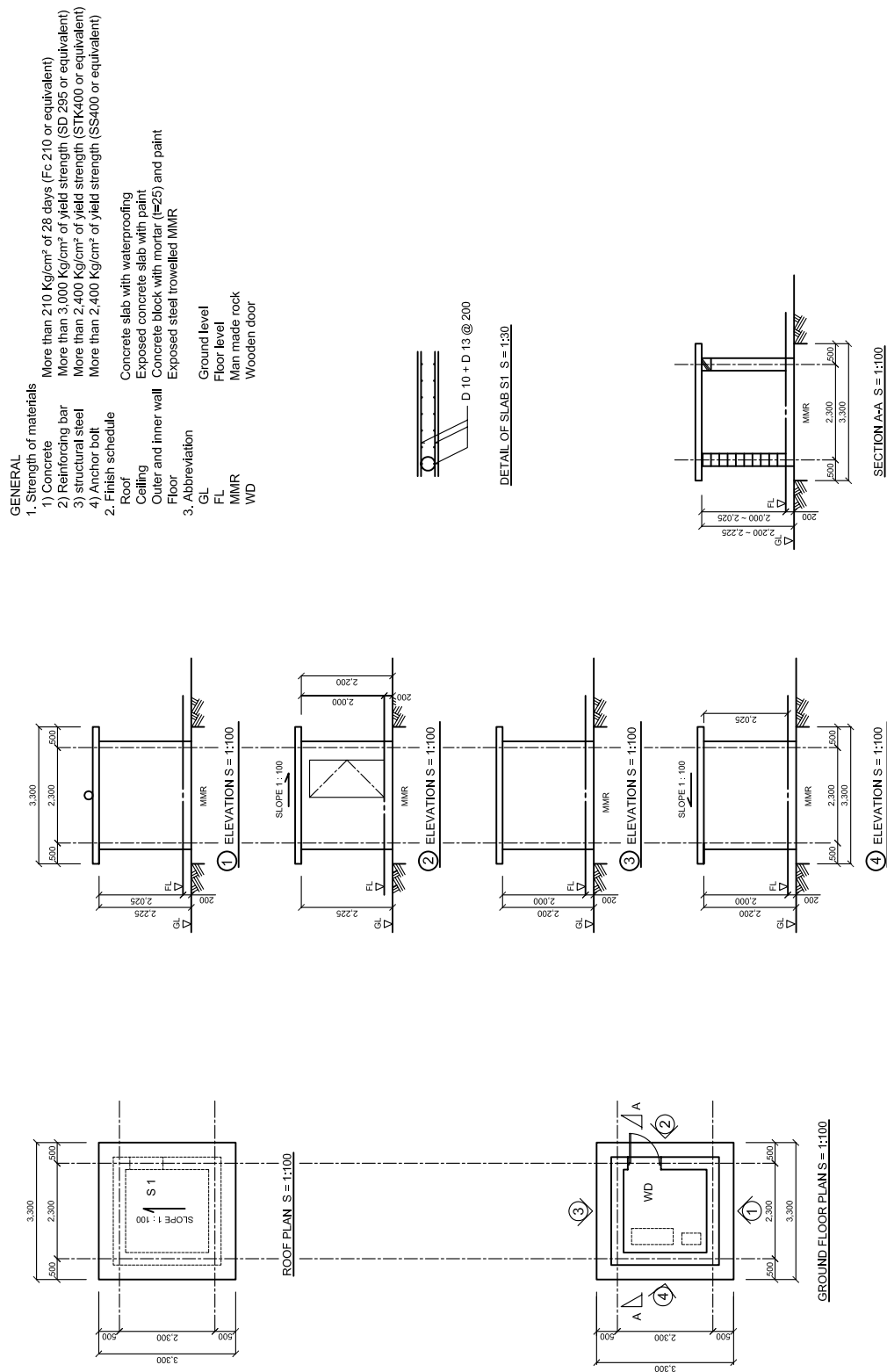




STORAGE HOUSE FOR ALARM MIKE EQUIPEMENT

APPENDIX K

ECONOMIC EVALUATION

**THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO**

APPENDIX K ECONOMIC EVALUATION

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CHAPTER 1. ECONOMIC CONDITIONS

1.1 National Economy

1.1.1 Macroeconomic Conditions

(1) Recent GDP Growth

Real GDP growth in Morocco has been fluctuating dramatically, showing positive figures in a year and negative ones in the following year. GDP growth rates in 1996 and 1998 are 12.2% and 6.5% respectively while those in 1995, 1997 and 1999 are -6.6%, -2.3% and -0.7% respectively due to the decline of agricultural production caused by drought. The total cereal production, for example, dwindles by 81.6% in 1995 and by 59.5% in 1997 (please refer to Table K.1.1). With the results of last eight years, it can be said that GDP in Morocco is strongly influenced by the performance of the rain-fed agricultural sector (please refer to Table K.1.2).

Recent GDP Growth in Morocco

	1995	1996	1997	1998	1999
GDP at market prices (Dh bn)	281.7	319.3	318.3	342.6	343.1
GDP at market prices (US\$ bn)	33.0	36.6	33.4	35.7	35.0
Real GDP Growth (%)	-6.6	12.2	-2.3	6.5	-0.7

Source: EIU, *Country Report, Morocco, July and October 2000*

(2) Economic Structure

The GDP shares of sectors in 1998 are as follows: agriculture 17.0%, industry 31.9% (manufacturing 17.3%) and services 51.1%. In comparison with other North African countries including Algeria, Egypt and Tunisia, it is noticeable that the economic structure is similar to that of Egypt. The agriculture share is in the higher side with Egypt. Historically, the agricultural share exceeds 17% as 17.9% in 1979 and 17.2% in 1989. Shares of industry and services sectors are in the middle level. The industry share is around 32% level with Egypt and the services share is just-over 50% level with Egypt.

GDP Shares of Sectors

(1998; % of GDP)

	Morocco	Algeria	Egypt	Tunisia
Agriculture	17.0	12.1	17.5	12.4
Industry	31.9	47.3	32.3	28.4
Manufacturing	17.1	10.6	25.9	18.2
Services	51.1	40.6	50.2	59.1

Source: World Bank, *Country at a Glance*

It should be noticed that the recent agricultural production fluctuates dramatically as mentioned in the previous section, as its share shows 11.6% in 1995, 18.3% in 1996 and 14.8% in 1999. The agriculture, however, is still an important industry since farming consumes around 40% of the labor force, according to *EIU Country Profile 2000*.

The phosphate mining is also an important industry, which earns foreign exchange. Morocco is the largest exporting country in the world concerning both raw and processed products of phosphates including phosphoric acid and fertilizers.

Phosphate Rock Production, Sales and Prices

	1994	1995	1996	1997	1998
Production ('000 tonnes)	20,335	20,186	20,792	23,084	22,966
Domestic sales ('000 tonnes)	10,906	10,766	10,534	11,252	10,825
Exports ('000 tonnes)	9,527	9,420	10,140	11,669	11,753
Price (\$/tonnes)	33	35	39	41	43

Source: EIU, *Country Profile, Morocco, 2000*

Tourism is another important industry in Morocco. Please refer to *Appendix F: Tourism* for the details of tourism industry.

(3) Inflation

Consumer price inflation is low in the regional standard. Although CPI is 6.2% in 1995, it has been suppressed to less than 3% and in 1999 it is less than 1%. On the other hand, CPIs in Algeria and Tunisia are 4.2% and 2.5% respectively in 1999. A main reason for the low CPI is the powerless domestic demand reflecting the low GDP growth and personal incomes. It is understandable when we take a look at the share of the private consumption, which is 67.2% in GDP component in 1998. Another reason for the low CPI is relatively stable exchange rate and low world prices.

Prices

(Average; % change, year on year)

	1995	1996	1997	1998	1999
Consumer prices	6.2	3.0	0.9	2.9	0.9
Wholesale prices	6.5	4.4	-1.6	3.5	NA

Source: EIU, *Country Report, Morocco, July and October 2000*

(4) Government Finance

Though the general budget balance of the central government has been deficit, its ratio to GDP has been declining from 5.3% in FY 1995 to 2.3% in FY 1999, according to *EIU Country Profile 2000*. This fiscal improvement is attributable to privatization and license money on the national assets. The World Bank reports that Morocco's fiscal stance has stayed broadly unchanged in recent years and the public expenditure patterns have become increasingly rigid in the absence of profound sectoral and public management reforms (*Morocco in Brief*, May 2000). Economic reform is discussed in the next section. Anyway, deficits of 2-3% of GDP can be construed as manageable.

Government Finance

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999
General balance/GDP (%)	-5.3	-5.0	-2.0	-3.1	-2.3

Source: EIU, *Country Profile, Morocco, 2000*

(5) Foreign Trade and Payments

Morocco's main foreign trade partners are France, Spain, India and Japan for exports; and France, Spain and US for imports. EU as a whole is a significantly important trade partner as its share exceeds 50% (59.3% for exports and 55.7% for imports in 1998).

Major exported commodities are agricultural products, minerals (phosphate) and those processed. On the other hand, major imported ones are crude oil, materials for heavy and chemical industries, machinery and equipment. Consumer goods are also large imported items.

The trade balance in Morocco has been showing around \$2 billion deficit, which is 6.5% of GDP in 1998. On the other hand, the service balance has been showing positive figures, \$932 million in 1998, thanks to the buoying tourism industry. The income balance, which consists mainly of investment profit/loss, records more than \$1.1 billion deficit. The current transfer balance, which consists mainly of food aid programs, is a large surplus item with \$2,252 million in 1998. As a result, the current-account balance shows a few hundreds million dollars deficit with \$236 million in 1998, which is 0.7% of GDP (please refer to Table K.1.3).

Balance of Payments

(\$ million)

	1994	1995	1996	1997	1998
Trade balance	-2,107	-2,482	-2,194	-1,864	-2,319
Services balance	284	283	961	747	932
Income balance	-1,170	-1,318	-1,309	-1,176	-1,101
Current transfers balance	2,269	2,220	2,483	2,123	2,252
Current-account balance	-724	-1,297	-59	-170	-236

Source: IMF, *International Financial Statistics*

1.1.2 Economic Policies and Reforms

In the late 1980's, a comprehensive economic reform started in Morocco. In this reform, trade protection was reduced; the fiscal deficit was cut; and its external debt was rescheduled. As a result, Moroccan economy enjoyed a growth at an average rate of 4.5% between 1985 and 1991. However, in 1990's its average growth rate fell down to below 2%, which means 0% growth in per capita basis. This is not only because of fluctuating agricultural production but also because of stagnated industrial sectors caused by a declining external competitiveness as the Dirham appreciation by 18%.

The privatization program was launched by the Moroccan government in 1992. The World Bank pushed the government to adopt a medium-term financial strategy in 1995. It aims to consolidate the economic management, especially its fiscal policy, in order to raise annual growth rates to a sustainable 5-6% level as well as to reduce dependence on rain-fed agriculture. Under the World Bank supervision, the government is guided to speed up its reform program, in which the reduction of the budget deficits is deemed as the most important short-term economic policy.

The privatization program identifies 114 state enterprises. Its progress is slow but steadily as 60 have been sold by 1999. The liberalization and privatization have progressed most in the telecommunication sector. Receipts from such privatization and licensing contribute to supply considerable budgetary revenue to the nation in 1999.

Recent Economic Reforms

1992	The privatization program (approved by parliament in 1989) is finally launched.
1993	Dirham convertibility introduced for current-account transactions.
1993-96	Restructuring of financial sector, supported by a \$250 million World Bank loan and a \$225 million African Development Bank loan.
1994-97	Phased liberalization of imports of basic items, including petroleum products, cereals, sugar and edible oils.
1995	Reform of the investment code.
1996	Launch of privatization bonds and Global Depository Receipts (GDRs). Interest rates liberalized.
1997	Launch of industrial modernization program. An important reform program in the justice sector was initiated.
1999	Privatization process is given new momentum by the sale of Global System for Mobile Communication (GSM) license; a new three-year World Bank assistance program is announced.

Source: EIU, *Country Profile, Morocco, 2000* and World Bank, *Morocco in Brief, May 2000*

1.1.3 Economic Forecast

According to *the Global Economic Prospects 2001* issued by the World Bank, it is expected that developing countries enjoy the highest economic growth in the next decade thanks to the improvement of health, school attendance and literacy, attained by the implementation of reform programs necessary for the sustainable development. On the other hand, instability of financial markets, slow-down of US economy and fluctuation of oil prices would be latent downside risks for the long-term prospects.

As for the global economic trend, the increase in the US economic growth, upturn in Europe and Japan, and rapid recovery of Asian countries from financial crisis support the global economy to reach a high level in the economic cycle in 2000. The report points out that the long-term prospect of the global economy has improved thanks to an upward trend of the productivity in the US, improvement in flexibility of labor markets and market competition of products in Europe as well as restructuring of the financial system and enterprises in Japan.

Concerning the long-term forecast of the economy in Middle East and North Africa (MNA) region, the report describes that progress in structural reforms and improved fiscal behavior with respect to commodity price booms and busts should support some acceleration of per capita growth over the next decade. However, the following factors should reduce growth rates to much lower than the average rate of developing countries; 1) large and inefficient public sectors, 2) a shortage of social safety nets, and 3) low savings and private investment rates. It forecasts that the MNA region's per capita growth rate is 1.7% per annum in 2000-2010 period in a base case, or 0.7% in a low case while its result in 1990s is 0.9% (the population growth rate is assumed at 1.3% per annum in 2001-2010 period and 1.6% in 1990s).

Growth of World GDP Per Capita

	Actual		Forecast	
			Baseline	Low case
	1980s	1990s	2000-2010	2000-2010
World total	1.3	1.3	2.3	1.3
High-income countries	2.4	1.9	2.7	1.7
Developing countries	0.8	1.8	3.7	2.3
Middle East and North Africa	-0.6	0.9	1.7	0.7

Source: World Bank, *The Global Economic Prospects 2001*

1.2 Economy of the Study Area

Agriculture and stock raising are the dominant industries in the Study Area. Although non-agricultural income including tourism is larger than agricultural income in some communes according to the social survey of the Study, it should be interpreted that farmers should work away from their home farm because income from agriculture is not enough.

The agriculture of AL Haouz Province is characterized by its diversified production: cereals, olive trees, apricot trees, citrus fruits, rose trees, potatoes, fodder, livestock, milk, honey, etc. The total agricultural area is estimated at about 604,000 ha, of which 75.6 % is composed of uncultivated areas, forests, and roads. The forests alone occupy 45.6 %, and useful agricultural areas occupy 147,700 ha, 24.4 % of the total province area. Agriculture and stock raising are most important industries in the Study Area. According to the JICA Electrification Study, agriculture, stock raising and forestry account for 46 %, 32 % and 0.1 % of the total household income in the province.

Three administrative organizations are involved in the development of this sector. ORMVAH is responsible for the agricultural development of 663,000 ha including large-scale irrigation areas by the Bune El Ouidane, Moulay Hassan 1st, Moulay Youssef, and Lalla Takerkoust Dam Reservoirs. DPA is concerned about agricultural areas that ORMVAH does not cover. DREF is responsible for the development of the forest areas.

1.2.1 Agriculture

Major crops are cereals such as barley, wheat and maize, and tree crops such as olive, almond and apple. Cereals account for nearly 80 % of the total agriculture land in the province, and barley alone occupies 45 %.

Area Occupation by Crop in Al Haouz Province

Agricultural Crops	Area (ha)	Percentage(%)
Cereals	105,154	78.4
Fodder	4,310	3.2
Vegetables	2,535	1.9
Beans	470	0.4
Tree crops	21,597	16.1
Total	134,066	100.0

Data Source: *Monographie de la d'Al Haouz, Oct., 1997*

Land holding in the province is very small in size. It is reported that about 90 % of agriculture households have less than 5 ha. In the mountain areas like the Study Area, the holding areas are smaller. The social survey conducted in this Study reveals that the average holding area of the answers is less 1 ha.

1.2.2 Stock Raising

In addition to agriculture, stock raising is also very important in the province. In the mountainous areas, people depend on stock raising more than the flat areas.

675,000 heads of livestock are kept in the province. Sheep and goats are main livestock, and account for 51 % and 31 % in terms of number of heads, followed by cattle of 11 % and donkeys and mules of 7 %.

Number of Livestock in Al Haouz Province

Livestock	Number (heads)	Percentage(%)
Cattle	74,654	11.1
Sheep	342,969	50.8
Goats	208,976	31.0
Donkeys and Mules	48,321	7.1
Total	674,920	100.0

Data Source: *Monographie de la d'Al Haouz, Oct., 1997*

1.2.3 Forestry

Based on the data from DREF Marrakech, forest dominates 43.7% of the province. Holm oak dominates 55.3% of total forest area, followed by Juniper, Thuya, and Alop pine. There is no Moroccan indigenous species in the table.

Asni cercle has the highest ratio of forest of 53.5%, followed by Amizmiz, Tahanaout and Ait Ourir cercles, respectively. Although Ait Ourir cercle has the smallest ratio of 39.9%, it has the largest forest area of 990 km².

It is reported that an area of 603 km² or 22% of the forest area has been deforested due to human activities or natural activities such as landslide. According to as the JICA Electrification Study, the annual consumption of firewood is estimated at 2.7t per household in mountain villages, of which 2.4t or 88% is collected from the forest.

1.2.4 Industry

Major industrial products are agricultural food and olive oil. They are all related with agricultural productions. Industrial activities are characterized with the following figures in 1998:

Industrial Activities in Al Haouz Province in 1998

(Dh million for monetary figures)

	Production	Realized Turnover	Export	Value Added	Investment	No. of Companies	Permanent Employees
Agricultural food	202	202	2	39	5	3	131
Chemical	104	114	—	71	—	1	478
Textile & Leather	—	—	—	—	13	1	45
Machinery & Electronics	1	1	—	—	—	1	12
Total in Al Haouz	307	317	2	110	18	6	666
Total in the Region	5,191	5,341	1,422	1,711	346	310	15,867

Source: Délégation Provinciale du Ministère du Commerce, de l'Industrie et de l'Artisanat, Wilaya de Marrakech

- (1) Its total industrial production amounts to Dh 307 million, which is 5.9% of the total of million in the Region of Marrakech-Tensift-Alhaouz. Since the national total production is Dh 53,795 million, the provincial share is 0.57%.
- (2) Its realized turnover attains Dh 317 million, which is 5.9% of the Regional total.
- (3) The value added in the industrial sector reaches at Dh 110 million, which is 6.4% of the Region.
- (4) Investment in the sector amounts to Dh 18 million, which is 5.2% of the Region.
- (5) The number of permanent employees is counted at 666, which is 4.2% of the region.

The status of the Province in the industrial activities can be measured at 5-6% in the Regional scale. The number of employees, 4.2% is lower. . Its reason may be the higher production share of chemical sector, which employs less laborers; 33.9% in Al Haouz Province to 22.6% on the Region average.

Under the process of the economic reform including privatization and liberalization presently undertaken by the country and the private investment encouraged by such reform, the industrial configuration of the province will be changed notably. "Etude Monographique de la Province d'Al Haouz", which is reported in 1997 jointly by the Moroccan Government and UNDP, presents the following strategy for the provincial industrial development with considering above-mentioned situations:

- (1) reinforce the specialization on agricultural foods,
- (2) avoid an extreme concentration around the urban center of Ait Ourir for the benefit of other Communes including Tahannaout and Amizmiz,
- (3) reorganize the layout of economic activities more adapted to small and middle industries and to activities of handicraft industry, and
- (4) encourage light and non-polluting industry to preserve the ecological heritage of the Province.

1.2.5 Mining

Mining production increases between 1995 and 1999. Mineral production expands 1.1 times, to 1.7 times. The annual average productions in 1995-1998 of Zinc, lead, copper and barium are 169,623 tons, 30,558 tons 23,589 tons and 31,988 tons respectively, or 98.7%, 28.1%, 68.5% and 10.1% of that of the national production.

Changes in Mining Production

	1995	1996	1997	1998	1999
Zinc	148,800	151,200	167,555	210,936	208,056
Lead	26,729	28,650	31,219	35,635	35,140
Copper	15,059	21,800	25,779	31,719	25,170
Barium	26,898	12,330	31,045	57,678	33,707
Salt	1,077	1,604	1,519	1,320	1,193
Total	218,563	215,584	257,117	337,288	303,266

(ton)

Source: Délégation Provinciale du Ministère de l'Energie et des Mines, Wilaya de Marrakech

The number of employees also increases. It increases 1.2 times from 1991 to 1994 while the total mining production increases 2.8 times in the same period. According to the results of the 1994 census, the working population in the mining sector amounts to about 600, or 0.4 % of the total in the Province (0.2% in urban area and 0.5% in the rural area)

Number of Employees in Mining Sector

	1991	1992	1993	1994
No. of Employees	725	747	866	872

Source: Délégation Provinciale du Ministère de l'Energie et des Mines, Wilaya de Marrakech

1.2.6 Handicraft Industry

According to the census of 1994, 4.4% of the working population is craftsmen (19.3% in urban area and 3.4% in rural area). The number of handicraft cooperatives has been dwindling due to the weakness of craftsmen's adherence cooperatives. The rate of joining is less than 4%.

Number of Handicraft Cooperatives

	1995	1996	1997	1998	1999
Weaving	115	69	69	68	55
Pottery	78	78	78	78	71
Rug & Stitch	-	-	-	-	13
Embroidery	-	-	-	-	67

Source: Délégation Provinciale du Ministère du Commerce, de l'Industrie et de l'Artisanat, Wilaya de Marrakech

In 1999, twenty-seven craftsmen of the Province obtain credit of Dh 309 thousands in total from the Government. The average credit given is about Dh 11 thousands. The total amount of credit has been increasing remarkably.

Credit Given to Handicraftsmen

	1995	1996	1997	1998	1999
No. of Beneficiaries	7	4	8	17	27
Credit Amount (Dh '000)	46	48	124	211	309

Source: Délégation Provinciale du Ministère du Commerce, de l'Industrie et de l'Artisanat, Wilaya de Marrakech

1.2.7 Commerce

According to the results of the 1994 census, the working population belonging to the sector is 5.8%, more than 7,100 (1,800 in urban and 5,300 in rural areas). Sales of basic foodstuff is not so much changed in 1991-1995.

Sales of Basic Food Stuff

(Unit: ton)			
Product	1991	1995	Growth
Sugar	1,450	1,463	0.9%
Tea	274	278	1.5%
Flour	5,575	5,665	1.6%
Oil	770	781	1.4%

Source: *Etude Monographique de la Province d'Al Haouz, 1997*

According to "Etude Monographique de la Province d'Al Haouz", the number of wholesale establishments is 46 in 1996. 17% of them are concentrated in Ait Ourir, making the most important commercial center.

CHAPTER 2. COST-BENEFIT ANALYSIS OF THE MASTER PLAN

The Master Plan in this study was once formulated as the Draft Master Plan and it was further modified through implementation of the Pilot Project. Because of this study procedure, the cost-benefit analysis is examined in two cases; (1) Draft Master Plan and (2) Modified Master Plan due to the modification of the system, which mainly results in the change of construction cost and O&M cost.

2.1 Process of Cost-Benefit Analysis

Firstly, financial costs are converted to economic ones with applying appropriate conversion factors which are used in other projects, considering the accuracy of figures in the Master Plan Study phase. Next, benefits are examined from the viewpoint of the national economy and bases for measures are also identified. Then, the costs and benefits are compared to evaluate the Master Plan.

Following assumptions are made throughout the cost-benefit analysis:

- No shadow exchange rate is adopted in view of the near- convertibility of the Moroccan Dirham;
- Standard conversion factor 0.93 is applied to non-traded goods for the calculation of their economic prices (please refer to Table K.2.1 for the calculation of the standard conversion factor); and
- Institutional programs to be conducted within governmental authorities are not included in the numerical calculation because such programs are carried out in the course of ordinary tasks of governments and it is very difficult to clarify and separate benefits from those in other everyday jobs of the governments.

2.2 Cost Side

2.2.1 Financial Cost Summary

(1) Financial Cost for the Draft Master Plan

Financial costs of the Draft Master Plan is estimated at **Dh 72.2 million** (net cost: Dh 60.4 million and VAT: Dh 10.8 million), with applying such VAT rates as equipment supply: 20%, facility construction in 2003 prices: 14% and consulting services: 20%. Financial costs for the Draft Master Plan are summarized in Table K.2.2.

(2) Financial Cost for the Modified Master Plan

Through the further study including implementation of the Pilot Project, the financial costs of the Modified Master Plan is estimated at **Dh 60.6 million** (net cost: Dh 50.7 million and VAT: Dh 9.0 million) in 2003 prices. Financial costs for the Modified Master Plan are also summarized in Table K.2.3.

2.2.2 Economic Cost Conversion

According to a recent World Bank report^{*}, following conversion factors are calculated as a function of the foreign exchange component of each cost category, the import duties on that foreign exchange component, and the value added tax applied to that cost category: civil works 0.77, equipment 0.63, consulting services 0.83. If these figures are applied to the above cost for the both Draft Master Plan and Modified Master Plan, economic costs are estimated at **Dh 49.0 million and Dh 41.1 million** in 2003 prices, which are summarized in Table K.2.4 and K.2.5.

Ratio of the resulted total economic cost to financial one is 0.68 (= Dh 49.0 million / Dh 72.2 million or = Dh 41.1 million / Dh 60.6 million).

JICA's report on rural electrification in the same study area^{**} employs conversion factors 0.9 for material costs and 0.5 for labor costs after deducting transfer items. Then, if it is assumed that an average tax rate is 18.6%[†] of market price and conversion factor 0.9 is applied to traded goods and skilled labor, and that shares of non-traded goods and unskilled labor is negligible in the Master Plan, $(1 - 0.186) \times 0.9 \approx 0.73$ can be applied to the Master Plan for its economic cost. Above-mentioned 0.68 to which World Bank data is applied is similar to this result.

2.3 Benefit Side

The benefits are the same in both cases of Draft and Modified Master Plan.

* Please note that prices are quoted in 2000 prices except where indicated otherwise.

2.3.1 Identification of the Benefit Items

The following benefits are basically expected by the implementation of the Master Plan from the viewpoint of their possibility of measure in monetary terms: evacuation of movable assets, and promotion of tourism industry. Even though they are measurable, they need some considerations for adding to the total benefit amount, which are discussed later. In addition, reduction in the risk of human lives is also one of the benefits, it is discussed separately as a reference because it needs special consideration for the calculation of its value.

Lately, contingent valuation method (CVM) is attracting attention for the measure of those benefits which are not traded in markets. The economic evaluation for the Master Plan, however, does not employ CVM with the following reasons:

- **Lack of common information basis.** According to the study jointly carried out by the Moroccan Government and the UNDP, the illiteracy rate is 80.2% in Al Haouz Province in 1994. In such social situation, it is very difficult to assume that every resident shares the same information. It is questionable of the validity of such data as summing up the valuations getting from the residents who have no common information base.

* World Bank (1998), *Staff Appraisal Report, Kingdom of Morocco Water Resources Management Project*.

** JICA (1998), *Master Plan Study on Decentralized Rural Electrification of Haouz Region in Kingdom of Morocco*.

[†] It is estimated with import duty: 2.5%, domestic handling cost: 5% of CIF, and VAT: 20%.

- **Unfamiliarity.** In the rural area, it is not usual for the people, especially for women, to show their views freely to the questions. In addition, CVM asks hypothetical questions that are complicated for the people who have no experience. So, it is highly expected that answering to CVM questions are very difficult or impossible for the residents.

2.3.2 Evacuation of Movable Assets

(1) Identification of Movable Assets

Main movable assets to be evacuated in case of floods are livestock for residents and automobiles for tourists. A majority of residents evacuated carrying with nothing and only small number of people carried money and their household effects when they evacuated, according to the social study and public awareness survey by the Study Team. Please refer to **Appendix E: Social Survey** for the details of the social study and public awareness survey. After the implementation of the Master Plan, it is expected that residents will be able evacuate some of their household effects. Personal effects carried by tourists should be very limited.

(2) Livestock

Market prices of typical kinds of livestock have been provided by DPA. Since livestock are non-traded goods, the standard conversion factor 0.93 is used for economic values. As a result of the calculation, economic values per head are as follows; **cattle: Dh 6,975, sheep: Dh 791, goat: Dh 372, mule: Dh 3,255 and donkey: Dh 465.**

Net Economic Value of Livestock

(Unit: Dh/head)

	Cattle	Sheep	Goat	Mule	Donkey
Market price	7,500	850	400	3,500	500
Economic value	6,975	791	372	3,255	465

Source: DPA

(3) Automobiles

Tourists use automobiles which are imported from foreign countries. Benefit from evacuation of automobiles is their asset value, which is depreciated from the price of brand-new ones, according to the years of use. Since the data on years of use is not available, following assumptions are made for the purpose of simplification:

- Automobiles are used until they cannot be used at all;
- Salvage values are minimal and can be neglected;
- Remaining lives are uniformly distributed; and
- All automobiles are the same type.

With the above-mentioned assumptions, the asset value of a typical automobile is just half of the price of brand new ones. A brand-new passenger car which is most popular in Morocco costs about Dh 150,000 in CIF. CIF price is employed from the view point of economic evaluation because it does not include transfer items such as import duties and VAT. Thus, the asset value of an automobile to be saved is estimated at **Dh 75,000.**

(4) Household Effects

Value of household effects including saved cash money is estimated at 10% of depreciated value of house. The value of a typical new house is Dh 128,000*. The depreciated value of a house on average is estimated at Dh 64,000 with the following assumptions since the data on years of use is not available:

- Houses are used until they cannot be used at all;
- Salvage values are minimal and can be neglected;
- Remaining lives are uniformly distributed; and
- All houses are the same type.

Finally, this value is converted to economic one with the standard conversion factor, 0.93, resulting in **Dh 60,000** for a house. Then, the economic value of household effects comes to **Dh 6,000**.

2.3.3 Promotion of Tourism Industry

(1) Identification of Benefits

Decrease in the risk of death and asset damage makes people to feel safer against floods, and promotes tourism industry. The promotion of tourism industry means increase in tourists' expenditure in restaurants, handicraft shops, fuel station and so on, resulting in GDP growth of the country. This benefit will be brought about deterministically while that of life and asset evacuation probably.

Tourists' expenditure has an effect on GDP growth in two ways. One is a direct effect that the expenditure increases value added by a certain percent of its amount. The other is an indirect effect that increases GDP in such a way as additional expenditure leads to new investment by suppliers and it increases demand of goods related to the investment in turn. It is also called multiplier effect.

(2) Direct Effect of Tourists' Expenditure

Direct GDP contribution of tourists' expenditure can be grasped with using the input-output table of the country. According to JICA's report, *The Study on Tourism Development Projects in the Arab Republic of Egypt, July 2000*, the direct contribution to GDP per one unit of tourists' expenditure is estimated at 0.554 on average in Egypt. Since the economic structure of Morocco is similar to Egypt in the North African region (please refer to (2) Economic Structure in **1.1.1 Macroeconomic Conditions**), coefficient of value added 0.554 is employed in this Study with an assumption that tourists spend 70% for restaurants/hotels and remaining 30 % for other shops. According to the tourism survey of the Study, it is estimated that an average expenditure of tourists is Dh 106.4 per person per day. Thus, direct GDP contribution per tourist per day is Dh 58.9.

* Unit construction cost: Dh 2,000 per m² and average house size: 64 m².

Direct GDP Contribution of Expenditure by Tourist

	Assumed expenditure (Dh/person/day)	Coefficient of Value Added ¹⁾	Value added (Direct Contribution to GDP; Dh/person/day)
Food, beverage and hotel expenditure	74.5	0.444 ²⁾	33.1
Expenditure in other shops	31.9	0.810 ³⁾	25.9
Total	106.4	0.554 ⁴⁾	58.9

Note: 1) Input-output table of Egypt in 1991/92

2) Restaurants & hotels sector

3) Wholesale & retailing sector

4) Weighted average of the two sectors

Source: JICA, *The Study on Tourism Development Projects in the Arab Republic of Egypt, July 2000*, and JICA Study Team

The tourism survey of the Study shows an estimated total man-day of tourists in the Study Area is approximately 800,000 in 2000 (Ourika River: 452,000, Rheraya River: 296,000 and Imlil: 50,000). The total direct effect of tourists' expenditure is about **Dh 47 million**.

Tourists in a Year (man-day)

('000)

	Ourika River	Rheraya River	Total (man-day/year)
Weekday in peak months (man/day)	2.5	1.0	140.0
Weekend in peak months (man/day)	6.3	5.4	234.0
Weekday on season (man/day)	0.5	0.2	140.0
Weekend on season (man/day)	1.3	1.1	234.0
Total (man-day/year)	452.0	296.0	748.0

Note: 1) Peak months are July and August;

2) Man/day in other months are 20% of peak months; and

3) Number of Imlil is estimated at 50,000.

Source: JICA Study Team

(3) Indirect Effect of Tourists' Expenditure

According to JICA's report, *The Study on Tourism Development Projects in the Arab Republic of Egypt, July 2000*, indirect effect of tourists' expenditure is estimated at 30% of the direct GDP contribution. The same rate is applied in this Study since the economic structure of Morocco is similar to Egypt in the North African region (please refer to (2) Economic Structure in **1.1.1 Macroeconomic Conditions**). As a result, the total indirect effect of tourists' expenditure is estimated at **Dh 14 million** in 2000. The total effect of tourists' expenditure, or the market size of tourism industry is estimated at **Dh 61 million** in 2000.

(4) Benefit of the Master Plan

The effect of the Master Plan can be grasped by estimating how many tourist increases comparing with the without-project case because the increase in safety affects the choice of tourists. On the other hand, the amount of expenditure per person per day is assumed to increase in accordance with per capita GDP growth rate.

Increase in Expenditure Per Person Per Day

	2000	2001	2005	2010
Per capita GDP growth rate (forecast)	1.7%	1.7%	1.7%	1.7%
Expenditure (Dh/person/day)	106.4	108.2	115.8	125.9

Source: World Bank, *The Global Economic Prospects 2001* and JICA Study Team

A present value of increase in expenditure by one man-day for 2001-2010 is calculated at Dh 776 with 8% of discount rate. According to the survey on the present conditions of the tourism spots, the number of automobiles and tourists visiting almost reaches the full capacity of the facility such as parking lots and roads. In addition, there is no concrete future development plan for tourism in the Study Area. It is very difficult to forecast that the number of tourists would increase drastically in the future without additional investment in tourism development. It is estimated that the direct GDP contribution per tourist per day is Dh 58.9 and indirect effect is Dh 17.7. With 1% increase in the present number of tourists for 2001-2010 thanks to the Master Plan, the benefit would be Dh 6.2 million although the detailed figure is not clear with the available data.

2.4 Economic Evaluation

* Please note that prices are quoted in 2000 prices except where indicated otherwise.

2.4.1 Data Availability

This economic evaluation examines economic feasibility of the Master Plan with identified costs and benefits which are converted to "economic" values or shadow prices. Generally, economic evaluation for river works is conducted in the following steps:

- 1) Determination of flood prone area
- 2) Estimation of asset value in the flood prone area
- 3) Estimation of damage in the flood prone area
- 4) Estimation of inundation-damage correlation
- 5) Estimation of probable damage
- 6) Estimation of average annual damage
- 7) Estimation of expected amount of decrease in damage for each return period by implementation of the project
- 8) Calculation of annual benefit (B: summation of damage reduction by project implementation)

- 9) Estimation of project cost (C)
- 10) Calculation of Internal Rate of Return (IRR), Benefit-Cost Ratio (B/C) and Net Present Value (NPV)

In order to carry out economic evaluation, following data/materials are necessary:

- Hydraulic/hydrological and topographic data for the determination of flood prone area
- Statistic data on demography, houses, households, assets of houses for the estimation of asset value
- Data on damage caused by past floods for the estimation of damage amount
- Statistic data for the estimation of expected reduction in damage amount by the implementation of the project

Data/materials recorded by authorities in the area is very limited for the purpose of the economic evaluation as follows:

- Data on flood damage have been hardly prepared so far. As for damage amount, we have such data only in 1995 and 1999.
- Because the flood forecasting and warning system, which is the objective of the Master Plan, is a non-structural measure against floods, its targets for damage reduction are some of movable assets (a part of household effects, automobiles and livestock). However, past flood damage data do not necessarily recorded detailed contents of damage.

Thus, the Study compensates the lack of necessary data by conducting the following surveys:

- Topographic surveys and hydraulic/hydrological analysis
- Public awareness survey

Please refer to **Appendix C: Hydrology and Hydraulics** and **Appendix D: Hydraulic Model Simulation** for the details of the topographic surveys and hydraulic/hydrological analysis, and to **Appendix E: Social Survey** for those of the public awareness survey.

2.4.2 Reported Damage by Past Floods

According to the Ministry of Equipment, the Ministry of Agriculture and the Regional Police Office as well as the survey by the Study Team, reported damage by floods in 1995 includes agricultural land which is washed away, lost livestock, automobiles, houses, roads and other public facilities as well as human lives. The total amount of losses are reported at Dh 70 million by DGH and the total number of fatalities is reported at 289 while the economic value of moveable asset losses is estimated at **Dh 19.96 million** (cattle: 1,725, goats: 1,447, and automobiles: 83, and some household effects).

Concerning to the 1999 flood, no losses on automobiles and human lives are reported thanks to off-season timing. The economic value of moveable asset losses is estimated at **Dh 0.08 million** (sheep: 10, goats: 12, and some household effects).

Please refer to Tables K.2.6 and K.2.7 for details.

2.4.3 Fatalities from Past Floods

It is reported that 289 persons are killed by 1995 flood, according to the regional police office report. The most are dead in Ourika. Its breakdown is as follows: 263 in Ourika, 14 in Aito Ourir and 12 in Asni.

The report describes the flood in Ourika as follows. The alarm was launched at about 8:00 pm on August 17th 1995 and water level decreased at the Ourika Bridge at about 10:00 pm. The traffic towards Setti Fadma became impossible starting from the Ourika Brigade. The floodwaters had submerged the road. The search for discovering corpses started from the next day. The final result was as follows:

- Number of non-identified corpses: 129;
- Number of identified corpses that were buried by their families: 51 including 23 males and 28 females;
- Number of corpses identified by their families and buried by the local authorities: 6 including 5 males and 1 female; and
- Missed persons: 7.

2.4.4 Annul Average Damage

Annual average damage value is usually calculated with the above-mentioned estimated losses as a basic data and with the following process:

- 1) Estimation of inundation depth-damage (or water discharge-damage) correlation
- 2) Calculation of inundation depth for each return period with hydraulic/hydrological analysis
- 3) Calculation of damage value by depth-damage (or water discharge-damage) correlation with the calculated data of inundation depth for each return period with hydraulic/hydrological analysis

This Study, however, employs a simplified way that estimates a probability-damage correlation on movable assets directly with the damage by the past two floods. It is assumed to be in proportion to the length of road submerged which is calculated by the computerized hydrologic simulation model. With this estimation, an annual average damage to movable assets is calculated. Its detailed procedure is as follows:

- 1) The computerized hydrologic model simulates the floods with the return periods of 2, 5, 10, 20, 30, 50 and 100, and the length of the submerged road is calculated with each return period (please refer to Table K.2.8);
- 2) The damage by the flood with each return period is estimated in proportion to the length of the road submerged (please refer to Table K.2.8);
- 3) In 2), two series of damage are estimated; one is based on the actual damage in 1995 and the other is based on the actual damage in 1999;
- 4) The annual average damage is a weighted average of the two series in 3) because the flood in 1995 broke out on tourism season and that in 1999 off-season; and
- 5) The weight for on-season is determined at 1/6 and that for off-season at 5/6 based on the hydrological data (refer to Table K.2.9).

The calculation results shows that the annual average damage to movable assets is **Dh 0.72 million** (please refer to Table K.2.10). Please note again these results have a considerable error that can be realized in the calculation process and the data availability.

2.4.5 Economic Evaluation

(1) Benefit

The benefit of the Master Plan is identified as the value which is expected to be reduced in the annual average damage on movable assets by the implementation of the Flood Forecasting and Warning System. The benefit from the promotion of tourism industry is excluded here because the effect on it is not clear with available data.

The total reduction in the annual average damage amounts to Dh 0.72 million in 2000 prices or Dh 0.76 million in 2003 prices* on the assumption that all the movable assets would be escaped from the flood damage. Although it would be difficult to expect the benefit can be realized fully in reality, it can be deemed as the maximum expected amount of the benefit. Then, the benefit of the Draft Master Plan or Modified Master Plan is the net of that from the Pilot Project. It is assumed that the benefit from each project arises in proportion to its initial implementation cost. Thus, the benefit of the Draft Master Plan amounts to **Dh 0.55 million in 2003 prices** and that of Modified Master Plan amounts to **Dh 0.53 million in 2003 prices**.

(2) EIRR, B/C and NPV

Economic Internal Rate of Return (EIRR), Benefit-cost ratio (B/C) and Net Present Value (NPV) in order to examine the economic feasibility of the Master Plan (Draft and Modified ones). Firstly, cash flow tables are made with the annual average benefit, construction cost and O&M cost in accordance with the implementation schedule. Then, EIRR, B/C and NPV are calculated based on the cash flow tables.

EIRR, B/C and NPV are calculated with the following assumptions:

- Project life: 30 years;
- Replacement: 10 years for equipment items, and 30 years for facility;
- Annual operation and maintenance (O&M) cost: 5% of equipment cost, which is estimated with the technical consideration;
- Benefit accrues after installation of equipment;
- Salvage value is counted as negative cost only for equipment;
- Discount rate: 8%; and
- Values are indicated at 2003 prices.

A cash flow table is made with the annual average benefit, construction cost and O&M cost in accordance with the implementation schedule (please refer to Tables K.2.11 to K.2.13).

* 2000 prices are converted to 2003 prices with GDP deflator as follows: 1.5% in 2000, 1.58% in 2001 and 2.59% in 2002 according to the World Bank.

Results of the calculation based on the cash flow tables as follows:

EIRR, B/C and NPV

Item	Draft Master Plan	Modified Master Plan Alternative-1	Modified Master Plan Alternative-2
EIRR	Negative*	Negative*	Negative*
B/C	0.07	0.08	0.08
NPV	-Dh 60.00 million	-Dh 49.55 million	-Dh 45.31 million

Note: * EIRR cannot be calculated numerically because the benefit is too small comparing with the construction cost and O&M cost.

(3) Examination of Results

As shown in the above table, EIRR is very small because the benefit from reduction of damage on movable assets is minimal. B/C and NPV also present the same results. As long as we consider the Master Plan only with these results, it is not economically viable. However, it is not preferable to consider the economic viability without taking into consideration the benefit of the reduction in the risk of human lives which is one of the main objectives of the project.

2.4.6 Reference for Economic Evaluation

This part tries to include the value of human lives because one of the major objectives of the Master Plan is to reduce the risk of human lives, or to save human lives. Usually, the value of human lives is not included in economic evaluation of infrastructure projects in ODA schemes due to the difficulty of calculation as well as data availability. It should be noted that the figures used in this part are presented for a reference purpose and be treated with much care.

(1) Value of Reduction in the Risk of Human Lives

(a) Estimation Method[†]

When estimate the benefit of the reduction in the risk of human lives, it is inevitable to measure the value of a life in monetary terms. The value of a life means here the value of a *statistical* life, not the value of the life of a particular person. In other words, it is the value of one less death in a population on average.

There are some methods for valuing a life to be saved. Popular ones include the forgone earnings method, the consumer purchase studies and the labor market studies. All three methods can be considered as variations of the market analogy method which is used for the valuation of goods produced by government projects and not sold in well-functioning markets, including public university education and government-provided home care. Such goods are similar to goods provided by the private sector and sold in well-functioning markets. The markets for those private goods i.e. analogous markets often show the signal of values, or price information for the publicly produced goods. The details of the popular methods can be summarized as follows:

- **Foregone earnings method.** This is a natural extension of valuing time saved.

[†] The discussion in this subsection is based on Boardman, A. E., et al. (1996), *Cost-Benefit Analysis Concepts and Practice*, Gramlich, M. E. (1990), *A Guide to Benefit-Cost Analysis*, and Jones-Lee, M. W. (1989), *The Economics of Safety and Physical Risk*.

That is, if a person's value to society for one hour could be measured in his/her hourly wage, the person's value to society for the rest of his/her lifetime could be measured in the discounted total future earnings. This method is used by the courts in the US, Japan and in some other countries for the calculation of compensation in the cases including death.

- **Consumer purchase studies.** If a person is indifferent between the two alternatives: one is to purchase a safety-enhancing device such as an airbag and a fire extinguisher for reducing a probability of death; the other is to get along without it. In this case, the value of a life can be calculated by solving an equation including a price of the device, which can be observed in the market, and the reduction in the probability of death by the device.
- **Labor market studies.** It observes the additional wage that workers require in compensation for exposing themselves to a greater probability of death on the job. The value of a life can be calculated by solving an equation including the amount of the additional wage and the increase in the probability of death on the job.

Past studies for industrialized countries including US, UK and Australia show a wide range of estimated amounts, from £130,000 to £7,950,000 at 1987 prices or more than sixty times with employing the method of consumer price studies or labor market studies according to Jones-Lee (1989), (please refer to Table K.2.14). Gramlich (1990) notes that a human life is estimated from \$2.5 million to \$5 million at 1988 prices by labor market studies and it is five to ten times larger than those would get by the foregone earnings method. On the other hand, Boardman, A. E., et al. (1996) shows \$2 to \$3 million for North American applications at 1990 prices as a rule of thumb.

The consumer purchasing studies and the labor market studies are not easily applied to the evaluation of the Master Plan with the following reasons:

- Concerning the consumer purchasing studies, you can find markets of items which compose the flood warning and forecasting system but there is no market of the system, which as a whole reduces the risk of death. In addition, even if there was a market of the system, it would bring about the same problems as CVM when asking to people the indifference of the two alternatives, namely lack of common base of information and unfamiliarity of questioning.
- Concerning the labor market studies, wage data is not reliable because workers are seldom provided with enough information for evaluating risks. Even if workers have enough information on the risk of jobs, they sometimes have to accept a lower wage in order not to lose the jobs in the circumstances of high unemployment rate. Additionally, it is very difficult to measure the risk of jobs.

Firstly, the foregone earnings method is applied to the economic evaluation of the Master Plan with some revisions from the viewpoint of data availability. Secondly, because it is very difficult to apply the method of the labor market studies, results of the labor market studies are applied based on the information given by Gramlich (1990).

(b) Estimation by the Foregone Earnings Method

The targeted people consist of residents, Moroccan tourists and foreign tourists. The foreign tourists should be excluded from the calculation of the value of a life because their future earnings do not directly belong to the Moroccan economy. From the viewpoint of the Moroccan economy, effects of the Master Plan on the foreign tourists should be examined as a contribution to the tourism industry. As a matter of fact, since the foreign

tourists compose only 6% of the total tourist visiting the Study Area according to the tourism survey of the Study, it may be safe to assume that all the targeted people are Moroccan for the purpose of the economic evaluation.

On the other hand, it is very difficult to identify the classification that victims belong to, residents or tourists. In addition, it is reported that a large majority of victims of the floods are tourists who come from all over the country although its precise percentage is not recorded. Therefore, the probable victims can be assumed as *generic* Moroccan people that consist of all generations.

Because the victims are assumed as generic Moroccan, their value to society or their contribution to the Moroccan economy can be assumed as per capita GDP in the context of a *statistical* life as discussed in the previous subsection instead of assuming as earnings.

As a result of the discussion so far, the value of a statistical life concerning the targeted people can be estimated with a discounted future per capita GDP for the rest of his/her life. As the remaining length of the lives are different for the persons who belong to different generation, the discounted future per capita GDP of a generic person is a weighted average of each generation in Morocco, using a national demographic data. Concerning discount rate, 8% is applied since this rate is used for the evaluation of infrastructure projects by DGH.

An expected remaining length of each generation is calculated with the difference of the life expectancy at birth and his/her age. According to the World Bank, the life expectancy at birth in Morocco is 67 years in 1998 (*World Development Indicators database, July 2000*). Remaining lives of age classes that exceed the life expectancy are assumed zero in this calculation. The result of the calculation is presented in Table K.2.15.

According to the World Bank, per capita GDP in the Middle East and North Africa region is expected to grow 1.7% annually in the baseline case for the period of 2000-2010. The Study Team assumes per capita GDP growth rate is flattened after 2010 from a conservative viewpoint. In addition, EIU estimates that Morocco's per capita GDP is Dh 12,631 in 2000 at market price. As a result, Morocco's per capita GDP is estimated in time series as follows.

Estimated Per Capita GDP in Time Series

	2000	2001	2005	2010	2011-
Growth rate (%)	1.7	1.7	1.7	1.7	0.0
Per capita GDP at 2000 price (Dh)	12,631	12,845	13,741	14,950	14,950

Source: EIU, *Country Report, Morocco, October 2000* and JICA Study Team

Total future per capita GDP for each age class can be calculated with the expected remaining life, per capita GDP in time series and 8% discount rate. The value of a statistical life is a weighted average of all age classes. The calculation result is **Dh 155,243** at 2000 price. The detailed calculation result is presented in Table K.2. 16.

(c) Utilizing the Results of Labor Market Studies

In order to apply the results of the labor market studies to the Master Plan, it is assumed that the value of life estimated by the method of the labor market studies is in proportion to per capita GDP of the country. The calculation for the Morocco is conducted with the

following information:

Information for the Calculation of the Value of Life

Item	Figure	Source
Estimated value of a life in US at 1988 prices	\$2.5 million	Gramlich, M. E. (1990), <i>A Guide to Benefit-Cost Analysis</i>
Ratio of purchasing power between 1988 and 1998 in US (CPI)	1.41	US Bureau of labor Statistics
Per capita GDP of US in 1998 (current price)	\$32,489	IMF, <i>International Financial Statistics</i>
Per capita GDP of Morocco in 1998 (current price)	\$1,284	IMF, <i>International Financial Statistics</i>
Official exchange rate in 1998 (average)	9.604	IMF, <i>International Financial Statistics</i>
CPI in Morocco in 1999 (average)	0.9%	EIU, <i>Country Report, Morocco October 2000</i>
CPI in Morocco in 2000 (average)	1.6%	EIU, <i>Country Report, Morocco October 2000</i>

As a result, the value of a life in US at 1998 prices is \$3.5 million. The ratio of per capita GDP between US and Morocco is 25.3. Therefore, the value of a life in Morocco is calculated at \$139,308 at 1998 prices or **Dh 1,371,555** at 2000 prices. When it is compared with the figure calculated by the foregone earnings method, the former is 8.83 times larger, which is in accordance with the description of Gramlich (1990) that it is five to ten times larger.

Summary of Calculation Results

Item	Calculation Result
Ratio of per capita GDP between US and Morocco	25.3
The value of a life in Morocco in 2000	Dh 1,371,555
Ratio between the value calculated with the result of the labor market studies and that by the method of foregone earnings	8.83

(2) Benefit

If all the people were saved, the total benefit would be Dh 14.65 million in 2000 prices or Dh 15.50 million in 2003 prices*, which represents the annual average of damage on movable assets and human lives (please refer to Tables K.2.17). Although it would be difficult to expect the benefit can be realized fully in reality, it can be deemed as the maximum expected amount of the benefit. Then, the benefit of the Draft Master Plan or Modified Master Plan is the net of that from the Pilot Project. It is assumed that the benefit from each project arises in proportion to its initial implementation cost. Thus, the benefit of the Draft Master Plan amounts to **Dh 11.27 million in 2003 prices** and that of Modified Master Plan amounts to **Dh 10.71 million in 2003 prices**.

(3) EIRR, B/C and NPV

The next step is to calculate Economic Internal Rate of Return (EIRR), Benefit-cost ratio (B/C) and Net Present Value (NPV) in order to examine the economic feasibility of the Master Plan. Firstly, cash flow tables are made with the annual average benefit, construction cost and O&M

* 2000 prices are converted to 2003 prices with GDP deflator as follows: 1.5% in 2000, 1.58% in 2001 and 2.59% in 2002 according to the World Bank.

cost in accordance with the implementation schedule (please refer to Tables K.2.18 to K.2.20). Then, EIRR, B/C and NPV are calculated based on the cash flow tables as follows:

EIRR, B/C and NPV

Item	Draft Master Plan	Modified Master Plan Alternative-1	Modified Master Plan Alternative-2
EIRR	14.2%	16.7%	19.7%
B/C	1.4	1.6	1.7
NPV	Dh 25 million	Dh 31 million	Dh 31 million

(4) Examination of Results

Results are drastically changed, depending on whether the value of human lives are included or not. If the value of a human life is included, EIRRs exceed 12% as the benefit from reduction of damage increases significantly. B/C and NPV also present the same results. It is expected that the project is economically feasible with considering the benefit of the reduction in the risk of human lives which is one of the main objectives of the project.

CHAPTER 3. FINANCIAL CONSIDERATIONS

Financial consideration is also examined in two cases; (1) Draft Master Plan and (2) Modified Master Plan mainly due to the following change of the conditions:

- Change of construction cost as well as O&M cost.
- Change of organization from DRHT to ABHT, which have been taken place after the formulation of Draft Master Plan.

3.1 Provincial Budget System*

The draft budget is prepared by the governor, voted by the assembly and approved by the Minister of the Interior in agreement with the Minister of Finance. The budget must show in all its parts a balance between the receipts and the expenses. The budget consists of operating one and equipment one.

Operating budget. The financing of the operating budget is guaranteed by proper receipts and State subsidies. Direct receipts derive from the taxes and duties raised by the province. These taxes include driving license tax, tax on vehicle checking, and tax on forest products sale. The second source of financing is the VAT contribution that the State transfers to the local collectives. The receipts raised from the local taxation directly raised by the provinces and prefectures are very poor: they represent around 10% of their receipts for operating budget. Operating expenses are spending allocated to cover the exploitation and operating costs of the collectivities' services. They cover the costs of the personnel, maintenance, equipment, furniture, repayment of loans on annual basis, and other various costs.

Equipment budget. The finance of equipment budget is made by the surplus of receipts taken from the operating budget as well as the VAT grants and loans.

The share of the Provinces from the VAT comprises:

- (1) A grant representing wages and salaries of the personnel operating in the Province; and
- (2) An additional grant calculated on the basis of the following elements:
 - Lump sum subsidy: 1/6,
 - Population subsidy: 4/6, and
 - Area subsidy: 1/6.

3.2 Budget of Related Authorities

Sate budget also has operating one and equipment one like provinces. The equipment budget is 3.7 times larger than the operating one for the Ministry of Equipment, while the latter is 6.8 time larger for the Ministry of Interior, reflecting their characteristics of the services. Sate budget is summarized as follows:

* The description in this section is based on Ministry of the Interior, Morocco (1998), *Local Collectivities in Morocco*. The same explanation is applied to the Prefectural budget.

Summary of State Budget

(Dh million)

	1997/98 ¹⁾	1998/99 ¹⁾	1999/00 ²⁾
Revenue total	97,914	103,971	107,506
Operating budget total	-	60,253	64,574
Equipment budget total	-	16,045	18,508
Ministry of Interior total	-	6,315	6,813
Operating budget	-	5,559	5,944
Equipment budget	-	756	869
Ministry of Equipment total	-	3,007	3,019
Operating budget	-	626	639
Equipment budget	-	2,381	2,380

Note: 1) Realized;
2) Allocation

Source: Direction de la Statistique, *Annuaire Statistique du Maroc* 1999.

3.2.1 Budget for DRHT and ABHT

(1) Case of DRHT

DGH had controlled the hydrology-related budget of DRHs and allocated the budget. Allocation of some budget items had been decided after the collection of requests from DRHs. The Hydrology-related budget which were to be allocated to regional DRHs had amounted to Dh 7.2 million in 2000/01. All the hydrology-related operating budget had amounted to Dh 11.2 million.

Hydrology-Related Budget to Be Allocated to Regional DRHs in 2000/01

(Dh)

Budgetary Item	Total	Allocation to DRHT
Maintenance of hydrological stations (Buildings and equipment are included; electronic devices such as radios and personnel costs are excluded.)	2,200,000	300,000
Purchase of hydrological gauges	2,500,000	Not decided*
Purchase of miscellaneous goods (working wears/boots, etc)	1,000,000	140,000
Maintenance of electronic devises	500,000	Not decided*
Using radio frequencies payable to National Office for Posts & Telecommunications	1,000,000	Not decided*

Note: * DGH decides based on requests from DRHs.

Source: DGH.

As mentioned above, hydrology-related budget of DRHT had been controlled by DGH while administrative and personnel budgets were by DRE. DRHT had no direct budget for purchase and O&M of electronic devices. Hydrology-related budget of DRHT is summarized as follows:

Hydrology-Related Budget of DRHT

(Dh)

	1995/96	1996/97	1997/98	1998/99	1999/00
Maintenance of hydrologic stations	150,000	190,000	330,000	285,000	299,070
Construction of hydrologic stations (land acquisition cost is excluded)	140,600	500,000	270,000	-	300,000
Purchase of miscellaneous goods	20,000	50,000	100,000	120,000	138,890
Total	310,600	740,000	700,000	405,000	737,960

Note: Hydrologic fiscal year: September - August

Source: DRHT.

(2) Case of ABHT

In principle, implementation of the Master Plan will be undertaken by ABHT, which also has responsibility for O&M of the system proposed in the Master Plan. However, the financial situation of ABHT is under studying and has not been clarified yet, though it is expected that subsidy from the central government is indispensable to maintain the major works taken over from DRHT. In this connection, it is presumed that the budget allocation would not been changed from the previous years so much; the financial situation can be preserved at the level of previous DRHT and thus, ABHT can cope with financial situation to operate and maintain the system proposed in the Master Plan.

3.2.2 Budget for Al Haouz Province

The Budget of Al Haouz Province in 1999/00 is as follows. The total budget allocation to the Province is Dh 18.6 million. On the expense side is as follows: personnel costs (salaries, benefits and transportation costs are included): Dh 6,775,300, total operating budget: Dh 3,210,400 and total equipment budget is Dh 8,355,000.

3.3 Cost Burden on Local Authorities

Since securing O&M budget is very important for sustainability of the project and local authorities are responsible for O&M, affordability of O&M cost by local authorities are discussed here.

DRHT had cared data processing sub-system and data collecting sub-system, and ABHT is to take over the responsibility.

Al Haouz Province should care some of monitoring stations and warning dissemination sub-system, and Sidi Youssef Ben Ali (SYBA) Prefecture should care some of warning equipment. It means that the local authorities should bear such O&M cost. Since the budgets of local authorities are much more limited than that of the Central Government, special considerations should be required after the implementation of the Master Plan.

According to the technical consideration, the annual O&M cost is estimated at 5% of the equipment cost. Annual additional burdens are Dh 1,502,000 on ABHT (formerly DRHT). Those on Al Haouz Province and SYBA Prefecture are still as high as Dh 540,000 and Dh 45,000 respectively, although the modification of the warning dissemination system reduced their O&M costs considerably.

O&M Responsibility and Cost Burden on Local Authorities

(Dh'000)

	O&M responsibility	Draft Master Plan		Modified Master Plan	
		Equipment cost	O&M cost	Equipment cost	O&M cost
ABHT (formerly DRHT)	- The data processing sub-system except 5 monitoring stations - The data collection sub-system	30,039	1,502	30,039	1,502
Al Haouz Province	- A part of the data processing sub-system (5 monitoring stations) - Warning dissemination sub-system except 3 warning posts	14,447	722	10,807	540
SYBA Prefecture	- A part of the warning dissemination sub-system (3 warning posts)	3,262	163	905	45

It should be noted that these O&M costs are estimated only for the reference purpose because the equipment cost is estimated with accuracy in the Master Plan stage. Accurate O&M costs should be estimated at the detailed design stage. Actual costs would change according to maintenance contracts with the suppliers.

Concerning ABHT (formerly DRHT), the annual O&M cost exceeds its hydrology-related budget (about Dh 700,000). It is required that ABHT assure the budget for proper operation of the new FFWS or DGH may increase the budget allocation as the subsidy to ABHT for the purpose. Although, the amount of O&M cost is not small, it is expected that ABHT manages to assure the budget or DGH increase budget allocation to ABHT, taking it into consideration that improvement of FFWS is promoted as a part of National strategy by DGH, and FFWS modernization has already been promoted in other regions.

Concerning Al Haouz Province, annual cost for O&M amounts to 2.9% of its total budget or 16.8% of its operating budget in 1999/00. The O&M cost is not small either in this case. It is also expected, however, that the Ministry of Interior manages to expand the subsidy to Al Haouz Province for keeping the O&M of the equipment because local collectivities are responsible for protecting people from disaster and it is one of the most important functions for them.

TABLES

Table K.1.1 CEREAL PRODUCTION

Unit: million tones

	1993/94	1994/95	1995/96	1996/97	1997/98
Soft wheat	3.18	0.65	3.65	1.43	2.83
Hard wheat	2.34	0.44	2.27	0.88	1.54
Barley	3.72	0.61	3.83	1.32	1.97
Total incl others	9.63	1.77	10.09	4.09	6.62
Change (%)	-	-81.6%	470.1%	-59.5%	61.9%

Source: EIU Country Profile, Morocco, 2000

Table K.1.2 RAINFALL AND REAL GDP CHANGE

	Rainfall	Real GDP change (%)
1992	Poor	-4.0
1993	Poor	-1.0
1994	Heavy	10.4
1995	Very poor	-6.6
1996	Exceptional	12.1
1997	Poor	-2.0
1998	Average/good	6.5
1999	Poor	-0.7

Source: EIU Country Profile, Morocco, 2000

Table K.1.3 BALANCE OF PAYMENTS

(\$ million)

	1994	1995	1996	1997	1998
Goods: exports fob	5,541	6,871	6,886	7,039	7,144
Goods: imports cif	-7,648	-9,353	-9,080	-8,903	-9,463
Trade balance	-2,107	-2,482	-2,194	-1,864	-2,319
Services: credit	2,014	2,173	2,743	2,471	2,827
Services: debit	-1,730	-1,890	-1,782	-1,724	-1,895
Services balance	284	283	961	747	932
Income: credit	224	251	189	172	194
Income: debit	-1,394	-1,569	-1,498	-1,348	-1,295
Income balance	-1,170	-1,318	-1,309	-1,176	-1,101
Current transfers: credit	2,355	2,298	2,565	2,204	2,347
Current transfers: debit	-86	-78	-82	-81	-95
Current transfers balance	2,269	2,220	2,483	2,123	2,252
Current-account balance	-724	-1,297	-59	-170	-236

Source: IMF, *International Financial Statistics*

Table K.2.1 STANDARD CONVERSION FACTOR

(Dh million)

	1997	1998	Average
(1) Import Total (CIF)	90,712.0	98,676.0	94,694.0
(2) Export Total (FOB)	67,057.0	68,608.0	67,832.5
(3) Import Tax Total	12,550.0	12,734.0	12,642.0
(4) Export Tax Total	0.0	3.0	1.5
(5) Export Subsidy Total	—	—	—
(6)=(1)+(2)	157,769.0	167,284.0	162,526.5
(7)=(1)+(2)+(3)-(4)+(5)	170,319.0	180,015.0	175,167.0
(6) SCF=(6)/(7)	0.926	0.929	0.928

Source: Annuaire Statistique du Maroc 1999

Table K.2.2 FINANCIAL COST SUMMARY (DRAFT MASTER PLAN)

(Dh '000)

Item	Net Price	VAT	Total
A. Construction Cost	43,904	8,588	52,492
(1) Equipment	34,921	6,984	41,905
(2) Installation & Commissioning of Equipment	4,312	862	5,175
(3) Facility Construction	3,208	449	3,657
(4) Software Development	731	146	878
(5) Technical Training	731	146	878
B. Engineering Service	10,971	2,194	13,165
C. Total Construction Cost (A+B)	54,875	10,782	65,657
D. Physical Contingency (10% of C)	5,487	-	6,566
E. Total Construction Cost (C+D)	60,362	10,782	72,223
F. Land Acquisition Cost	—	—	—
G. Compensation Cost	—	—	—
H. Project Cost	60,362	10,782	72,223

VAT Rate 1) Equipment supply: 20%
2) Facility construction: 14%
3) Consulting services: 20%

Note: Cost of the Pilot Project is excluded.

Source: JICA Study Team

Table K.2.3 FINANCIAL COST SUMMARY (MODIFIED MASTER PLAN)

(Dh '000)

Item	Net Price	VAT	Total
A. Construction Cost	37,097	7,227	44,324
(1) Equipment	28,924	5,785	34,709
(2) Installation & Commissioning of Equipment	3,503	701	4,203
(3) Facility Construction	3,208	449	3,657
(4) Software Development	731	146	878
(5) Technical Training	731	146	878
B. Engineering Service	8,971	1,794	10,765
C. Total Construction Cost (A+B)	46,068	9,021	55,089
D. Physical Contingency (10% of C)	4,607	-	5,509
E. Total Construction Cost (C+D)	50,675	9,021	60,598
F. Land Acquisition Cost	—	—	—
G. Compensation Cost	—	—	—
H. Project Cost	50,675	9,021	60,598

VAT Rate 1) Equipment supply: 20%
2) Facility construction: 14%
3) Consulting services: 20%

Note: Cost of the Pilot Project is excluded.

Source: JICA Study Team

Table K.2.4 ECONOMIC COST SUMMARY (DRAFT MASTER PLAN)

(Dh '000 for costs)

Item	Financial Cost	Conversion Factor Applied	Economic Cost
A. Construction Cost	52,492	—	33,582
(1) Equipment	41,905	0.63	3,260
(2) Installation & Commissioning of Equipment	5,175	0.83	2,816
(3) Facility Construction	3,657	0.77	2,816
(4) Software Development	878	0.83	553
(5) Technical Training	878	0.83	553
B. Engineering Service	13,165	0.83	10,927
C. Total Construction Cost (A+B)	65,657	—	44,509
D. Physical Contingency (10% of C)	6,566	—	4,451
E. Total Construction Cost (C+D)	72,223	—	48,960
F. Land Acquisition Cost	—	—	—
G. Compensation Cost	—	—	—
H. Project Cost	72,223	—	48,960

Note: Cost of the Pilot Project is excluded.

Source: JICA Study Team

Table K.2.5 ECONOMIC COST SUMMARY (MODIFIED MASTER PLAN)

(Dh '000 for costs)

Item	Financial Cost	Conversion Factor Applied	Economic Cost
A. Construction Cost	44,324	—	28,436
(1) Equipment	34,709	0.63	21,867
(2) Installation & Commissioning of Equipment	4,203	0.83	2,648
(3) Facility Construction	3,657	0.77	2,816
(4) Software Development	878	0.83	553
(5) Technical Training	878	0.83	553
B. Engineering Service	10,765	0.83	8,935
C. Total Construction Cost (A+B)	55,089	—	37,371
D. Physical Contingency (10% of C)	5,509	—	3,737
E. Total Construction Cost (C+D)	60,598	—	41,108
F. Land Acquisition Cost	—	—	—
G. Compensation Cost	—	—	—
H. Project Cost	60,598	—	41,108

Note: Cost of the Pilot Project is excluded.

Source: JICA Study Team

Table K.2.6 SUMMARY OF REPORTED DAMAGE

	1995 Flood	1999 Flood	Sources
Agriculture (lost land)	Fruit tree: 13 ha Cereal: 197 ha	Fruit tree: 65 ha Cereal: 60.5 ha	Regional Police Office and Ministry of Agriculture
Livestock (lost)	Cattle: 1,725 Goat: 1,447	Sheep: 10 Goat: 12	Ministry of Agriculture
Automobiles	83	Not reported	Regional Police Office
Houses	194	15 (4 vacant)	Regional Police Office, public awareness survey
Fatalities	289	Not reported	Public awareness survey
Roads	Reported	Dh 600,000	Ministry of Equipment
Damage to other public facility	Irrigation channel: 35 km Reservoir: 20 Intake: 19, etc	Irrigation channel: 65 place Reservoir: 8, etc	Ministry of Equipment
Return period	30 years	20 years	JICA Study Team

Note: 1) Fruit trees are counted as olive trees;
 2) Cereals and other crops are counted as hard wheat;
 3) Large animals are counted as cattle;
 4) Buildings are counted as houses.

Table K.2.7 ESTIMATED LOSSES ON ASSETS

(Dh million)

	1995 Flood	1999 Flood
Agriculture	2.26	1.78
Livestock	12.57	0.01
Automobiles	6.23	0.00
Houses	11.64	0.90
Household effects	1.16	0.07
Roads	Details unknown	0.60
Damage to other public facility	Details unknown	Details unknown
Total damage Value	70.00*	3.36
Damage on movable assets	19.96	0.08

Note: 1) Economic value of olive trees: 17,850 Dh/ha; as it takes 7 years to grow olive trees to get harvest, net present value of future losses for seven years are included;

2) Hard wheat: 10,314 Dh/ha;

3) Please refer to **2.3 Benefit Side** for economic values of other items.

* Reported by DGH

Table K.2.8 RESULTS OF HYDROLOGIC MODEL SIMULATION AND DAMAGE RATIO

Return period	Discharge (m ³ /s)	Road submerged (m)	Damage ratio for 1995 flood	Damage ratio for 1999 flood
1/2	115	619	0.1567	0.2083
1/5	300	969	0.2453	0.3259
1/10	490	1,993	0.5047	0.6707
1/20	750	2,972	0.7525	1.0000
1/30	1,000	3,950	1.0000	1.3290
1/50	1,200	4,850	1.2279	1.6319
1/100	1,650	6,062	1.5347	2.0396

Note: 1) Simulation of Route 2017 (along Ourika River);

2) Discharge at Aghbalau Station.

Source: JICA Study Team

Table K.2.9 MONTHLY DISTRIBUTION OF MAXIMUM 10 FLOODS BY HYDROLOGIC STATION

	Sisi Rahal (R'dat)	Taferiat (Zat)	Aghbalau (Ourika)	Tahanaout (Rheraya)	Iguir N'kouris (N'fis)	Jmin Al Haman (N'fis)	Total
Jan.					2	1	3
Feb	1		1	1			3
Mar	2	2	2	1	1		8
Apr							0
May							0
Jun	1			1			2
Jul			1	2			3
Aug	2	1	2	1	1		7
Sep		1	2			1	4
Oct	1	1		2	1	1	6
Nov	3	3	1	1	3	5	16
Dec		2	1	1	2	2	8
Total	10	10	10	10	10	10	60

Note: 1) S Tourism on-season: July and August;

2) Probability of large floods braking out on-season: $(3 + 7)/60 = 1/6$.

Source: DRHT

Table K.2.10 ANNUAL AVERAGE DAMAGE

Return period (year)	Damage (Dh million)	Average (Dh million)	Probability of occurrence	Probability in interval	Annual average (Dh million)
1.1	0.00		0.99		
		0.27		0.49	0.13
2	0.53		0.5		
		0.69		0.3	0.21
5	0.84		0.2		
		1.28		0.1	0.13
10	1.72		0.1		
		2.15		0.05	0.11
20	2.57		0.05		
		2.99		0.017	0.05
30	3.41		0.033		
		3.80		0.013	0.05
50	4.19		0.02		
		4.71		0.01	0.05
100	5.24		0.01		
Total				0.98	0.72

Table K.2.11 CASH FLOW (DRAFT MASTER PLAN)

(Dh million)

Year	Benefit	Cost				Net Benefit	Description
		Initial	O&M	Replace	Total		
2005		6.01			6.01	-6.01	Engineering service
2006		6.01			6.01	-6.01	Engineering service
2007		29.04			29.04	-29.04	Procurement of equipment
2008		7.29			7.29	-7.29	Installation of equipment
2009	0.55	0.61	1.45		2.06	-1.51	Training
2010	0.55		1.45		1.45	-0.90	
2011	0.55		1.45		1.45	-0.90	
2012	0.55		1.45		1.45	-0.90	
2013	0.55		1.45		1.45	-0.90	
2014	0.55		1.45		1.45	-0.90	
2015	0.55		1.45		1.45	-0.90	
2016	0.55		1.45		1.45	-0.90	
2017	0.55		1.45		1.45	-0.90	
2018	0.55		1.45	29.04	30.49	-29.94	
2019	0.55		1.45		1.45	-0.90	
2020	0.55		1.45		1.45	-0.90	
2021	0.55		1.45		1.45	-0.90	
2022	0.55		1.45		1.45	-0.90	
2023	0.55		1.45		1.45	-0.90	
2024	0.55		1.45		1.45	-0.90	
2025	0.55		1.45		1.45	-0.90	
2026	0.55		1.45		1.45	-0.90	
2027	0.55		1.45		1.45	-0.90	
2028	0.55		1.45	29.04	30.49	-29.94	
2029	0.55		1.45		1.45	-0.90	
2030	0.55		1.45		1.45	-0.90	
2031	0.55		1.45		1.45	-0.90	
2032	0.55		1.45		1.45	-0.90	
2033	0.55		1.45		1.45	-0.90	
2034	0.55		1.45	-11.62	-10.16	10.72	

Table K.2.12 CASH FLOW (MODIFIED MASTER PLAN ALTERNATIVE-1)

(Dh million)

Year	Benefit	Cost				Net Benefit	Description
		Initial	O&M	Replace	Total		
2005		4.91			4.91	-4.91	Engineering service
2006		4.91			4.91	-4.91	Engineering service
2007		24.05			24.05	-24.05	Procurement of equipment
2008		6.62			6.62	-6.62	Installation of equipment
2009	0.53	0.61	1.20		1.81	-1.29	Training
2010	0.53		1.20		1.20	-0.68	
2011	0.53		1.20		1.20	-0.68	
2012	0.53		1.20		1.20	-0.68	
2013	0.53		1.20		1.20	-0.68	
2014	0.53		1.20		1.20	-0.68	
2015	0.53		1.20		1.20	-0.68	
2016	0.53		1.20		1.20	-0.68	
2017	0.53		1.20		1.20	-0.68	
2018	0.53		1.20	24.05	25.26	-24.73	
2019	0.53		1.20		1.20	-0.68	
2020	0.53		1.20		1.20	-0.68	
2021	0.53		1.20		1.20	-0.68	
2022	0.53		1.20		1.20	-0.68	
2023	0.53		1.20		1.20	-0.68	
2024	0.53		1.20		1.20	-0.68	
2025	0.53		1.20		1.20	-0.68	
2026	0.53		1.20		1.20	-0.68	
2027	0.53		1.20		1.20	-0.68	
2028	0.53		1.20	24.05	25.26	-24.73	
2029	0.53		1.20		1.20	-0.68	
2030	0.53		1.20		1.20	-0.68	
2031	0.53		1.20		1.20	-0.68	
2032	0.53		1.20		1.20	-0.68	
2033	0.53		1.20		1.20	-0.68	
2034	0.53		1.20	-9.62	-8.42	8.94	

Table K.2.13 CASH FLOW (MODIFIED MASTER PLAN ALTERNATIVE-2)

(Dh million)

Year	Phase 1				Phase 2				Phase 3				Benefit Total	Cost Total	Net Benefit	Description
	Benefit	Cost			Benefit	Cost			Benefit	Cost						
		Initial	O&M	Replace		Total	Initial	O&M		Replace	Total	Initial				
2005		2.29		2.29									0.00	2.29	-2.29	Engineering service
2006		2.29		2.29									0.00	2.29	-2.29	Engineering service
2007		17.84		17.84									0.00	17.84	-17.84	Installation of equipment
2008	0.24	0.61	0.56	1.17									0.24	1.17	-0.93	Training
2009	0.24	0.56	0.56	0.56		2.55		2.55					0.24	3.11	-2.86	Engineering service
2010	0.24	0.56	0.56	0.56		7.98		7.98					0.24	8.54	-8.30	Installation of equipment
2011	0.24	0.56	0.56	0.56	0.14	0.16	0.31	0.47					0.38	1.03	-0.65	Training
2012	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31	2.69			0.38	3.57	-3.19	Engineering service
2013	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31	8.44			0.38	9.32	-8.94	Installation of equipment
2014	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31	0.17	0.33		0.50	1.37	-0.84	Training
2015	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2016	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2017	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2018	0.24	0.56	11.22	11.79	0.14		0.31	0.31	0.31		0.33		0.33	12.43	-11.90	
2019	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2020	0.24	0.56	0.56	0.56	0.14		0.31	6.24	6.55		0.33		0.33	7.44	-6.91	
2021	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2022	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2023	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33	6.59	6.92	7.80	-7.27	
2024	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2025	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2026	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2027	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2028	0.24	0.56	11.22	11.79	0.14		0.31	0.31	0.31		0.33		0.33	12.43	-11.90	
2029	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2030	0.24	0.56	0.56	0.56	0.14		0.31	6.24	6.55		0.33		0.33	7.44	-6.91	
2031	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2032	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2033	0.24	0.56	0.56	0.56	0.14		0.31	0.31	0.31		0.33		0.33	1.20	-0.68	
2034	0.24	0.56	-4.49	-3.93	0.14		0.31	-3.74	-3.43		0.33	6.59	6.92	7.80	-7.27	
							0.31				0.33	-5.28	-4.95	-12.30	12.83	

Table K.2.14 ESTIMATES OF THE VALUE OF STATISTICAL LIFE

Author(s)	Nature of study	Estimated value of statistical life (£-sterling, 1987)
Thaler and Rosen (1973)	Compensating wage differentials (USA)	420,000
Smith, R.S. (1973)	Compensating wage differentials (USA)	7,950,000
Melinek (1974)	Compensating wage differentials (USA)	990,000
Melinek (1974)	Time-inconvenience-safety tradeoff in use of pedestrian subways (UK)	400,000
Ghosh et al. (1975)	Motorway time-fuel-safety tradeoff (UK)	400,000
Smith, R.S. (1976)	Compensating wage differentials (USA)	2,470,000
Jones-Lee (1977)	Wealth-safety tradeoff involved in frequency of tyre replacement (UK)	1,833,000
Viscusi (1978a)	Compensating wage differentials (USA)	2,590,000
Veljanovski (1978)	Compensating wage differentials (UK)	4,550,000
Dillingham (1979)	Compensating wage differentials (USA) ^b	400,000
Blomquist (1979)	Time-inconvenience-safety tradeoff in use of car seat-belts (USA)	400,000
Brown (1980)	Compensating wage differentials (USA) ^c	1,270,000
Dardis (1980)	Purchase of domestic smoke detectors (USA)	280,000
Needleman (1980)	Compensating wage differentials (UK)	130,000
Olson (1981)	Compensating wage differentials (USA) ^d	5,260,000
Portney (1981)	House price-air pollution tradeoff (USA)	150,000
Marin and Psacharopoulos (1982)	Compensating wage differentials (UK)	1,910,000
Smith, V.K. (1983)	Compensating wage differentials (USA)	600,000
Arnould and Nichols (1983)	Compensating wage differentials (USA)	410,000
Ippolito and Ippolito (1984)	Cigarette smokers' responses to health-hazard information (USA)	390,000
Weiss et al. (1986)	Compensating wage differentials (Austria)	3,250,000
	Mean	1,720,000
	Median	600,000

Notes:

^a With the exception of Jones-Lee (1977), Dardis (1980) and Portney (1981), all estimates are for ' self-only ' risks and do not include an allowance for willingness to pay for others, ' as well as own, safety. Portney's estimate is based on the aggregate risk of death from pollution-induced disease to all members of a household together with the assumption that all household members' safety is valued equally. This can therefore be viewed as an average value of own and relatives' lives. To the extent that the risks in the Jones-Lee and Dardis Studies applied to all the occupants of a motorcar or household, then the estimates from these studies will presumably reflect an additional willingness to pay for other people's safety. These studies will therefore, if anything, tend to overestimate the value of statistical life of ' self-only ' risks.

^b Estimate given is for the blue-Collar sample only.

^c Estimate given is for regression excluding individual-specific intercepts.

^d Estimate given is for regression excluding risk interaction variables.

Source: Jones-Lee, M. W. (1989), *The Economics of Safety and Physical Risk*.

Table K.2.15 EXPECTED REMAINING LIFE BY AGE CLASS

Age Class	Population in 1998 (million)	Relative Frequency	Expected Remaining Life
0 - 4	2,976	10.7%	65
5 - 9	3,180	11.4%	60
10 - 14	3,241	11.7%	55
15 - 19	3,132	11.3%	50
20 - 24	2,758	9.9%	45
25 - 29	2,420	8.7%	40
30 - 34	1,987	7.2%	35
35 - 39	1,863	6.7%	30
40 - 44	1,496	5.4%	25
45 - 49	1,177	4.2%	20
50 - 54	783	2.8%	15
55 - 59	777	2.8%	10
60 - 64	622	2.2%	5
65 - 69	590	2.1%	0
70 - 74	311	1.1%	0
75 -	462	1.7%	0
Total	27,775	100.0%	-

Source: Direction de la Statistique, *Annuaire Statistique du Maroc 1999*

Table K.2.16 VALUE OF A STATISTICAL LIFE

Age Class	Relative Frequency	Present Value of Age Class (Dh)	Weighted Average Calculation (Dh)
0 - 4	10.7%	177,413	19,009
5 - 9	11.4%	176,824	20,245
10 - 14	11.7%	175,958	20,532
15 - 19	11.3%	174,685	19,698
20 - 24	9.9%	172,815	17,160
25 - 29	8.7%	170,068	14,818
30 - 34	7.2%	166,030	11,878
35 - 39	6.7%	160,099	10,739
40 - 44	5.4%	151,383	8,154
45 - 49	4.2%	138,576	5,872
50 - 54	2.8%	119,759	3,376
55 - 59	2.8%	92,111	2,577
60 - 64	2.2%	52,924	1,185
65 - 69	2.1%	0	0
70 - 74	1.1%	0	0
75 -	1.7%	0	0
Total	100.0%	—	155,243

Source: JICA Study Team

Table K.2.17 ANNUAL AVERAGE DAMAGE (INCLUDING VALUE OF HUMAN LIVES)

Return period (year)	Damage (Dh million)	Average (Dh million)	Probability of occurrence	Probability in interval	Annual average (Dh million)
1.1	0.00		0.99		
		5.44		0.49	2.67
2	10.89		0.5		
		13.96		0.30	4.19
5	17.04		0.2		
		26.05		0.10	2.61
10	35.06		0.1		
		43.67		0.05	2.18
20	52.28		0.05		
		60.88		0.017	1.03
30	69.48		0.033		
		77.39		0.013	1.01
50	85.31		0.02		
		95.97		0.01	0.96
100	106.63		0.01		
Total				0.98	14.65

Table K.2.18 CASH FLOW
(INCLUDING VALUE OF HUMAN LIVES DRAFT MASTER PLAN)

(Dh million)

Year	Benefit	Cost				Net Benefit	Description
		Initial	O&M	Replace	Total		
2005		6.01			6.01	-6.01	Engineering service
2006		6.01			6.01	-6.01	Engineering service
2007		29.04			29.04	-29.04	Procurement of equipment
2008		7.29			7.29	-7.29	Installation of equipment
2009	11.27	0.61	1.45		2.06	9.21	Training
2010	11.27		1.45		1.45	9.82	
2011	11.27		1.45		1.45	9.82	
2012	11.27		1.45		1.45	9.82	
2013	11.27		1.45		1.45	9.82	
2014	11.27		1.45		1.45	9.82	
2015	11.27		1.45		1.45	9.82	
2016	11.27		1.45		1.45	9.82	
2017	11.27		1.45		1.45	9.82	
2018	11.27		1.45	29.04	30.49	-19.22	
2019	11.27		1.45		1.45	9.82	
2020	11.27		1.45		1.45	9.82	
2021	11.27		1.45		1.45	9.82	
2022	11.27		1.45		1.45	9.82	
2023	11.27		1.45		1.45	9.82	
2024	11.27		1.45		1.45	9.82	
2025	11.27		1.45		1.45	9.82	
2026	11.27		1.45		1.45	9.82	
2027	11.27		1.45		1.45	9.82	
2028	11.27		1.45	29.04	30.49	-19.22	
2029	11.27		1.45		1.45	9.82	
2030	11.27		1.45		1.45	9.82	
2031	11.27		1.45		1.45	9.82	
2032	11.27		1.45		1.45	9.82	
2033	11.27		1.45		1.45	9.82	
2034	11.27		1.45	-11.62	-10.16	21.43	

Table K.2.19 CASH FLOW
(INCLUDING VALUE OF HUMAN LIVES MODIFIED MASTER PLAN ALTERNATIVE-1)

(Dh million)

Year	Benefit	Cost				Net Benefit	Description
		Initial	O&M	Replace	Total		
2005		4.91			4.91	-4.91	Engineering service
2006		4.91			4.91	-4.91	Engineering service
2007		24.05			24.05	-24.05	Installation of equipment
2008		6.62			6.62	-6.62	Training
2009	10.71	0.61	1.20		1.81	8.90	
2010	10.71		1.20		1.20	9.51	
2011	10.71		1.20		1.20	9.51	
2012	10.71		1.20		1.20	9.51	
2013	10.71		1.20		1.20	9.51	
2014	10.71		1.20		1.20	9.51	
2015	10.71		1.20		1.20	9.51	
2016	10.71		1.20		1.20	9.51	
2017	10.71		1.20		1.20	9.51	
2018	10.71		1.20	24.05	25.26	-14.55	
2019	10.71		1.20		1.20	9.51	
2020	10.71		1.20		1.20	9.51	
2021	10.71		1.20		1.20	9.51	
2022	10.71		1.20		1.20	9.51	
2023	10.71		1.20		1.20	9.51	
2024	10.71		1.20		1.20	9.51	
2025	10.71		1.20		1.20	9.51	
2026	10.71		1.20		1.20	9.51	
2027	10.71		1.20		1.20	9.51	
2028	10.71		1.20	24.05	25.26	-14.55	
2029	10.71		1.20		1.20	9.51	
2030	10.71		1.20		1.20	9.51	
2031	10.71		1.20		1.20	9.51	
2032	10.71		1.20		1.20	9.51	
2033	10.71		1.20		1.20	9.51	
2034	10.71		1.20	-9.62	-8.42	19.13	

Table K.2.20 CASH FLOW
(INCLUDING VALUE OF HUMAN LIVES MODIFIED MASTER PLAN ALTERNATIVE-2)

(Dh million)

Year	Phase 1				Phase 2				Phase 3				Benefit Total	Cost Total	Net Benefit	Description	
	Benefit	Cost			Benefit	Cost			Benefit	Cost							
		Initial	O&M	Replace		Total	Initial	O&M		Replace	Total	Initial					O&M
2005		2.29			2.29									0.00	2.29	-2.29	Engineering service
2006		2.29			2.29									0.00	2.29	-2.29	Engineering service
2007		14.24			14.24									0.00	14.24	-14.24	Installation of equipment
2008	4.98	0.28	0.56		0.85									4.98	0.85	4.13	Training
2009	4.98		0.56		0.56				2.55					4.98	3.11	1.87	Engineering service
2010	4.98		0.56		0.56				7.98					4.98	8.54	-3.56	Installation of equipment
2011	4.98		0.56		0.56		0.16	0.31		0.47				7.76	1.03	6.73	Training
2012	4.98		0.56		0.56			0.31		0.31			2.69	7.76	3.57	4.20	Engineering service
2013	4.98		0.56		0.56			0.31		0.31			8.44	7.76	9.32	-1.55	Installation of equipment
2014	4.98		0.56		0.56			0.31		0.31		0.17	0.33	10.71	1.37	9.34	Training
2015	4.98		0.56		0.56			0.31		0.31			0.33	10.71	1.20	9.51	
2016	4.98		0.56		0.56			0.31		0.31			0.33	10.71	1.20	9.51	
2017	4.98		0.56		0.56			0.31		0.31			0.33	10.71	1.20	9.51	
2018	4.98		0.56	11.22	11.79			0.31		0.31			0.33	10.71	12.43	-1.72	
2019	4.98		0.56		0.56			0.31		0.31			0.33	10.71	1.20	9.51	
2020	4.98		0.56		0.56			0.31	6.24	6.55	2.95		0.33	10.71	7.44	3.27	
2021	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2022	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2023	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	7.80	2.91	
2024	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2025	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2026	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2027	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2028	4.98		0.56	11.22	11.79			0.31		0.31	2.95		0.33	10.71	12.43	-1.72	
2029	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2030	4.98		0.56		0.56			0.31	6.24	6.55	2.95		0.33	10.71	7.44	3.27	
2031	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2032	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	1.20	9.51	
2033	4.98		0.56		0.56			0.31		0.31	2.95		0.33	10.71	7.80	2.91	
2034	4.98		0.56	-4.49	-3.93			0.31	-3.74	-3.43	2.95		0.33	10.71	-12.30	23.01	

APPENDIX L

INSTITUTION

**THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO**

APPENDIX L INSTITUTION

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APPENDIX L INSTITUTION

CHAPTER 1. CONDITIONS ON PUBLIC ADMINISTRATION

1.1 National Government

Morocco is a country of constitutional monarchy. The current King, Mohammed VI acceded to the throne on the death of his father, the previous King, Hassan II on July 23rd 1999. The ruler has a dual role as temporal leader (king) and spiritual guide (*amir al-muminin*, or commander of the faith). According to the constitutional revision made in 1992, the king appoints the Prime Minister, who then chooses a government subject to royal approval. Before the 1992 revision, the king personally appointed the entire cabinet. The king also has the power to dismiss both government and parliament, but in practice has been reluctant to wield this last resort. The King is expected to promote further political and economic modernization such as democratization, decentralization and privatization, which started with the previous King.

The new constitution, approved by the referendum for the constitutional reform held in September 1996, introduced bicameral parliament composed of the lower house, Chamber of Representatives whose members are directly elected by the nation and the upper house, Chamber of Advisers with the members indirectly elected. The constitution reserves for the upper chamber the power to dismiss the Government. The latest executive branch of the government, appointed by the King in November 2002, is composed of 33 ministers and 6 secretaries of the state.

1.2 Local Administration

The constitution established regions, prefectures/provinces, and communes as local collectivities. Prefectures are established for urban areas, while provinces are located for rural areas.

Local Collectivities

Level of Local Collectivities	Decision Making Body	Executive Body	Number in Morocco
Region	Regional council elected by indirect suffrage through several colleges of direct voters	Governor of a prefecture or province of the region nominated by <i>dahir</i>	16
Prefecture/ Province	Assembly of province or prefecture, elected by universal indirect suffrage through colleges of communal councilors and colleges of professional chambers	Governor of the prefecture or province nominated by <i>dahir</i>	24/ 44
Commune	Communal councils elected by universal direct suffrage	President of the communal council elected by and among its members	249-urban 1,249-rural

(Source) Local Collectivities in Morocco, Documentation Center of Local Collectivities, 1998

Local administration in Morocco can be characterized as two dual concepts developed in its history. Because of intricacy and transition of the two pairs of factors, it is sometimes difficult to understand the local administration system and practices.

(1) Traditional Communal System vs. Modern Local Administration:

Traditional communal system has tribal origin and geographical boundaries based on consanguinity links. Traditional Rural councils were run in a democratic manner by a co-opted collegial group (*Jemaa*) and the executive powers (*Amghar*) powers were vested with general

competencies for collective matters, such as internal order, water management, roads organization as well as judiciary practices. The traditional system seems to have some informal or mental validity, especially at grass-root level in rural areas.

Modern local administration was launched under the protectorate with establishment of central ministerial administration. The colonial administration gradually introduced modern municipal (city council) system based on the statute law. Since the independence, a modern and general system has been adopted. Communal council elections were established and the communal jurisdictions were defined in 1959 *dahir* (a royal decree). Communal Charter of 1976 widened attributions of the communal councils and enhanced the competence of the executive power of the commune substantially, retaining some supervision and intervention by the central administration. Prefectures/provinces have become local collectivities by 1962 first constitution. Although prefectures/provinces have each assembly, governors, who are appointed by and delegate the central administration, have executive power. Regional system was introduced by 1992 constitution to promote regional socio-economic development and to reduce regional disparity, corresponding to smaller divisions of communes and prefectures/ provinces to be closer to aspiration of the residents. Regions have each council, while each executive power is vested in a governor nominated among prefectural/provincial governors in the region.

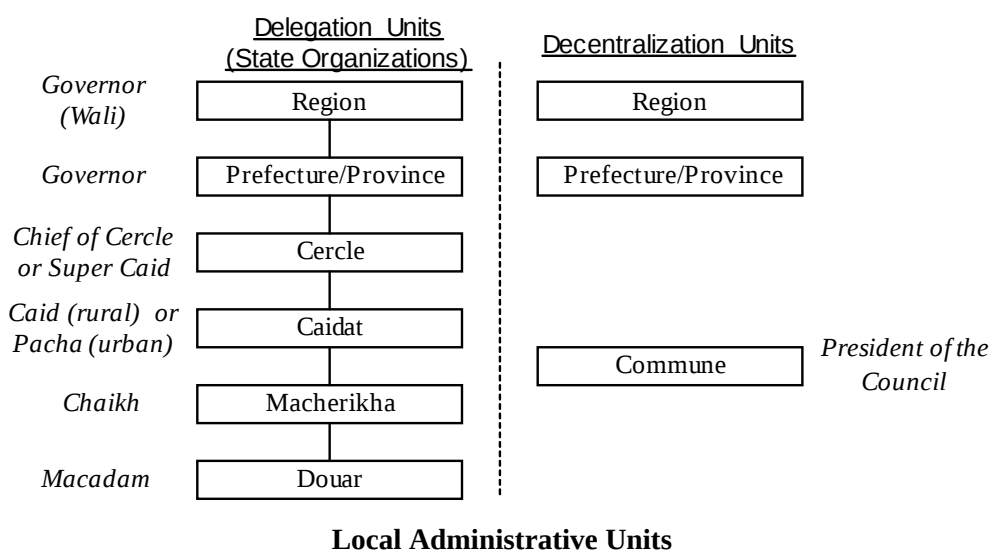
(2) Delegation vs. Decentralization:

Administration in Morocco adopts both delegation and decentralization as most of the countries in the world and decentralization would be developed further.

Decentralization is strongly applied at the level of commune, especially in urban communes. Each commune has its council whose members are directly elected by residents and its executive branch is headed by the president of the council with financial autonomy.

As can be seen in the attributions of governors (*dahir* – Law No. 1-75-168), governors are representatives of the state administration in their jurisdiction on the one hand. On the other hand they have been entrusted to implement the decisions of the assemblies whose members are indirectly elected by the residents (Governors embody both delegation of the state authority and decentralization). In parallel to the administrative divisions for decentralization, administrative units of delegation concept are further divided as follows.

Central ministries have their branch offices in regions and in prefectures/provinces, as regional directorates and provincial directorates of ministries (delegation system).



Almost all of the Study Area belongs into the Region of Marrakech-Tensift-Al Haouz, while very small area of southern parts falls in the Region of Souss Massa-Drâa (Province of Ouarzazate). Most of the study area belongs to the Province of Al Haouz, while limited area of the Issyl River Basin is located in the Prefecture of Sidi Youssef Ben Ali. Al Haouz Province is further divided into the four *cercles*, namely *cercles* of i) Ait Ourir, ii) Amimiz, iii) Asni and iv) Tahannaout, and the study area extends to all of the four cercles. There are 39 communes, including one urban commune, and 1,690 *douars* (villages) in the province. Borders of the jurisdiction of the Province, Cercle, and Communes are shown in Figure L.1. 1.

Number of Communes and Douars in Al Haouz Province

Cercles	Number of Communes			Number of Douars
	Urban	Rural	Total	
Ait Ourir	1	15	16	593
Amimiz	-	10	10	202
Asni	-	7	7	612
Tahanaout	-	6	6	283
Total	1	38	39	1,690

(Source) Etude Monographique de la province d'Al Haouz, Oct. 1997

CHAPTER 2. WATER ADMINISTRATION BY THE WATER ACT (LAW NO. 10 – 95)

2.1 Supreme Council of Water and Climate

Chapter IV of the water law gives a framework for administration of water in the territory of Morocco. By the law, the Supreme Council of Water and Climate is to be created which is in charge of formulating general orientation of the national policy for the matter of water and climate. The Supreme Council shall formulate the following plans and a strategy, apart from occasional ones assigned to it by the government authority (Art. 13):

- 1) National strategy on the improvement of climate knowledge and the control of impacts thereof on the development of water resources.
- 2) National Water Plan
- 3) Master Plans on Integrated Water Resources Development in water basins, especially water allocation to various sectors and to different regions of the country or within the same basin, as well as the necessary provisions for the development, protection and conservation of water resources.

The Supreme Council shall be composed of the following representatives, besides it may invite any specialized persons to meetings (Art. 14).

- 1) For a half, representatives from
 - a) the State
 - b) Basin Agencies
 - c) National Office of Potable Water (ONEP)
 - d) National Office of Electricity
 - e) Regional Offices of Agricultural Development (ORMVA)
- 2) For another half, representatives from
 - a) Water Users
 - b) Prefectural/Provincial Assemblies
 - c) Higher Education and Scientific Research Institutes working in the field
 - d) Professional and Scientific Associations, Experts of the field

2.2 National Water Plan and Master Plan on Integrated Water Resources Development

The State shall plan usage of national water resources within the framework of water basins as “National Water Plan” and “Master Plan on Integrated Water Resources Development” (Art. 15). “Master Plan on Integrated Water Resources Development” shall be examined by the administration for each basin (i.e. each water basin agency after its establishment) for a period of 20 years at least to be approved by a decree with recommendations by the Supreme Council, and be revised at the end of each five years (Art. 17).

The Master Plan shall include; i) area to be applicable, ii) quantitative and qualitative evaluation of the resource potential and the demand, iii) the resource allocation among various sectors, and transfer its surplus to other basins, iv) necessary activities for operation, distribution, protection and restoration of the resources of public domain, especially those for hydraulic works, v) quality objectives with deadline of achievement and measures to be taken, vi) priority order for water allocation and necessary measures in the case of exceptional climatic conditions, vii) general water resources development plan to assure the needs, viii) safeguard and prohibited zones for the abstraction of groundwater, ix) particular conditions of water use related to its development, quality preservation and misuse control (Art. 16).

A “National Water Plan” shall be formulated by the administration based on the conclusions of the “Master Plans on Integrated Water Resources Development” for water basins, and shall be approved by decree after approval of the Supreme Council. It shall contain i) national properties related to mobilization and usage of water resources, ii) planning and deadlines of implementation of hydraulic facilities at the national level, iii) convergences that must exist between the “National Water Plan”, “Master Plans on Integrated Water Resources Development”, and regional development plans, etc., iv) measures to be taken, particularly those pertaining to economy, finance, regulations, institutions, organizations, public awareness and population education required for the implementation, v) conditions of water transfer from a basin of surplus to that of deficit. The national plan shall be formulated for the period of 20 years and subject to be revised in every 5 years saving exceptional cases of no requirement for modification before the termination of the period (Art. 19).

Currently the “National Water Plan is in the course of formulation and interim reports were issued in January 2001 with consultancy of Bechtel Limited and Moroccan Development, supported by the World Bank. Master plans on integrated water development for major basins were formulated in 1989, and no major modifications were made until now.

2.3 Basin Agencies

There shall be created a Basin Agency for each river basin of or a group of river basins as a public establishment with juridical personality and financial autonomy. The Basin Agencies are to be in charge of the followings (Art. 20):

- 1) to elaborate a master plan on integrated water resources development in its jurisdiction
- 2) to follow up the implementation of the master plan
- 3) to deliver authorizations and concessions for use of water of public domain according to the master plan
- 4) to provide financial assistance and technical services to public or private persons upon their requests for pollution control, development and use of water resources of public domain
- 5) to conduct hydrometric measurements, hydrological and hydrogeological studies for quantitative and qualitative planning and management of water
- 6) to conduct quality measurement and to apply provisions of this law and laws for protection and restoration of water quality in collaboration with governmental authorities in charge of environment
- 7) to propose and to execute adequate measures, particularly regulatory ones, to assure water supply in case that water shortage is declared in accordance with related provisions of the Law on Water (Chapter X) or to prevent flood hazards
- 8) to manage and supervise the use of transferred water resources
- 9) to establish infrastructure necessary for flood prevention and control
- 10) to keep a register of recognized water rights and of granted concessions and authorization as water debit

The Basin Agency is administrated by an administrative council chaired by the governmental authority in charge of water resources (Ministry of Equipment at present) and whose members may be neither under 24 nor over 48 and are composed of the following

- 1) for one third – state representatives
- 2) for one quarter – representatives from state public establishments in charge production of potable water, hydroelectric power and irrigation
- 3) for the rest – representatives from;
 - a) concerned agricultural chambers
 - b) concerned chambers of commerce, industry and service

- c) concerned prefectural/provincial assemblies
- d) concerned ethnic collectivities
- e) concerned agricultural water users' associations

The administrative council shall perform the followings. The administrative council may create all committees, when it deems useful to delegate certain power of the agency (Art. 21).

- 1) to examine the Master Plan on Integrated Water Resources Development before its approval
- 2) to study programs for water resources development and management as well as general activities of the agency planned for a year or more before its approval by the government authority in charge of water resources (DGH at present)
- 3) to fix the budget and accounts of the agency
- 4) to allocated charges collected from pollution to specific water cleanup activities
- 5) to propose to the government authority in charge of water resources (DGH) base rate of the charge which constitute remuneration from the users for the services of the agency
- 6) to elaborate statute of personnel for the agency which is approved in conditions provided by the legislation in force for the personnel of public establishment
- 7) to approve conventions and concession contracts passed by the agency

Each Basin Agency shall be managed by a director nominated in conformity with legislation in force. The director shall have all powers and attributions necessary to manage the Basin Agency. The director shall execute decisions of the administrative council or, if need be, of the committees, and to deliver authorizations and concessions for the utilization of water of public domain as provided in the Law on Water (Art. 22).

The budget of the agency includes the following (Art. 23):

- 1) Incomes
 - a) revenue and operational profits of as well as those from their operations and their properties
 - b) revenue of charge remunerated from users of their services
 - c) revenue of charge for utilization of water of public domain
 - d) subsidies from the State
 - e) donation, legacy or other revenue
 - f) repayable advances loans from the State or public or private organizations as well as borrowings authorized in accordance with regulations in force
 - g) indirect taxation set for instituted to its profit
 - h) all other receipts related to its activity
- 2) Expense
 - a) operation and investment expenses of the agency
 - b) repayment of advances, loans and borrowings
 - c) all other expenditure related to its activity

Properties of water of public domain, necessary for the agencies to execute their mission are granted by the Law on Water, and are put at their disposal in the conditions fixed by regulatory way. For the constitution of initial properties of the basin agency, the mobile or immobile goods belonging to State's private domain necessary for smooth operation the agencies shall be transferred to the agency, in full use of, according to terms fixed by regulatory way.

2.4 Decree No. 2-00-79 for Creation of the Tensift Hydraulic Basin Agency

The decree No. 2-00-79 by the Prime Minister dated November 14, 2000 was published for creation of Tensift Hydraulic Basin Agency according to the Water Act (No. 10 – 95). The decree for the creation of the Tensift Hydraulic Basin Agency has almost same composition and contents as that for Oum Er Rbia (No. 2-96-536 dated November 2, 1996), being just different in names of the specific organizations which send representatives to the administrative council. The headquarters of the Agency is to be placed in Marrakech (Art. 1)

The Minister of Equipment is to the State supervision of the Agency, without prejudice to the powers and attributions allotted to the Minister of Economy and Finances (Art. 2). The administrative council is to be chaired by Minister of Equipment and to be composed of 32 members as listed below. The representatives of the ministers shall have director level of the central administration at lowest, and the national offices as well as state-controlled companies shall also have director level (Art. 3). The Minister of Interior can nominate ten representatives, including one from the ministry, while Minister of Equipment and Minister of Agriculture, Rural Development, and Water and Forest can nominate two representatives for each, provided that the chairperson, called president of the council, the representative from the Ministry of Equipment, may invite any qualified persons to the council meeting who shall have each consultative vote.

- * a representative of the Minister in charge of the Interior (1)
- * a representative of the Minister in charge of Finances (2)
- * a representative of the Minister of Agriculture, Rural Development and the Water and Forests (3)
- * representative of the Minister of Equipment (4)
- * a representative of the Minister of Industry, Commerce, Energy and Mines (5)
- * a representative of the Minister of Maritime Fishing (6)
- * a representative of the Minister of Public Health (7)
- * a representative of the Minister in charge of Economic Forecasting and Plan (8)
- * a representative of the Minister of Territory Development, Environment, Urbanism and Habitat (9)
- * a representative of the Minister in charge of Crafts (10)
- * a representative of the Administration of National Defense (11)
- * a representative of the National Office of Drinking Water, nominated by the Minister of Equipment (12)
- * two representatives of the National Office of Electricity, nominated by the Minister in charge of Energy and Mines (13, 14)
- * a representative of the O.R.M.V.A. of Al Haouz, nominated by the Minister in charge of Agriculture (15)
- * two representatives of the Autonomous State-Controlled Companies for Water and Electricity Distribution of Marrakech, nominated by the Minister of the Interior (16, 17)
- * three representatives of the Agricultural Chambers of Essaouira, Marrakech and Safi, elected by a electoral college composed from among the members of the bureaus of the said chambers (18, 19, 20)
- * three representatives of the Chambers of Commerce, Industry and Services of Essaouira, Marrakech and Safi, elected by a electoral college composed from among the members of the bureaus of the said chambers (21, 22, 23)
- * five representatives of Prefectural and Provincial Assemblies of Al Haouz, Chichaoua, Essaouira, Marrakech-Menara, Marrakech-Medina and Sidi Youssef Ben Ali, nominated by the Minister of the Interior (24, 25, 26, 27, 28)

- * two representatives of the Ethnic Collectivities in the Agency's action area, nominated by the Minister of the Interior (29, 30)
- * two representatives of agriculture water users' associations elected by and among the presidents of the associations in the action area of the Agency (31, 32)

The administrative council shall meet upon convoking by the president as often as the needs of the agency require and twice for an accounting year at minimum (Art. 4)

- to settle the summary status of the accounting year after the closing date not later than June 30
- to fix the budget of the next accounting year before the beginning date and not later than October 15

The administrative council exercises the attributions assigned by the Article 21 of Law on Water (No. 10-95) and validly deliberates with a quorum of half of its members at least and takes decisions of the majority vote; in case the equal distribution of votes, the chairman has the casting vote (Art. 5). The director is to be nominated in conformity with the rules in force (currently recommended by the Minister of Equipment for royal nomination), and the director shall (Art. 6);

- 1) execute the decisions by the administrative council and, if need be, those of a committee or committees created by the council,
- 2) manage the agency and act in the name of the agency,
- 3) accomplish or authorize acts and operation related to objects of the agency,
- 4) deliver authorizations of use of water of public domain, conclude conventions and contracts, and notify to the concessionaires after the approval of the administrative council,
- 5) represent before the court, have position to act and to defend in the name of the agency, however he immediately have to notify to the administrative council
- 6) assure technical preparation and secure secretaryship for meetings of the administrative council
- 7) be an authorized person to receive and expend and, in such capacity, commit expenditure through acts, contracts or deals, keep accounting of committed expenses, and liquid and constant expenditure and revenue of the agency, and deliver corresponding orders of payment titles of receipt to the accounting agency

The director can delegate, under the responsibility of the director, a part of the powers and attributions to management personnel of the agency.

Goods of public hydraulic domain necessary for execution of the mission of the agency are to be granted to its disposal by joint orders of the Minister of Equipment and Minister in charge of Finances. Conditions of the transfer of the goods to the agency, particularly the ones related to their management, maintenance, repair, monitoring and preservation are to be fixed by the Minister of Equipment (Art. 7). Mobile and immobile property of private domain of the State necessary for the agency to accomplish the mission are to be transferred to the agency, being included in an approved inventory, by joint orders of the Minister of Equipment and Minister in charge of Finances (Art. 8). The Minister of Economy, Finance, Privatization and Tourism and the Minister of Equipment, in each concern, are in charge of execution of the present decree.

2.5 Current Conditions of Oum Er Rbia Hydraulic Basin Agency

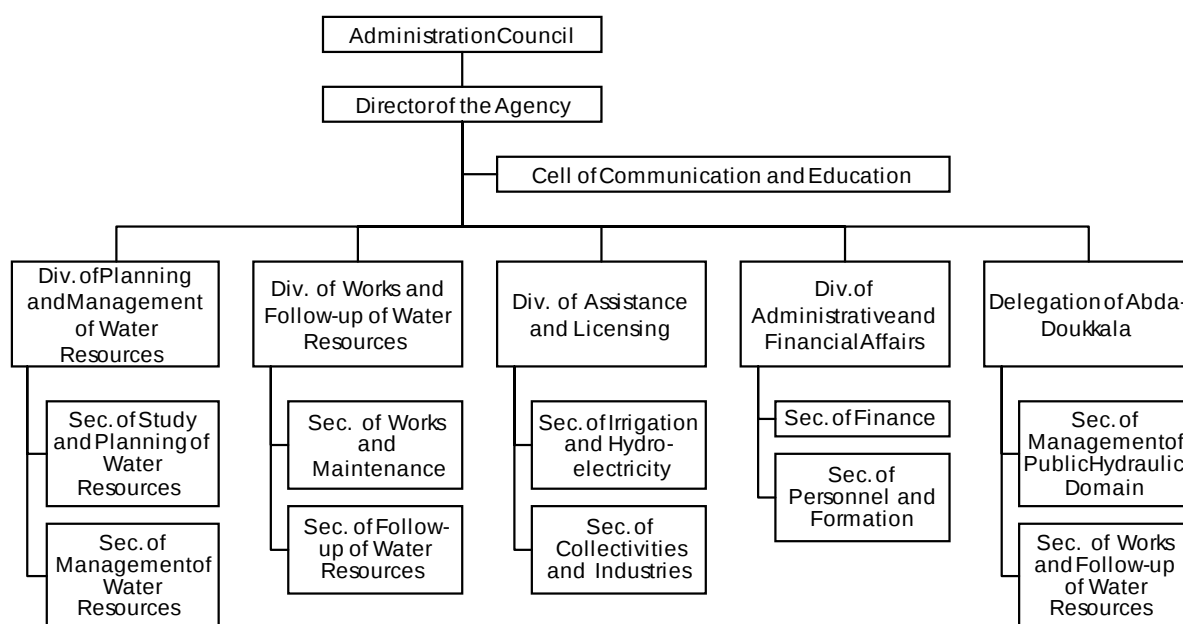
The Oum Er Rbia Hydraulic Basin Agency was created by the decree of the Prime Minister, No. 2-96-536 dated November 2, 1996, with its coverage of 48,070m² and population of 4.9 million (19% of the country). The basin has irrigable lands of 450,000 ha, which correspond to one third of total irrigable lands of the country.

The organization of the headquarters of the agency is illustrated below. At present, 190 persons are employed in the agency, and around 50 persons work in the headquarters, including nine engineers, while the rest (around 140 persons) work in dams (around 120) and hydrological stations (23 persons at present) managed by the agency. According to an interview with the director most of the personnel working in the headquarters shifted from DRH of Oum Er Rbia and employees in Dams from DPEs. The agency has a plan to enhance personnel of the headquarters.

Personnel of Oum Er Rbia Hydraulic Basin Agency

	Persons
Siège	51
Complexe Hydraulique de la Tassaoute	21
Barrage Al Massira	25
Barrage Al My Hassan I	18
Barrage Sidi Driss	24
Digue de Safi	14
Digue de Daoul	1
Complexe de Kasba Tadia	13
Observateurs des Stations Hydrologiques	23
Total	190

(Source) Oum Er Rbia Hydraulic Basin Agency



(Source) Oum Er Rbia Hydraulic Basin Agency

Organization Chart of Oum Er Rbia Hydraulic Basin Agency

Major changes in duties from those of DRH to the agency has occurred as follows:

- 1) Management of Dams including hydrological measurement at dam sites, previously conducted by DPEs, were shifted to the agency.
- 2) Rural water supply by drilling boreholes (PAGER), undertaken by DRH before creation of agency, are implemented by DPEs at present.
- 3) Charging on use of gravel taken from river areas were transferred from DPEs to the agency.

The agency does not depend any subsidy from the State 2001 due to payment by ONE, including the charge billed for 1999, while all the budget came from the State in the first year of its operation. This financial status, however, will end soon, and the agency will ask some subsidy for the budget of 2002, according to the interview made with the director.

Revenue and Expenditure of Oum Er Rbia Hydraulic Basin Agency

(Unit: Dh. million)

	1999 ^{*1}	2000 ^{*1}	2001 ^{*1}
Revenue	12	30.5	(5.7)
State Subsidy	12	6	0
Charge Collection from ONE		24.5	(5.7) ^{*2}
Expenditure	12	6	30
Balance	0	24.5	-

(Source) Oum Er Rbia Hydraulic Basin Agency

(Note) *1: Fiscal year of Moroccan Government has changed to the one same as a calendar year in 2000. Periods of each fiscal year is;
1999 – from Jul. 1, 1999 to Jun. 30, 2000 (twelve month);
2000 – from Jul. 1, 2000 to Dec. 31, 2000 (six month);
2001 – from Jan. 1, 2001 to Dec. 31, 2000 (twelve month).

*2: Paid for the first half of the year.

The rapid increase in budgeted expenditure occurs in 2001 because of commencement of the following studies and programs:

- 1) Census study of water use: to identify persons or groups to use water of public domain, including discharge of wastewater, in order to calculate charges for water intake and discharge
- 2) Improvement of safety in dam maintenance
- 3) Improvement of hydrological measurement and data communication system
- 4) Flood risk assessment and formulation of countermeasures

Financial status of the Oum Er Rbia Agency might be improved in future although it may take long period of times. Oum Er Rbia Basin is known as rich area with abundant water resources and huge areas of irrigable lands as well as advanced water resources development. The agency, with consultancy with the World Bank, estimates the future charge collection as follows. The agency, however, recognizes the difficulty of charge collection and thinks that the realization might not be near future, especially from agricultural and small users.

Estimated Charge Collection by Oum Er Rbia Hydraulic Basin Agency

Users (Sector)	Amount	Rate	Charge (Dh. million)	%
Irrigation	(million m ³)			
* ORMVA	1,200	Dh. 0.02 /m ³	24	25-37
* Private	100	Dh. 0.02 x 0.8 /m ³	1.6	
Domestic Water Supply	(million m ³)			
* Within the Basin	60	Dh. 0.04 /m ³	2.4	8-11
* Outside the Basin	140	Dh. 0.04 /m ³	5.6	
ONE (Electricity)	750 GW	Dh. 0.02 /KW	10-15	14-15
Pollution	(EH-headcount)			
* Local Collectivities	1.6 million	10-20	16-32	10-20
* Industries	1 million		10-20	
TOTAL			70-100	

(Source) Oum Er Rbia Hydraulic Basin Agency

As for flood forecasting and warning, the agency seems not to share similar conditions and problems prevailing in the Tensift River Basin. The agency has little areas suffering flash floods. According to the director, 90% of the water resources are regulated with dams, numerous hydrological stations are developed in the basin, and, for the Oum Er Rbia Agency, flood control can be achieved by operation of dams.

2.6 Possible Impact of Creation of Tensift Water Basin Agency on the Master Plan on Flood Forecasting and Warning

With an interview and an analysis of the Laws on Water (No. 10-95) and decrees for creation of water basin agencies, following impacts by the establishment of the Tensift Water Basin Agency on flood forecasting and warning in the Study could be foreseeable.

No Rapid or Drastic Change

It would be highly possible for the Tensift Agency to employ almost all personnel of DRHT, as Oum Er Rbia Agency did at the time of its creation. Ministry of Equipment, through DGH, will continue the supervision as the responsible organization of the State administration, as provided in the decree. There may not occur any rapid or drastic change in jobs done by the agency, although some changes in formality may bother day-to-day works.

As for financial status, the Tensift Water Basin Agency may not be able to achieve financial independence in short period of time and subsidy from the State should continue. In case DGH cuts the budget, the operation of the agency might be seriously affected.

Decentralization and Flexible Operation

Establishment of the agency may contribute to decentralized management of water resources, including those for flood forecasting and warning.

After establishment of the agency it may take long times for decision-making to be done by the administrative council represented by members from various sectors. Flexible operation, however, may be followed by leadership of the director given by the law and the decree. Prompt actions, probably required for the implementation of the pilot project, may be hindered during the discussion on policies for flood forecasting and warning by representatives from many sectors. In the timeframe of the master

plan, however, the discussion in the council may promote involvement coordination among various sectors necessary to realize the master plan.

2.7 Prefectural/Provincial Commission of Water

Prefectural/Provincial Water Commissions have been established based on the Water Act (Article 101) according to the Decree No. 2-97-488 of 1998. The commission is chaired by the Governor of the Prefecture/Province and its headquarters is located in the prefectural/provincial headquarters. The Commission is comprised of the following members:

- * a representative of the government authority in charge of Equipment (1)
- * a representative of the government authority in charge of Agriculture (2)
- * a representative of the National Office of Drinking Water, nominated by the government authority in charge of Equipment (3)
- * a representative of the National Office of Electricity, nominated by the government authority in charge of Energy (4)
- * a representative of the Hydraulic Basin Agency, nominated by the government authority in charge of Equipment (5)
- * a representative of the O.R.M.V.A., nominated by the government authority in charge of Agriculture (6)
- * President of the prefectural/provincial assembly (7)
- * President of the chamber of agriculture (8)
- * President of the chamber of commerce, industry and services (9)
- * three representatives of communal councils nominated by the the prefectural/provincial assembly (10, 11, 12)
- * a representative of the ethnic collectivities nominated by the Minister of Interior (13)

The president may invite any competent person for assistance or consultation to the meeting of the Commission. The secretary of the Commission, assured by the Minister in charge of the Equipment, is in charge of preparation of the meeting and of following-up the execution of the recommendation. The commission meets once in three months or the time when necessity arises. The State Minister to Interior, Ministers of Agriculture, of Equipment, and of Environment, by each concern, are in charge of the execution of this decree.

CHAPTER 3. CURRENT INSTITUTIONAL STATUS FOR FLOOD FORECASTING AND WARNING

3.1 Laws and Regulations

There could not be found laws specifically relevant to flood forecasting and warning. The primary law on water management, including flood control, is the Water Act (Law No. 10-95). There are two important directives on flood forecast and warning, namely “*Gestion de Phénomènes Catastrophique Naturels Liés aux Pluies et aux Crues* – Management of Natural Catastrophic Phenomena Related to Rain and Flood” prepared by Ministry of Equipment (MOE Guideline) and “*Plan d’Organisation des Secours* – Rescue Organization Plan” (ORSEC Plan).

3.1.1 Water Act

The Water Act stipulates principles for water management with following chapters, recognizing all water, including groundwater, as public goods, and watercourses, water sources, and works for public use, as public domain.

Chapter I	Waters of Public Domain (defining scope of public domain)
Chapter II	Granting Rights on Waters
Chapter III	Conservation and Protection of Waters
Chapter IV	Planning of Basin Development and Utilization of Water Resources
Chapter V	General Conditions of Water Use
Chapter VI	Combating against Water Pollution
Chapter VII	Provisions on Exploitation and Sale of Natural Water for Medical Interest, of so called “Source” Water and “Table” Water.
Chapter IX	Provisions on Development and Utilization for Agricultural Water Use
Chapter X	Provisions Related to Water Use in Case of Shortage
Chapter XI	Transitory and Miscellaneous Provisions

Although river areas, water courses, such as river beds, submersible lands, and zones within 2 m from water courses are defined as public domain, whether ownership of the lands falls under private property or not (Article 2), required procedures for the use of the lands near the watercourses, including flood prone areas, are not clearly stipulated in the act itself. Some decrees were promulgated providing required procedures mainly for use of water and for excavation of materials.

Provisions on fighting against floods are included in Section II of Chapter XI, mainly stipulating structural flood control measures. The section prohibits unauthorized construction of dykes, embankment and other works in submersible lands, except those for protection of inhabitants and private properties, in order not to hinder floodwater flow (Art. 94). The basin agency may order modification or removal of those works with compensation given by the Agency, when the agency deems those works may hinder water flow or extend to flooded areas (Art.95). In case of necessity from public interest, the agency may impose on owners of properties beside the watercourse to construct dykes for protection of their properties (Art. 96). It is prohibited to perform plantation, construction or depositing on the land between a water course and protection dykes constructed closely to border of the watercourse (Art. 97).

There are no other provisions in the act on collective activities for flood control, whether on structural or non-structural measures, neither on duties assigned clearly to relevant entities nor coordination/demarcation among the relevant entities.

3.1.2 MOE Guideline

The Guideline is prepared as a practical guide to reduce hesitation and ad-hoc measures in extraordinary hydrological conditions for internal diffusion within the Ministry of Equipment. The Guideline shall be up-dated regularly every year between May and June. The Guideline orders each Regional/Provincial Directorate of Equipment (*Direction Régionale/ Provinciale de l'Équipement*: DRE/DPE) to prepare many lists for effective and efficient activities in cases of food occurrence.

The Guideline is composed of the following two parts.

- a) An inventory of required data and tools which have to be permanently available and up-dated
- b) A description of actions to be launched or undertaken to correspond to catastrophic events

(1) Enhancement of Preparedness in Ordinary Situations

The Guideline instructs each DRE and/or DPE to establish and maintain permanently communication system and job assignment for preparedness of managers and technicians who should be equipped with necessary tools, especially communication and mobilization means, such as radio phones, telephones, vehicles with the drivers, staff and materials for the repairs.

Each DRE/DPE should keep and update monthly a file composed of lists and tables on duty assignment, on contact points and persons (address and phone number for days and nights), and maps on roads and hydraulic works, etc, for information collection. The Guideline indicates full utilization radio network of Directorate of Roads and Road Traffic (*Direction des Routes et de la Circulation Routière*: DRCR) and close contacts with Directorate(s) of Hydraulic Region (*Direction(s) Région(s) Hydraulique(s)* DRH(s))– organized by a major river basin).

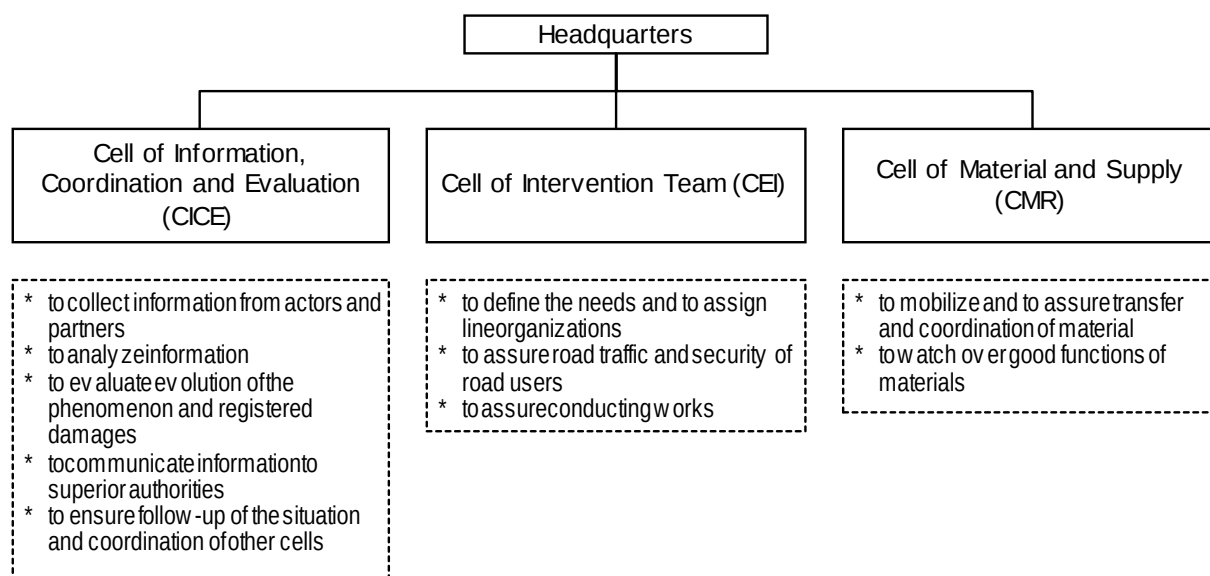
At ordinary times, every DRE/DPE should verify and assure i) operation of telecommunication tools, ii) availability of materials, equipment and vehicles with necessary supplies (fuel, battery, etc.), iii) warning and mobilization of staff of DRE/DPE (managers, engineers, technicians, drivers, gauging team, etc.), iv) contacts with local authorities and Civil Protection for preparedness for all probabilities.

(2) Pre-alert and Alert Conditions and Intervention against Flood

In a condition that intensive rainfall is predictable, Directorate of National Meteorology (*Direction de la Météorologie Nationale*: DMN) shall issue pre-alert message. On receipt of the pre-alert, relevant DRE/DPE should start vigilance of hydrological conditions with assistance of DRH (DRHT – Directorate of Hydraulic Region of Tensift, in case of the Study Area) and DMN. DRHT also receives meteorological forecasts directly from DMN and should analyze the forecast. DRHT starts careful and intensive monitoring of hydrological conditions, utilizing and controlling the hydro-climatological network it manages. According to the evolution of the situation, DRE/DPE should dispatch a patrol vehicle with communication tools for field reconnaissance and surveillance. Collected information should regularly be sent to pre-determined organizations, such as Ministry of Equipment, DGH, DRCR, DMN, DRE and local authorities. In case DRE/DPE deems necessary, it may establish headquarters (or – *poste commandement*: PC) and cells as shown below to combat against floods.

In case that highly intensive rainfall is imminent, DMN issues an alert message. Upon receipt of the alert message or in case of worsening conditions, DRE/DPE should establish a PC, if not yet established. DRHT, as a regional center, should analyze data and information and issue flood forecast, if deemed predictable, with identification of the location and prediction of seriousness of the flood as well as advisory messages, utilizing its data and information network and continuously contacting with DMN. DRHT should send the results of the analysis to DRE/DPE. According to the staff of DRHT, DRHT may send the message of flood forecast directly to a

governor of the related province. DRE/DPE should dispatch first brigade with two heavy vehicles with a radio set, and signboards for traffic control, as well as send equipment to damaged sites from prefixed center (Urgent Intervention Center – CIU) according to the updated reassessment of flood prone areas and required material intervention.



(Source) MOE Guideline

Action Plan of DPE in Case of a Natural Disaster

(3) Reporting and Evaluation

In conducting follow-up intervention DRE/DPE should transmit information in prescribed formats to pre-defined organizations according to the evolution, regarding i) pluviometric data, ii) situation of water courses, iii) damages occurred, and iv) situation of road infrastructure. The information should be verified and shared by DRH.

After disastrous events, DRH and DRE/DPE should prepare detailed evaluation report in aspects of i) Hydro-pluviometric situation (physical characteristics of the basin, study on rainfall, study on flood, history of flood events, lessons learned and measures to be taken on hydrology of small or medium basins and on lay out of construction works and hydraulic works, ii) damage caused on human lives and assets, iii) financial evaluation, and iv) evaluation of the follow-up and intervention undertaken by DRE/DPE.

3.1.3 ORSEC Plan

ORSEC is a plan for organizing rescue and aid activities in an emergency situation caused by a disaster, whether natural or artificial. The plan aims effective and efficient uses of human and material resources kept by governmental and non-governmental organization as well as by the private sector for relief activities without creation of a new permanent organization and without adding new stock of materials.

The directive for planning, organizing and implementing the ORSEC Plan prepared by Directorate of Civil Protection of the Ministry of Interior illustrated the standard organization for relief activities against disasters as shown in Figure L.3.1. The directive instructs manner of elaboration of each prefectural/provincial ORSEC Plan by respective governor with collaboration of responsible persons to be appointed as heads of the services of the organization illustrated in the directive. Each head of the service should prepare with supports by Civil Protection Committees a document containing the following elements. The documents should be carefully checked at least twice a year in June and December.

- (a) Inventory of available means and resources
- (b) List of personnel to be alerted and called upon (home and office address/telephone number, means of transportation, etc.)
- (c) Missions to be assigned and rules to be observed
- (d) List of communication means
- (e) Providing telephone services for days and nights at various administrative and technical levels
- (f) Telephone directory, names and addresses, in order of the Services designated in the directive, of official and executives who keep materials, equipment and foodstuff
- (g) List of personnel who constitute the Operational and Fixed Headquarters and means to call upon them

The directive stipulates roles of i) witness (the person who finds the unusual phenomenon), ii) territorial units for intervention of relief and fire fighting services, iii) the police and Royal Gendarmerie. The directive also well provides procedure, rules, criteria and issues by step of relief intervention.

ORSEC Plan of the Al Haouz Province has been documented with revision made in 2000, according to the provisions of the directive.

In the field of flood forecast and warning, delegation system can be widely adopted in MOE Guideline named “Management of Natural Catastrophic Phenomena Related to Rains and Floods” and “Rescue Organization Plan (ORSEC Plan)” because of the necessity of strong leadership and well-organized command line

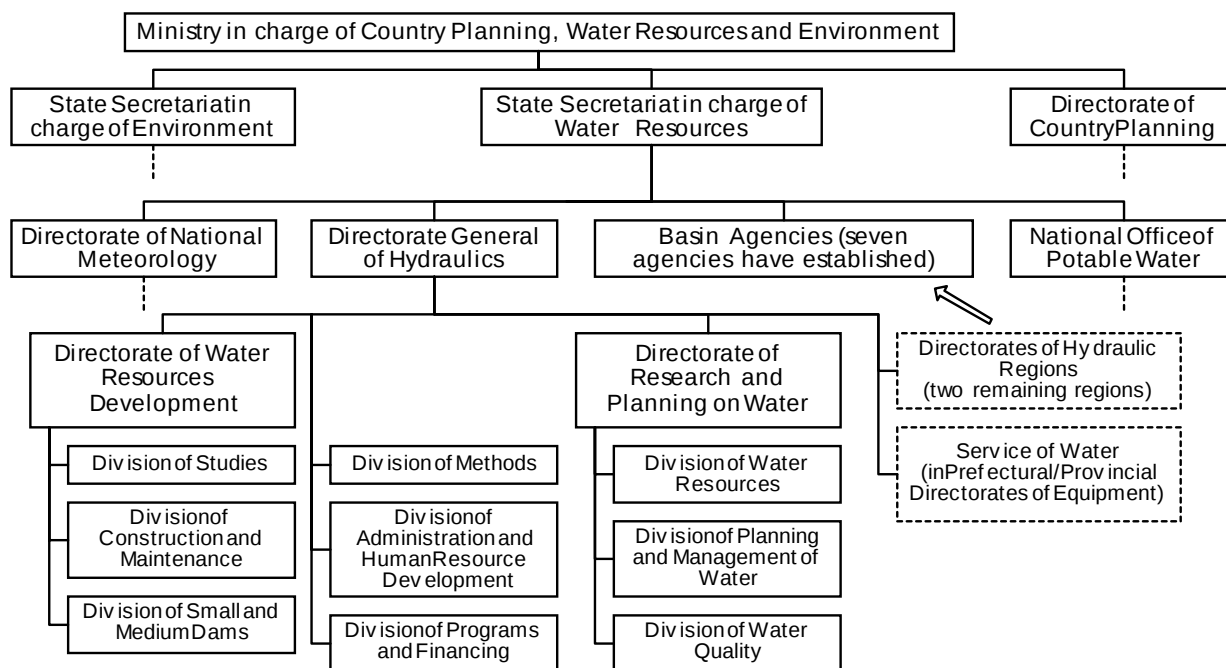
3.2 Relevant Organizations

Relevant ministry for flood forecasting is the Ministry in charge of Country Planning, Water Resources and Environment (*Ministère de l'Aménagement du Territoire, de l'Eau et de l'Environnement*: MATEE), while that related to flood warning is the Ministry of Interior (*Ministère de l'intérieur*). Organizations for water resources management are in process of transition with two recent changes in formation in terms of the central ministries and regional administration. In the reshuffle of the cabinet, the functions previously attributed to the Ministry of Equipment (*Ministère de l'Équipement*: MOE) have been divided into two ministries, to MATEE and Ministry of Equipment and Transport (*Ministère de l'Équipement et du Transport*). The water management as well as meteorological services is included in the portfolio of MATEE, while road construction and control of road traffic are discharged by the Ministry of Equipment and Transport.

At regional Level, seven Basin Agencies, including that for the Tensift, have been established as provided in the Water Act (Law No. 10-95). Regional/Provincial extension or delegation of former MOE, including that of Directorate of Hydraulics Development (*Direction des Aménagements Hydrauliques*: DAH) and Service (Section) of Water at regional/provincial level, will be allegedly reorganized by the end of 2003.

3.2.1 Organizations under Ministry in Charge of Country Planning, Water Resources

In November 2002, the King appointed a new government proposed by the Prime Minister. The functions of the previous MOE were divided into two ministries, namely MATEE and Ministry of Equipment and Transport. The relevant functions related to flood forecasting, including those for hydrological measurement and assessment, are attached to attributions of the former ministry. The organization structure of MATEE is as follows.



(Source) DGH

Organization Structure of Ministry in charge of Country Planning, Water Resources and Environment

MATEE also provides meteorological services, including rainfall forecast, through Directorate of National Meteorology (*Direction de Météorologie Nationale*: DMN) with a centralized and sophisticated system. The headquarters of DMN is located in Casablanca and the directorate has four regional directorates, Center in Casablanca, North-East in Fès, South in Agadir and North in Larache. DMN has a station in Marrakech, which functions as one of 41 synoptic stations and one of aeronautic stations. DMN Marrakech Station has three observation stations, namely i) Marrakech, ii) Oukaimedan, and iii) Lalla Takelkoust Dam. DMN Marrakech Station observes meteorological conditions with items of a) wind (direction and speed), b) visibility, c) clouds conditions, d) temperature, e) humidity, f) air pressure (at sea level) and g) prompt variation of weather conditions (storms, etc.) 24 hours a day. Observed data are sent to the national center every three hours. Marrakech Station makes its own 9-hours weather forecast in every three hours, i.e., eight times a day, starting 1:00 a.m. for the purpose of aviation safety for items of winds, visibility, clouds, rainfall and meteorological phenomena such as storm or strong winds. The Station is staffed with 24 persons, of whom 14 are civilian technicians and 10 of the technicians are at superior level.

MATEE is also in charge of water management through Directorate General of Hydraulics (*Direction Général de l'Hydraulique*: DGH), while the Ministry also discharge development of ports.

DGH has two directorate, besides administrative divisions, namely Directorate of Hydraulics Development (*Direction des Aménagements Hydrauliques*: DAH), and Directorate of Water Research and Planning (*Direction de la Recherche et de la Planification de l'Eau*: DRPE). DAH is in charge of design, construction, operation and maintenance of works for water use, mainly of dams, while DRPE conducts water resources management, in terms of quantity and quality, mainly through regulatory instruments as well as technical and financial supports. The organization composition of DGH as well as its duties had not been modified at the time of reshuffle of the ministries in 2002.

In the regional division for water management, river basins had been adopted as geographical units even before establishment of basin agencies. At the time of the commencement of this study, directorates of hydraulic regions had been established by basins discharged hydrological observation and analysis, including rainfall and flood measurement, analysis and flood forecasting. In case of the study area,

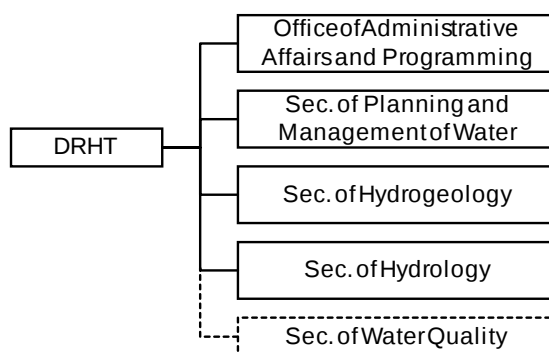
Directorate of Hydraulic Region of Tensift (Direction de la Région Hydraulique du Tensift: DRHT) undertook the duty under the supervision of DGH.

DRHs were organized as branch offices of DRPE in DGH of MOE for each of major river basins (delegation system). However, only one river basin agency was established at the time of the start of the Study and other river basin agencies were to be established with each administrative councils as decision making bodies whose members are representing not only central ministries, but also local collectivities and users' associations. The concept of decentralization would be applied in water administration to some extent.

Regional service extension of DAH spreads through the Water Services in DPEs under supervision and supports of DRE, while the extension services of DRPE were undertaken by DRHs.

At local level, major relevant organizations for flood forecast and warning in the Study Area, were i) Directorate of Hydraulic Region of Tensift (DRHT), ii) Provincial Directorate of Equipment of Al Haouz (DPE-Al Haouz) and the Province of Al Haouz when the JICA Study started.

DRHT had an office in Marrakech, and was composed of the following three sections (services) and an administrative office. DRHT had a plan for creation of Section of Water Quality, whose functions were taken by a unit in the Section of Planning and Management of Water. Flood forecasting, and hydrological measurement and assessment were carried out by the Section of Hydrology. The service had five units of i) Study, ii) Management of Hydro-climatological Network, iii) Flood Announce, iv) Maintenance of Material and v) Coordination of Hydraulic Activities with the Section (Service) of Water in DPE, and had 13 persons working in the Section, including two technicians for maintenance of equipment.

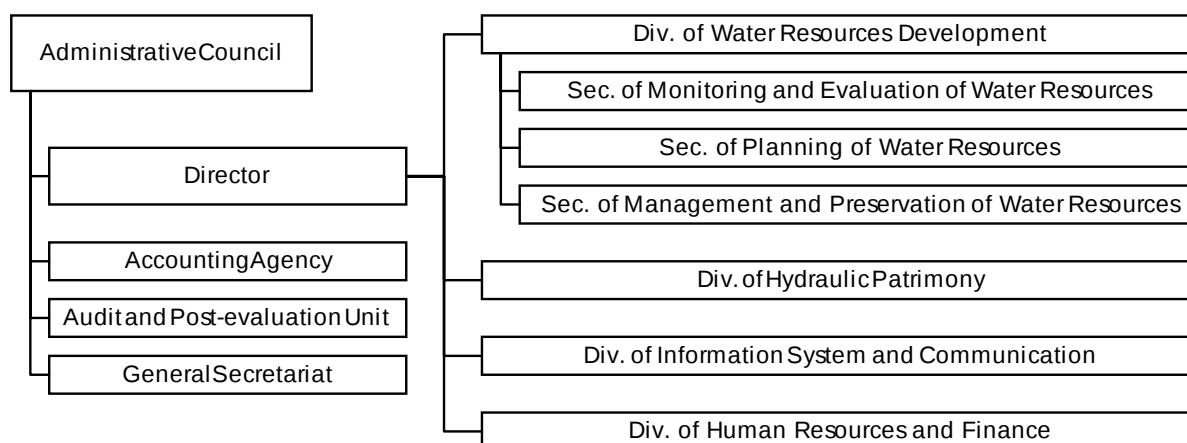


(Source) DRHT

Organization of DRHT

Since DRHT has limited operational capacity, Water Service of DPE-Al Haouz, having 65 persons engaged in the services, supports hydrological measurement, and data collection operation, such as some of construction works of the observation stations and personnel management of observers at hydrological stations operated by DRHT. Hydrological data collected at stations without a radio set also may be collected by the Service of the DRE. In case of issuance of flood forecast determined by DRHT, DPE-Al Haouz immediately receive the message and diffusion of the message is mainly undertaken by the DPE, according to the MOE Guideline.

A basin agency called Tensift Hydraulic Basin Agency (ABHT: *Agence du Bassin Hydraulique du Tensift*) is in the process of its establishment at present based on the provisions in the Water Act and Decree No. 2-00-79. Although formal establishment and staff allocation are subject to the approval of the ministry in charge of public finance, the establishment was actually advanced and activities have already started.



(Source) ABHT

Organization Structure of ABHT

The Division of Water Resources Development (*Division du Développement des Ressources en Eau*) is in charge of hydrological measurement and flood forecasting, although names of the divisions and services as well as the job descriptions do not explicitly mention flood control activities. The staff allocation of ABHT as well as the Division is listed below:

Numbers of Employees of ABHT

Staff Level	Total of ABHT	Div. of Water Resources Management	Dams	Hydrological Stations
Chief Engineer	7	2	0	0
Engineer	10	3	0	0
Administrative Staff	1	1	0	0
Principal Technician	10	3	0	0
Technician	22	7	3	0
Agents	63	5	13	23
Total	113	21	16	23

(Source) ABHT

Currently major activities for ABHT have been concentrated in studies on i) modernization of administration, including human resource development, ii) water resources monitoring and evaluation (assessment), and iii) studies on public domain (water and watercourses). In the item of iii), delimitation of areas of public domain subject to water administration by ABHT is included. After the delimitation, dangerousness of tributaries, including those in the JICA Study Area will be assessed as jobs of ABHT, while slopes outside the limits of public hydraulic domain will be assessed of Water and Forest under the agricultural ministry.

3.2.2 Organizations under Ministry of Interior

Ministry of Interior has a wide area of authorities, as well as responsibilities, for domestic administration, such as supervision of local collectivities, civil protection, etc. The Ministry has, in its central administration, the cabinet of the minister and the following general directorates and directorates:

- 1) Secretariat General (*Secrétariat Général*)
- 2) Directorate General of Internal Affairs (*Direction Générale des Affaires Intérieures*)
- 3) Directorate General of National Security (*Direction Générale de la Sécurité Nationale*)

- 4) Inspectorate General of Auxiliary Forces (*Inspection Générale des Forces Auxiliaires*)
- 5) Inspectorate General of Territorial Administration (*Inspection Générale de l'Administration Territoriale*)
- 6) Directorate of Transmissions (*Division des Transmissions*) (directly attached to the Minister)
- 7) Directorate General of Local Collectivities (*Direction Générale des Collectivités Locales*)
- 8) Directorate General of Town Planning, Architecture and Territorial Development (*Direction Générale de l'Urbanisme, de l'Architecture et de l'Aménagement du Territoire*)
- 9) Directorate of Rural Affairs (*Direction des Affaires Rurales*)
- 10) Directorate of Civil Protection (*Direction de la Protection Civile*)
- 11) Directorate of Formation of Administrative and Technical Set-up (*Direction de la Formation des Cadres Administratifs et Techniques*)
- 12) Directorate of Coordination of Economic Affairs (*Direction de la Coordination des Affaires Économiques*)
- 13) Directorate of State Companies and Conceded Services (*Direction des Régies et des Services Concédés*)
- 14) Directorate of Administrative Affairs (*Direction des Affaires Administratives*)
- 15) Division of Coordination on Social Affairs (*Division de la Coordination des Affaires Sociales*)
- 16) Division of Liaisons and Organization (*Division des Liaisons et de l'Organisation*)

Among the above, Directorate of Civil Protection (*Direction de la Protection Civile*) is closely related to the flood warning and evacuation as well as to rescue activities after floods damages occur. The mission of directorate includes the followings:

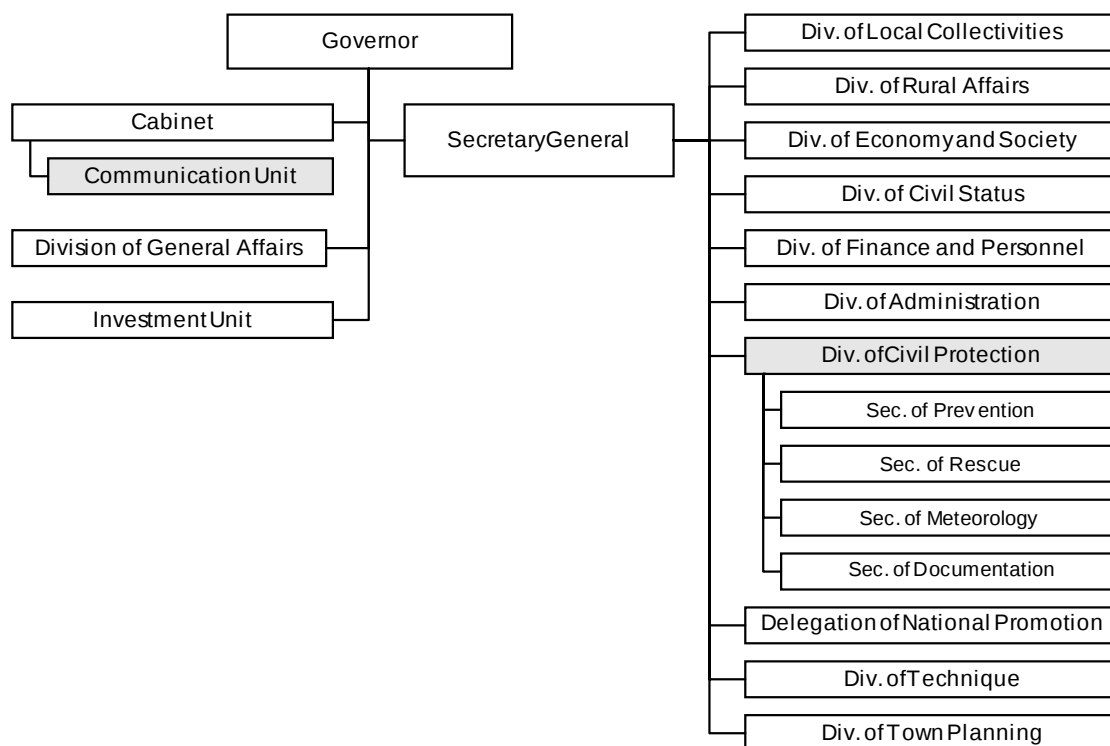
- * to organize, to lead and to coordinate implementation of measures for protection and rescue of people and goods at the time of calamities and disasters
- * to assure the protection and the safeguard of the population and the national heritage, and during the circumstances of the civil defense, foreign nationals
- * to promote prevention of risks and to fight against all disasters, in particular fires
- * to organize and to assure administrative and technical management of emergency services and struggle against the fire
- * to prepare and to undertake all actions for anti-locust struggle.

The Directorate has following divisions and sections (services).

- * Division of Studies and Coordination (*Division des Études et de la Coordination*)
 - Section of Studies and Rescue Plans (*Service des Études et des Plans de Secours*)
 - Section of Coordination on Rescue (*Service de la Coordination des Secours*)
 - Section of Health (*Service de Santé*)
 - Section of Information and Documentation (*Service de l'Information et de la Documentation*)
- * Division of Inspection of Rescue Services (*Division de l'Inspection des Services de Secours*)
 - Section of Inspection (*Service de l'Inspection*)
 - Section of Prevention and Regulation (*Service de la Prévention et de la Réglementation*)
 - Section of Logistics and Maintenance (*Service de la Logistique et la Maintenance*)
 - Section of Social Actions (*Service de l'Action Sociale*)
- * Division of Administrative Services (*Division des Services Administratifs*)
 - Section of Strength (*Service des Effectifs*)
 - Section of Credit and Accounting (*Service des Crédits et de la Comptabilité*)
 - Section of Materials (*Service du Matériel*)

- * National Center of Anti-locusts Struggle (*Centre National de la Lutte Anti-acridienne*)
 - Section of Research and Interventions (*Service de la Recherche et des Interventions*)
 - Section of Facilities and Stores (*Service des Équipements et des Approvisionnements*)
 - Section of Administrative Management (*Service de la Gestion Administrative*)
- * School of Civil Protection (*L'Ecole de la Protection Civile*)

The Province of Al Haouz, having around 140 officials working there, is in charge of issuance and diffusion of flood warning to people after the message from DPE-Al Haouz. Preparation of the ORSEC Plan is conducted by the Division of Civil Protection. Radio communication tools, installed up to the Caïdat level and to the Warning Post, is managed by the Transmission Unit of the Cabinet of the Governor. Detail organization structure is given in Figure L.3.2.



Organization of The Province of Al Haouz

A committee for risk management, placing emphasis on combating against floods in the Ourika Valley is in preparation for the establishment with the leadership of the Governor and secretaryship of ABHT. The members of the committee will be composed of representatives of following organizations:

- * Al Haouz Province
- * ABHT
- * Protection Civil
- * Royal Mounted Police
- * Auxiliary Forces
- * DPE
- * Caïdat
- * Communes, and so on.

Directorate General of Town Planning, Architecture and Territorial Development (*Direction Générale de l'Urbanisme, de l'Architecture et de l'Aménagement du Territoire*) of Ministry of Interior is also concerned with flood control, or reduction of flood damage through land use regulation based on the Law No. 12-90. According to the law, every person who wants to build a house or any other building

has to submit a plan to the commune of the location. Then, Commission of Instruction of Project Files (*Commission d'Instruction des Dossiers*) gives the permission for implementation when it deems the project as proper.

At present, the Urban Agency of Marrakech is formulating a land use plan along the Ourika Valley, from Setti Fatma to Tnine Ourika. The plan will include zoning and prohibition of establishment of buildings in zones prone to floods or debris flows. The agency is collecting the information for the zoning from ABHT.

CHAPTER 4. INSTITUTIONAL PLANNING FOR FLOOD FORECASTING AND WARNING

4.1 Concepts and Principle for Institutional Plan

4.1.1 Issues

(1) Directives

Current directives prevailed in Morocco on flood forecast, warning, evacuation and relief activities, i.e., MOE Guideline and the directive for ORSEC Plan well cover most of essential elements required for organizing and managing flood fighting activities. Compared to the corresponding legislation of Japan, however, there might be some missing elements to be regulated and enforced.

In Japan, there are two important laws related to flood combating activities, namely, “Flood Fighting Act (Law No. 193 of 1949, and amended partially more than 15 times up to the present)” and “Basic Act on Disaster Countermeasures (Law No. 223 of 1961)”. The former act gives provisions on i) an objective and definitions, ii) flood fighting organizations, iii) flood fighting activities, including river watch, flood alert and warning, iv) management of flood fighting activities, v) cost allocation and subsidies, vi) miscellaneous provisions, and vii) penalties. The latter basic act gives, i) general provisions – an objective, definitions, and responsibilities, ii) organizations for disaster countermeasures and their relations, iii) disaster countermeasure plans (planning items, planning entities, etc.), iv) disaster prevention (preparation of organizations, stock of materials, education and training, exercises, etc.), v) emergent activities against disasters (information collection and communication, alert and warning, evacuation, traffic control, use of materials and equipment, compensation, etc.), vi) restoration, vii) financing, viii) declaration of emergency conditions, ix) miscellaneous provisions. The basic act stipulates that there shall be no contradiction between the two acts. Outlines of the two acts are introduced in seminal materials in Data Book.

Besides, in Morocco MOE Guideline deals with the procedure for issuance of flood forecast and alert and some activities related on traffic control and emergent road restoration which belong to jurisdiction of the Ministry of Equipment (currently of Ministry of Equipment and Transport), because of the guideline’s nature of internal circulation only. The directive for ORSEC Plan covers wide areas, emphasizing on relief activities. The latter directive deals with thorough operations of large scale, involving many sectors of the government and the private entities, and thus some parts are not suitable to flash floods, which requires forecasting and prompt countermeasures.

One of the most important elements in anti-flood activities, i.e. exercises (drills) and training, is missing in the both directives, while large scale of exercises are implemented every year in most of the flood-prone areas in Japan to enhance preparedness for flood countermeasures.

There might be some problems in enforcement and implementation of the two directives. The 2000 version of the MOE guideline, which should be revised every year in May and June, is not available at the moment and specific documentation under the guideline for Province of Al Haouz, Prefecture of Sidi Youssef Ben Ali or Marrakech Menara seems not be prepared.

Although a report was issued by DGH and DRHT on the flood of 1995 and flood damages and deficiencies of anti-flood system were well analyzed, records and analyses on activities at the occasion by relevant organizations were not sufficiently included and contents of the Guideline were not reviewed. A basic principle of management cycle; “to plan – implement – monitor &

evaluate – revise – implement -” seems not to be explicitly applied in the management of anti-flood activities.

Currently mass media, such as radio or TV broadcasting, in alert and warning dissemination are not fully employed, probably because of limited channel, coverage or usage of the media in rural areas. Corresponding to progress of electrification and expansion of the broadcasting as well as gradual change in living styles of the people, importance of those media will grow in the future.

(2) Capacities of the Relevant Organizations

DRHT (ABHT at present), specialized in hydro-climatological analysis and technical advisory, seems to lack mobilization capability for information collection and activities after issuance of flood forecast and alert messages. Besides, DPE/DPEs –(Al Haouz and Marrakech Wilaya, covering Prefectures of Sidi Youssef Ben Ali, Marrakech Menara, Marrakech Medina and Chichaoua Province) seem not to have sufficient analytical capabilities for flood forecasting, and their jurisdiction extends not in basin-wise but only to a province, or a province and prefectures. As stipulated in the Water Act, a river agency is created whose duties will include hydro-climatological measurement and flood fighting infrastructure arrangement. In case of the river basin of Oum Er-Rbia, the only model of the establishment, provincial water services remain, taking the responsibilities of maintenance of hydraulic works. The capability and staffing of the river basin agency established for the Tensift River is not yet fully developed at the moment. The Province does not have sufficient technical capabilities for hydrological analysis and flood forecasting although it has an authority for warning and evacuation instruction.

Under the current conditions, the three organizations, as core agencies, should coordinate for flood forecasting, warning, and emergent activities, such as guiding evacuation of the residents and tourists of the flooding areas, equipped with communication.

4.1.2 Principles

(1) Objectives

The objectives of the institutional plan are set as follows based on the strategy set for the formulation of the Master Plan:

- * to enable accurate and timely forecast with close cooperation of relevant entities
- * to enhance preparedness for timely and effective warning and evacuation

(2) Approaches

To achieve the above objectives the following approaches should be adopted based on the assessment of the current conditions.

(a) Inter-ministerial Involvement with Clear Assignment to Each of the Relevant Entities

For reliable and prompt issuance and dissemination of flood forecast and warning messages, as well as instructions for evacuation, close information exchange and cooperation for warning dissemination and evacuation are inevitable under the current situation or even in some period after the establishment of a river basin agency in the Tensift River Basin. For effective and efficient information exchange and cooperation in emergency situations, it is a prerequisite to prescribe clear assignment and procedure as well as to prepare formats used in the communication. Inter-ministerial preparation should be carried out. Joint evaluation will help further improvement of anti-flood

activities.

(b) Enhancing Preparedness

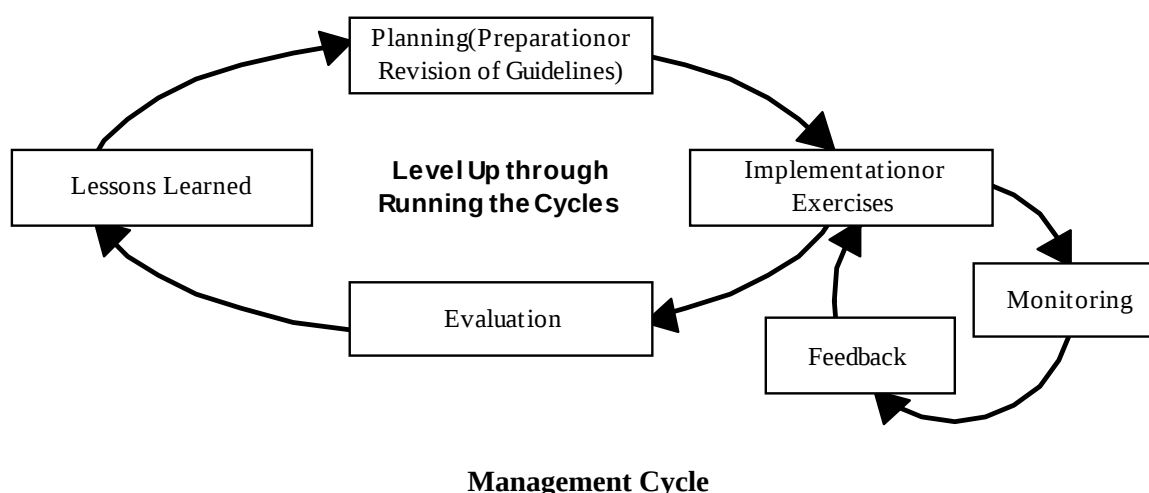
Prompt and effective activities in catastrophic conditions can be attained only with enhanced preparedness. Although some troubles can not be avoidable even with enhanced preparedness, well-organized preparation is the only way to reduce happening of troubles and problems in emergency situations.

(c) Residents Participation

Normally, to let people obey the rules or instructions decided by other persons is difficult. Instead, people are better willing to follow the rules or plans which are determined by themselves. At least, taking their opinions into consideration will encourage the obedience of the people. Participation of the people with their local knowledge will contribute much to more effective and efficient plans and rules.

(d) Applying Management Cycle

Any types of modern management employ the process of “plan – do – see – plan -” or “plan – do – check – action – plan -”. This management is also applied in the two acts related to anti-flood activities in Japan. Explicit application of the method would help grade up of the management level.



4.1.3 Conceptual Plans

(1) Preparation of an Operational Guideline for Flood Fighting

Preparation of a guideline suitable to characteristics of the floods in Study Area, especially for flash floods, as well as applicable and effective in the social conditions of the area and capacities or capabilities of the relevant organizations, would be recommended in the Master Plan. Outline would be prepared with counterparts through discussions of relevant organizations, based on the current MOE Guideline and the directive for ORSEC Plan, and referring corresponding laws, regulations and actual plans enforced in Japan. Participation of the stakeholders should be encouraged in detail planning, especially planning of evacuation of or warning to tourists. Required procedure to encourage the participation should be analyzed.

After careful discussions and checks with exercises, as recommended below, legal status of the directives or plan should be raised up to regulations or decisions of the Governor for smooth and enforced implementation.

(2) Explanations and Exercises to Enhance Preparedness against Flood

Preparation against floods should start with documentation as described in the two directives prevailed in Morocco. Additional documentation as stipulated in the laws and regulations in Japan, if it is necessary and applicable in the Study Area, would be recommended with suitable formats.

Contents of some parts of the documents as well as the plans and messages, should carefully and repeatedly be explained to relevant organizations and residents before the occurrence of the floods in order to avoid misinterpretations, which often occur in extraordinary conditions.

Exercises are often carried out in Japan in almost all flood prone areas as stipulated in the laws and regulations as obligations. Exercises, comprising of desk-top drills and in-situ exercises, would help to check the functions of equipment and operations and to detect mal-functions of them before the occurrence of the disasters. The results of exercises should be evaluated and reported for further improvement. Typical models of the exercises conducted in Japan would be introduced in the Master Plan.

Mass media have large potential for dissemination of forecast, alert and warning messages and for education on disaster prevention. However, careful design of messages with plain language is necessary to avoid misunderstanding of the people. Despite the possible misinterpretations, diffusion of risk information should be stated to exploit the huge potential of the media. Explanations and discussions with relevant entities should start for preparation. Model of usage of mass media would be introduced.

(3) Running Management Cycle

Everyone may know the merits of the application of management cycles and still there are many places and fields yet to adopt this approach. Examples of successful running of management cycle in the anti-flood activities would be introduced. Problems which hinder proceeding the cycle should be identified. Countermeasures to solve the problems and to promote grading up of the management would be recommended.

(d) Organizational Strengthening and Training

Organizational strengthening and staff training required for reliable and prompt operation of the proposed FFWS would be recommended. After study of required personnel and skills to manage the proposed system, necessary staff increase and contents of training would be recommended.

4.2 Draft Institutional Recommendations

4.2.1 Responsibility Allocation and Cooperation among Related Entities

For reliable FFWS, clear responsibility allocation and definite assignment of every task to a specific position of related organization should be prescribed and these responsibility allocation and assignment should be published and known by all of the related organizations.

Principally, the Director of DRHT (ABHT at present) is responsible to prepare and issue Flood and Debris Flow Notices, while the Governors of Al Haouz Province and Sidi Youssef Ben Ali Prefecture are responsible to prepare and issue Flood and Debris Flow Warning, and to prepare and guide evacuation of residents and tourists. Although the Governors are responsible for subsequent relief activities, relief activities are out of the scope of the Study and are not discussed in this report in detail. The Governors and the director are also responsible to revise and update the plan of FFWS within their

jurisdiction and scope of their responsibilities. They are also responsible to secure comprehensiveness of the FFWS, consulting one another and with related organizations.

Although DPEs of Al Haouz and DRE of Wilaya Marrakech should take major roles in FFWS, their responsibilities are limited to those for assistance and supports to DRHT (ABHT at present) and the Province/Prefecture, and the DPEs' activities for FFWS should be controlled by DRHT (ABHT) or the Province/Prefecture. DPEs should also take primary role in rehabilitation activities after flood or debris flow although rehabilitation activities are not dealt in this report.

Since DRHT (ABHT) and the Province/Prefecture only cannot execute FFWS activities promptly or efficiently, coordination with DMN, DPEs and other related organizations, such as tourism related industries would be required. With the progress of decentralization and wider spread of mass communication media, involvement of rural communes and broadcasting entities, such as RTM (Moroccan Radio and Television), will become more important. Coordination with organizations of Civil Protection, Police or Royal Gendarmerie, ONEP (National Office of Potable Water), ONE (National Office of Electricity), ORMAVAH (Regional Office of Agricultural Development of Al Haouz), medical entities, or Moroccan Red Crescent is important for relief and rehabilitation activities, thus only timely information flow to these entities are examined in the Study.

4.2.2 Organization Setup

In order to realize the proposed FFWS in the Atlas Region, i) establishment of additional flood watch stations, ii) establishment of new organizations, such as warning posts and iii) organizing task forces for evacuation of tourists by tourism relating industries are necessary. To strengthen coordination for enhancing preparedness, iv) frequent periodical meeting among related organization held by DRHT (ABHT at present) and the Province/Prefecture is necessary. Examination for v) involvement of rural communes and vi) use of broadcasting entities should be started to cope with future change in local administration and life style of the people in the region.

(1) Establishment of Additional Flood Watch Stations

For the FFWS proposed in the Master Plan, additional twelve flood watch stations are planed. In principle, current management can be applied to the additional stations because of little problems in the existing stations. Due to the introduction of new equipment for automatic measurement and data transmission which is not used at the stations in the region and not widely spread in Morocco, however, maintenance system of the equipment should be enhanced. The cell for equipment maintenance should be strengthened with assured budget for the maintenance.

(2) Establishment of Warning Posts

For the efficient establishment of warning posts, installation of warning equipments in some existing institutions, such as schools or mosques, should be examined. After the selection of locations of the installation, two or three caretakers for a warning posts are be nominated among the persons destined to the existing organization for shifts of permanent duty (24 hours a day) whose costs are to be born by the Province/Prefecture. Initial explanation on the FFWS and operation and daily inspection of the warning equipments is inevitable. Periodical inspection and maintenance is the responsibility of the Province/Prefecture with assistance of DRHT (ABHT) and the relevant DPE.

(3) Organizing Tourism Related Industries

Managers and employees of tourism related industries, such as hotels, restaurants and souvenir or other shops, are willing to assist evacuation of tourists, and they have capability to do it. After designation of evacuation places and planning of evacuation guidance by the

Province/Prefecture, organizing task forces constituted of managers and employees of the local tourism related industries is recommendable.

At first, nomination of task managers and assignments of duties required for evacuation guidance of tourists are to be made through meetings by the relevant Province/Prefecture and tourism related industries of the location. The task manager should preferably be a manager of a large hotel or restaurant which have a telephone line to be used for direct instruction from the Province/Prefecture. Then, the task force should work out detail evacuation plan by themselves suitable to each conditions of the area and submit the plan to the Province/Prefecture for approval. After the approval of the plan, they should assist evacuation of the tourists as planned.

The task force should also participate in evacuation drill held every year before the tourist season, evaluate their performance by themselves and revise their detail plan based on their self-evaluation and the evaluation by the Province/Prefecture.

(4) Periodical Meeting to Enhance the Preparedness and Strengthening Cooperation

Frequent and periodical joint meetings with the initiative of DRHT (ABHT) and the Province/Prefecture and with participation of all major relating are recommendable to attain preparedness at any time, to make FFWS reliable and to enable prompt and proper activities at the time of floods and debris flows. At least, meeting should be held at following times.

- a) Every May to prepare the drill of the year
- b) Every June to evaluate the performance in the drill and to revised operation plans, lists and formats of FFWS
- c) After evacuation, relief and rehabilitation activities of actual floods and debris flows evaluate the actual performance and to revised operation plans, lists and formats of FFWS

(5) Involvement of Rural Communes

Decentralization is gradually proceeding and capability of rural communes will grow. According to the progress of decentralization, involvement of rural communes in FFWS should be considered for prompt operation suitable to the local conditions. In the timeframe of the Master Plan, however, rural communes would not be able to take major responsibility in FFWS. Rather, preparation for rural communes to take major role should be examined and started. At first, involvement of rural communes in dissemination of cautions/warnings issued by the Governor, in evacuation guidance and in controlling the task force for tourist evacuation. Then day-to-day management of warning posts with technical and financial assistance of the Province/Prefecture could be a target of the involvement of rural communes in the Master Plan.

(6) Use of Mass Media in Dissemination of Flood Notice and Warning

With more diffusion of radio and TV sets in the high risk areas of the region, use of these mass media will become more effective and efficient. At the same time, however, information dissemination with these media may cause misunderstanding by public in large scale if the dissemination is not well-organized. Checks and control in the course of dissemination through these media should be carefully examined. Discussions by DRHT (ABHT) and the Province/Prefecture with broadcasting entities and their supervising organization, such as ministry in charge of communication, should be started.

4.2.3 Required Human Resource Development

With the introduction of new system and equipments, as well as organization set-up for the FFWS proposed in the Master Plan, the following training would be required.

(1) DRHT (ABHT) and Flood Watch Stations

First, few engineers and several technicians should be explained or trained by the staff in DGH/DRPE, Study Team, and contractors for installation of the equipment on whole operation and maintenance required for data collection, flood forecasting and transmission of the Notices to related organizations with the system proposed in the Master Plan. Then, observers at flood watch stations should be explained and trained by DHRT, the Study Team, and contractors for installation of the equipment on operation and daily inspection for the measurements data transmission to DRHT (ABHT) headquarters.

Training and research/development by themselves self to enable to revised the criteria and parameters for forecasting and issuance of notices with accumulation of measurements and data storage would be very important to develop further reliable FFWS. Assistance of DGH/DRPE would be necessary.

(2) The Province/Prefecture and Warning Posts

Responsible persons, such as the Governors, and heads of the Civil Protection Division and Transmission Cell of the Cabinet in the Province/Prefecture should be explained on the whole FFWS by the DRHT (ABHT), Study Team, and contractors for installation of the equipment. Thereafter, a few communication operators in the headquarters and a few caretakers for each warning post should be trained on matters required for warning operation and daily inspection of the equipment.

(3) Other Organizations

Responsible persons in DPEs and the main staff of the Water Service should be explained on the whole FFWS by DRHT, Study Team and the Province/Prefecture. Later, personnel in the Water Service and relevant brigades and should be trained by the main staff of the Water Service of the respective DPE on matters required to carry out assignment. Initial explanation on the whole system as well as on the assignment would be made to the managers and core staff of the related organization, such as the task force composed of the managers and employees tourism related industries.

CHAPTER 5. MODIFICATION OF INSTITUTIONAL PLAN

5.1 Issues Arisen during the Implementation of the Pilot Project

5.1.1 Pilot Project

(1) Entities in Charge

Before the implementation of the pilot projects, outlines of the pilot project were explained to entities in charge, including DGH, DRHT (ABHT at present), Province of Al Haouz, and provincial delegations of Royal Mounted Police, Civil Protections, Auxiliary Forces, and Health as well as the Communes of Setti Fadma and Ourika. Demarcation in operation between the water management entity (DRHT at the time and ABHT at present) - up to issuance of flood alerts and notices, and the Province - from issuance and dissemination of flood cautions and evacuation advices was confirmed as planned in the draft master plan.

For rapid communication of flood forecasting with telemetric system, direct route from DRHT (ABHT) to the Province, rather than communication through DPE as described the MOE Guideline, was selected as preferable one.

Equipment for the FFW system, including those for a warning post was determined through consultations between JICA Study Team and mainly with DGH and DRHT/ABHT and the Province. The building of the Warning Post was constructed with financial cooperation by DRHT, while the Province provided the land and employed two agents through the Commune for operation and maintenance of the Warning Posts.

In March 2003, a kind of committee meeting for traffic control in the Ourika Valley was held upon suggestion of the JICA Study Team and with participations ABHT, local authorities, such as the Province and Caïdat, Communes as local collectivities, and delegation organizations of the state administration, such as Royal Mounted Police, Civil Protection, Auxiliary Forces, DPE and Water and Forest, recognizing importance of the control to avoid traffic jam or other troubles during evacuations. In the meeting, temporary parking zones as well as no parking zones and sign poles were determined.

(2) Drills for Communication and Evacuation

During the pilot project communication and evacuation drills were held by an initiative of JICA Study Team with close cooperation with ABHT, the Province of Al Haouz and its subsidiary line authorities, such as Ourika Caïdat and Iraghf Douar, and relevant government authorities including Royal Mounted Police and Auxiliary Forces. Owing to the meeting and drills, a base for inter-institutional coordination has gradually established with ABHT and the Province as core organizations.

To the drills, inhabitants, especially managers and employees of the restaurants, hotels and shops participated with leadership of the Macadam of the Douar.

5.1.2 Recent Floods

In June 14, a small flood occurred at the Ourika Valley. In August 4, a very intensive rainfall was observed and debris flows rather than river floods occurred soon after the intensive rainfall. At the time of the former flood, flood notice was not effectively issued because ABHT had not yet established shifts for permanent duty on holidays. In the latter flood, evacuation advice was not issued effectively because i) there was only very a short period of time from the intensive rainfall to occurrence of the debris flows,

ii) some trouble occurred in communication equipment, ii) staff of the Province did not fully understand how to monitor the information through computer system, while post-floods activities were promptly carried out with good coordination with relevant organizations under leadership of the Province and Caïdat of Ourika.

The evaluation meetings on the above floods were held with initiative of JICA Study Team and with participation of ABHT, the Province and the Warning Post. Communication route of flood warning were discussed. In the meeting, parallel routes from the Province to the Warning Post, Cercle and Caïdat, rather than a route following administrative hierarchy of Province-(Cercle)-Caïdat-Warning Post, were selected as better ones for less lead-time.

5.1.3 Results of the Study on National Plan of Protection against Floods

During the period of the pilot project, the study on national plan of protection against flood completed. The followings are included in the institutional plans for the study with principals of i) transversal coordination, ii) localization and decentralization of flood control activities.

- 1) to obtain and accumulate knowledge on flood risks
 - * development of hazard and vulnerability maps according to defined classifications of flood seriousness and corresponding countermeasures
 - * establishment of a national observatory for collection of information and promotion of researches
- 2) to reform of legislative and regulatory framework
 - * development of a flood protection code with i) a fundamental law on introductory framework and a legal anthology with related laws/decrees
 - * revision of laws/decrees on water and town planning to take account of flood risks and combating measures explicitly
- 3) to introduce expropriation of public utilities and indemnification system of damages caused by floods
- 4) to strength the institution for flood control
 - * to prepare and implement Prefectural/Provincial Plan of Flood Risk Prevention (PPRI)
 - * to establish Prefectural/Provincial Water Committee for Prevention of Flood Risks

5.2 Lessons Learned during the Pilot Project

5.2.1 Permanent Duty

To establish a permanent duty, 24 hours a day and 365 days a year, for normal phase in ABHT, the Province, and Caïdat Office is a must for the proper operation of FFWS as revealed in the recent floods. One person who can receive DMN message, hear the pre-alert or alert signal, and know what to do in case of change in phases should stay in each places equipped with necessary communication tools and documents.

Although specific problems were not found, the lists (persons to be called, organizations to be communicated, available materials or resources) stipulated in MOE Guideline and ORSEC plan are not updated, are not clearly published or are not available for all relevant persons. Preparation, publication and display are essential for smooth operation in catastrophic conditions. It would better to establish common rule and exchange the lists among relevant entities.

5.2.2 Explanation and Training for Full Understanding and Improvement of FFWS

Since the FFWS installed in the pilot project and planned in the master plan is new and have not yet been familiar to all of the related persons, especially those work for the Province and offices under it.

For the reliable and prompt operation as well as for subsequent evacuation activities, all of the related persons have to know the contents and limits of the system, although level of required knowledge might be different depending on the role of each person in FFWS and subsequent activities.

Several members of ABHT should know in detail for full and effective utilization of the system as well as to improve the system. The system has to be improved through experiences and data accumulation and analysis.

Current pre-alert or alert messages provide only data on rainfall and water levels at stations. It would be better to transfer analytical information to serve effective and timely subsequent activities. Substantial know-how may be required. Besides knowledge accumulation, much effort will be necessary for upgrading skills of core staff of ABHT.

5.2.3 Interactive Analysis with DMN Marrakech Station for Weather Forecast

Taking high risks of debris flows and flash floods in the area, weather forecasting on rainfalls is a crucial factor for timely operation of the system as revealed in the August floods of 2003. Ideally, radar installation for the region and rainfall forecasting based on analysis of the data from the radar can serve for reliable and timely forecasting of floods and debris flows. Even at present, full utilization of the capacity of DMN Marrakech Station may help, although currently it has limited observation stations and other resources. Close contact with DPE and information collection also may help.

5.2.4 Actions to be done in Preparatory Phase

To cope with debris flows and flash floods that may occur soon after intensive rainfalls start, activities after DMN rainfall forecasts, i.e., those in preparatory phases, are very important to avoid troubles found in recent flood fighting. The action mentioned in the previous section should be included in preparatory phases.

Checks of communication and warning equipment, and conditions of preparation of relevant organizations in the preparatory phases may substantially reduce the troubles. When some troubles are detected in communication equipment, for example, substitute communication channels should be prepared for communications in later phases. In case the place of some person to be nominated as a member of FFWS operations team is not identified in a preparatory phase, it is necessary to search the person or to find another person to be nominated.

Currently DMN forecasting and messages are not used properly. To cope with debris flows and flash flood, establishment of FFWS operation teams in ABHT after DMN messages is crucial. In addition, establishment of a preparatory team, comprised of communication technician of Communication Unit and one or two persons of Division of Civil Protection in the Province is necessary.

The provincial preparatory team should check the conditions of preparation in its subsidiary organization, especially Caïdat and the Warning Post, and relevant organization such as Civil Protection and security organizations, and establish substitute measures in case of some troubles. The team should continuously contact with relevant entities, especially with ABHT and DMN as well as its affiliated organizations for information collection and supports for the decision of the Governor.

5.2.5 Combination of FFWS with Local Information

Since the FFWS has limits, supplemental information collection and its analysis are essential for more effective operation of flood fighting. Besides the interactive analysis with DMN, information from local people is also very important. As traditionally done, local people report to each Macadam when some unusual occasions arise. Then the Macadam sends the reports to the Macherikha, and the Macherikha to the Caïdat, the Caïdat to the Cercle, and the Cercle to the Province, following well-established

hierarchy. ABHT as well as the Province, should analyze the local information during preparatory and flood watch phases.

Decisions of the Governor may also depend on qualitative information on actual conditions, beside the quantitative information provided by ABHT. Qualitative information on actual conditions as well as happenings at the site communicated through the traditional communication channel is important as well. It is be recommendable for the Macadam to use the communication tools of the Warning Post for reporting to the Caïd and the Caïd to the Province with the equipment installed in the station, although some discussion and arrangements will be required to skip the Cercle and the Macherikha.

5.2.6 Evaluation and Grade-up Applying Management Cycle

Post-evaluation on actual floods damages as well as on activities to reduce the damages is very useful to improve future activities. Many lessons can be learned, or most of sources for the improvement of the activities can be derived from the evaluation. Evaluation should accompany a report, covering the followings.

- records of damages (type, locations, scales) and major cause of each type of damages
- records of communications and activities for evacuation and rescue, and review and assessment of the activities
- measures to be taken to improve forecasting, issuance and transmission of alert notices
- measures to be taken to improve issuance and dissemination of flood caution or evacuation advice
- measures to be taken to improve evacuation and to further reduce the damages

5.2.7 Establishment of Committee for Risk Management

Flood forecasting and warning as well as subsequent rescue and relief activities involve many kinds of organizations as role players. For better operation of FFWS and subsequent activities, cooperation and coordination among relevant entities are inevitable. As prepared recently as well as recommended in the National Master Plan against Flood, establishment of a deliberative organization for flood control activities will realize the coordination among the relevant organizations necessary for FFWS and subsequent activities.

Activities of the committee should include organization of evaluation after each flood as well as conducting drills. For evaluation, the committee should organize a team nominating staff among personnel in member organizations at first. The committee should compile a report, send to the Supreme Council of Water and promote implementation/operation and cooperation of relevant sector organizations to improve flood fighting activities.

5.2.8 Knowledge Accumulation

As recommended in the National Master Plan against Flood or commonly instructed many guidelines or other references spreading over the world, accumulation of knowledge on flood risks as well as on measures against floods in the past or of other countries would be a base for planning and improvement of flood combating activities. At first, collection of existing documents, such as laws/decrees or other regulations, official plans of the government, domestic and international references, is necessary with reference services.

Important source for the knowledge can be derived from evaluation of the actual floods. As mentioned above, reporting is crucial for knowledge accumulation.

Considerable portion of damages caused by debris flows and flash floods has been concentrated in the area of the JICA Study. ABHT can and should be a core organization leading information collection and researches on debris flows and flash floods with assistance of the central administration of DGH.

5.2.9 Risk Assessment of Debris Flows

Due to very short lead-time from rainfalls to occurrences of debris flows in many cases, risk management only FFWS would not be sufficient to reduce damages caused by debris flow. Hazard maps and vulnerability maps can be useful and support the operation of FFWS.

After delimitation public hydraulic domain, ABHT, within the borders, and Water and Forest outside the domain should monitor the conditions of tributary valleys and slopes in each jurisdiction and assess the risks of debris flows and slope failures. After the intensive rainfalls and debris flows occur, as observed on August 4, 2003, ABHT have to dispatch a team for the risk assessment of the tributaries to collect information since the occurrence of debris flows may change the risk conditions and because it would be a good opportunity to understand the geomorphologic condition of the valleys.

Exchange of information on geomorphologic condition of adjacent areas with Water and Forest may substantially contribute to efficient risk assessment of both jurisdictions as well as effective flood fighting activities including flood forecasting and warning.

5.2.10 Participation of Inhabitants and Tourism related Industries

As proved in drills, inhabitants, especially of managers and employees of restaurants, hotels or shops are willing to participate in evacuation. Participation of them will help effective evacuation. Instead of the current participation of volunteer base, it would better to organize their participation under the leadership of Macadams and through discussions within associations of tourism related industries.

As required by some restaurants and hotels during the drill, it would contribute to effective evacuations to display signboards to show evacuation routes and sites in restaurants and hotels permanently.

5.3 Institutional and Human Resource Development Plan

5.3.1 Responsibility Allocation and Coordination

Basic demarcation in FFWS – ABHT; flood notices and the communication to the Province/ Prefecture and the Province/Prefecture; issuance and dissemination of flood cautions and evacuation advices – is clear as confirmed during the implementation of the pilot project. Ownership of the equipment for FFWS and responsibilities of its operation should correspond to the demarcation.

As for operation and maintenance of equipment of FFWS, the demarcation of the above should apply. The ownership of the equipment belongs to the ABHT and the Province according to the scope of the operation. Having the basic recognition of the demarcation, the Province can make agreement with ABHT or DGH for technical or financial supports to realize consistent maintenance throughout the system. Routine maintenance, however, should be carried out by respective organizations.

Flood fighting activities should involve various sector organizations. Civil Protection is in charge of management and coordination of rescue and relief activities against all types of disasters including those by floods and debris flows. The security organizations such as Royal Mounted Police and Auxiliary Forces, should keep public order even in cases of disasters. DPEs/DRE should be involved in flood fighting, mainly through water and road services, including structural measures, and should assist ABHT to supplement insufficient extension capability of ABHT. Involvement of DMN is essential through weather forecasting and provision of climatological information. Urban agencies should control land use in areas prone to floods and debris flows for residential, social, commercial and industrial establishments, while agricultural sector, mainly thorough Water and Forest to prevent slope failure outside the public hydraulic domain. Countless other involvements of many sectors, such as tourism or health sector, are inevitable for effective activities.

It would be necessary to describe the responsibility and duties on flood risk explicitly in job description of each relevant sector organization and assign specific personnel.

Cooperation and coordination is essential for reliable and timely operation of FFWS and effective activities to reduced the damages caused by floods and debris flows. Provincial/Prefectural Committees on Flood Risk Management, as currently prepared in Al Haouz Province, is required for deliberative functions, while implementation of relevant entities that will compose of the committees. The committee would preferably be established separately from and under the Provincial/Prefectural Commissions Water, focusing flood-fighting activities, because of different composition from the commission. In addition to the membership prepared at present, a member from DMN Marrakech Station is required as learned during the pilot project. It is also recommendable to add a representative from radio or TV broadcasting organizations to start their involvement in flood forecasting and warning.

The Committee should meet periodically and when necessary, preferably as follows:

- * once at the time to prepare budget for the next fiscal year to confirm or discuss implementation plans of relevant organizations for flood fighting
- * once in May or June to confirm and exchange of lists for communication or others and to prepare a drill for Jun or July
- * once in June or July to review performance of the drills and to confirm or revise rules for communication and joint operation for flood forecasting and warning
- * once soon after every flood to organize evaluation team composed of the member organizations and once in one or two months later to compile and issue a report for evaluation of flood damages and flood fighting activities and reviewing of implementation plans of the Master Plan.

5.3.2 Organization Setup

Establishment of a specific section (service) in charge of flood fighting in ABHT is recommendable, in addition to the establishment of the committees. A few engineers and a few technicians would be required. The section will be in charge of all matters of ABHT related to FFWS and other flood control activities. The section is also in charge of explanation and training of relevant persons on FFWS. The section should be a core of researches on flood control or fighting, especially flash floods and debris flows with supports of a central administration, DGH or a national observatory as recommended in the study for National Plan of Protection against Floods.

Implementation of permanent duties is crucial. Core organizations like ABHT (Master Information Center) and its Flood Watch Stations, and the Province (or Prefecture) and the Caïdat (Monitoring Stations) and DPEs should establish shifts according to the development of the Master Plan. The core organizations should also organize FFWS operation teams when necessary and prepare the shifts as mentioned in the draft Master Plan. In addition, a preparatory team should be established in the Province and the Caïdat Monitoring Stations, as learned during the pilot project.

Organization set-up for the Warning Post and Flood Watch Stations has been conducted successfully in general during the pilot project. ABHT and the Province can continue the efforts for staffing the posts and stations in the same way according to the implementation of the Master Plan.

Participation to evacuation by tourism related entities has also been started successfully. To enhance their capability for guiding evacuation of tourists, further efforts to organize the managers and employees of restaurants, hotels and shops as teams for flood fighting activities. Discussions with the associations of tourism related entities are necessary.

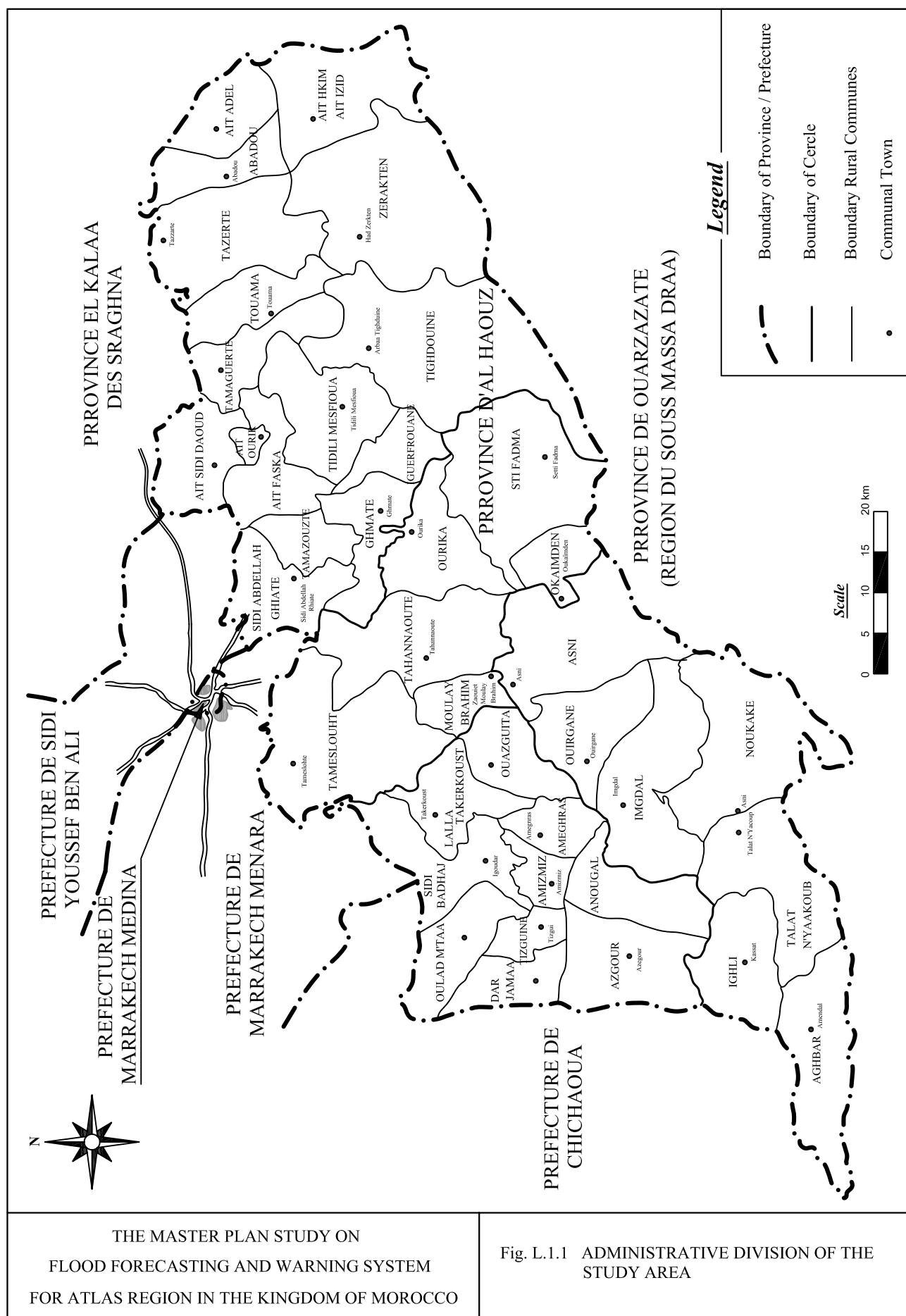
5.3.3 Human Resource Development

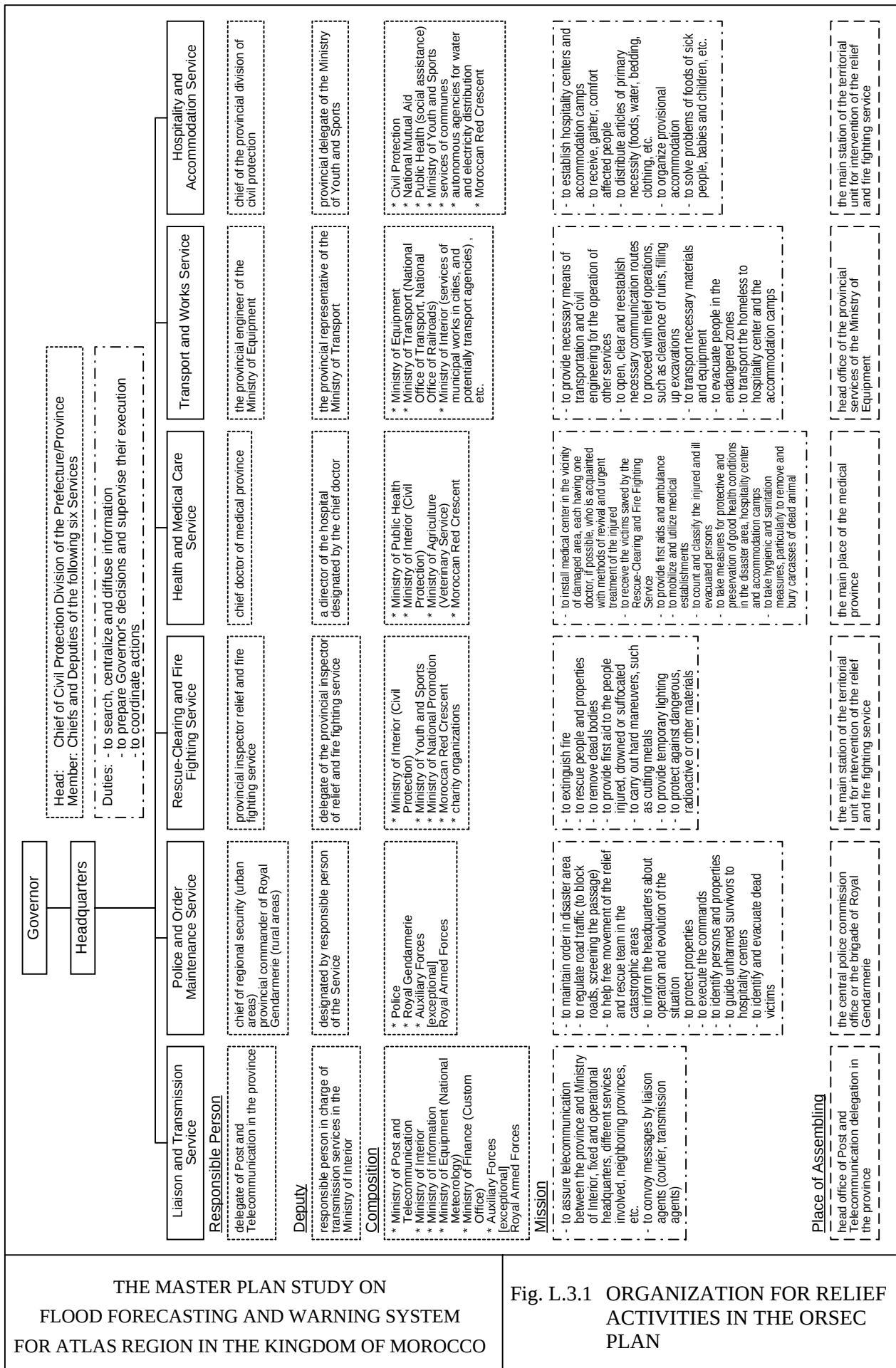
At first, ABHT or staff of the section in ABHT assigned to flood fighting activities should understand in detail the FFWS installed by the pilot project as well as that proposed in the Master Plan. The section

then has to explain the contents and limits of the system to all relevant entities. Training by the section is also necessary for all operating persons, including those nominated in the FFWS operation teams and preparatory teams as well as tourism related persons who guide evacuation of tourists. In-situ explanations and training would be more effective. Corresponding to development of the system and changes of personnel in charge in relevant organizations, the explanation and training should be conducted continuously.

The section of ABHT should substantially grade-up its own technical level to improve the FFWS. To provide useful and effective information, rather than just data observed, much efforts should be made to strengthen analytical capabilities. To cope with debris flow and flash floods, analyses on climatological data and information should largely be enhanced. Assistance of DGTH will be required. Due to the expected leading position in Morocco, domestic source of information might be insufficient and utilization of cooperation programs by foreign countries or international organizations, such as World Meteorological Organization (WMO) can be recommended.

FIGURES





THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. L.3.1 ORGANIZATION FOR RELIEF
ACTIVITIES IN THE ORSEC
PLAN

