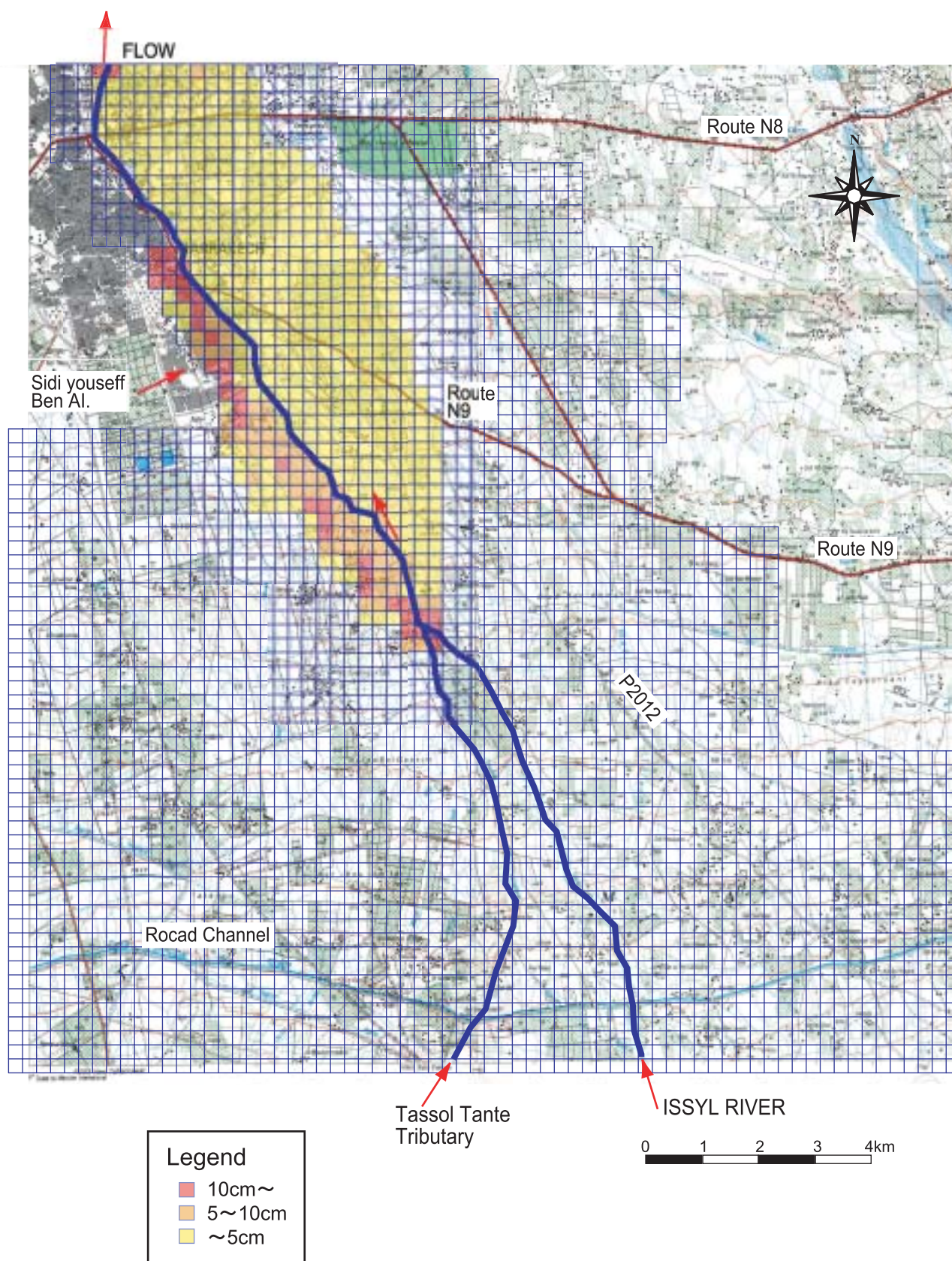


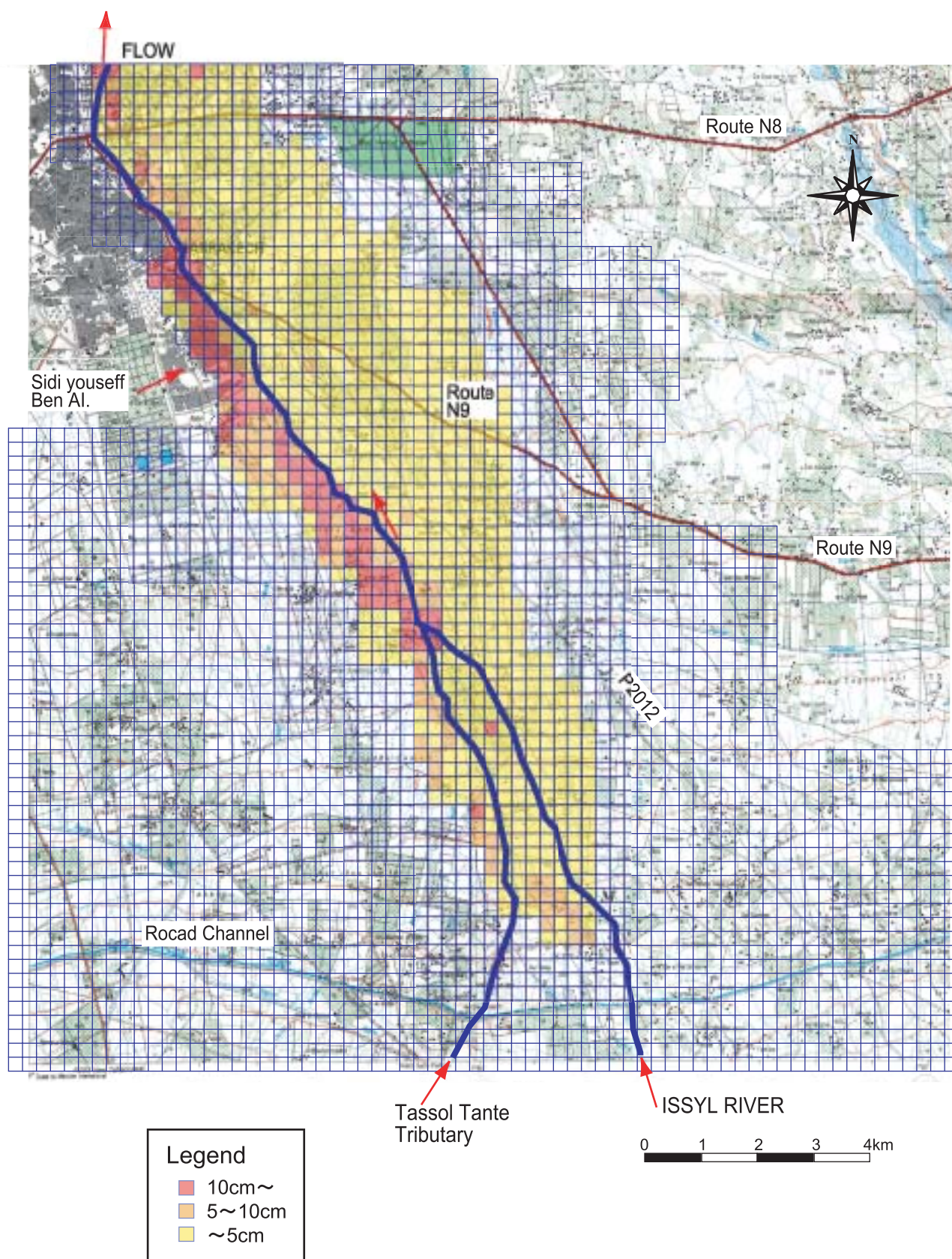
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN KINGDOM OF MOROCCO

Fig. D.3.10 (1/4) FLOOD MAP OF ISSYL RIVER
(10 YEAR FLOOD)



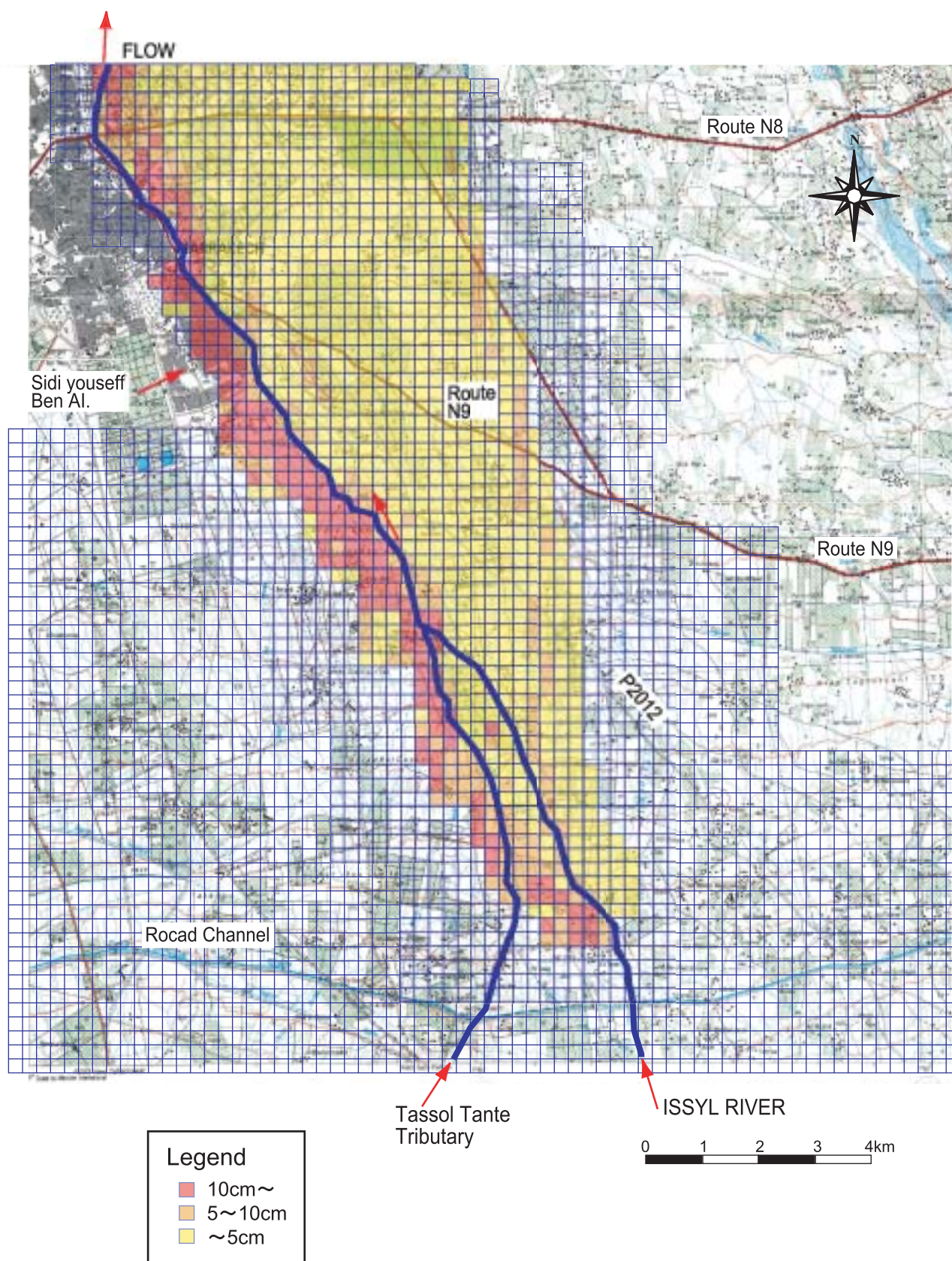
THE MASTER PLAN STUDY ON
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Fig. D.3.10 (2/4) FLOOD MAP OF ISSYL RIVER
(20 YEAR FLOOD)



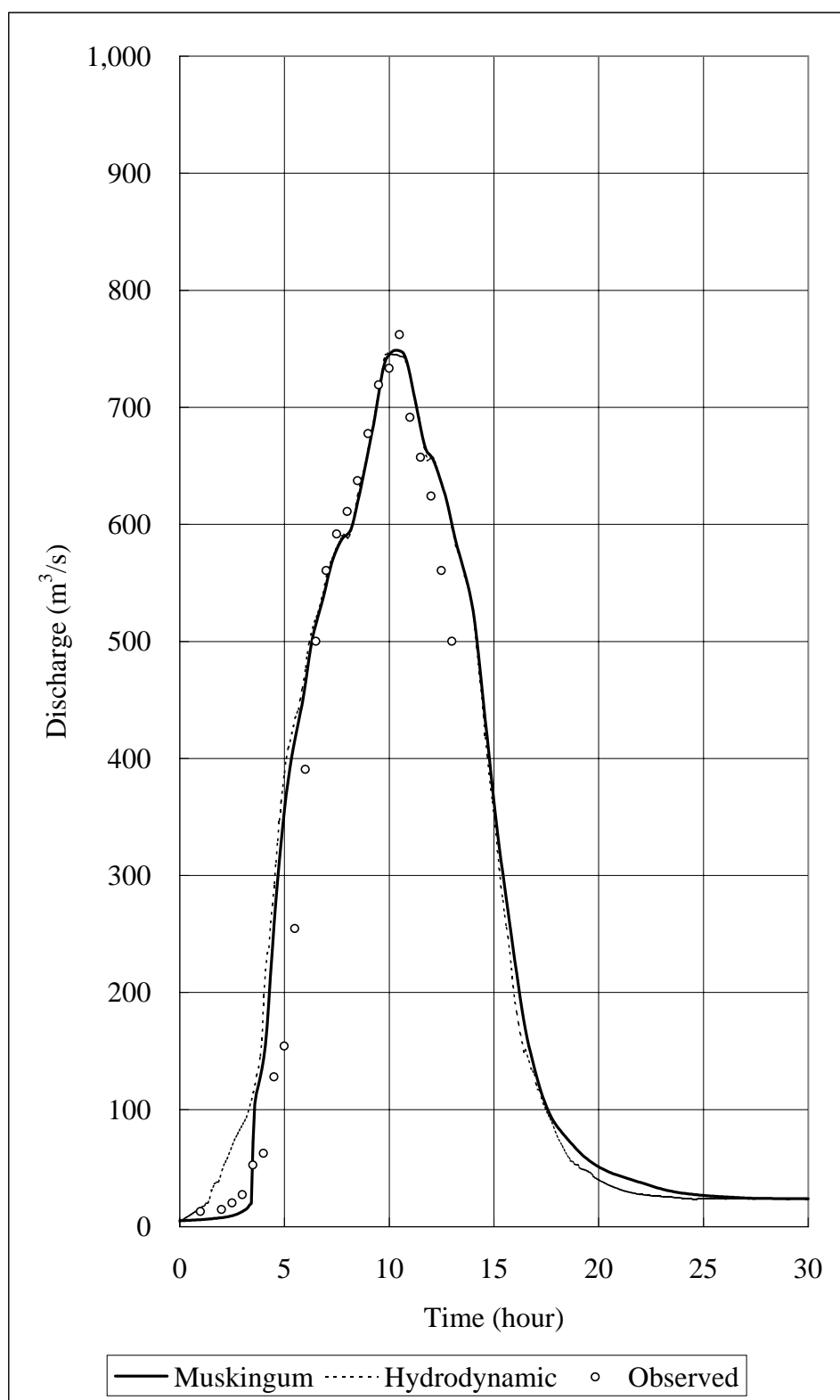
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN KINGDOM OF MOROCCO

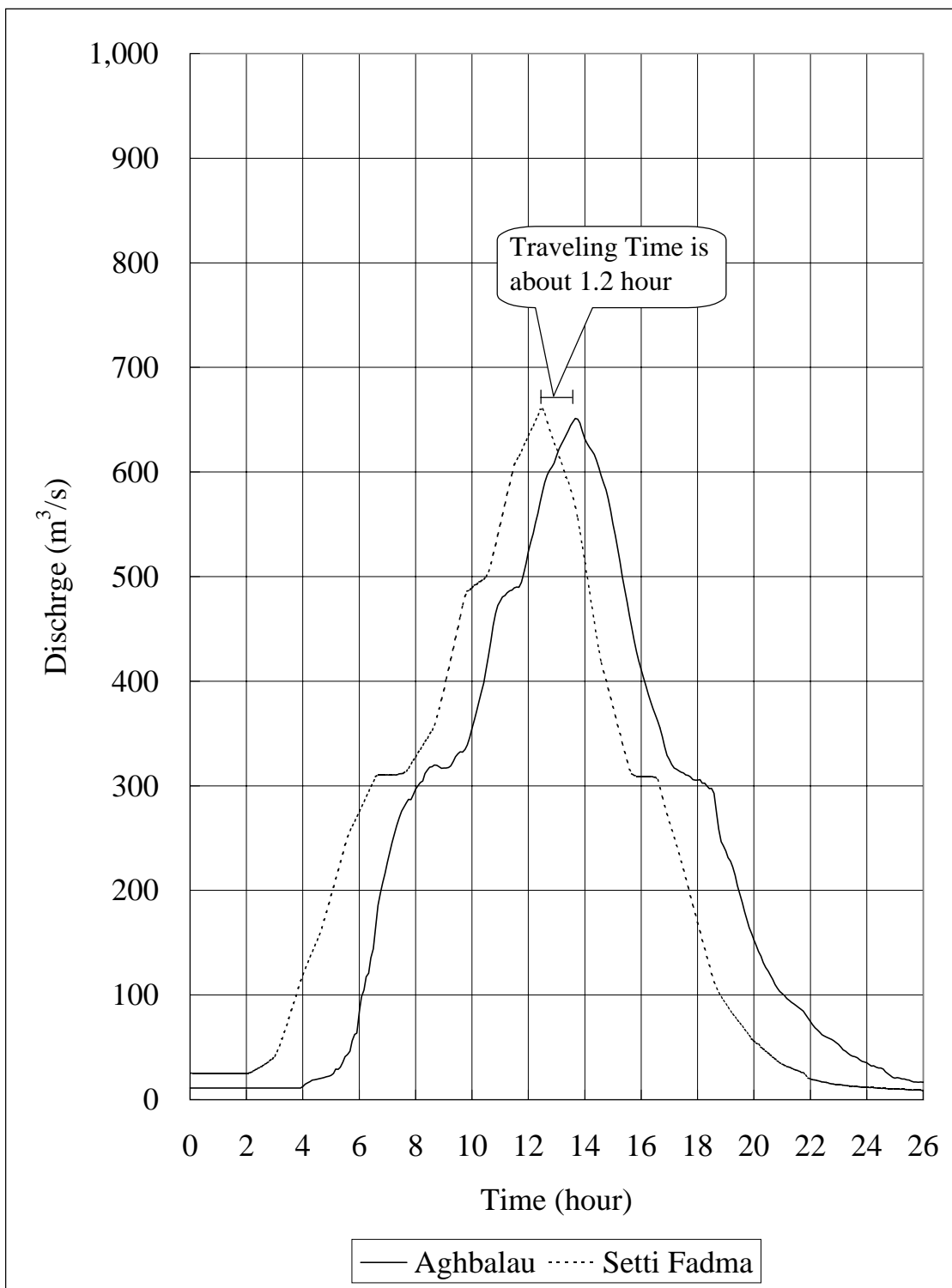
Fig. D.3.10 (3/4) FLOOD MAP OF ISSYL RIVER
(50 YEAR FLOOD)



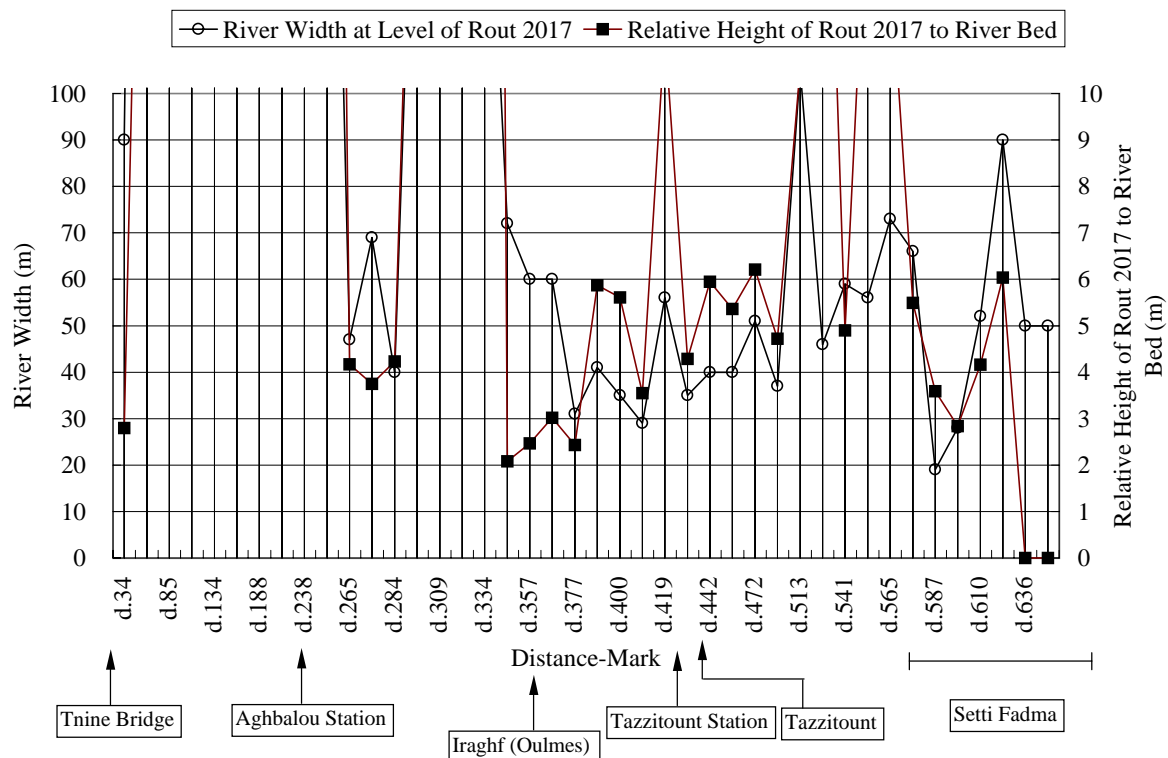
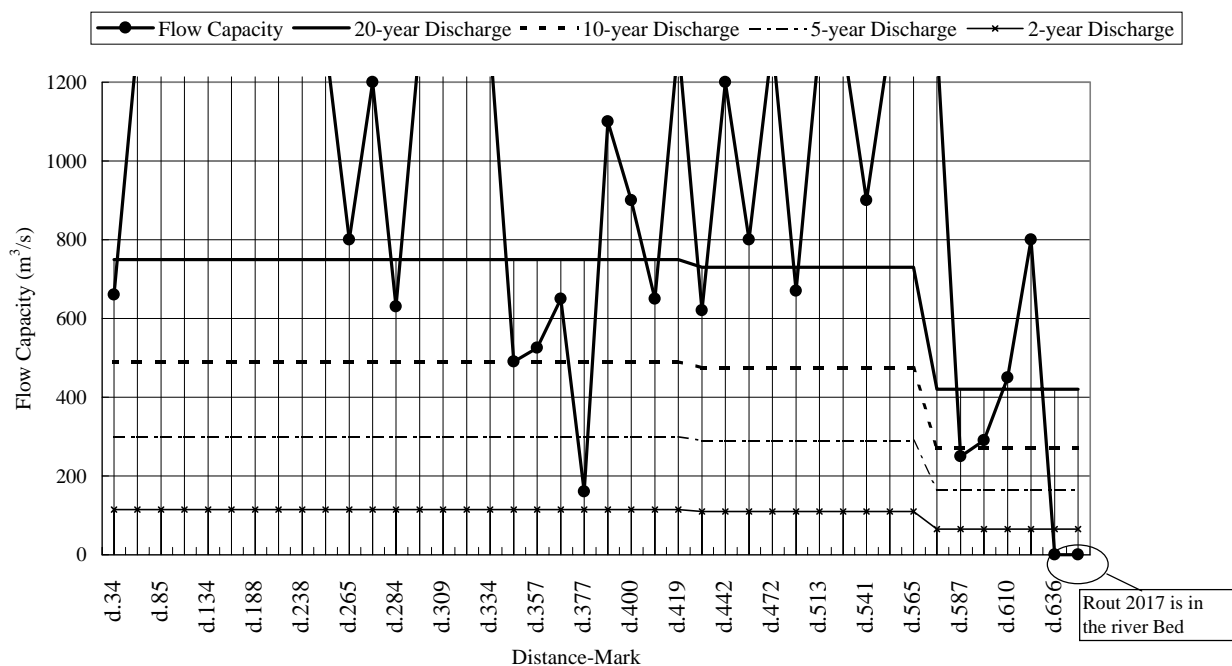
THE MASTER PLAN STUDY ON
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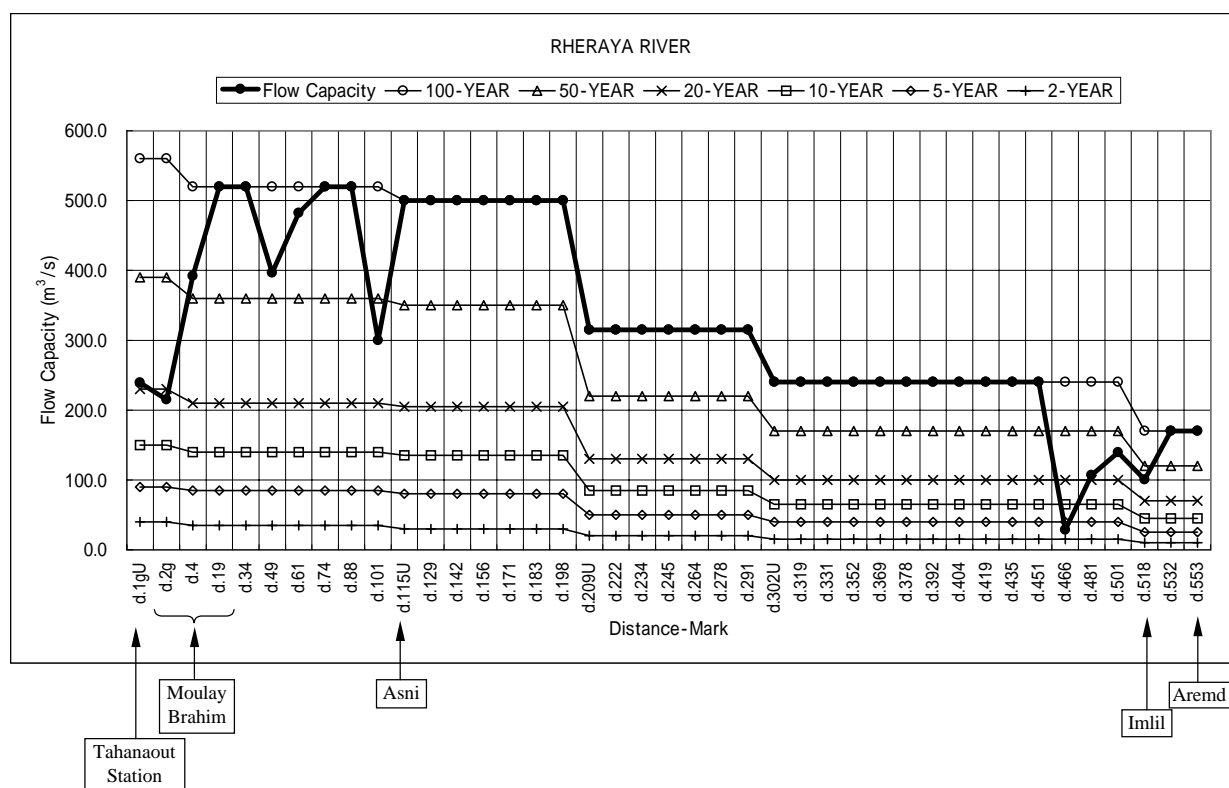
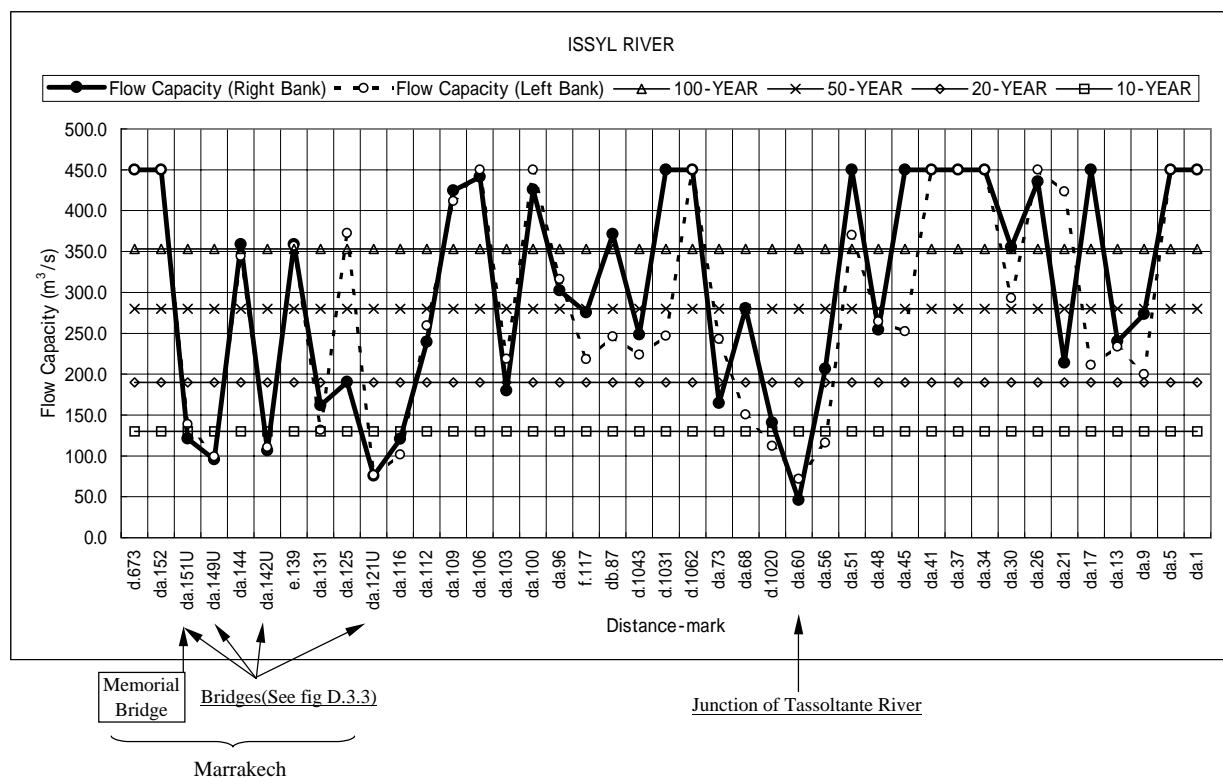
Fig. D.3.10 (4/4) FLOOD MAP OF ISSYL RIVER
(100 YEAR FLOOD)





* Simulation for examination of traveling time carry out without lateral flow from tributaries





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

**Fig. D.4.3(2) FLOW CAPACITY OF RIVER
(RHERAYA AND ISSYL)**

APPENDIX E

SOCIAL SURVEY

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

APPENDIX E SOCIAL SURVEY

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APPENDIX E SOCIAL SURVEY

CHAPTER 1. BASIC CONCEPT AND APPROACH FOR SURVEY

1.1 Background Information and Objectives of Survey

The study area was struck by flash flood and debris flow on August 17, 1995 and October 28, 1999 and these particular hazards heavily affected some communities by claiming a number of human lives and property. Above all, people who used to live almost hand to mouth have suffered a heavy blow for their lives. These two disasters caused a serious damage to the local communities socially and economically and are, therefore, still fresh in people's mind as the worst calamities ever had.

Social survey needs to be conducted as part of the master plan study. It is expected to provide all available materials on social issue for making a basic concept and framework of the plan. For this purpose, it is important to begin with collection of accurate and reliable information on disastrous damage over the area, and if such information and data are properly furnished, strategic approach can be determined for conducting an effective survey. Objective of the survey is to confirm or to make clear the following:

- (a) Actual damage conditions by flash flood or debris flow in study area,
- (b) Perception and reaction of local residents to natural disaster,
 - Method and time lag of perception
 - Evacuation and warning
 - Hazard management and disaster preparedness
 - Group activities for rescue operation and restoration
- (c) Willingness to participate in the Government plan, and
- (d) Rural environment and social conditions.

Prior to the commencement of the survey, demographic data and information were assembled from Al Haouz Province and Prefecture of Sidi Youssef Ben Ali. Although the data is based on 1994 census, it could be effectively used for estimating an up-to-date population and its density at each Commune level. Furthermore, the number of Communes involved and administrative jurisdiction in the study area were made clear through the document called "*Données Monographiques*" to facilitate social survey.

1.2 Methodology of Social Survey

Social study was conducted by means of questionnaire and direct interview with people in selected douars damaged by flood or vulnerable to the attack of natural disaster. Discussion and coordination with DRH counterparts as well as local authorities concerned have been made in an effort to achieve study objectives. Practically, the interview and questionnaire surveys started on May 5th, 2000 and ended on June 20th of the same year in collaboration of DRH personnel in Marrakech.

The survey approach has been carefully considered particularly for determining number of samples and selection of proper douars. These are fundamental factors in carrying out an effective work in a limited period for an extensive study area. In this regard, further details are described as follows:

1.2.1 Identification of Flood-damaged Douars

Number of flood-damaged douars and their respective locations need to be identified prior to the commencement of field survey. In fact, this work is hardly achievable without cooperation of Al Haouz Province. Therefore, the letter was delivered to the province through DRH asking for a listing of douars that have been damaged by floods and are susceptible to floods. By keeping a close contact with the Province, information has been received in facsimile from local authorities addressed to the governor. The basic information was obtained in such a way by relatively quick action of the local authorities, and it is confirmed that there are 250 flood-damaged douars and 152 are menaced by floods over the extensive area of Al Haouz Province (refer to Table E.1.1). In general, floods have not claimed many lives of local people but caused damage to their lands and rural infrastructure. However, the damage magnitude has not been clear enough.

1.2.2 Selection of Douars for the Survey

In view of the fact that there are a great number of villages listed in flood-damaged douars as mentioned above, douars need to be selected to provide suitable number for conducting interview and questionnaire surveys. It should be noted that douars in Cercle Amizmiz can be removed from eligible villages for the survey as those are located outside the boundary of study basins. Judging from time constraint and accessibility to Douars, the target number of samples was set to be 500, which may be considered as a required number to assure statistical reliability.

Based on discussions with local authorities and a document titled “*Identification des Zones Inondables dans la Province d’Al Haouz*” prepared in 1996 by Al Haouz Province, 34 douars have been selected for the interview and questionnaire surveys. This number is determined in such a way that one full day will need to be spent for the survey at each douar and 15 samples are supposed to be collected on the daily average. As the survey team is composed of five *enquêteurs*, daily working capacity is limited, and according to the experience in preliminary survey, 15 samples may be optimum and reasonable number as a daily-based sample collection.

In selecting the above douars, following conditions were taken into consideration and mutually agreed between the survey team and local authorities concerned:

- Being seriously damaged by the disaster of 1995 and/or 1999,
- Being struck by disaster caused by flood rather than debris flow,
- Providing relatively easy accessibility to the site, and
- Being typical and representative community in the area in terms of culture and socioeconomy.

List of douars selected as such is given in Table E.1.2 and their respective locations are shown in Fig. E.1.1.

1.2.3 Major Components of the Survey

Question form for both interview and questionnaire was tentatively prepared expecting to collect information about social characteristics as well as public awareness of natural disaster. In this connection, flood years in question are limited to 1995 and 1999 for the convenience of survey because these two years are notorious for giving heavy blows to the local people and still fresh in their memory. The form of interview is somewhat different from that of questionnaire and is composed of mainly four sections, i.e. (1) general information of the family or village, (2) land ownership, (3) socioeconomic situation, and (4) flood information. Spaces are provided particularly in the last section for detailed description.

For interview survey, three samples need to be collected from each douar, and a chief of village, so called *Moquadem* and two residents have to be selected for this purpose. It is anticipated to gather detailed information on the 1995 and 1999 disasters. In addition, the situation of rural infrastructure and flood damage magnitude can be made clear at small community level through the interview with the chief of village.

For questionnaire, on the other hand, twelve samples are required from residents selected at random in each douar. Optional answers are provided in the form so it seems that questions are rather simple and clear for respondents if compared to those for interview. The questionnaire also contains four major subjects. These are related to (1) household economy, (2) details of reaction to 1995 and 1999 disasters, (3) damage experience and its magnitude, and (4) perception of natural disaster.

From the above considerations, preliminary survey was conducted in three different douars by keeping a pace of one village a day. It is an unavoidable step for *enquêteurs* to have an idea of the way of questioning. Through the 3-day trial survey, questions were occasionally modified and adjusted for respondents to get interested in the questions and to make proper answers.

The form of interview survey and finalized questionnaire were both submitted to ABHT on May 2 for approval, and real survey began on May 5 with Douar Tiguemmi in C.R Ourika.

CHAPTER 2. ANALYSIS OF OUTPUT DATA

Field survey has been successfully completed in the 34 selected douars as mentioned in the previous section, and total number of collected samples is as many as 513, out of which 411 are answers to questionnaire and the rest are from the interview. Knowing the fact that illiterate rate is quite high in this study area, man-to-man interview system was adopted even for questionnaire survey, and as a result all delivered forms were filled in and returned to the team without any exception.

Essential data and information were extracted from collected samples and inputted into computer to facilitate analysis work. By going through such a process, social environment, economic situation and public awareness of natural disaster can be made visible. Based on data produced by the sample analysis work, the survey results can be described as follows:

2.1 Social Environment

Information on rural infrastructure and social environment was assembled through the interview survey with a chief of each selected douar called "*Moquadem*" or "*Cheikh*", and general characteristics of the community in terms of social environment are summarized as follows:

- Transportation service is available only in 23 douars where artery road is passing nearby. In general, the service is not officially authorized and may be rendered a few times a day for village people by privately owned vehicle(s).
- Among 34 selected douars, dispensary is found in 6 sites only. These are locations where medical doctor or local authority is residing, or social infrastructure is relatively developed to provide better living environment, Imlil is a good example in this regard as there is neither doctor nor local authority but a midwife.
- Primary school can not be found in 9 sample douars, but children go to school in the neighboring village which is generally a few kilometers away from their own. With regard to number of classes, it varies depending on community scale. There are only 1 to 2 classes in small douar, but on the other hand it is likely to be a large Douar if there are more than 5 classes such as Centre Asni, Talat N'Yakoub and Arba Tighedouine.
- Although rural electrification is now in process of development in the province, there are 16 non-electrified villages accounting for 47 % of the total number of sampling sites. Electrification seems to be more difficult for villages located more than 1 km away from the trunk road.
- Main sources of drinking water are spring and wells. Basically water is rich in both quality and quantity all year round except some douars such as Ait Ben Aamr, Anrar, Tachdirte. River water is also being used for drinking water in some communities of C.R Setti Fadma, but local people express the concern about quality deterioration in mid-summer due to the wastes dumped by the tourists. River water is playing an important role in supplying irrigation water by open ditch canal called "*Seguia*". Water supply system by ONEP is installed only in Moulay Brahim and Sidi Youssef Ben Ali.
- For urgent communication with local authority, telephone can be used only in 6 douars among the said sampling sites in the province. Should a caidat office be located in the same douar such as Arba Tighedouine, Centre Asni and Talat N'Yakoub, it will be certainly much easier to get in touch

with him at any time. However, for communities situated several kilometers away from the route, people have to walk or take a ride on mule or bicycle down to the road and then make use of transportation service therefrom to the caïdat office.

- As many people visit to spend their summer holidays in Setti Fadma in the Ourika River Basin as well as Asni and Moulay Brahim in the Rheraya River Basin, tourist business is being activated as an important income source of the local residents. Therefore, hotels, restaurants and other tourist facilities are provided for visitors coming from every part of the country and even from Europe.

Based on the above information, social environment is further summarized at each douar level and it is presented in Table E.2.1.

2.2 Household Economy

From 411 samples collected by the questionnaire, information on household economy is made available to help represent characteristics of rural economy in the study area. In general, the answer to questionnaire was given by the chief of each household selected by random sampling method.

Agriculture is predominant in the study area as the base of regional economy so respondents are basically farmers being engaged in small-scaled agriculture. However, agricultural income is apparently insufficient to make their living. Under these circumstances, their lives can not be guaranteed without resort to income from other sources. The average of household economy in the Province is shown below:

<u>Annual income</u>	: 20,763 Dh	<u>Annual expenditure</u>	: 19,958 Dh
Agriculture	: 12,338 Dh	Foods	: 14,604 Dh
Non-agriculture	: 8,425 Dh	Others	: 5,354 Dh

Further details on household economy are presented in Table E.2.2, and based on these data and information, current economic situation in the study area can be explained as follows:

- An average household consists of 6 to 9 persons. This number has been proved by 203 respondents or 49 % of the total number of samples, and then followed by 10 to 14 persons as a result of 102 respondents or 25 % of the same.
- Agricultural income is estimated at 12,338 Dh a year corresponding to about 59 % of the total annual income. This amount is insufficient for a family to survive on and even too small to cover up for food expenditure.
- Income sources other than agriculture are indispensable for almost all families to live on. Some communities in Setti Fadma and Asni can benefit from tourist business, and their earnings may be more than agricultural income. For the rest of communities, people definitely need to get employed to support family regardless of whether permanently or non-permanently.
- Although people are engaged in agriculture, annual spending for foods is estimated to be 14,604 Dh. This figure will account for 73 % of the total expenditure and shows a very symbolic farming situation of the study area that crop production is hardly enough to achieve self-sufficiency.
- Meanwhile, food expenditure is only 5,202 Dh a year for an average respondent of Sidi Youssef Ben Ali, which is about 30 % of total annual spending. It is likely to be underestimated. The

average income of people in Sidi Youssef is 17,337 Dh, about 3,000 Dh less than that in the province. However, about 70 % of annual income is spent on other purposes to keep up with urban life.

- With regard to land scale, people in the province are farming about 1.3 ha of land on the average. It is so called “*Melk*” or private property. Traditional irrigation system called “*Seguia*” is developed in the area covering about 2/3 of the land for cultivation of mainly barley and cash crop trees such as olive, prune, apple, cherry, etc. The land use of a standard family is classified as follows:

<u>Total land area</u>	: <u>13,324 m²</u>
Rain-fed land	: 4,286 m ²
Irrigation land	: 8,855 m ²
Plantation	: 6,649 m ²
Housing area	: 183 m ²

- Livestock is playing major part of income source for farmers of remote area in Zerkten, Setti Fadma and Talat N’Yakoub. Flock of animals can be seen in these communities. As a result of survey, an average household in the study area owns 6 to 7 goats and 3 to 4 sheep. Cattle raising is not developed in this area, and usually one household keeps one or two cattle for milking or plowing whichever more convenient, and it also keeps one mule or donkey to be used for transportation.

2.3 Perception and Reaction of Local People to Natural Disaster

This item presents description of people’s reaction and consciousness of natural disaster which are based on the summary of answers to questionnaire on 1995 and 1999 disasters (refer to Table E.2.3).

2.3.1 Perception of Disaster

To the question “*Did you perceive possible attack of disaster ahead of time?*” 365 people answered with “*Yes*” for 1995 disaster and 349 people for 1999. This means that people who did not become aware of disaster are 91 and 64 respectively. Many of these people were probably not staying in flood-prone area or near steep tributary called “*Chaabas*” in Arabic.

To the people who answered with “*Yes*” in the above question, next question was raised to ask “*How did you perceive or get informed?*” and plural answers were received in optional way. It should be noted that local people are sensitive to unusual weather conditions in the upper river basin and symptom of disaster produced thereby. Through the past experience and by weird sound from the upper basin, a number of local people can predict the disaster at more than one hour before its occurrence. These two methods are overwhelming as traditional way of perception of disaster. It can be proved by more than 85 % of answers at both 1995 and 1999 floods. In relation to the perception, the output of questionnaire is tabulated below:

Means of Perception

Classification	1995		1999	
	Answers	%	Answers	%
1. Weather forecast of TV	2	0.5	5	1.2
2. Weather forecast of radio	4	1.0	4	0.9
3. Prediction based on past experience	192	49.2	297	69.9
4. Sound from upstream basin	140	36.0	82	19.3
5. People's shout and scream	43	11.0	30	7.1
6. Information from chief of village	6	1.5	7	1.6
7. Others	3	0.8	0	0.0
Total	390	100.0	425	100.0

In addition, time of perception needs to be cleared in a series of questions and answers to such a question are given in the following table:

Time Lag for Perception of Disaster

Classification	1995		1999	
	Answers	%	Answers	%
1. More than 1 hour before the disaster	177	49.3	251	73.2
2. 30 min – 1 hour before the disaster	64	17.8	36	10.5
3. 15 – 30 min before the disaster	45	12.6	24	7.0
4. 5 – 15 min before the disaster	55	15.3	27	7.9
5. just before the attack of disaster	18	5.0	5	1.4
Total	359	100.0	343	100.0

2.3.2 Evacuation

According to the collected data through survey, the number of respondents who made an evacuation is 163 in 1995 disaster and 89 in 1999 disaster respectively. These figures are corresponding to 36 % and 22 % of the whole respondents about this question. However, evacuation rate becomes a little higher if the question is limited to those who perceived possible attack of disaster as mentioned above. As a result, it could be understood that about 45 % of people evacuated in 1995 after disastrous symptom had been perceived, but it was reduced to nearly 26 % in 1999 case. This can be explained that unexpected heavy magnitude of disaster struck the area in 1995.

	<u>1995</u>		<u>1999</u>	
Evacuated :	163	(36 %)	89	(22 %)
Not evacuated :	285	(64 %)	314	(78 %)
Total	448		403	

As a matter of course, evacuation scale varies depending on topographic conditions of the community and its vulnerability to the attack of natural disasters, so the collected data was again put to use for making a confirmation of flood-damaged communities. From the above consideration, the number of evacuees was classified at each commune level and also by the river basin as shown in the following table:

Number of Evacuees in 1995 and 1999 Disasters

River basin	C.R.	1995 disaster		1999 disaster	
		Evacuee	Non-evacuee	Evacuee	Non-evacuee
R'dat	Zerkten	19	20	8	14
Zat	Tighedouine	8	42	4	42
Ourika	Ourika	17	47	15	48
	Setti Fadma	49	72	28	89
Rheraya	My Brahim	4	4	1	6
	Asni	26	35	12	33
N'fis	Ouirgane	8	23	5	23
	Imgdal	18	12	9	20
	Ijoukak	2	8	1	11
	Talat N'Yakoub	0	22	0	27
Issyl	S.Y. Ben Ali *	12	0	6	1
Total		163	285	89	314

* Sidi Youssef Ben Ali was not struck by 1995 and 1999 disasters, therefore information given above is based on 1982 and 1994 disasters

To the question posed to evacuees “*When did you evacuate?*”, In case of 1995, 60 people or 37 % of evacuees answered that it was “*immediately after noticing or getting informed*”. The second most answer is “*after the occurrence of disaster*” given by 54 evacuees accounting for 33 %. These two answers go to the opposite extreme to each other in a sense of risk management. However, the same tendency can be seen for 1999.

Almost all people run or walked with family and/or neighbors. Cars or motorbikes are hardly available for the local people. These machines are, rather, not best choice for evacuation. Some people evacuated with livestock if time allowed them to do so, but most of evacuees carried nothing with them.

There is no designated evacuation area in the study area so in case of emergency, people follow the path leading to the safety place wherever most convenient to them. They certainly go up on a hill or higher location nearby and stay for a while. In 1995 flood disaster, for example, 40 % of evacuees stayed in relative's house or mosque located in or out of their village and 6 % of people stayed on the roof as a narrow escape from disaster.

2.3.3 Warning

Although there is no sophisticated warning system in the community, About half of the people gave a warning or information to the family and neighbors immediately after noticing danger. Danger signal can be transmitted from one place to another by a loud shout of the people. In tourist places such warning was given to visitors by 55 local people at 1995 disaster and 21 people at 1999 disaster respectively. In this connection, survey data are summarized as follows:

Question: “*Did you give the warning?*”

Answer:

	<u>1995</u>	<u>1999</u>
Yes	221	152
No	172	172
Total	393	324

Question: “*To whom did you give the warning?*”

Answer:

	<u>1995</u>	<u>1999</u>
1. Neighbors	179	143
2. Family	162	132
3. Tourists	55	21
4. Villages located downstream	24	22
5. Chief of village	0	0
Total	420	318

2.3.4 Possible Measures for Damage Mitigation

People became more cautious about flood after being struck by heavy blow in 1995 and 1999, and 144 residents or about 35 % of all respondents took some measures subsequently to mitigate flood damage. The idea is on individual basis and not at community level under the strong leadership of the chief.

Mitigation measures are apparently related to the preparation for evacuation such as securing route and place and packing things to get ready for escape from disaster. These measures are of no practical use for preventives but may be the most realistic options under the present condition.

2.3.5 Relocation

As the present community is the identical place of origin for 371 people corresponding to 90 % of all respondents, it makes no sense to ask such a question as “*Did you know that your place is vulnerable to disaster prior to your immigration?*”. However, proper answers were returned from the rest of 10 %. Among those, 15 people answered “yes” and 26 were “no”. Probably they had no choice in selecting location at that time and have been living there ever since.

In considering the above conditions, a question was given to ask whether they wish to relocate their house to the safe place. Negative answer was returned from 273 residents, which account for 67 % of all. It seems to be quite hard for them to quit their home village even though the safety is not guaranteed. Main reasons are as follows:

- Financial problem
- Land problem
- Relationship with local community
- Employment opportunity

These are realistic reasons associated with social problems. Although there are 135 people who expressed the wish to relocate their house, they know that its realization is beyond their economic capability, and in fact it is not easy since they have already established closer ties with family-like society.

2.3.6 Restoration Work

According to the survey data, 397 people or 86 % of total respondents have participated in restoration works after disaster. These works were carried out on voluntary basis as the community is established on mutual aid system. The priority was given to the restoration of communal property, and works have

been done for immediate retrieval of their life support facilities such as access road, irrigation canal, water intake and so on.

Floods caused heavy damage to the above facilities and farmland but not to private houses. Therefore, a large number of people could take part in the restoration works for the public interest. Based on sample data collected, types of restoration work are shown below:

<u>Type of restoration work</u>	<u>Number of responses</u>
1. House of my own	65
2. House of neighbors	101
3. Access road	314
4. Schools, hospitals, etc	25
5. Others (farmland, irrigation canal, water intake, etc)	179
Total	684

2.4 Analysis of Damage

The majority of respondents gave an affirmative answer to the question whether or not debris flow and landslide occurred in the subject disasters. However, as a result of questionnaire survey, it is not clear whether the damage was attributed to flood or other calamities.

Based on information given in the interview with the chief of village, damage scale or magnitude in the 1995 and 1999 disasters can be made clear for the selected douars of the province. Meanwhile, Sidi Youssef Ben Ali was not struck by the disaster in the said years so that information shall be based on the only 1982-flood disaster because no damage has been informed for the 1994 flood. Thus, such damage is listed at each douar level and subsequently summarized at Commune level as shown in the following Tables:

List of Damage in Selected Douars in Al Haouz Province

River basin	C.R.	1995 disaster					1999 disaster				
		Dead	Injured	House	Live-stock	Land (ha)	Dead	Injured	House	Live-stock	Land (ha)
R'dat	Zerkten	0	1	4	0	6.0	0	0	0	0	4.0
Zat	Tighedouine	0	0	0	22	158.0	0	0	0	22	160.5
Ourika	Ourika	1	0	12	0	23.5	0	0	3	0	15.5
	Setti Fadma	132	25	83	151	72.0	0	15	7	0	88.0
Rheraya	My Brahim	5	0	0	0	2.5	0	0	0	0	3.0
	Asni	2	0	10	4	54.0	0	0	0	0	8.0
N'fis	Ouirgane	0	0	0	0	30.0	0	0	0	0	4.0
	Imgdal	7	2	2	303	11.5	0	0	1	0	6.6
	Ijoukak	0	0	0	0	3.0	0	0	0	0	10.0
	T.N Yakoub	0	0	0	0	6.0	0	0	0	0	5.0
Total		147	28	111	480	366.5	0	15	11	22	304.6

List of Damage of Sidi Youssef Ben Ali Prefecture

River basin	Municipality	1982 disaster				
		Dead	Injured	House	Livestock (head)	Land (ha)
Issyl	Sidi Youssef Ben Ali	0	15	25	30	0

The 1995 disaster claimed the lives of 147 people as shown in the above list. Most are said to be tourists, but some are local residents. From samples collected by questionnaire, the number of local victims is clarified to be 6 for the dead and 9 for the injured (refer to Table E.2.3). A number of victims are found particularly in popular holidaymaking spots of Setti Fadma such as Irghef, Aghbalou Tazitounte Asgaour.

With regard to damage to houses, the number in the above list includes 58 of partially damaged houses in 1995 and 5 of the same in 1999. Apparently the locations can be identified as heavily attacked sites which are almost the same as stated above. Meantime, Municipality of Sidi Youssef Ben Ali, part of Marrakech urban area, suffers recurrent disaster and 25 houses were damaged by 1982 flood. However, it is reported that 19 of those are small damage.

Taking a look at damage to livestock in 1995, goat ranks first in the number of loss reaching a total of 332 heads followed by sheep amounting to 139. The livestock loss is outstandingly high in Tizgui in C.R. Imgdal and Tiourdiouine in C.R. Setti Fadma. In 1999 on the other hand, it can be seen only in Arba Tighedouine.

Damage to the land gave a heavy impact to a great number of people. It is disclosed by the questionnaire that about 75 % of respondents had damage to their respective farmlands in 1995. The number was reduced to 64 % in 1999 but still shows high average. Damage is mainly to the cultivated land rather than plantation. In this regard, Anammer in C.R. Tighedouine was hit most seriously among all selected douars.

Besides damage listed above, many tourist facilities were also hit by floods, and hotel and cafe or restaurant were heavily destroyed in holiday spots of the Ourika, Rheraya and R'dat River Basins. Moreover, floods caused a lot of damage to water supply facilities such as water mill, water intake and irrigation canal and also destroyed road and bridges, by which communication with other communities was completely cut off.

It should be noted that numerous vehicles were flushed out by the 1995 flood. The number of lost cars is not clear but it is estimated at 200 according to the survey. Cars are owned by holidaymakers visiting to such tourist places as Asgaour, Irghef and Aghbalou in C.R. Setti Fadma as well as Imlil in C.R. Asni.

Further details of damage in each selected douars are shown in Tables E.2.4 and E.2.5.

2.5 Local Interest in Flood Forecasting and Warning System

From the past dreadful experience local people are cautious about natural disaster, and therefore positive answer was given by about 83 % of respondents to the question whether they want to participate in evacuation drill. This kind of drill has never been practiced in any community in the study basin.

People also expressed an interest in some technical system in order that predictive flood information can be disseminated to them in advance. Naturally, they are not familiar with flood forecasting and warning system but expect some measures to be taken by the Government for the protection of their lives and property.

In consideration of the above, a question was raised to ask if flood forecasting system is necessary for their village, and answer with "Yes" was received from 465 people accounting for 97 % of all respondents. Among them 380 people answered that they are willing to contribute themselves to the task of operation and maintenance of the system if required.

For further detailed description about the contribution, the type of services is provided in the questionnaire to be at their option and plural answers were accepted in this connection. As a result following answers were obtained:

	<u>Type of contribution</u>	<u>Answers</u>
1.	To be voluntarily engaged in radio communication during flood period	278
2.	To keep watch on communication equipment	244
3.	Any possible work if required	45

2.6 Weather Description

Based on information collected by the interview with local residents, detail of weather conditions of disastrous day can be made clear. Information is picked up from flood-damaged Douars or representative communities in each river basin and may be characteristically described as follows:

1995 disaster

(1) The R'dat River Basin

(a) Tazlida-Tabahgate, C.R. Zerkten

The weather was good in whole morning even if it was partially clouded. From noon to 16:00 it was thundering and lightning and became rainstorm between 16:00 and 19:00. The first flood occurred at around 19:00, then it was followed by the second flood about half an hour later.

(b) Ait Ben Aamr, C.R. Zerkten

From the daybreak it was cloudy and hot, and from noon black clouds started to cover upper river basin. There was thunder and lightning at 16:00 and it started raining at 17:30. It became stormy afterward, and as a result disaster struck the village at 18:30.

(2) The Zat River Basin

(a) Anammer, C.R. Tighedouine

The sky was clear until 10 a.m. but it was very hot in the morning. The rain began to fall at 16:00 accompanied by thunder and violent wind from the south. The village was struck by the disaster at about 20:00 with heavy rainfall.

(b) Arba Tighedouine, C.R. Tighedouine

It was cloudy in the morning and hot until 17:00. The rain accompanied by thunder started to fall at 18:00 but this weather phenomenon could be seen only in the upper basin of the Zat River. Flood occurred at about 20:00.

(3) The Ourika River Basin

(a) Tiguemmi, C.R. Ourika

The sky was clear during the daytime. The rain started to fall around 19:00 and it was thundering at that time but some people did not hear it. People were taken by surprise at the sudden attack of flood that occurred at 19:30.

(b) Aghbalou, C.R. Setti Fadma

It was hot weather from 5 a.m. to 5 p.m. and then clouds appeared to cover the sky with violent wind. There was a little rainfall at 19:00 but about 20 minutes later it became torrential downpour and caused blackout thereby. Flood occurred around 19:30.

(c) Irghef, C.R. Setti Fadma

From the morning until 3 p.m. the weather was fine, but afterward it was becoming cloudy and started raining and thundering around 16:30. It became hard rainstorm at 17:30 and about 2 hours later flood attacked the area.

(d) Tazitounte, C.R. Setti Fadma

It was fine and hot weather in the morning, but clouds appeared and moved toward the south in the afternoon and about 16:00 the sky was finally covered with black clouds causing thunder and violent wind. It became a rainstorm at 18:30 and the first flood occurred just 15 minutes later then followed by the second flood in 15 minutes afterward causing heavy damage.

(e) Asgaour, C.R. Setti Fadma

The weather was good until 4 p.m. and then it became a cloudy sky accompanied by thunder and strong wind. The rain began to fall at 17:30 and kept pouring down. Around 19:30 the river flooded massively and it continued for about half an hour.

(f) Anfli, C.R. Setti Fadma

It was hot weather and clear sky till 4 p.m. From 16:00 the sky was going to be covered with dense clouds and around 17:00 there was heavy rainfall accompanied by thunder and hail. The area was struck by disaster at 18:30.

(g) Tiourdiouine, C.R. Setti Fadma

It was a little cloudy and very hot in the morning. Around 14:00 black clouds started to accumulate and cover the sky and heat increased accordingly. At 17:00 there was thunder and lightning and it was hailing when wind blew violently. The rain also started to fall almost at the same time and the area was attacked by the first flood at 17:30 and by the second flood at 17:50.

(4) The Rheraya River Basin

(a) Imlil, C.R. Asni

It was a clear sky and very hot until 2 p.m. From 16:00 clouds appeared to cover completely the sky and strong wind was blowing from the west to the east. Torrential downpour accompanied by thunder continued for about 90 minutes. Flood occurred at 17:30.

(b) Centre Asni, C.R. Asni

The weather was fine but very hot. The sky was covered with black clouds at about 15:00, and wind was blowing from the south to the north and one hour later it became violently. At 17:00 the river flooded over the area.

(5) The N'fis River Basin

(a) Tizgui, C.R. Imgdal

The sky was clear with high temperature in the morning. In the afternoon there was thunder and violent wind blowing from the south. At 16:00 the sky was covered with dense clouds and thunder continued to rumble. There was heavy rainfall at 17:00 and one hour later disaster occurred.

(b) Talat N'Yakoub

It was a clear sky with high temperature before noon. When thunder started to rumble around 12:00, people were scared and evacuated from the river. There was rainstorm at 16:30 and disaster occurred at around 18:00.

1999 disaster

(1) The R'dat River Basin

(a) Tazlida-Tabahgate, C.R. Zerkten

It was raining all day long but no flood occurred.

(b) Ait Ben Aamr

It was raining for a couple of days. Flood occurred on the second day at 16:30 at the time when rainfall intensity became high.

(2) The Zat River Basin

(a) Anammer, C.R. Tighedouine

The rain continued to fall for 24 hours. Flood occurred on the following day at 16:00 and this massive flow continued for about 4 hours.

(b) Arba Tighedouine, C.R. Tighedouine

There was no thunder nor lightning but rain for the whole day. The area was flooded at 16:00

(3) The Ourika River Basin

(a) Irghef, C.R. Setti Fadma

It was raining during the whole morning. The river flooded at 10:00 but its peak was around 14:00. Flood situation remained for 3 days.

(b) Anfli, C.R. Setti Fadma

There was 24 hours of rainfall before the occurrence of flood that is to be around 14:00. The rain continued to fall for 6 or 7 days.

(4) The Rheraya River Basin

(a) Imlil, C.R. Asni

The rain continued to fall for 48 hours before the disaster. Flood occurred around 17:00 and the area remained flooded for 6 days.

(b) Centre Asni, C.R. Asni

It was raining for 24 hours before the occurrence of flood. The river flooded at 3:00 a.m. but the rain still continued to fall.

(5) The N'fis River Basin

(a) Tizgui, C.R. Imgdal

There was one full day of raining before flooding. It occurred at 15:00 but peak flood time was around 16:30.

(b) Talat N'Yakoub, C.R. Talat N' Yakoub

Flood occurred at 6:00 a.m. after raining for 24 hours. Progressively it was becoming massive and reached its peak at 10:00.

Besides descriptive information given above, the Municipality of Sidi Youssef Ben Ali suffered floods by the Issyl River in the past few decades. In this regard, a brief description can be added for the year 1982 and 1994.

1982 flood

It was raining in the morning and people were surprised by a sudden attack of flood at about 16:00.

1994 flood

The rain continued to fall during the whole morning. The thunder started rumbling around 16:00 and nearly three hours later flood occurred.

CHAPTER 3. EVALUATION

3.1 Public Concern

Master plan needs to be evaluated from the viewpoint of social aspect so it has to be discussed as a matter of public concern in order to recognize its significance for the local people. Based on all output data and information of the interview survey, social characteristics of the communities in the river basins can be summarized as follows:

- Rural infrastructure and availability of public services are still far beyond the satisfactory level,
- Although agriculture is the base of regional economy, crop production is not sufficient to cover their own consumption,
- Apart from agriculture, employment opportunity can be hardly found in the study area, and
- As a result, young manpower is flowing out of the village to be engaged in other income sources in urban area as a means of economic support for the family.

From the above situation, it is understood that local people are in a very hard position from a socioeconomic point of view. They eke out a living from day to day. Under such a precarious living condition, it is somewhat difficult to call their attention to the flood forecasting and warning system.

However, local residents realize the necessity to take some preventive measures against natural disaster for securing their lives and property, but they do not know what to do and how to approach this question, and consequently, no pre-emptive action has been taken by themselves. They expect that the Government will show them an idea of alleviating threat to disaster and take necessary measures to mitigate flood damages. It means there is no way to go ahead without leadership of the Government.

Evacuation drill or exercise may be a good example. People have never experienced in such a drill or exercise, but about 83 % of them gave an affirmative answer in the interview survey to participate in the drill if the authority would plan it. It is further important to consider the fact that 97 % of all respondents answered that the flood forecasting and warning system is necessary for the security of their communities, and many of them are even disposed to contribute something to the said system. It is apparent that people do not know what the system is like technically, but they are well aware that it is something quite useful for flood prediction.

Giving consideration to the above message from the local people, the Government is required to take the initiative in giving them guidance on risk management for natural disaster and should take action at the earliest time possible to motivate people's mind. In this regard, it should be noted that cooperation with other institutions and agencies concerned is absolutely important to attain satisfactory result.

3.2 Perspective and Justification of the Plan

As master plan is intended to outline a comprehensive task-oriented approach to the regional development, it will certainly help improve the present situation for public interest. The plan should be socially acceptable and mutually understandable between the proponent and residents/stakeholders. Therefore, public opinion and people's reactions to the plan have been fully examined in the social study and as a result, there seems to be neither controversial issue nor negative observation.

The following are main points to keep careful watch on and can be expected to come true for the benefit of local communities and residents:

- To enhance people's reaction capability and their consciousness of disaster preparedness and management,
- To develop self-reliance by promoting and encouraging the spirit of self-help and mutual assistance among local authorities and communities,
- To provide security coverage in disaster area ensuring the safety of human lives and minimization of property loss,
- To encourage tourist activities in holiday-making spots by taking measures on disaster prevention, control and mitigation, and
- To establish communication linkages between local authorities and their constituents and to make them available for information dissemination.

While flood forecasting and warning system is to be operated under the joint responsibility of ABHT, DPE and local Government, its effectiveness will largely depend on the skills, resources, and involvement of local authorities and communities. The plan comprises various aspects on non-structural measures and may not include significant requirement for large-scaled construction works and relocation of people. Therefore, it is not detrimental to the natural environment and will not cause a negative campaign by the general public against the plan. It is expected that the plan is beneficial to the emergency preparedness and may lead to the improvement of social environment.

TABLES

**Table E.1.1 NUMBER OF DOUARS DAMAGED AND MENACED BY FLOODS
IN AL HAOUZ PROVINCE**

Cercle	Caidat	Rural Commune	Number of Douars	
			Damaged	Menaced
Ait Ourir	Abadou	Tazourte	9	9
	Touama	Zerkten	20	20
	Mesfioua	Tighedouine	17	17
		Tidili Mesfioua	3	3
	Faska Sidi Daoud	Ait Faska	1	1
	Ghmate	Ghmate	2	2
	Sub-total		52	52
Tahanaout	Tahanaout	My Brahim	1	1
	Ourika	Ourika	5	7
		Setti Fadma	9	32
	Tamesloht	Tamesloht	0	3
	Sub-total		15	43
Amizmiz	Amizmiz	Amizmiz	2	4
	Ouazguita	Lalla Takarkoust	6	5
		Ouzguita	4	0
		Sidi Bedhaj	1	1
		Oulad Mtaa	4	4
	Guedmioua	Tizguine	1	3
		Anougal	5	2
		Dar Jamaa	0	4
		Azgour	6	3
	Sub-total		29	26
Asni	Asni	Asni	12	11
	Ouirgane	Ouirgane	13	0
		Imgdal	27	0
	Talat N'Yakoub	Ijoukak	35	2
		Talat N'Yakoub	26	18
		Ighil	22	0
		Aghbar	19	0
	Sub-total		154	31
Total			250	152

Source: Al Haouz Province in May, 2000

**Table E.1.2 LIST OF SELECTED DOUARS FOR SOCIAL STUDY AND
PUBLIC AWARENESS OF NATURAL DISASTER**

Cercle	Caidat	Rural Commune	Douar
Ait Ourir	Touama	Zerkten	Tazlida-Ait Moussa
			Tazlida-Tabahggate
			Ait Ben Aamr
	Mesfioua	Tighedouine	Ouayfirt
			Tazourte
			Anammer
			Arba Tighedouine
Tahanaout	Tahanaout	My. brahim	Rha My. Brahim
	Ourika	Ourika	Timalizen
			Asguine
			Taourirte
			Anrar
			Tiguemmi
		Setti Fadma	Aghbalou
			Iraghf (Oulmes)
			Tazitount
			Imintadart
			El kri
			Asgaour
			Anfli
			Tiourdiouine
			Timichi
Asni	Asni	Asni	Imlil
			Tachdirte
			Tansgharte
			Centre Asni
	Ouirgane	Ouirgane	Tororte
			Tassaouirgane
		Imgdal	Tizgui
	Talat N'Yakoub		Targua
		Ijoukak	Ouathkerri
Prefecture de Sidi Youseef Ben Ali		Sidi Youssef Ben Ali	Dougouj
			Talat NCB Bas
			Urban

Table E.2.1 SOCIAL ENVIRONMENT OF SELECTED DOUARS IN STUDY AREA (1/3)

R.C / Douar	Availability of transport service	Dispensary	School	Electricity	Source of water	Communication w/ Caïd	Distance (m)		Tourist business		
							River	Route	Hotel	Restaurant/ cafe	Shop
R.C. Zerkten											
Tazlida-Ait Moussa	no	no	yes (2 classes)	no	spring	mule/car	100	7,000	0	0	0
Tazlida-Tabahgate	yes	no	yes (1 class)	yes	spring	telephone/car	10	10	0	4	0
Ait Ben Aamr	yes	no	yes (1 class)	no	spring/ river	telephone	20	80	0	0	0
R.C. Tighedouine											
Ouayfirt	yes	no	no	no	spring/well	walk/rental car	1,000	1,100	0	4	0
Tazourte	yes	no	yes (2 classes)	no	river/well	rental car	400	1,000	0	0	0
Anammer	yes	no	no	no	well	walk/rental car	50	1,500	0	0	0
Arba Tighedouine	yes	yes	yes (5 classes)	yes	river/well	direct talk (Caïd in same Douar)	50	100	5	8	0
R.C. My Brahimi											
Rha My Brahimi	yes	no	no	yes	ONEP	radio/telephone	20	20	0	8	0
R.C. Ourika											
Timalizen	yes	no	yes (3 classes)	yes	spring/well	car/motorbike	50	150	0	0	1
Asguine	yes	no	yes (4 classes)	yes	well/canal	car/bicycle	500	0	0	4	10
Taourirt	no	no	yes (3 classes)	no	spring/well	car	500	3,000	0	0	0
Anrar	yes	no	no	yes	canal	car/motorbike	500	20	0	0	0
Tiguemmi	yes	no	no	yes	well/river	telephone/car	100	600	0	0	0

Note: Based on information gathered during the interview survey with a chief of each selected village called "Moquadem" or "Cheikh".

ONEP stands for Office National de l'Eau Potable or National Water Supply Office.

Table E.2.1 SOCIAL ENVIRONMENT OF SELECTED DOUARS IN STUDY AREA (2/3)

R.C / Douar	Availability of transport service	Dispensary	School	Electricity	Source of water	Communication w/ Caid	Distance (m)		Tourist business		
							River	Route	Hotel	Restaurant/ cafe	Shop
R.C. Setti Fadma											
Aghbalou	yes	yes	yes (4 classes)	yes	spring/river	telephone/car	500	500	0	4	10
Irghef (Oulmes)	yes	no	yes (4 classes)	yes	well/canal	car	10	10	5	14	0
Tazitounte	yes	no	no	no	spring/ river	car	20	10	0	1	0
Imintadart	yes	no	yes (4 classes)	yes	river	public transportation	10	10	0	0	0
El kri	yes	no	yes (5 classes)	yes	spring/river	car	70	50	24	10	0
Asgaour	yes	no	no	yes	river	rental car	150	50	9	4	0
Anfli	no	no	yes (3 classes)	no	river	mule & car	2,000	7,000	0	0	0
Tiourdiouine	no	no	yes (1 class)	no	river/canal	walk & car	500	9,000	0	0	0
Timichi	no	no	yes (1 class)	no	spring	walk & car	20	13,000	2	0	0
R.C. Asni											
Imlil	yes	yes	yes (5 classes)	yes	spring/river	telephone	100	80	4	7	0
Tachdirte	no	no	no	no	spring	walk & car	500	17,000	0	1	0
Tansgharte	no	no	yes (2 classes)	no	spring	walk & bike	500	5,000	0	0	0
Centre Asni	yes	yes	yes (7 classes)	yes	spring/well	direct talk (Caid in same Douar	500	100	1	15	0

Note: Based on information gathered during the interview survey with a chief of each selected village called "Moquadem" or "Cheikh".

ONEP stands for Office National de l'Eau Potable or National Water Supply Office.

Table E.2.1 SOCIAL ENVIRONMENT OF SELECTED DOUARS IN STUDY AREA (3/3)

R.C / Douar	Availability of transport service	Dispensary	School	Electricity	Source of water	Communication w/ Caïd	Distance (m)		Tourist business		
							River	Route	Hotel	Restaurant/ cafe	Shop
R.C. Ouïrgane											
Tortote	no	no	yes (4 classes)	no	spring/river	mule/walk	50	4,000	0	0	0
Tassaouïrgane	no	no	yes (1 class)	no	spring/river	motorbike	600	6,000	0	0	0
R.C. Imgdal											
Tizgui	no	no	yes (2 classes)	no	spring/river	truck	150	17,000	0	0	0
Targua	no	no	yes (4 classes)	no	river	walk/truck	150	12,000	0	0	0
R.C. Ijoukak											
Ouathkerri	yes	no	yes (1 class)	yes	spring	walk/bicycle	700	5	0	0	0
R.C. Talat N'Yakoub											
Dougouj	yes	no	no	yes	well	car	500	10	0	0	0
Talat N'Yakoub	yes	yes	yes (9 classes)	yes	spring/well	direct talk (Caïd in same Douar)	300	10	0	3	0
Pre. Sidi Youssef Ben Ali											
Municipality of Sidi Youssef Ben Ali	yes	yes	yes (300 classes)	yes	ONEP	telephone	20	-	0	0	0

Note: Based on information gathered during the interview survey with a chief of each selected village called "Moquadem" or "Cheikh".

ONEP stands for Office National de l'Eau Potable or National Water Supply Office.