains high concentration of salt as shown in the result of water quality survey.

- The main issue of agricultural production is Bayoud for palm trees.

#### G.2.2 Inventory Survey

Farmland devastation is caused by limited water resources, dry climate, encroaching sand, emigrant of 30s men and so on. The situation of limited water resources and encroaching sand are indicated in the inventory survey for 410 khettaras. Two factors, such as fluctuation of water flow of khettara and influence of encroaching sand, are picked up to explain the situation of farmland devastation from inventory survey of 410 khettara.

#### (1) Fluctuation of water flow of khettara

The fluctuation of water flow of khettara by zone is shown in Table G.2.1, and summarized in the following table. The number of valid response to the interview concerning fluctuation of water flow is 305 among 410 khettaras.

		The number of khettaras ( inside of ( ): percentage to valid response <sup>*1</sup> )
Water flow exist	Dried up khettaras <sup>*2</sup>	160 ( 52.5% )
or not exist	Khettaras with water flow at least limited term in the year*3	145 ( 47.5% )
	Total	305 (100 %)
Twenty yeas before	Dried up khettara over twenty years before	72 (23.6%)
Last five years	Khettaras dried up or reducing water flow during last five yeas <sup>*4</sup>	143 (46.9 %)
	Khettaras with continuous water flow thorough year <sup>*5</sup>	123 ( 40.3% )
	Khettaras with constant or increased water flow <sup>*6</sup>	23 (7.5%)

Fluctuation of Water Coming from Khettara

\*1: The number of valid response is 305 among 410 khettaras.

\*2: The sum of the number of answers from (1) to (4) in the Table G.2.1

\*3: The sum of the number of answers from (5) to (8) in the Table G.2.1

\*4: The sum of the number of answers from (4) to (6) in the Table G.2.1

\*5: The sum of the number of answers from (6) to (8) in the Table G.2.1

\*6: The sum of the number of answers from (7) to (8) in the Table G.2.1

(Source: Inventory survey by the JICA Study Team and the ORMVA/TF) The productive khettara are 191 numbers in the main report, and their share is 46 % of 410 as total number of khettaras. According to inventory survey, khettaras with water flow at least limited term through year are 47.5 % of 305 khettaras, which have valid responses of the interview. There are not big differences

between two population parameters. It seems that 305 khettaras shows the close enough situation of 410 khettaras. The population parameter is, therefore, 305 khettaras in the following analysis.

The khettaras with perennial water flow are 40 %. The khettaras, which have constant water flow or increased water flow, are only 7.5 %. The khettaras dried up over twenty years before are 23.6 %. The khettaras, which are dried up or reduced water flow in last five year, are 46.9 % of 305 khettaras. Almost half of khettaras reduce their water flow in last five years.

The percentage of each answer from (1) to (8) by Zone except of Zone C, which has no valid answer, is shown in the following figure. There are many unproductive khettaras from over 20 years ago in Zone D, E, and F. Many khettaras in Zone G decrease their water flows within recent five years.



(1): No water flow from 1950s or 1970s

(2): No water flow in the last two-decade

(3): No water flow in the last decade

(4): No water flow in the passive five years

(5): No water in the dry season in the past five years

(6): Water flow exist thorough year, but water flow is reduced year by year.

(7): Constant water flow

(8): Water flow is increased

(Source: Inventory survey by the JICA Study Team and the ORMVA/TF)

Fluctuation of Water Flow by Zone

#### (2) Influence of encroaching sand

The influence of encroaching sand to khettara and farmland was investigated in the inventory survey to 410 khettara. The degree of the damage by encroaching sand to four portions of traditional irrigation system by khettara, such as catchments, conduit, open channel, and irrigation canal, is shown in Table G.2.2.

The following analysis is based on valid answers. It is shown as the reference, because the number of valid answer varies by Zone and by portion of khettara irrigation system.

It is considered that the number of significant damaged khettaras in Zone D, E, and F is larger than that of ones in Zone A, B, C and G as shown in the following figure. This tendency corresponds to the situation that unproductive Khettaras concentrated into Zone D, E, and F. as mentioned in the above contents of "1) Fluctuation of water flow of khettara".



(Source: Inventory survey by the JICA Study Team and the ORMVA/TF)

Percentage of Significant Damaged Khettaras by Encroaching Sand by Zone

## G.2.3 Water Quality Survey

(1) Sampling and method

Water quality surveys by the JICA Study Team are summarized in the following table. Sampling locations are shown in Figure G.2.1

Sampling date	Sampling location	Method	Analysis item
From June 25 to July 16, 2003	Zone A: 6 khettaras Zone B : 2 khettaras Zone C : 2 khettaras Zone D : 6 khettaras Zone E : 4 khettaras Zone F : 2 khettaras Zone G : 6 khettaras Total 28 khettaras	Location of Sampling: outlet of each khettara	32 items shown in the Table G.2.3
From February 11 to 13, 2004	Zone A: 2 khettaras Zone D : 3 khettaras Zone G : 2 khettaras Total 7 khettaras	Location of Sampling: outlet of each khettara	32 items shown in the Table G.2.3
In July, 2005	Khettara Taoumart, Ait Ben Omar, Ait Moulay Mamoun	Location of sampling: Washing place Simplified color test	COD and surfactant

Water quality surveys done by the JICA Study Team

# (2) Result of water quality survey

The water samples from 35 khettaras were analyzed for 32 water quality items. The result of survey and adaptation to irrigation water standard is summarized in Table G.2.3, and adaptation to drinking water standard in Table G.2.4.

(3) Evaluation of quality of khettara water

The khettara water is often used for both of irrigation and drinking in the project area. Water quality of

khettara, therefore, should be evaluated by the both standard of irrigation and dinking water. The irrigation water quality is evaluated by the Moroccan standard, and salinity by USDA's standard. The Moroccan standard of drinking water and WHO's guideline are adopted to evaluate the quality of drinking water. Moroccan standard of irrigation and drinking and WHO's guideline are shown in Table G.2.5.

#### (a) Irrigation water

The evaluation of all samples by Moroccan standard is shown in Table G.2.6. The main issue of irrigation water is salinity in the study area.

Samples in Zone D, E and F have high electric conductivity, which indicates the total volume of inorganic ion. These samples also contain high value of chloride (Cl<sup>-</sup>), sulfate (SO<sub>4</sub><sup>2-</sup>), and sodium (Na). The source of these high value items is considered to be derived from original rock and soil around the surveyed area.

All 35 samples' classifications of conductivity and Sodium Adsorption Ratio (SAR) under the USDA standard for irrigation are shown in the following figure.



 $SAR = Na^{+} / ((Ca^{2+} + Mg^{2+}) / 2)^{1/2}$ 

SAR

#### Classification of SAR and Conductivity

Nineteen samples out of 35 are classified into C3-S4 and C4-S4 as shown in the following table. All samples in Zone D, E, and F are classified in C3-C4 and C4-S4, while a few samples in Zone A and G are classified into high SAR. For all samples classified listed in the following table, it is necessary to be careful to occur salinity problem. Water saving irrigation techniques (drip irrigation and so on) and cultivation of high tolerance crops are necessary to spread farmers in those area.

Classification		Zone	Nos	Khettaras	Nos of all samples
C3-S4, C4-S4	Conductivity: High - Very High SAR: Very High	Zone A	1	Taltafroute R.D	8
		Zone B	1	Chouater	2
		Zone C	1	Ouled Ali	2
		Zone D	9	Souihla Ouled Ghanem, Kadima Krair Lahloua Monkara, Jdida El Bouya, Khitiria Hannabou, Lagrinia Hannabou, Lambarkia, Ouastania, Lagrinia	9
		Zone E	4	Kadima Sifa, Haj Allal, Ighzer Charchmia	4
		Zone F	2	Haroun, El Bgaa	2
		Zone G	1	Takacha	8

Very High SAR and Conductivity Khettaras

(Source: Water Quality Survey by the JICA Study Team)

## (b) Drinking water

All samples are evaluated by 26 items, except of six items, such as total hardness (TH), silica (SiO<sub>2</sub>), Carbonate (CO<sub>3</sub><sup>-</sup>), Potassium (K), Calcium (Ca), and Magnesium (Mg), which are not contained in these three standards. The evaluation of all samples is shown in the Table G.2.7.

Coli form group and fecal coli form are detected from all samples except of 4 khettaras. The detection of coli form is thought to be caused by the contamination of human and animal feces and domestic wastewater. The treatment of disinfection by chloride is necessary to drink the water in those areas.

The sample of Souihla Ouled Ghanem and so on, contains much volume of total nitrogen, ammonium ion, BOD, and COD. On the contrary, it contains low volume of dissolved oxygen, which has the inverse association with the value of BOD. These phenomena area considered to be caused by the contamination of animal waste and domestic wastewater. It is necessary to make effort to treat adequately animal waste and not to drain domestic water into canals.

All of the value of nitrate and nitrite are under the standard of WHO. Some samples in Zone A and G has high value of nitrate as 24.8 mg/lit, and nitrite as 0.5 mg/lit. A sample from the well has high value of Nitrate as 28.0 mg/lit, and the sample from the khettara close to that well has also slightly high value of nitrate and nitrite.

### (4) The brief survey of surfactant

Water guided through khettara is not only used for irrigation but also for drinking, livestock breeding, washing and other living activities. In some Khettara, laundry place is not properly equipped and after
wash water flows into irrigation canal. This causes deterioration of water quality for agriculture and rural life. The ORMVA/TF and the JICA improve laundry places accompanied to khettara and also carry out enlightenment activities in cooperation with local associations in order to prevent after wash water from re-entering into irrigation canal. The water coming from khettara, on the contrary, is very valuable for beneficiaries. They don't want to lose water by draining after washing water outside of irrigation canal. For that reason, we instruct inhabitants to drain after wash water with synthetic detergent into drainage tank installed beside of laundry place, and to return after rinsing water into irrigation canal. This project was implemented in Ait Ben Omar, Ait Moulay L'mamoun, and Taoumart.

The brief survey of COD and surfactant was carried out by the JICA Study Team to verify the effectiveness of improvement of laundry places. The measurement of COD and surfactant was carried out 3 times as shown in the following table.

		11000duie of the fileds	
	Timing	Location of measurement	Purpose of measurement
1	Before washing	Upstream of laundry place	To measure the value of COD and surfactant in the base condition (no laundry practice)
2	Just after washing clothes with synthetic detergent	Just downstream of laundry place	To measure the value of them in the condition of before project
2	Just after rinsing clothes with khettara water	Just downstream of laundry place	To measure the value of them in the condition of after project

Procedure	of	the	Measurement
I I OCCUUIC	OI.	unc	mousurement

The result of the survey is shown in the following table.

I. a and in a	I	Values (mg/lit)						
Location	Location     Items     Base condition       Ait Ben Omar     COD     2       Surfactant     0.5       Moulay L'mamoun     COD     1       Taoumart     COD     1       Surfactant     0.5       Taoumart     Surfactant     0.5	Before project	After project					
Ait Day Ower	COD	2	50	3				
Ait Ben Omar	Surfactant	0.5	2	2				
A : 4 M ] T ?	COD	1	30	5				
Alt Moulay L mamoun	Surfactant	0.5	5	1.5				
T	COD	1	1	1				
Taoumart	Surfactant	0.5	0.5	0.5				

### The Result of Brief Survey of COD and Surfactant

(Source: Survey by the JICA Study Team)

It is confirmed that the values of surfactant COD and were reduced by preventing after wash water with synthetic detergent from re-entering into irrigation canal. The values of surfactant were a little bit high comparing with the Japanese standard of drinking water (0.2 mg/lit). These values is not big problem for inhabitants health, because drinking water is usually taken from the upstream of washing place. Concerning irrigation water, there is no standard for surfactant. The values of COD in the condition of after project bellow the Moroccan standard of drinking water (25 mg/lit).

### G.3 Environmental Impact Assessment

### G.3.1 Initial Environmental Examination

The IEE follows basically the JICA's guideline of environmental impact assessment issued in March 2002. The checklist of IEE is shown in Table G.3.1. The checklist covers the items defined by both the older one issued in 2002 and the new one issued in 2004. The JICA's Guidelines for Environmental and Social Considerations was issued in April 2004.

No item in the checklist of IEE has significant or slight negative environmental impact. Some environmental impacts that is necessary to be monitored in future are as follows,

- It is necessary to be careful to spread Bayoud into the expanded palm tree fields by the implementation of projects proposed in the Master Plan.

- It is necessary to monitor the conductivity of irrigation water gained through khettara located the area from Jorf to Taouz (Merzouga), because those water have high conductivity.

IEE for the plan of facilities for underground water increment is not undertaken, because it is not enough for the JICA Study Team to assess it at present. Environmental Impact Assessment will be necessary to be undertaken, when a specific plan is designed.

# G.3.2 Environmental Impact Assessment

Environmental Impact Assessment was undertaken in the selected 7 areas, such as Ait Ben Omar, Diba, Lambarkia, Ouastania, Lagrinia, Timarzit, and Taoumart. The environmental evaluation is shown in Annex J.

# G.4 Environmental Policy and Framework in Morocco

### G.4.1 Procedure of Environmental Impact Assessment in Morocco

The project, which is necessary to undertake Environment Impact Assessment (EIE), is defined in the Moroccan law of EIE by the Department of Environment, as shown in Table G.4.1. Any projects proposed in the Master Plan are not contained in projects in Table G.4.1.

The Moroccan law for EIE is introduced as reference in the following contents.

The Moroccan law for EIE (Loi n° 12-03 relative aux études d'impactsur l'environnement) was established by the department of environment in Morocco in May 2003. Promoters of the project are obliged to conduct EIE, in case of the implementation of the project shown in Table G.4.1. In this law, the following items were defined,

- the purpose, contents and procedure of the evaluation study
- Setting up national or rural committee of environment
- release the evaluation document to public and hearing public opinions

The procedure of EIE is shown in Figure G.4.1, and sample of evaluation document is shown in Table G.4.2.

# G.4.2 Countermeasure against farmland devastation

# (1) National program

The national action program against desertification (Programme d'action National de Lutte Contre la Desertification) is carried out as the integrated program among water resources, agriculture, forestry and so on is implemented since 2001.

The long-term programs and strategies are shown in Table G.4.3. And the principal projects in the five years plan of countermeasures against desertification from 2000 to 2004 is shown in Table G.4.4.

# (2) Countermeasure against encroaching sand - case of El Bouya

Some kinds of fences, such as concrete fence and grid fence with palm leaves, have been installed to fix encroaching sand in El Bouya in 1980s. Rehabilitation of shafts and installing covers of shaft has also been conducted for protecting khettara from sands.

The project, which recovers 5ha farm covered by sand, started from July 2003. Lattice fence with palm leaves was installed to protect farmlands from encroaching sand in October 2003. Palm seedlings are going to be planted in the farmland surrounded by the fence. This project is implemented under the cooperation of the following organizations.

Agency and organization	Role
The ORMVA/TF	Researches and surveys
	• Management and extension of installation of lattice fence with palm
	leaves
	• Delivery of palm seedlings
	Management and extension of afforestation
	<ul> <li>Management and extension of promotion of drip irrigation</li> </ul>
	• Follow-up the whole project
Ministry of Regional Planning, Environment, Urban	• Subsidy to purchase palm leaves for lattice fence
Development and Housing	· Follow-up the project of holding encroaching sand
ADS (Social Development Agency)	• Subsidy to purchase materials of drip irrigation
	Follow-up to the drip irrigation project
SEEN (Service des Expérimentations, des Essais et de la Normalisation)	• Management and extension of the drip irrigation project
Association Amal	Providing labors, lands and wells
(Association in El Bouya)	• Researches and surveys (cooperating with the ORMVA/TF)
	• Operating the project
Association de Lutte Contre la Desertification	Supporting Association Amal
(NGO in Jorf)	• Follow-up the whole project (with the ORMVA/TF)
University of Errachidia	• Follow-up the whole project (with the ORMVA/TF)

### Recovering Farmland Project in El Bouya and Related Organizations

(Source: the ORMVA/TF)

The water source of this project is the groundwater from a well with pumping machine. Three thousand and five hundred Tamarixes have been already planted in that area with the donation of Ministry of Regional Planning, Environment, Urban Development and Housing.

Tables

Table G.2.1 Fluctuation of water Flow by 2	Zone
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	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
	Goulmima	Beni-Tadjit,	Zone	Fezna, Jorf,	Sifa	Rissani et	Alnif	
	& Tinjdad	Gourrama	Boudenib	& Hannabou		Taouz		
Number of khettaras	137	24	8	69	25	44	103	410
(1) No water flow from 1950s or 1970s	9	0	0	26	6	18	13	72
	(12.7%)	(0.0%)	(0.0%)	(40.0%)	(28.6%)	(46.2%)	(13.4%)	(23.6%)
(2) No water flow in the last two-decade	0	1	0	7	1	7	19	35
	(0.0%)	(8.3%)	(0.0%)	(10.8%)	(4.8%)	(17.9%)	(19.6%)	(11.5%)
(3) No water flow in the last decade	5	1	0	4	5	4	13	32
	(7.0%)	(8.3%)	(0.0%)	(6.2%)	(23.8%)	(10.3%)	(13.4%)	(10.5%)
(4) No water flow in the passive five years	3	1	0	3	0	0	14	21
	(2.2%)	(4.2%)	(0.0%)	(4.3%)	(0.0%)	(0.0%)	(13.6%)	(6.9%)
(5) No water in the dry season in the past five years	3	1	0	6	0	1	11	22
	(4.2%)	(8.3%)	(0.0%)	(9.2%)	(0.0%)	(2.6%)	(11.3%)	(7.2%)
(6) Water flow thorough year, but water flow is reduced	36	4	0	18	6	9	27	100
	(50.7%)	(33.3%)	(0.0%)	(27.7%)	(28.6%)	(23.1%)	(27.8%)	(24.4%)
(7) Constant water flow	14	4	0	0	1	0	0	19
	(19.7%)	(33.3%)	(0.0%)	(0.0%)	(4.8%)	(0.0%)	(0.0%)	(6.2%)
(8) Water flow is increased	1	0	0	1	2	0	0	4
	(1.4%)	(0.0%)	(0.0%)	(1.5%)	(9.5%)	(0.0%)	(0.0%)	(1.3%)
No answer or invalid response	66	12	8	4	4	5	6	105
	(48.2%)	(50.0%)	(100.0%)	(5.8%)	(16.0%)	(11.4%)	(5.8%)	(25.6%)

Table G.2.2Influence of Encroaching Sand (1/3)(1) Influence of encroaching sand in catchments area

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
	Goulmima & Tinjdad	Beni-Tadjit, Gourrama	Zone Boudenib	Fezna, Jorf &t Hannabou	Sifa	Rissani & Taouz	Alnif	
Number of khettaras	137	24	8	69	25	44	103	410
(1) Khettaras damaged significantly by encroaching sand	28	3	1	1	1	17	5	56
	(20.4%)	(12.5%)	(12.5%)	(1.4%)	(4.0%)	(38.6%)	(4.9%)	(13.7%)
(2) Khettaras damaged partially by encroaching sand	17	8	3	1	2	4	38	73
	(12.4%)	(33.3%)	(37.5%)	(1.4%)	(8.0%)	(9.1%)	(36.9%)	(17.8%)
(3) Khettaras damaged negligibly by encroaching sand	55	13	4	3	15	19	13	122
	(40.1%)	(54.2%)	(50.0%)	(4.3%)	(60.0%)	(43.2%)	(12.6%)	(29.8%)
invalid response	37	0	0	64	7	4	47	159
	(27.0%)	(0.0%)	(0.0%)	(92.8%)	(28.0%)	(9.1%)	(45.6%)	(38.8%)

(2) Influence of encroaching sand to conduit of khettaras

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
	Goulmima & Tinjdad	Beni-Tadjit, Gourrama	Zone Boudenib	Fezna, Jorf & Hannabou	Sifa	Rissani & Taouz	Alnif	
Number of khettaras	137	24	8	69	25	44	103	410
(1) Khettaras damaged significantly by encroaching sand	21	2	1	37	15	19	8	103
	(15.3%)	(8.3%)	(12.5%)	(53.6%)	(60.0%)	(43.2%)	(7.8%)	(25.1%)
(2) Khettaras damaged partially by encroaching sand	12	7	3	9	3	6	39	79
	(8.8%)	(29.2%)	(37.5%)	(13.0%)	(12.0%)	(13.6%)	(37.9%)	(19.3%)
(3) Khettaras damaged negligibly by encroaching sand	56	14	4	11	0	13	13	111
	(40.9%)	(58.3%)	(50.0%)	(15.9%)	(0.0%)	(29.5%)	(12.6%)	(27.1%)
invalid response	48	1	0	12	7	6	43	117
	(35.0%)	(4.2%)	(0.0%)	(17.4%)	(28.0%)	(13.6%)	(41.7%)	(28.5%)

# Table G.2.2Influence of Encroaching Sand (2/3)

# (3) Influence of encroaching sand to open channel of khettara

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
	Goulmima & Tinidad	Beni-Tadjit, Gourrama	Zone Boudenib	Fezna, Jorf et Hannabou	Sifa	Rissani et Taouz	Alnif	
Number of khettaras	137	24	8	69	25	44	103	410
(1) Khettaras damaged significantly by encroaching sand	42	4	0	7	12	16	14	95
	(30.7%)	(16.7%)	(0.0%)	(10.1%)	(48.0%)	(36.4%)	(13.6%)	(23.2%)
(2) Khettaras damaged partially by encroaching sand	9	4	3	0	3	2	33	54
	(6.6%)	(16.7%)	(37.5%)	(0.0%)	(12.0%)	(4.5%)	(32.0%)	(13.2%)
(3) Khettaras damaged negligibly by encroaching sand	52	13	5	2	2	21	12	107
	(38.0%)	(54.2%)	(62.5%)	(2.9%)	(8.0%)	(47.7%)	(11.7%)	(26.1%)
invalid response	34	3	0	60	8	5	44	154
	(24.8%)	(12.5%)	(0.0%)	(87.0%)	(32.0%)	(11.4%)	(42.7%)	(37.6%)
(4) Influence of encroaching sand to irrigation canal						·		
	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
Number of khettaras	137	24	8	69	25	44	103	410
(1) Khettaras damaged significantly by encroaching sand	38	6	0	19	10	19	9	101
	(27.7%)	(25.0%)	(0.0%)	(27.5%)	(40.0%)	(43.2%)	(8.7%)	(24.6%)
(2) Khettaras damaged partially by encroaching sand	14	5	0	4	4	5	34	66
	(10.2%)	(20.8%)	(0.0%)	(5.8%)	(16.0%)	(11.4%)	(33.0%)	(16.1%)
(3) Khettaras damaged negligibly by encroaching sand	50	13	8	1	3	16	15	106
	(36.5%)	(54.2%)	(100.0%)	(1.4%)	(12.0%)	(36.4%)	(14.6%)	(25.9%)
invalid response	35	0	0	45	8	4	45	137
	(25.5%)	(0.0%)	(0.0%)	(65.2%)	(32.0%)	(9.1%)	(43.7%)	(33.4%)

Table G.2.2Influence of Encroaching Sand (3/3)(5) The level of damage of open channel by encroaching sand

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
	Goulmima & Tinjdad	Beni-Tadjit, Gourrama	Zone Boudenib	Fezna, Jorf & Hannabou	Sifa	Rissani & Taouz	Alnif	
Total of (1)+(2)+(3)+(4)+(5)	57	18	1	13	16	40	30	175
(1) The sand reaches nearby open channel of khettara	29	7	0	6	4	14	7	67
	(50.9%)	(38.9%)	(0.0%)	(46.2%)	(25.0%)	(35.0%)	(23.3%)	(38.3%)
(2) The sand encroaches into open channel of khettara, but	11	7	0	6	5	14	10	53
this sand is available to remove by human power	(19.3%)	(38.9%)	(0.0%)	(46.2%)	(31.3%)	(35.0%)	(33.3%)	(30.3%)
(3) The sand encroaches into open channel of khettara, but this sand is unavailable to remove by human power	5	1	0	1	4	5	4	20
	(8.8%)	(5.6%)	(0.0%)	(7.7%)	(25.0%)	(12.5%)	(13.3%)	(11.4%)
(4) The sand encroaches into covered open channel, in spite of rehabilitation of channel	6	0	0	0	3	5	6	20
	(10.5%)	(0.0%)	(0.0%)	(0.0%)	(18.8%)	(12.5%)	(20.0%)	(11.4%)
(5) The sand encroaches into covered open channel, because of rehabilitation of channel	6	3	1	0	0	2	3	15
	(10.5%)	(16.7%)	(100.0%)	(0.0%)	(0.0%)	(5.0%)	(10.0%)	(8.6%)

(6) The level of damage to farmland

	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Total
Total of (1)+(2)+(3)	86	20	0	38	17	64	77	302
(1) The sand reached nearby farmland	44	12	0	10	7	22	29	124
	(51.2%)	(60.0%)	-	(26.3%)	(41.2%)	(34.4%)	(37.7%)	(41.1%)
(2) Agricultural activities are influenced by encroaching sand	25	6	0	8	10	22	25	96
	(29.1%)	(30.0%)	-	(21.1%)	(58.8%)	(34.4%)	(32.5%)	(31.8%)
(3) The agricultural land was abandoned by encroaching sand.	17	2	0	20	0	20	23	82
	(19.8%)	(10.0%)	-	(52.6%)	(0.0%)	(31.3%)	(29.9%)	(27.2%)

# Table G.2.3

The Result of Water Quality Survey and Adaptation to Irrigation Water Standard (1/4)

			pН	Tempera	Conduc	Disso	Turbid	Sus	Color	Total
			1	-ture	-tivity	-lved O <sub>2</sub>	-ity	-pended		Hardness
				(water)	(20)			Solid		
				( )	( µ S/cm)	(mg/lit)	NTU	(mg/lit)	(mg/lit)	(mg/lit)
Water	Moroccan standard	l of	6.5 ~ 8.4	35	12,000	-	-	100(Spot	-	-
Quality	irrigation water	•						irrigation)		
Standard								2,000		
								(Spread		
								irrigation)		
Samp	ling location									
Zone	Name of khettar	a	7 75	22.5	1 105	0.10	11.0	<u> </u>		115 0
A Goulmina	Dakassia		7.73	22.3	1,105	0.10 ( 19	26.50	0.0	د -	443.0
& Tinidad	Ouinigui		7.80	27.5	525	0.48	20.50	0.8	5	202.0
J. J. J.			8.15	22.2	1,125	7.30	6.06	2.8	5	424.8
	Taghia		8.20	27.0	510	7.68	1.82	2.8	5	290.2
	Agoudim		8.15	19.5	955	/.84	9.28	3.6	5	590.8
	Taltafroute R.D		7.50	26.0	2,190	5.92	2.86	3.8	5	660.1
	Aït Ben Omar		7.50	19.8	748	7.20	3.34	4.0	<5	0.0
	Diba		7.20	18.5	1,120	8.80	8.20	1.4	< <u>,</u>	0.0
B Beni-Tadiit			7.80	23.5	4,115	8.48	0.08	3.0	د -	124.9
Deni-Taujit	Abd		7.95	19.5	800	8.64	68.80	50.8	5	409.8
С	Jdida Ksar		8.20	22.0	845	7.20	1.60	0.6	5	249.8
Boudnib	Boudnib									
	Ouled Ali		8.10	21.0	2,245	8.00	1.66	3.5	5	649.3
D	Souihla Ouled		7.90	22.4	2,870	2.80	39.40	23.0	5	710.1
Fezna,	Ghanem									
Jorf &	Kadima Krair		8.00	23.7	2,690	7.50	2.97	0.8	5	760.1
паппароц	Lahloua Mounkara		7.80	20.8	3,230	8.20	69.30	78.0	5	819.9
	Jdida El Bouya		8.05	23.3	3,125	7.90	3.40	2.8	5	830.0
	Khitiria Hannabou		7.90	23.3	3,065	7.52	0.74	0.8	5	839.6
	Lagrinia Hannabou		8.20	23.3	2,345	7.36	4.89	2.2	5	675.2
	Lambarkia		7.50	16.9	2,490	8.60	23.70	8.1	<5	0.0
	Ouastania		7.50	21.4	1,914	5.90	1.20	4.7	<5	0.0
	Lagrinia		7.12	21.2	2,330	6.40	2.54	3.3	<5	0.0
Е	Kadima Sifa		8.00	23.7	2,880	7.95	2.57	2.8	5	775.0
Sifa	Haj Allal		7.95	23.5	2,570	7.95	2.61	2.0	5	699.8
	Ighzer		8.25	25.0	4,410	7.36	4.36	2.8	5	1150.0
	Charchmia		8.10	22.8	2,580	7.95	3.16	2.6	5	705.0
F	Haroun		8.25	23.0	5,295	7.52	12.80	6.8	5	1728.0
Rissani & Taouz	El Bgaa		8.30	28.9	4,960	7.20	4.60	10.6	5	1100.0
G	Takacha		8.30	31.8	1,060	7.52	11.30	5.2	5	249.9
Alnif	Toufassamam		8.30	23.5	365	7.52	5.50	4.2	5	183.1
	Aachich Ait Izza		8.20	27.5	625	8.64	3.39	0.43	ی ۲	205.6
	Tigirna		8.30	26.3	705	9.20	3.37	1.8	ی ۲	257.2
	Tinifift		8.00	26.4	515	8.96	1.50	2.4	5	280.7
	Azag		8.15	23.5	565	8.84	6.19	1.2	5	239.9
	Taoumart		7 58	18.2	690	5 60	2.12	5 3	<5	0.0
	Timarzit		7.85	16.3	567	8.30	2.02	0.3	<5	0.0



			Cl	Total	SiO <sup>-</sup> 2	HCO <sub>3</sub>	$CO^{2}_{3}$	NO <sub>3</sub> <sup>-</sup>	NO <sub>2</sub>	As
		i <sup>1</sup>		Nitrogen	_			-		
			(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(µg/lit)
Water	Moroccan standar	d of	105(Spot	-		518	-	30Nitrate-Ni	-	100
Quality	irrigation wate	r	Irrigation)	I				trogen)		
Standard	1	I	350(Spread	I				133mg/lit		
	<u> </u>	I	irrigation)				<u> </u>	(Nitrate ion)		
Samp	ling location	<mark>اا</mark>	ļl				<u> </u>		ļ	
Zone	Name of khetta	ra						- <b></b>		
A	Bakassia	<sup> </sup>	203.8	0.385	15.5	322.1	0.0	9.25	0.031	6.8
Gouimima & Tineidad	Ouinigui		43.1	0.325	21.9	268.4	0.0	0.21	0.031	31.0
& Thejuau	Litama	<sup> </sup>	191.1	0.390	13.3	287.9	0.0	12.80	0.031	6.8
	Taghia	l	29.8	0.265	26.5	280.6	0.0	11.00	0.031	6.8
	Agoudim	l	42.5	0.145	15.2	331.8	0.0	11.00	0.031	6.8
	Taltafroute R.D	I	424.0	0.465	13.9	385.1	0.0	5.50	0.031	6.8
	Aït Ben Omar	l	65.9	0.281	13.9	339.2	0.0	17.07	0	6.8
	Diba	l	93.6	0.293	16.3	303.8	0.0	15.81	0	6.8
В	Chouater	+	1,038.6		16.3	151.2	0.0	13.80	0.031	6.8
Beni-Tadjit	El kbira Ait El	[ <sup></sup>	46.8	0.145	15.9	317.2	0.0	13.60	0.031	6.8
	Abd	I!		- 					0.021	
С	Jdida Ksar		125.0	0.340	12.0	180.0	0.0	7.50	0.031	6.8
Boudnib	Boudnib	l								
	Ouled Ali	I!	473.0	0.240	15.0	278.0	0.0	4.40	0.031	9.3
D	Souihla Ouled		578.9	4.200	19.1	370.9	0.0	0.08	0.031	14.1
Fezna,	Ghanem	<sup> </sup>							ļ	
Jorf &	Kadima Krair	l	612.6	0.345	19.3	317.2	0.0	11.00	0.031	7.3
Hannabou	Lahloua Mounkara	l	733.8	0.545	17.0	268.4	0.0	9.80	0.031	6.8
	Jdida El Bouya	I	717.5	0.185	17.3	297.7	0.0	10.00	0.031	6.8
	Khitiria Hannabou	l	731.5	0.066	18.4	322.1	0.0	10.50	0.031	6.8
	Lagrinia	1	561.0	0.260	20.4	292.8	0.0	9.75	0.031	7.6
	Hannabou	l				ļ			ļ	
	Lambarkia	l	804.0	0.216	10.1	322.1	0.0	19.96	0	6.8
	Ouastania	I	420.0	0.253	21.8	295.2	0.0	10.35	0	6.8
	Lagrinia	l	542.0	0.257	20.4	268.4	0.0	10.71	0	6.8
Е	Kadima Sifa		667.9	0.135	17.9	297.7	0.0	11.50	0.031	16.0
Sifa	Haj Allal	1	578.5	0.090	18.2	312.3	0.0	10.50	0.031	6.8
	Ighzer	[	1,084.8	0.135	20.2	226.9	0.0	9.25	0.031	6.8
	Charchmia		587.0	0.080	18.2	283.6	0.0	11.75	0.031	6.8
	Haroun	┍╼╼ィ	1,394.0	1.320	14.7	163.5	0.0	9.75	0.123	6.8
Rissani &	Fl Rgaa	<sup> </sup>	913.2	0 505	14.3	117.1	0.0	5.00	0.031	7.1
Taouz	Li D <sub>5</sub> uu	I!	713.2	0.505	17.5	11/.1	0.0	5.00	0.031	/
G	Takacha	<b></b> -7	85.9	0.215	16.6	251.3	0.0	6.50	0.031	6.8
Alnif	Toufassamam	1	22.9	0.305	18.7	175.6	0.0	4.50	0.031	6.8
	Aachich Ait Izza		51.1	0.175	21.7	185.4	0.0	14.50	0.031	6.8
	Tigirna	1	59.6	0.125	22.4	205.0	8.4	19.00	0.031	6.8
	Tinifift	( <sup>+</sup>	21.3	0.340	24.4	258.6	0.0	7.50	0.031	6.8
	Azag	<sup> </sup>	42.5	0.075	17.2	249.0	0.0	3.10	0.031	6.8
	Taoumart	 	28.5	0.528	27.0	324 5	0.0	2.29	0.051	6.8
	Timarzit	<sup> </sup>	26.0	0.320	27.0	240.0	0.0	0.37		6.8
	I IIII ai Zit	1 '	20.0	0.550	55.0	240.0	0.0	0.57	v	0.0

# Table G.2.3The Result of Water Quality Survey and Adaptation to Irrigation Water Standard (2/4)

: Maladoptation to irrigation standard

			As	Al	$\mathrm{NH_4}^+$	Cd	Fe	F	$SO_4^{2-}$	Na	K
			(µg/lit)	(µg/lit)	(mg/lit)	(µg/lit)	(µg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)
Water Quality	Moroccan standard of irrigation water	of	100	5,000	-	10	5,000	1.0	250	69mg/l(Spot irrigation)	-
Standard						 				9SAR(Sprea d irrigation)	
Samp	ling location			<b></b>		<b></b>			Ē		
Zone	Name of khettara										
A	Bakassia		6.8	14	0.022	0.4	41.5	0.52	141.0	101.1	3.87
Goulmima	Ouinigui		31.0	59.5	0.008	0.4	79.8	0.35	23.5	23.4	2.26
& Tinejuau	Litama		6.8	14	0.109	0.4	17.4	0.33	130.0	97.4	2.99
	Taghia		6.8	14	0.667	0.4	10.4	0.35	35.5	23.0	3.80
	Agoudim		6.8	14	0.094	0.4	62.5	0.55	313.0	28.3	1.45
	Taltafroute R.D		6.8	14	0.082	0.4	37.1	0.55	245.0	245.0	4.80
	Aït Ben Omar		6.8	14	0.045	0.4	30.4	0.15	91.6	55.3	2.88
	Diba		6.8	14	0.019	0.4	24.8	0.16	164.2	89.6	3.63
В	Chouater	[	6.8	14	0.013	0.4	70.7	1.60	487.5	638.0	6.80
Beni-Tadjit	El kbira Ait El Abd		6.8	14	0.058	0.4	534.2	0.37	132.0	38.8	0.62
С	Jdida Ksar		6.8	14	0.016	0.4	12.0	0.55	85.0	90.5	2.86
Boudnib	Boudnib					ļ		l			
	Ouled Ali		9.3	14	0.056	0.4	14.1	0.85	235.0	250.5	4.12
D	Souihla Ouled		14.1	188.3	0.937	0.4	590.5	0.45	277.5	379.8	13.50
Fezna, Jorf	Ghanem					 	25.2	0.55	245.0	220.2	- 10
& Hannahou	Kadıma Krair		1.5	14	0.005	0.4	35.3	0.57	345.0	328.2	5.42
Tiamaoou	Lahloua Mounkara		6.8	14	0.022	0.4	286.8	0.68	370.0	412.4	6.85
	Jdida El Bouya		6.8	14	0.023	0.4	12.5	0.70	335.0	390.1	6.42
	Khitiria Hannabou		6.8	14	0.002	0.4	10.4	0.53	407.5	368.2	5.21
	Lagrinia Hannabou		7.6	14	0.003	0.4	52.7	0.65	340.0	296.8	4.81
	Lambarkia		6.8	14	0.017	0.4	60.0	0.22	473.9	387.8	7.73
	Ouastania		6.8	14	0.007	0.4	10.4	0.32	265.7	225.9	4.55
	Lagrinia		6.8	14	0.011	0.4	10.4	0.33	336.9	279.4	6.25
Е	Kadima Sifa		16.0	14	0.031	0.4	14.8	0.65	370.9	343.6	5.87
Sifa	Haj Allal		6.8	14	0.010	0.4	12.8	0.76	313.0	298.0	5.04
	Ighzer		6.8	14	0.031	0.4	32.9	0.68	557.5	570.2	7.96
	Charchmia		6.8	14	0.012	0.4	23.4	0.72	317.5	309.5	5.11
F	Haroun	1	6.8	14	0.662	0.4	65.3	0.81	730.0	632.0	13.80
Rissani & Taouz	El Bgaa		7.1	14	0.249	0.4	44.5	1.30	1,450.0	738.0	8.90
G	Takacha	ï	6.8	14	0.026	0.4	118.5	1.20	158.0	153.0	5.96
Alnif	Toufassamam		6.8	14	0.076	0.4	60.6	0.26	21.8	14.8	2.10
	Aachich Ait Izza		6.8	14	0.010	0.4	12.0	0.85	60.4	67.8	2.50
	Tigirna		6.8	14	0.055	0.4	30.5	0.62	117.0	59.4	4.90
	Tinifift		6.8	14	0.020	0.4	10.4	0.32	29.8	20.6	1.40
	Azag		6.8	14	0.016	0.4	45.0	0.44	62.5	39.8	2.30
	Taoumart		6.8	14	<0,002	0.4	661.0	0.08	127.0	45.5	5.02
	Timarzit		6.8	14	<0,002	0.4	205.0	0.08	141.0	47.5	4.74

# Table G.2.3The Result of Water Quality Survey and Adaptation to Irrigation Water Standard (3/4)

: Maladoptation to irrigation standard

		Ca	Mn	Mg	BOD	COD	Coli form Group	Fecal coli	Hg
		(mg/lit)	(ug/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(/100ml)	(/100ml)	(mg/lit)
Water	Moroccan standard of	-	200	-	-	-	-	1.000	0.001
Ouality	irrigation water		200					1,000	0.001
Standard	6								
Sampling location									
Zone	Name of khettara								
А	Bakassia	132.3	38.2	27.9	1.96	26.9	600	200	0
Goulmima	Ouinigui	80.7	13.8	14.9	6.30	38.4	30,000	4,600	0
& Tinejdad	Litama	128.2	8.9	25.5	0.41	36.5	150,000	13,000	0
	Taghia	80.2	1	21.9	1.14	28.8	35,000	2,100	0
	Agoudim	109.8	6.6	77.0	2.83	25.0	700	140	0
	Taltafroute R.D	186.4	6.2	47.4	0.96	17.3	10,000	7,000	0
	Aït Ben Omar	113.8	8.5	20.9	1.63	<7,5	30	0	0
	Diba	88.2	7.4	60.8	0.56	<7,5	80	70	0
В	Chouater	170.3	17.0	72.9	0.2	7.7	0	0	0
Beni-Tadjit	El kbira Ait El	105.2	89.2	35.8	1.55	17.3	930,000	400,000	0
	Abd								
C	Jdida Ksar	67.3	1	19.9	0.2	7.5	5,400	2,600	0
Boudnib	Boudnib								
	Ouled Ali	156.0	2.2	63.2	0.88	12.1	3,300	980	0
D	Souihla Ouled	184.4	34.8	60.8	52.30	147.0	3,200	1,200	0
Fezna, Jorf	Ghanem								
&	Kadima Krair	148.3	1.6	94.8	0.2	20.2	3,300	1,200	0
Hannabou	Lahloua Mounkara	190.4	10.8	83.8	0.2	54.4	4,600	2,200	0
	Jdida El Bouya	200.4	1.6	80.2	0.2	46.3	2,100	620	0
	Khitiria Hannabou	165.3	3.4	103.8	0.2	29.2	210	50	0
	Lagrinia	142.3	2.1	77.8	0.2	24.2	4,400	1,800	0
	Hannabou								
	Lambarkia	239.0	31.8	86.0	0.71	19.2	13,000	4,000	0
	Ouastania	123.0	1.5	68.5	0.37	<7,5	90	60	0
	Lagrinia	139.0	2.9	94.0	0.38	<7,5	300	0	0
E	Kadima Sifa	188.4	3.1	74.1	0.78	25.0	900	400	0
Sifa	Haj Allal	172.3	2.5	65.6	0.62	40.3	12,000	4,800	0
	Ighzer	204.4	4.2	155.5	0.78	25.0	7,000	2,800	0
	Charchmia	166.3	1.8	70.5	0.55	28.8	6,000	900	0
F	Haroun	360.7	7.6	201.4	1.26	53.8	6,000	800	0
Rissani &	El Bgaa	348.7	4.5	55.9	1.96	46.1	4,000	600	0
Taouz									
G	Takacha	60.1	15.2	24.3	0.43	7.5	500	0	0
Alnıf	Toufassamam	54.1	17.4	11.7	1.85	11.5	44,000	16,000	0
	Aachich Ait Izza	78.2	2.6	2.6	0.53	7.5	12,000	7,000	0
	Tigirna	70.1	5.4	20.0	0.82	22.0	6,000	700	0
	Tinifift	79.2	4.0	20.2	0.67	7.5	46,000	13,000	0
	Azag	70.1	7.4	15.8	0.72	22.0	11,000	900	0
	Taoumart	98.6	33.6	37.9	0.30	13.4	1,600	450	0
	Timarzit	59.3	8.9	45.4	<0,20	<7,5	8,000	850	0

# Table G.2.3The Result of Water Quality Survey and Adaptation to Irrigation Water Standard (4/4)

: Maladoptation to irrigation standard

14010 0.2			Zuanty Du	ivey and r	lupuno		miking	Water D	unuuru	(1/4)
			pН	Tempera	Conduc	Disso	Turbid	Sus	Color	Total
				-ture	-tivity	-lved	-ity	-pended		Hardness
				(water)	(20)	$O_2$		Solid	( (1))	( (1))
				( )	(µ S/cm)	(mg/lı t)	NTU	(mg/lit)	(mg/lit)	(mg/lit)
Water	Moroccan Standard	A1-G	6.5 ~ 8.5	20	1,300	7.0	-	50	<10	-
Quality	of drinking water	A1-I	-	30	2,700	-	-	-	20	-
Standard		A2-G	6.5 ~ 9.2	20	1,300	5.0	-	1,000	50	-
		A2-I	-	30	2.700	-	-	-	100	-
		A3-G	6.5~9.2	20	1,300	3.0	-	2,000	50	-
		A3-I	-	30	2.700	-	-	-	200	-
	G:Guide value	The strictest	6.5 ~ 8.5	20	1,300	7.0	-	50	<10	-
	I:Valeur imperative	value								
	WHO Guideline		-	-	-	-	5	-	15	-
Sam	oling location									
Zone	Name of kh	ettara								
А	Bakassia		7.75	22.5	1,185	8.10	11.60	6.0	5	445.0
Goulmima	Ouinigui		7.80	27.5	525	6.48	26.50	6.8	5	262.6
& Tinejdad	Litama		8.15	22.2	1,125	7.36	6.06	2.8	5	424.8
	Taghia		8.20	27.0	510	7.68	1.82	2.8	5	290.2
	Agoudim		8.15	19.5	955	7.84	9.28	3.6	5	590.8
	Taltafroute R.D		7.50	26.0	2,190	5.92	2.86	3.8	5	660.1
	Aït Ben Omar		7.50	19.8	748	7 20	3 34	4.0	<5	0.0
	Diba		7.20	18.5	1.120	8.80	8.26	1.4	<5	0.0
В	Chouater		7.80	23.5	4.115	8.48	6.08	3.6		724.9
Beni-Tadjit	Fl khira Ait Fl Abd		7.00	19.5	800	8 64	68.80	50.8	5	409.8
·	Idida Ksar Boudnib		8 20	22.0	845	7 20	1 60	0.0		240.8
Boudnib	Oulad Ali		0.20 9.10	22.0	2 2 4 5	7.20	1.00	2.5	<u>ح</u>	247.0 640.2
Douumo			8.10	21.0	2,243	8.00	1.00	3.3	<u>`</u>	049.5
D	Southla Ouled		7.90	22.4	2,870	2.80	39.40	23.0	5	710.1
Iorf &	Kadima Krair		8.00	22.7	2 600	7.50	2.07	0.8	5	760.1
Hannabou	Lahlaya Maynlana		0.00 7 90	23.7	2,090	0.00	60.20	78.0	ی ح	700.1 810.0
			7.00	20.0	2,125	0.20	2 40	70.0	ر ک	019.9
			8.05	23.3	3,125	7.90	5.40	2.8	<u>ح</u>	830.0
	Knitiria Hannabou		/.90	23.3	3,065	1.52	0.74	0.8	5	839.6
	Lagrinia Hannabou		8.20	23.3	2,345	/.36	4.89	2.2	5	6/5.2
	Lambarkia		7.50	16.9	2,490	8.60	23.70	8.1	<5	0.0
	Uuastania		/.50	21.4	1,914	5.90	1.20	4./	<) 	0.0
	Lagrinia Vadima Sifa		7.12	21.2	2,330	0.40	2.54	3.3	<>	775.0
E Sifa			8.00 7.05	23.1	2,000	7.95	2.57	2.0	<u>ح</u>	(00.8
5114	Haj Allal		7.95	23.5	2,570	7.95	2.01	2.0	5	099.8
	Ignzer		8.25	25.0	4,410	7.36	4.36	2.8	5	1150.0
	Charchmia		8.10	22.8	2,580	7.95	3.16	2.6	5	705.0
F D: · · ·	Haroun		8.25	23.0	5,295	7.52	12.80	6.8	5	1728.0
Rissani & Taouz	El Bgaa		8.30	28.9	4,960	7.20	4.60	10.6	5	1100.0
G	Takacha		8.30	31.8	1,060	7.52	11.30	5.2	5	249.9
Alnif	Toufassamam		8.30	23.5	365	7.52	5.50	4.2	5	183.1
	Aachich Ait Izza		8.20	27.5	625	8.64	3.39	0.43	5	205.6
	Tigirna		8.30	26.3	705	9.20	3,37	1.8	5	257.2
	Tinifift		8.00	26.4	515	8.96	1.50	2.4	5	280.7
	Α79σ		8 15	23.5	565	8 84	6.19	1 2.4	5	239.9
	Taoumart		7 52	18 2	003 003	5.64	2 14	5.2		0.0
	Timarzit		7.85	16.3	567	8.30	2.02	0.3	<5	0.0
								2.0	.e	5.0

Table G24 The Result of Water Quality Survey and Adaptation to Drinking Water Standard (1/4)

A1: with treatment of simple filtration, A2: with treatment of simple filtration and disinfection by chlorine, A3: with high level treatment, G: Guide value, I: Imperative value

10010 0.2.			Zuunty D	ui vey ui	ia maup	tution to		ing mut	er Stundu	14 (2/1)
			Cl	Total Nitrogen	SiO <sup>-</sup> <sub>2</sub>	HCO <sup>-</sup> <sub>3</sub>	CO <sup>2-</sup> 3	NO <sub>3</sub>	NO <sub>2</sub> <sup>-</sup>	As
			(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(µg/lit)
Water	Moroccan Standard	A1-G	300	1	-	-	-	-	-	-
Quality	of drinking water	A1-I	750	-	-	-	-	50	-	50
Standard		A2-G	300	2	-	-	-	-	-	-
		A2-I	750	-	-	-	-	50	-	50
		A3-G	300	3	-	-	-	-	-	-
		A3-I	750	-	-	-	-	50	-	100
	G:Guide value	The strictest	300	1	-	-	-	50	-	50
	I: Valeur imperative	value								
	WHO Guideline		250	-	-	-	-	50	3	10
Sam	oling location									
Zone	Name of kh	ettara	202.0	0.205	1.5.5	222.1	0.0	0.05	0.001	
A Goulmina	Bakassia		203.8	0.385	15.5	322.1	0.0	9.25	0.031	6.8
& Tineidad	Ouinigui		43.1	0.325	21.9	268.4	0.0	0.21	0.031	31.0
ee megaaa	Litama		191.1	0.390	13.3	287.9	0.0	12.80	0.031	6.8
	Taghia		29.8	0.265	26.5	280.6	0.0	11.00	0.031	6.8
	Agoudim		42.5	0.145	15.2	331.8	0.0	11.00	0.031	6.8
	Taltafroute R.D		424.0	0.465	13.9	385.1	0.0	5.50	0.031	6.8
	Aït Ben Omar		65.9	0.281	13.9	339.2	0.0	17.07	0	6.8
	Diba		93.6	0.293	16.3	303.8	0.0	15.81	0	6.8
В	Chouater		1,038.6		16.3	151.2	0.0	13.80	0.031	6.8
Beni-Tadjit	El kbira Ait El Abd		46.8	0.145	15.9	317.2	0.0	13.60	0.031	6.8
С	Jdida Ksar Boudnib		125.0	0.340	12.0	180.0	0.0	7.50	0.031	6.8
Boudnib	Ouled Ali		473.0	0.240	15.0	278.0	0.0	4.40	0.031	9.3
D	Souihla Ouled		578.9	4.200	19.1	370.9	0.0	0.08	0.031	14.1
Fezna,	Ghanem		0,000			0,000	0.0	0.00	0.051	1.111
Jorf &	Kadima Krair		612.6	0.345	19.3	317.2	0.0	11.00	0.031	7.3
Hannabou	Lahloua Mounkara		733.8	0.545	17.0	268.4	0.0	9.80	0.031	6.8
	Jdida El Bouya		717.5	0.185	17.3	297.7	0.0	10.00	0.031	6.8
	Khitiria Hannabou		731.5	0.066	18.4	322.1	0.0	10.50	0.031	6.8
	Lagrinia Hannabou		561.0	0.260	20.4	292.8	0.0	9.75	0.031	7.6
	Lambarkia		804.0	0.216	10.1	322.1	0.0	19.96	0	6.8
	Ouastania		420.0	0.253	21.8	295.2	0.0	10.35	0	6.8
	Lagrinia		542.0	0.257	20.4	268.4	0.0	10.71	0	6.8
	Kadima Sifa		667.9	0.135	17.0	200.1	0.0	11 50	0.021	16.0
Sifa	Hai Allal		578.5	0.155	18.2	312.3	0.0	10.50	0.031	10.0
	Iaj Ana		1 08/1 8	0.070	20.2	226.0	0.0	0.50	0.031	0.0
	Charohmia		587.0	0.133	18.2	220.9	0.0	9.23	0.031	0.0
	Ilenen		1 204 0	1.220	14.7	162.5	0.0	0.75	0.031	0.0
F Dissoni &	Haroun		1,394.0	1.320	14./	163.5	0.0	9.75	0.123	6.8
Taouz	El Bgaa		913.2	0.505	14.3	11/.1	0.0	5.00	0.031	/.1
G	Takacha		85.9	0.215	16.6	251.3	0.0	6.50	0.031	6.8
Alnif	Toufassamam		22.9	0.305	18.7	175.6	0.0	4.50	0.031	6.8
	Aachich Ait Izza		51.1	0.175	21.7	185.4	0.0	14.50	0.031	6.8
	Tigirna		59.6	0.125	22.4	205.0	84	19.00	0.031	6.8
	Tinifift		21.3	0.125	22.+ 24 A	255.0	0.4	7 50	0.031	0.0 6 9
	Δ799		121.5 125	0.340	17.2	2/0 0	0.0	7.50	0.031	U.0 2 0
	Taoumert		42.J 20 5	0.073	27.0	247.0	0.0	2.10	0.031	0.8
	Timorait		20.3	0.328	21.0	24.3	0.0	2.29	0	0.8
	1 imarZit		26.0	0.358	33.8	240.0	0.0	0.57	0	6.8

Table G24 The Result of Water Ouality Survey and Adaptation to Drinking Water Standard (2/4)

A1:with treatment of simple filtration A2:with treatment of simple filtration and disinfection by chlorine A3:with high-level treatment

G:Guide value, I: Imperative value

Table G.2.4	4 The Resu	ult of Water (	Quality S	urvey ar	d adapta	tion to D	Prinking '	Water Sta	andard (	(3/4)
			Al	$\mathrm{NH_4}^+$	Cd	Fe	F	$SO_4^{2-}$	Na	K
			(µg/lit)	(mg/lit)	(µg/lit)	(µg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)
Water	Moroccan Standard	A1-G	-	0.05	1	-	0.7	200	-	-
Quality	of drinking water	A1-I	-	0.50	5	300	1.5	-	-	-
Standard		A2-G	-	1.00	1	1,000	0.7	200	-	-
		A2-I	-	1.50	5	2,000	1.5	-	-	-
		A3-G	-	2.00	1	1,000	0.7	200	-	-
		A3-I	-	4.00	5	3,000	1.5	-	-	-
	G:Guide value	The strictest	-	0.05	1	300	0.7	200	-	-
	NULO Cui dalina	value	200		2	200	15	250	200	<u> </u>
C	who Guideline		200	-	3	300	1.5	250	200	-
Zono	Name of kh	ottoro								
	Rakassia	ettala	14	0.022	0.4	41.5	0.52	141.0	101.1	3 87
Goulmima	Ouiniqui		50 5	0.022	0.4	70.8	0.32	23.5	23 /	2.07
& Tinejdad	Litomo		37.3	0.008	0.4	17.0	0.33	120.0	07.4	2.20
-	Tashia		14	0.109	0.4	17.4	0.55	25.5	22.0	2.99
	I agma		14	0.007	0.4	10.4	0.55	212.0	23.0	3.80 1.45
	Agoudim		14	0.094	0.4	62.5	0.55	313.0	28.3	1.45
	Taltafroute R.D		14	0.082	0.4	37.1	0.55	245.0	245.0	4.80
	Aît Ben Omar		14	0.045	0.4	30.4	0.15	91.6	55.3	2.88
	Diba		14	0.019	0.4	24.8	0.16	164.2	89.6	3.63
B	Chouater		14	0.013	0.4	70.7	1.60	487.5	638.0	6.80
Beni-Tadjit	El kbira Ait El Abd		14	0.058	0.4	534.2	0.37	132.0	38.8	0.62
С	Jdida Ksar Boudnib		14	0.016	0.4	12.0	0.55	85.0	90.5	2.86
Boudnib	0 1 1 1 1			0.054		1.4.1	0.05	225.0	<b>0-</b> 0 -	4.10
	Ouled Ali		14	0.056	0.4	14.1	0.85	235.0	250.5	4.12
D Earna Iarf	Souihla Ouled		188.3	0.937	0.4	590.5	0.45	277.5	379.8	13.50
rezha, Joh	Kadima Krair		14	0.005	0.4	35.3	0.57	345.0	378.7	5 42
Hannabou	Labloua Mounkara		14	0.003	0.4	20.5	0.57	270.0	320.2 412.4	5.42 6.92
	Lailioua Moulikara		14	0.022	0.4	200.0	0.08	225.0	412.4 200.1	6.05
	Vhitinia Hannaham		14	0.023	0.4	12.3	0.70	333.0 407.5	269.1	5.21
			14	0.002	0.4	10.4	0.55	407.5	308.2	5.21
			14	0.003	0.4	52.7	0.05	340.0	290.8	4.81
	Lambarkia		14	0.017	0.4	60.0	0.22	4/3.9	387.8	1.13
	Ouastania		14	0.007	0.4	10.4	0.32	265.7	225.9	4.55
	Lagrinia		14	0.011	0.4	10.4	0.33	336.9	279.4	6.25
E	Kadima Sifa		14	0.031	0.4	14.8	0.65	370.9	343.6	5.87
Sira	Haj Allal		14	0.010	0.4	12.8	0.76	313.0	298.0	5.04
	Ighzer		14	0.031	0.4	32.9	0.68	557.5	570.2	7.96
	Charchmia		14	0.012	0.4	23.4	0.72	317.5	309.5	5.11
F	Haroun		14	0.662	0.4	65.3	0.81	730.0	632.0	13.80
Rissani &	El Bgaa		14	0.249	0.4	44.5	1.30	1,450.0	738.0	8.90
G	Takacha		14	0.026	0.4	118 5	1 20	158.0	153.0	5.96
Alnif	Toufassamam		14	0.020	0.4	60.6	0.26	21.8	133.0	2 10
	Aachich Ait Izza		14	0.070	0.4	12.0	0.20	60 A	67.8	2.10
	Tigirna		14	0.055	0.4	30.5	0.05	117.0	50 /	2.50 4 00
	Tinifift		14	0.033	0.4	10.4	0.02	20.0	20.4	4.70
	1 millit A zog		14	0.020	0.4	10.4	0.32	27.0 67 5	20.0	1.40 2.20
	Teourset		14	0.010	0.4	43.0	0.44	127.0	37.0 15 F	2.30
	1 aoumart		14	<0,002	0.4	001.0	0.08	127.0	43.3	5.02
	I imarzit		14	<0,002	0.4	205.0	0.08	141.0	47.5	4./4

A1:with treatment of simple filtration A2:with treatment of simple filtration and disinfection by chlorine

A3:with high-level treatment

G:Guide value, I: Imperative value

Table (	G.2.4
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The Result of Water Quality Survey and Adaptation to Drinking Water Standard (4/4)

			Ca	Mn	Mg	BOD	COD	Coli form	Fecal coli	Hg
					U			Group	form	Ũ
			(mg/lit)	(µg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(/100ml)	(/100ml)	(mg/lit)
Water	Moroccan Standard	A1-G	-	-	-	3	-	50	20	-
Quality	of drinking water	A1-I	-	100	-	-	-	-	-	0.001
Standard	-	A2-G	-	100	-	7	25	5,000	2,000	-
		A2-I	-	100	-	-	-	-	-	0.001
		A3-G	-	1,000	-	10	40	50,000	20,000	-
		A3-I	-	-	-	-	-	-	-	0.001
	G:Guide value	The strictest	-	100	-	3	25	50	20	0.001
	I:Valeur imperative	value								
	WHO Guideline		-	500	-	-	-	undetecte	undetected	0.001
								d		
Sam	oling location									
Zone	Name of kh	ettara								
А	Bakassia		132.3	38.2	27.9	1.96	26.9	600	200	0
Goulmima	Ouinigui		80.7	13.8	14.9	6.30	38.4	30,000	4,600	0
& Tinejdad	Litama		128.2	8.9	25.5	0.41	36.5	150,000	13,000	0
	Taghia		80.2	1	21.9	1.14	28.8	35,000	2,100	0
	Agoudim		109.8	6.6	77.0	2.83	25.0	700	140	0
	Taltafroute R.D		186.4	6.2	47.4	0.96	17.3	10,000	7,000	0
	Aït Ben Omar		113.8	8.5	20.9	1.63	<7,5	30	0	0
	Diba		88.2	7.4	60.8	0.56	<7,5	80	70	0
B	Chouater		170.3	17.0	72.9	0.2	7.7	0	0	0
Beni-Tadjit	El kbira Ait El Abd		105.2	89.2	35.8	1.55	17.3	930,000	400,000	0
С	Jdida Ksar Boudnib		67.3	1	19.9	0.2	7.5	5,400	2,600	0
Boudnib										
	Ouled Ali		156.0	2.2	63.2	0.88	12.1	3,300	980	0
D	Souihla Ouled		184.4	34.8	60.8	52.30	147.0	3,200	1,200	0
Fezna, Jorf	Ghanem									
&	Kadima Krair		148.3	1.6	94.8	0.2	20.2	3,300	1,200	0
Hannabou	Lahloua Mounkara		190.4	10.8	83.8	0.2	54.4	4,600	2,200	0
	Jdida El Bouya		200.4	1.6	80.2	0.2	46.3	2,100	620	0
	Khitiria Hannabou		165.3	3.4	103.8	0.2	29.2	210	50	0
	Lagrinia Hannabou		142.3	2.1	77.8	0.2	24.2	4.400	1.800	0
	L ambarkia		239.0	31.8	86.0	0.71	19.2	13,000	4 000	0
	Ouastania		123.0	1 5	68.5	0.71	<75	15,000	<del>-,000</del> 60	0
	I agrinia		139.0	2.9	94.0	0.37	<7.5	300	0	0
	Kadima Sifa		188.4	31	74.1	0.58	25.0	900	400	0
Sifa	Hai Allal		172.3	2.5	65.6	0.70	40.3	12 000	4 800	0
Sila	Ighzer		204.4	4.2	155.5	0.02	25.0	7 000	2,800	0
	Charchmia		166.3	1.8	70.5	0.55	28.8	6.000	900	0
F	Haroun		360.7	7.6	201.4	1 26	53.8	6 000	800	0
Rissani &	El Bgaa		348.7	4.5	55.9	1.96	46.1	4.000	600	0
Taouz	8							.,		
G	Takacha		60.1	15.2	24.3	0.43	7.5	500	0	0
Alnif	Toufassamam		54.1	17.4	11.7	1.85	11.5	44.000	16.000	0
	Aachich Ait Izza		78.2	2.6	2.6	0.53	7.5	12,000	7,000	0
	Tigirna		70.1	5.4	20.0	0.82	22.0	6.000	700	0
	Tinifift		79.2	4.0	20.2	0.67	0 7 5	46.000	13.000	0
	Α790		70.1	74	15.8	0.72	22.0	11,000	900	0
	Taoumart		, 0,1 08 6	,.+ 33 K	37.0	0.72	13 /	1 600	450	0
	Timarzit		59.3	8.9	45.4	< 0.20	<7.5	8.000	850	0

A1:with treatment of simple filtration

A2:with treatment of simple initiation A2:with treatment of simple filtration and disinfection by chlorine A3:with high-level treatment G:Guide value

I: Imperative value

Table G.2.5 Result of water Quality Standa	ara
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		<u> </u>																		
			pH	Tem	perature	Conduc	Disso	Turbid	Sus	a 1.1	Color	Total	C	ľ	Total	SiO <sup>2</sup>	HCO <sup>-</sup> <sub>3</sub>	$\text{CO}^{2}_{3}$	NO <sub>3</sub> <sup>-</sup>	NO <sub>2</sub> <sup>-</sup>
				(1	(ater)	(20)	-Ived O	-1ty	-pended S	Solia		Hardness			Nitrogen					
				(	)	(µS/cm)	(mg/lit)	NTU	(mg/li	it)	(mg/lit)	(mg/lit)	(mg	/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/lit)	(mg/li t)
Water Quality	Moroccan stan	dard of	6.5 ~ 8.4	4	35	12,000	-	-	100(Sp	oot	-	-	105(	Spot	-	-	518	-	30Nitrate-	-
Standard	irrigation w	ater							irrigatio	on)			Irriga	tion)					Nitrogen)	
									2,000 (Sp	oread			350(S	pread					(Nitrate ion)	
	Moroccan	A1-G	65~8	5	20	1 300	7.0	-	50	л)	<10	-	30	0	1	-	_	_	-	_
	Standard of	A1-I		5	30	2,700	-	-	-		20		75	50	-	-	-		50	-
	drinking water	A2-G	6.5 ~ 9.2	2	20	1,300	5.0	-	1,000	)	50	-	30	)0	2	-	-	-	-	-
		A2-I	_		30	2,700		_	_		100	-	75	50	-	-	_	-	50	-
		A3-G	6.5 ~ 9.2	2	20	1,300	3.0	-	2,000	)	50	-	30	00	3	-	-	-	-	-
		A3-I	-	-	30	2,700	-	-	-		200	-	75	50	-	-	-	-	50	-
	G:Guide value	Ine	6.5 ~ 8.5	5	20	1,300	7.0	-	50		<10	-	30	0	1	-	-	-	50	-
	imperative	value																		
	WHO Guideline		-		-	-	-	5	-		15	-	25	50	-	-	-	-	50	3
			As	Al	$\mathrm{NH_4}^+$	Cd	Fe	F	SO4 <sup>2-</sup>		Na	K	Ca	Mn	Mg	BOD	COD	Coli fo	orm Fecal c	oli Hg
			$(11 \alpha/lit)$	( 11 g/lit)	(mg/lit)	(11 g/lit)	( 11 g/lit)	(mg/lit)	(mg/lit)	(n	ng/lit)	(mg/lit)	(mg/lit)	( 11 a/lit	(mg/lit)	) (mg/lit	t) (mg/lif	Grou	np form	J (mg/lit)
			(µg/m)	(µg/m)	(ing/int)	(µg/m)	(µg/m)	(ing/int)	(ing/int)	(11	ig/iit)	(ing/int)	(ing/int)	(µg/m	) (ing/int/	(ing/in	(ing/in	/100r	nl) /100m	l)
Water Quality	Moroccan stan	dard of	100	5,000	-	10	5,000	1.0	250	69m	g/l(Spot	-	-	200	-	-	-	-	1,000	0.001
Standard	irrigation w	ater								irrig	gation)									
										9SAI irri	(Spread									
	Moroccan	A1-G	_	-	0.05	1	-	0.7	200	mn	-	-	-	-	-	3	-	50	20	-
	Standard of															-				
	drinking water					ļ														
		Al-I	50	-	0.50	5	300	1.5	- 200		-	-	-	100	-	- 7	-	-		0.001
		A2-G	- 50	-	1.00	5	2 000	0.7	- 200		-	-	-	100	-	/	- 23	3,00	0 2,000	, -
		A3-G	-	-	2.00	1	1,000	0.7	200		-	-	-	1,000	-	10	40	50,0	20,00	0 -
		A3-I	100	-	4.00	5	3,000	1.5	-		-	-	-	-	-	-	-	-	-	0.001
	G:Guide value	The	50	-	0.05	1	300	0.7	200		-	-	-	100	-	3	25	50	20	0.001
	I:Valeur	strictest																		
	WHO Contractive	value	10	200		2	200	15	250		200			500					atad ytt	tad 0.001
	who Guideline	1	10	200		3	300	1.5	230		200	-	-	1 300	-	-		undete	cied   undetec	100 - 0.001

Item of s	urvey	Moroccan Standard of		Th	e num	ber of	f samp	les	1	Evaluation	Cause of Maladaptation
		irrigation water	W	hich ex	xceed	the sti	Tictest	standa $E(2)$	rd		
			A (8)	<b>Б</b> (2)	C (2)	(9)	E (4)	г(2)	(8)		
pH		6.5 ~ 8.4	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
Temperature (water)	( )	35	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
Conductivity (20)	( µ S/cm)	12,000	0	0	0	0	0	0	0	- ditto -	-
Dissolved O <sub>2</sub>	(mg/l)	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-
Suspended Solid	(mg/lit)	100(Spot irrigation) 2.000(Spread irrigation)	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
Color	(mg/lit)	-	-	-	-	-	-	-	-	_	_
Total Hardness	(mg/lit)	-	-	-	-	-	-	-	-	-	-
Cl-	(mg/lit)	105(Spot Irrigation) 350(Spread irrigation)	3	1	2	9	4	2	0	Twenty-one samples exceed the standard of irrigation water. The samples containing high value of chloride concentrate to Zone D, E, and F.	The main source of high chloride is derived from original rock and soil in the sampled area.
Total Nitrogen	(mg/lit)	-	-	-	-	-	-	-	-	-	-
SiO <sub>2</sub>	(mg/lit)	-	-	-	-	-	-	-	-	-	-
HCO <sub>3</sub> <sup>-</sup>	(mg/lit)	518	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
CO3 <sup>2-</sup>	(mg/lit)	-	-	-	-	-	-	-	-	-	-
NO <sub>3</sub>	(mg/lit)	30(Nitrate-Nitrogen) 133mg/lit(Nitrate ion)	0	0	0	0	0	0	0	All samples meet the standard of irrigation and drinking water.	-
NO <sub>2</sub> <sup>-</sup>	(mg/lit)	-	-	-	-	-	-	-	-	-	-
As	(µg/lit)	100	0	0	0	0	0	0	0	All samples meet the irrigation standard	-

Table G.2.6The Adaptation to the Irrigation Standard by Zone and the Cause of Maladaptation (1/2)

Item of s	survey	Moroccan Standard of		T	he nu	nber of	samp	es 1	1	Evaluation	Cause of Maladaptation
		irrigation water	(8)	B(2)	C(2)	D(9)	$\mathbf{F}(4)$	F(2)	G(8)		
Al	(ug/lit)	5,000	0	$\frac{D(2)}{0}$	$\frac{c(2)}{0}$	0	0	0	0	All samples meet the irrigation standard	
$NH_4^+$	(mg/lit)	-	-	-	-	-	-	-	-	-	_
Cd	(µg/lit)	10	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
Fe	$(\mu g/lit)$	5,000	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
F	(mg/lit)	1.0	0	1	0	0	0	1	1	Three samples exceed the irrigation standard.	The source of fluorine ion is derived from the original rock and soil in the sampled area.
SO <sub>4</sub> <sup>2-</sup>	(mg/lit)	250	1	1	0	9	4	2	0	Fifteen samples exceed the standard of irrigation standard.	The source of sulfate ion is derived from original rock and soil in the sampled area. There is the possibility that the cause of it is contamination of domestic wastewater.
Na	(mg/lit)	69mg/lit(Spot irrigation) 9SAR(Spread irrigation)	4	1	2	9	4	2	0	Twenty-two samples don't meet the Moroccan standard of irrigation water (Spot irrigation). The samples of high volume of sodium ion concentrate to Zone D, E, and F.	The source of high volume of sodium ion is thought to be derived from original rock and soil in the sampled area.
K	(mg/lit)	-	-	-	-	-	-	-	-	-	-
Ca	(mg/lit)	-	-	-	-	-	-	-	-	-	-
Mn	(µg/lit)	200	0	0	0	0	0	0	0	All samples meet the irrigation standard	-
Mg	(mg/lit)	-	-	-	-	I	-	-	I	-	-
BOD	(mg/lit)	-	1	0	0	1	0	0	0	The samples of Ouinigui and Souihla Ouled Ghaner don't meet the Moroccan standard of drinking water (A1-G).	The high value of BOD and COD indicate that the sample contains rich organic mater. The high value of BOD and COD is thought to be caused by contamination of animal waste and domestic wastewater.
COD	(mg/lit)	-	4	0	0	4	2	2	0	Twelve samples in Zone A, D, E, and F don't mee (A2-G).	t the Moroccan standard of drinking water
Coli form Group	(/100ml)	-	-	-	-	-	-	-	-	Coli form groups are detected from all samples except of Chouater.	The high value of coli form group and fiscal coli form is caused by the contamination of animal and human excreta and domestic wastewater. Almost khettaras water except of 4 khettara should be disinfected by chorine for drinking.
Fecal Coli form	(/100ml)	1,000	4	1	1	5	2	0	3	Fiscal coli forms are detected from all samples exe Takacha.	cept of Ait Ben Omar, Chouater, Lagrinia and
Hg	(mg/lit)	0.001	0	0	0	0	0	0	0	Hg is not detected from all samples.	-

Table G.2.6The Adaptation to the Irrigation standard by Zone and the Cause of Maladaptation (2/2)

Item of s	urvey	Morocca n standard	WHO Guidelin	w	Tł hich e	ne nun xceed	nber of the str	sampl	les standa	rd	Evaluation	Cause of Maladaptation
		standard	Ũ	A (8)	B (2)	C(2)	D (9)	E (4)	F (2)	G (8)		
pH		6.5 ~ 8.5	-	0	0	0	0	0	0	0	All samples meet the drinking water standard	-
Temperature (water)	( )	20	-	5	1	2	8	4	2	6	Twenty-eight samples exceed the drinking water standard	-
Conductivity (20)	(µS/cm)	1,300	-	1	1	1	9	4	2	0	The high value of conductivity concentrate to Zone D, E, F.	Electric conductivity is the indicator of total volume of inorganic ion. These inorganic ions are derived from original rock and soil, because the volume of inorganic ions, such as Na, Cl, SO4, are also high, and no big industrial factory exists in the sampled area. There is the possibility that the source of them is domestic wastewater.
Dissolved O <sub>2</sub>	(mg/l)	7.0	-	2	0	0	3	0	0	1	Almost samples, except of 3 samples in Zone A, 2 samples in Zone D, and 1 sample in Zone G, meet the drinking water standard (A1-G).	Dissolved Oxygen (DO) has inverse association with BOD. The water indicating high BOD contains the low DO. The sample at Souihla Ouled Ghaner, which has extremely high BOD as 52.3mg/lit, has low DO as 2.8mg/lit.
Turbidity	NTU	-	5	5	2	0	3	0	1	3	Twelve samples exceed the standard of WHO guideline. The values of turbidity vary from location to location.	The main source of turbid is contamination of sand from shafts of khettara.
Suspended Solid	(mg/lit)	50	-	0	1	0	1	0	0	0	All samples, except of El Kbira Ait El in Zone A and Lahloua Monkara in Zone D, meet the standard of drinking water (A1-G).	Two samples mentioned in the left column also contain high value of turbidity. The samples, which contain high value of SS, are considered of contaminating much volume of sand.
Color	(mg/lit)	<10	15	0	0	0	0	0	0	0	All samples meet the drinking water standard	-
Total Hardness	(mg/lit)	-	-	-	-	-	-	-	-	-	The total hardness of samples varies from 183mg/lit,to 1,728mg/lit. According to WHO Guideline, all samples are classified into very hard.	Total hardness is the total volume of calcium and magnesium ion. These are derived from original rock and soil in the sampled area.
Cl-	(mg/lit)	300	250	1	1	1	9	4	2	0	Eighteen samples exceed the standard of drinking water. The samples containing high value of chloride concentrate to Zone D, E, and F.	The main source of high chloride is derived from original rock and soil in the sampled area.

 Table G.2.7
 The Adaptation to the Drinking Water Standard by Zone and the Cause of Maladaptation (1/3)

Item of	survey	Morocca	WHO		Т	he nun	nber of	sampl	es		Evaluation	Cause of Maladaptation
		n	Guidelin	,	which e	exceed	the str	ictest s	tandaro	d		
		standard	e	A (8)	$\mathbf{R}(2)$	C(2)	D (0)	$\mathbf{F}(4)$	F(2)	G (8)		
Total Nitrogen	(mg/lit)	1	-	0	0	0	1	0	1	0	All samples except of Souihla Ouled Ghaner in Zone D and Haroun in Zone F meet the standard of drinking water (A1-G).	Almost samples contain low total nitrogen, and all samples contains low nitrate. Then, the pollution by chemical fertilizer does not consider existing in this area.
SiO <sub>2</sub>	(mg/lit)	-	-	-	-	-	-	-	-	-	The concentration of SiO2 in natural water is normally from 1 to 30 mg/lit. All samples are in the normal range.	-
HCO <sub>3</sub> <sup>-</sup>	(mg/lit)	-	-	0	0	0	0	0	0	0	All samples meet the drinking water standards	-
$CO_{3}^{2}$	(mg/lit)	-	-	-	-	-	-	-	-	-	All samples include no carbonate ion.	-
NO <sub>3</sub> <sup>-</sup>	(mg/lit)	50	50	0	0	0	0	0	0	0	All samples meet the standard of irrigation and drinking water.	_
NO <sub>2</sub> <sup>-</sup>	(mg/lit)	-	3	0	0	0	0	0	0	0	All samples meet the standard of irrigation and drinking water.	-
As	( µ g/lit)	50	10	1	0	0	1	1	0	0	All samples meet the Moroccan standard of drinking water(A1-I), while three sample samples don't meet the WHO guideline.	-
Al	(µg/lit)	-	200	0	0	0	0	0	0	0	All samples meet the WHO guideline.	-
NH4 <sup>+</sup>	(mg/lit)	0.05	-	4	1	1	1	0	2	2	One each sample in zone A, D, and F, exceed the standard of drinking water (A1-I), while 11 samples exceed the standard of drinking water (A1-2).	High concentration of Ammonium ion is caused by contamination of animal waste and domestic wastewater.
Cd	(µg/lit)	1	3	0	0	0	0	0	0	0	All samples bellow the detection limits.	-
Fe	(µg/lit)	300	300	0	1	0	1	0	0	0	All samples, except of El Kbira Ait El Abd in Zone B and Souihla Ouled Ghaner in Zone D, exceed the WHO Guideline. These values bellow the level of health damaging to inhabitants.	The source of high volume of Fe is thought to be derived from original rock and soil in the sampled area.
Al	(µg/lit)	-	200	0	0	0	0	0	0	0	All samples meet the WHO guideline.	-
NH4 <sup>+</sup>	(mg/lit)	0.05	-	4	1	1	1	0	2	2	One each sample in zone A, D, and F, exceed the standard of drinking water (A1-I), while 11 samples exceed the standard of drinking water (A1-2).	High concentration of Ammonium ion is caused by contamination of animal waste and domestic wastewater.

 Table G.2.7
 The Adaptation to the Drinking Water Standard by Zone and the Cause of Maladaptation (2/3)

Item of s	survey	Moroccan	WHO		Th	e nun	ber of	samp	les		Evaluation	Cause of Maladaptation
		standard	Guideline	W	hich e	xceed	the str	ictest	standa	rd		
				A (8)	B (2)	C (2)	D (9)	E (4)	F (2)	G (8)		
Cd	(µg/lit)	1	3	0	0	0	0	0	0	0	All samples bellow the detection limits.	-
Fe	( µ g/lit)	300	300	0	1	0	1	0	0	0	All samples, except of El Kbira Ait El Abd and Souihla Ouled Ghaner, exceed the WHO Guideline. These values bellow the level of health damaging to inhabitants.	The source of high volume of Fe is thought to be derived from original rock and soil in the sampled area.
F	(mg/lit)	0.7	1.5	0	1	1	0	2	2	2	The sample at Chouater exceeds slightly the WHO Guideline, while 8 samples exceed the Moroccan standard (A1-G).	The source of fluorine ion is derived from the original rock and soil around the sampled area.
SO4 <sup>2-</sup>	(mg/lit)	200	250	2	1	1	9	4	2	0	Nineteen samples exceed the standard of drinking water (A1-G).	The source of sulfate ion is derived from original rock and soil in the sampled area. There is the possibility that the cause of it is contamination of domestic wastewater.
Na	(mg/lit)	-	200	1	1	2	9	4	2	0	Eighteen samples don't meet the WHO guideline. The samples of high volume of sodium ion concentrate to Zone D, E, and F.	The source of high volume of sodium ion is thought to be derived from original rock and soil in the sampled area.
K	(mg/lit)	-	-	-	-	-	-	-	-	-	-	-
Ca	(mg/lit)	-	-	-	-	-	-	-	-	-	-	-
Mn	(µg/lit)	100	500	0	0	0	0	0	0	0	All samples meet the drinking water standard.	-
Mg	(mg/lit)	-	-	-	-	-	-	-	-	-	-	-
BOD	(mg/lit)	3	-	1	0	0	1	0	0	0	The samples of Ouinigui and Souihla Ouled Ghaner don't meet the Moroccan standard of drinking water (A1-G).	The high value of BOD and COD indicate that the sample contains rich organic mater. The high value of BOD and COD is thought to be caused by contamination of animal waste and domestic wastewater.
COD	(mg/lit)	25	-	4	0	0	4	2	2	0	Twelve samples in Zone A, D, E, and F don't meet the	Moroccan standard of drinking water (A2-G).
Coli form Group	(/100ml)	50	undetected	8	1	2	9	4	2	8	Coli form groups are detected from all samples except of Chouater.	The high value of coli form group and fiscal coli form is caused by the contamination of animal and human excreta and domestic wastewater. Almost khettaras water except of 4 khettara should be disinfected by chorine for drinking.
Fecal Coli form	(/100ml)	20	undetected			×		×	×		Fiscal coli forms are detected from all samples except Takacha.	of Ait Ben Omar, Chouater, Lagrinia and
Hg	(mg/lit)	0.001	0.001	0	0	0	0	0	0	0	Hg is not detected from all samples.	-

Table G.2.7The Adaptation to the Drinking Water Standard by Zone and the Cause of Maladaptation (3/3)

Segment of the environment	Evaluation	Underpinning
I Social environment		
1. Social life		
1-1 Life of populations		
1. Programed displacements of population	D	This project does not envisage displacements of population.
2. No voluntary displacements of population	D	No expulsion is necessary.
3. Modification of life modes	D	The program should not change on the way of life. On the other hand for the advance of income generation projects and life improvement projects in the Master Plan, it is considered that the social status and role of women are changed. It is not evaluated as negative impact.
4. Frictions between inhabitants	D	The Master Plan takes into account the fairness of the opportunity of khettara and irrigation canal rehabilitation. Because it is possible that inhabitants whose khettara is include in the long term plan (it will be rehabilitated after 10 years later) complain that their khettara's rehabilitation is implemented more earlier, it is necessary that the ORMVA/TF should explain inhabitants the selection criteria and basis of priority for khettara and canal rehabilitations.
5. Natives, minorities and nomads	D	This project will not have effect on the life of nomads.
1-2 Demographic problems		
1. Increase in the population	D	Because of its function first which is to guarantee the water of irrigation of the current arable lands, the project should not have effect over the increase in the population or the changes of the demographic composition (the stabilization of the incomes should on the hand dam up the rural migration towards the cities.
2. Abrupt modification of the demographic composition	D	idem
1-3 Economic activities		
1.Displacement of the bases of the economic activity	D	Of share its objective which is to help those which take part in the bases of agricultural economics, it will not cause unemployment or displacements of the economic bases.
2. Economic conversions, unemployment	D	idem
3. Digging of disparities of incomes	D	The increase in the income of farmers through the increase in the production of the farmers' lower-income group and the stabilization of their standard life being an objective of this project, the disparities should on the contrary grow blurred.

Table G.3.1Initial Environment Examination (the Master Plan) (1/5)

Segment of the environment	Evaluation	Underpinning
1-4 Institution and custom		
1. Adjustment of water right	D	The rehabilitation projects in the Master plan are implemented on the basis of the traditional water right system. Because the traditional water right system has wide flexibility, irrigation schedule is available to be adjusted in the water right system, even if the condition of irrigation schedule is changed by the khettara or canal rehabilitation.
2. Conversion of community structure by unionisation and so on	D	It is possible that organizing farmers' groups make influence to community structure. It is not evaluated as negative impact.
3. Conversion of existing institution and custom	D	The Master Plan does not have negative impact to existing institution and custom
2. Health, hygiene		
1. Increase of agricultural chemicals	D	Currently agriculture chemicals are scarcely used in the Study Area. On the other hand, chemical fertilizer is used in a matter in the Study Area. The quantity consumed of chemical fertilizer will not increased rapidly, because the utilization of organic fertilizer, such as straw, green manure, barnyard manure is considered to be promoted by implementation of the Mater Plan. Therefore, negative impact to environment hardly occurs.
2. Appearance of endemics	D	In the surroundings there are no diseases endemic or serious contagious and the project should not reveal some.
3. Propagation of the contagious diseases	D	The project should not cause the appearance or the propagation of new contagious diseases. As measures of fight against the disease of the fly on the eyes which is a local problem of health we let us envisage constituting of compost with the household refuse. This should cause to prevent the appearance of contagious diseases.
4. Residual toxicity (accumulation of phytosanitary products)	D	Currently agriculture chemicals are scarcely used in the Study Area. On the other hand, chemical fertilizer is used in a matter in the Study Area. The quantity consumed of chemical fertilizer will not increased rapidly, because the utilization of organic fertilizer, such as straw, green manure, barnyard manure is considered to be promoted by implementation of the Mater Plan. Therefore, negative impact to environment hardly occurs.
5. Increase in waste and dejections	D	This project having for objective to maintain volumes of agricultural water useful for the current farms (the number of owners is fixed) it will not have there abrupt flow of the population.
6. Others (drinking water )	-	Currently in the majority of the villages, the khettara's water is used as drinking water whereas the analyses show that it is unsuitable with consumption. It is necessary to convince the population served by ONEP not to drink more the khettara's water.

Table G.3.1Initial Environment Examination (the Master Plan) (2/5)

Segment of the environment	Evaluation	Underpinning
3. Historic sites, cultural inheritance, la	ndscapes	
1. Deterioration or destruction of the historic sites or cultural inheritance	D	One does not know historic sites or masonry indexed with the cultural inheritance in surroundings of the site (but they will have all the same to be taken into account if they are discovered under study). The khettaras themselves are regarded as forming part of the cultural inheritance, on which of this fact tour project will have a positive impact (maintenance and conservation)
2. Degradation of nice landscapes	D	There is not in the surroundings of the site of the rare landscapes and our project will not deteriorate the landscape.
3. Underground resources	D	No buried object is indexed in the surroundings of the site.
II. Natural Environment		
4. Rare species and ecological sites		
1. Modification of vegetable cover	D	Measurements against the desertification should somewhat improve or reconstitute vegetable cover. (Positive effect). That will not have effect on the ecological system.
2. Rare and particular vegetable species	D	idem
3. Biodiversity	D	idem
4. Invasion and proliferation of the harmful species	С	The areas of date culture will increase with the project; it will be necessary to pay attention so that the disease of the Bayoud caused by a bacterium of the soil
5. Soils and lands		
5-1 Soils		
1. Erosion of soils	D	The project will not have new incidence on erosion of the soil.
2. Salinity of soils	С	The project will introduce the water saving irrigation which is a method which does not have any impact on salinity, it will be necessary however to remain attentive because the water of khettara contains salts.
3. Decrease of soil fertility	D	The utilization of organic fertilizer, such as straw, green manure, barnyard manure and crop rotation are planned in the Master Plan. It is considered that soil fertility is increased by implementation of the Master Plan.
4. Soils pollution	D	Currently agriculture chemicals are scarcely used in the Study Area. On the other hand, chemical fertilizer is used in a matter in the Study Area. The quantity consumed of chemical fertilizer will not increased rapidly, because the utilization of organic fertilizer, such as straw, green manure, barnyard manure is considered to be promoted by implementation of the Mater Plan. Therefore, negative impact to environment hardly occurs.

Table G.3.1Initial Environment Examination (the Master Plan) (3/5)

Segment of the environment	Evaluation	Underpinning
5-2 Lands		
1. Degradation of lands (including desertification)	D	The rehabilitation of khettaras and other shutters of the project will take part in protection against the degradation of the lands and against desertification; they will absolutely not cause a fall of productivity of the lands or the progress of desert. Moreover the afforestation is envisaged like measures of fight against desertification. Its results will have to be supervised.
2. Degradation of back-country (wood, pastures)	D	There will be no increase in the population, no increase in the wood of heating and no increase in pasture likely to deteriorate the back-country.
3. Subsidence of the ground	D	There is no soft foundation in the Study Area and thus it should not occurs subsidence. Moreover it has until now never deferred case of subsidence because of water collecting in the underground.
6. Hydrogeology		
6-1 Hydrology		
1. Modification of surface flows	D	Surface flows are not influenced by khettara or canal rehabilitations.
		It is possible that surface flows are influence by construction of recahrge facility to underground water. The influence should be evaluated in future. (Zones A, C, D, E, G)
2. Modification of the underground flows and level of the water sheets	D	A gallery of collecting will be built close of the water sheet for water storage on a great surface and to send it by gravity. This type of installation should slightly modify the level of the water sheet without having a very large incidence on the underground flows or the modification of the level. The equipment of recharge which they will be used to reload the overdrawn water sheet with surface water will not have either negative impact. It will be necessary to study the consequences which could have of the equipment of big size. There will be no impact because of the rehabilitation of khettaras. It will be necessary well to study the installation of the equipment of recharge so that they do not have repercussions (zones A, C, D, E, G).
3. Appearance of floods	D	There will be no impact because of the rehabilitation of khettaras. It will be necessary well to study the implementation of equipment of so that they do not have repercussions (zones A, C, D, E, G)
4. Sand accumulation	D	There will be no impact because of the rehabilitation of khettaras. The influence of recharge facilities to underground water should be evaluated in future.
5. Subsidence of bed of rivers	D	idem

Table G.3.1Initial Environment Examination (the Master Plan) (4/5)

Segment of the environment	Evaluation	Underpinning
6-2 Quality and water temperature		
1. Water polution	D	The water pollution will not occur by implementation of the Master Plan. Wastewater after washing and feces and food scraps as one of the sources of water pollution is expected to be reduced by enlightenment activities planned in the life improvement plan. The water quality is expected to be improved by implementation of the Master Plan.
2. Eutrophication	D	Nutritive salts which constitute the enrichment of the water sheet should not increase.
3. Temperature change	D	The temperature of the water sheet is stable, and should not change much after the rehabilitation and installation of recharge equipment.
6-3 Atmosphere		
1. Atmosphere pollution	D	The rehabilitations of khettaras are work of relatively small scale which should not have negative effect.
		In case of big scale recharge facilities, it will be necessary to take in consideration this factor, and to study the working methods to measurement of the progress of the study.

Table G.3.1Initial Environment Examination (the Master Plan) (5/5)

Added Components in the New the JICA's Guideline

Segment of the environment	Evaluation	Underpinning
Bottom Material	D	It is not influenced by khettara or canal rehabilitation
		In case construction of recharge facility to underground
		water, it is necessary to consider this factor.
Accidents	D	It is planned in the Master Plan that existing khettaras
		and canals are rehabilitated. The techniques of khettara
		and canals rehabilitation were stocked well through the
		long experience. We can prevent accidents from paying
		attention well to safety at implementation of
		rehabilitation works.
Greenhouse warming	D	The rehabilitation of kehttaras and canals are small scale
		works, and they don't influence to greenhouse warming
Children's entitlement	D	The rural life is expected to be improved by
		implementation of the Master Plan. Advancement rate is
		expected to be increased by the improvement of rural
		life. Therefore, they are evaluated as positive impact.

#### Table G.4.1

#### Projects subjected to environmental impact assessment

(Law n°12-03 relating to environmental impact assessment)

- 1 Unsanitary, unpractical or dangerous facilities classified in category I.
- 2 Infrastructure projects
  - Road construction (national highways and freeways);
  - Railways;
  - Airports;
  - Development of urban areas;
  - Development of industrial areas;
  - Trading ports and marinas;
  - Dams or any other facilities intended for permanent water retention or water storage
  - Tourism complexes, namely those located along the coast, in the mountain and in rural areas;
  - Facilities for waste or storage disposal, whatever their nature or their disposal method;
  - Waste water treatment stations and related works;
  - Sea drainage channels;
  - Transportation of hazardous or toxic materials.
- 3 Industrial projects
  - 3.1 Mining industry:
    - Mines;
    - Sand and gravel quarries;
    - Cement works;
    - Plaster industry;
    - Cork processing.
  - 3.2 Power industry:
    - Facilities intended for the storage of gas and any other inflammable products;
    - Oil refineries;
    - Energy transfer heavy engineering construction;
    - Thermal power plants and other facilities with a combustion heating capacity of at least 300 MW;
    - Nuclear power plants;
    - Hydro-electric power stations.
  - 3.3 Chemical industry:
    - Facilities for chemical products, pesticides, pharmaceutical products, varnish paints,
    - elastomers and peroxide manufacturing;
    - Launching of new chemical products on the market;
    - Asbestos mining, processing and transformation.
  - 3.4 Metal processing :
    - Iron-and-steel works;
    - Metal surface treatment and coating;
    - Sheet metal works and metallic equipment.
- E' 3.5 Food products industry:
  - Animal and plant product preservation;
  - Milk product manufacturing;
  - Brewery;
  - Confectionery and drink manufacturing;
  - Fish meal and oil plants;
  - Industrial starch industry;
  - Sugar plants and molasses processing;
  - Flour mills and semolina mills;
  - Oil mills.
  - 3.6 Textile, leather, wood, paper, paperboard and pottery industry:
    - Paper pulp, paper and paperboard manufacturing;
    - Tanning and tawing industry;
    - Cellulose production and processing;
    - Fiber dyeing;
    - Fiber, particle and plywood panel manufacturing;
    - Textile and dyeing industry;
    - Pottery.
  - 3.7 Rubber industry:
    - Elastomer-based product manufacturing and processing.
- 4 Agriculture
  - Rural land consolidation projects;
  - Reforestation projects with a surface area above 100 hectares;
  - Wasteland or semi-natural land piece allocation projects for large-scale farming.
- 5 Aquaculture and fish-farming projects

Table G.4.2

Sample of Contents of EIE report

### PROJECT NOTIFICATION FORM DESCRIPTION SHEET

### **1- PROJECT SPONSOR**

1.1 Name of person in charge

- 1.2 Address Telephone
- 1.3 Profession
- 1.4 Nationality

## 2- COMPANY CHARACTERISTICS

2.1- Company name

- 2.2- The mission
- 2.3- Legal form

2.4- Corporate capital

2.5- Main shareholders if applicable, specify the share of resident and non-resident capital)

2.6- Component headquarters (specify if it is an agency, an affiliate or a subsidiary)

2.7 ? Amount of investment

### **3-LOCATION**

- 3.1- Land geographical location (location map)
- 3.2- Land Real estate by-laws
- 3.3- Land surface area
- 3.4- Covered surface area
- 3.5- Nature of construction

### **4- PROJECT DESCRIPTION**

- 4.1- Nature of activity
- 4.2- Manufacturing processes considered
- 4.3- Nature and characteristics of raw materials
- 4.4- Energy used
- 4.5- Origin of raw materials

4.6- Nature, characteristics and quantity of intermediate and finished products

- 4.7- Storage conditions
- 4.8- Equipment required
- 4.9. Water consumption considered
- 4.10. Power consumption considered

4 11. Infrastructures considered (drinking water distribution, sewage service, roads network, VRD)

### 5- ENVIRONMENT AND MAIN CONSTRAINTS DESCRIPTION

5 1. Land use in the vicinity of the project site

5 2. Nature of soil, topography, groundwater level

### 6- CHARACTERIZATION AND QUANTIFICATION OF REJETS ON THE NATURAL AND HUMAN ENVIRONMENT

- ? Liquid discharges
- Volume of discharged waste water per day (m3/j)
- Characterization of discharged waste water (physicochemical and bacteriological composition)
- What purification or treatment system is anticipated?

? Solid wastes (what volume management method are anticipated?)

? Atmospheric emissions (gas, fumes, dusts, etc.)

? Sound (noise) and odor (foul smell) nuisances

### 7- NUMBER OF JOBS CREATED

# 8- PROJECT EXECUTION SCHEDULE

Source: Home page of the State Secretariat for Environment

 Table G.4.3
 National program Countermeasure against Desertification (Long-term)

Strategies of program	Principal Objective	Cost (millions DH)	Target year
Irrigation development	To enlarge the irrigable area until 1.36 million ha (one million ha is currently irrigated).	37,400	2020
	The plans concerns the extension and rehabilitation of large hydraulic system and small and middle hydraulic system (*PMH: Petite et Moyenne Hydraulique)		
National program for watershed management	Implementation of 3 millions ha	3,000	2020
Reforestation plan	Reforestation of 1.5 millions ha	18,000	2030
Strategy of development for pasturage land	Implementation and management of 20 millions ha. Reform and rehabilitation of 2 millions ha.	12,000	2020
Master plan for protective zones	Management and conservation of 154 biologically and ecologically important sites	364	2025
Master plan of conservation for agricultural land	Promotion of conservation of agricultural land at some pilot project sites	6000	2020

Programme of agricultural and farmland development, preservation of the natural resources, and the struggle against the desertification and the draught

Program of infrastructure and basic social services

Strategies of program	Principal Objective	Cost (millions DH)	Target year
Strategy of water resources development	Construction of 70 large and middle scaled dams, at the rate of 3 units per year	32,000	2020
Program of provision of drinking water for rural population (PAGER)	Drinking water for 31,000 local areas covering 11 million ha	11	2010
(*PAGER : Programme d'Approvisionnement Groupé en Eau Potable des Populations Rurales )			
National Program of construction of rural roads (PNCRR) (*PNCRR: Program National de Construction des Routes Rurales)	Construction and / or rehabilitation of 11.200 km of rural roads and piste		
Program of global electrification in rural area (PERG) (*PERG: Programme d'Electrification Rurale Global	Electrification of 1,500,000 houses in rural area, to achieve the electrical rate of 80 %	15,000	2010
BAJI Programme	Improvement of the rate of access to basic educational service in 14 underprivileged provinces	2,600	

Table G.4.4	National Program Countermeasure against Desertification (Short-term)
Economi	c and social plan for countermeasure against desertification from 2000 to 2004

Components	Contents of components	Cost ( millions DH)
Larte scaled irrigation	Extension to 86,120ha of irrigation arae and rehabilitation	4,021,900
Small and middle scaled irrigation (PMH) (PMH: Petite et moyenne hydraulique)	Extension to 13,620ha of samll and middle scaled irrigation area, 136,500 ha of rehabilitation	3,163
Farmland improvement	Removing stones (40,000ha), rehabilitation of agricultural land (32,000ha), and land reform (98,000ha)	56,800
Integratd development projects	Agricultural and rural development projects	2,285
Procedures of increasing plant production	Extension of 150,000ha of olive and regenesis of citrus orchards (34,000ha)	964
Procedures of increasing animal production	Genetic improvement of livestock sheep, cattle, and goat	599
Management of quality	Phytosanitary treatment and creation of laboratories	267
Formation of research and training	Formation of professionals and techniques	1,216
Studies and information systems	Natural ressources inventories	112
Other activities	Promotion of investment and economy of water	16,173
Management of forest area	Installing equipments and safeguard in forest area	154,760
Management of forest	Management of forest activities (14,700ha)	75,370
Biodiversity	Management of biodiversity in 21 SIBE (*SIBE: Sites présentant un intérêt Biologique et Ecologique)	124,150
Reforestation	Reforestation projects to 114,000 ha area	734,370
Countermeasure to erosion	Projects of range management for control erosion and countermeasure to 1,800 ha of sand dune	117,240
Integrated development of forestation and peri-forestation area	Realization of a integrated development project	228,860
Reinforcement of institutions and researches		74,650

Figures



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