

IX. SEMINAR TEXT (5 NOV 2003)

PROGRAM OF TECHNOLOGY TRANSFER SEMINAR

Wednesday, 5 November 2003

9:15 - 9:30	Registration at Al Haouz Province in Tahanaout
9:30 - 9:40	Opening Speech by Mr. ICHENNARN MOHAMED, Governor of Al Haouz Province
9:40 - 9:50	Welcome Speech by Mr. BENBIBA MAJID, Director of ABHT
9:50 - 10:00	Welcome Speech by Mr. Eihiko OBATA, Deputy Resident Representative of JICA Morocco Office
10:00 - 10:30	Presentation on Flood problems in the Atlas Region by Mr. Hassan Aresmouk, Chief Engineer, ABHT
10:30 - 11:50	Presentation on Mater Plan by Mr. Yoshiharu Matsumoto, Team Leader of JICA Study Team, and Discussion
11:50 – 13:10	Presentation on Pilot Project by Mr. Masami KATAYAMA, Deputy Team Leader of JICA Study Team, and Discussion
13:10 - 13:25	Break
13:25 - 13:45	Video Show on Debris Flow
13:45 - 14:30	Presentation on Coping capacity to flood disasters in mountain regions by Mr. Masayuki WATANABE, Chairman of JICA Advisory Committee
14:30 - 14:45	Demonstration of Debris Flow by JICA Study Team
14:45 - 15:00	Closing by Mr. ICHENNARN MOHAMED, Governor of Al Haouz Province
15:00	Dissolution



TENSIFT HYDRAULIC BASIN AGENCY

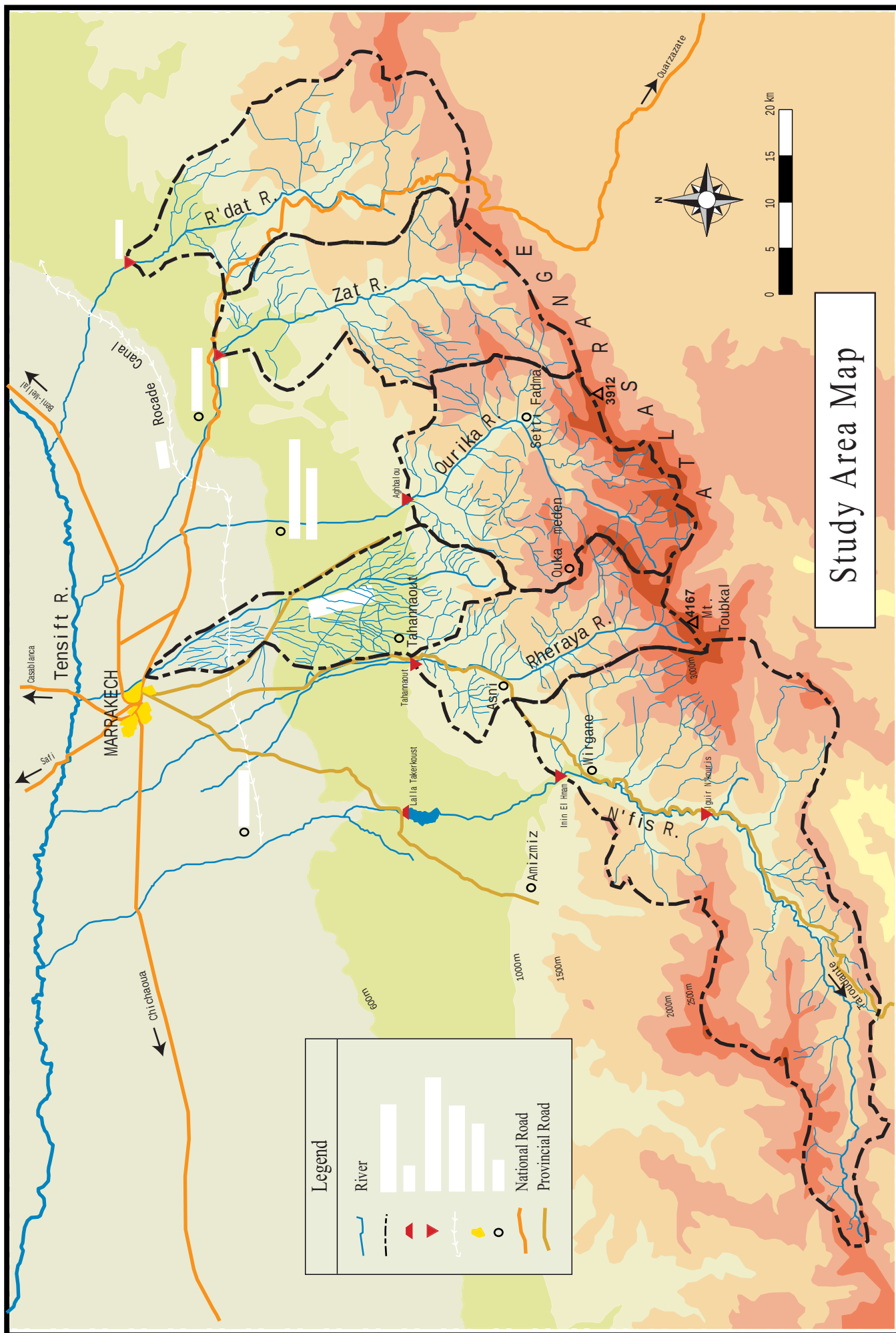


**JAPAN INTERNATIONAL COOPERATION
AGENCY**

**THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO
TECHNOLOGY TRANSFER SEMINAR
NOVEMBER 2003**



**CTI ENGINEERING INTERNATIONAL CO., LTD.
YACHIYO ENGINEERING CO., LTD.**



FLOOD FORECASTING AND WARNING SYSTEM OF THE OURIKA RIVER BASIN (PILOT PROJECT)

N

MARRAKECH



Centre informatique Principal de l'ABHT



DGH Monitoring Station
RABAT

Legend

- ABHT Master Information Center
- Monitoring Station
- Flood Watch Station (Rainfall)
- Flood Watch Station (Rainfall and Level Water)
- Telemetry Relay Station
- Warning System Relay Station
- Computer Network
- Warning System Radio Network
- Telemetry VHF Radio Network
- Warning Post



DPE Al Haouz

DPE

Al Haouz Province

Ourika Caida



Ourika Caida



Warning Post and Loud Speaker at Iraghf



Tazitount Station



Aoulous Relay Station



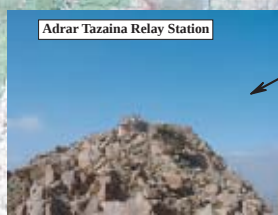
Tourcht Station



Ultrasonic Water Level Gauge at Tiourdiou Station



Agouns Station



Adrar Tazaina Relay Station



Amenzal Station

Scale

0 5 10 15 Km

KINGDOM OF MOROCCO
MINISTRY OF LAND PLANNING, WATER AND ENVIRONMENT
TENSIFT HYDRAULIC BASIN AGENCY
MARRAKECH

FLOOD PROBLEMS IN THE ATLAS REGION

AL HAOUZ PROVINCE

05 November 2003

BY MOHAMED EL HASSAN ARESMOUK

PRESENTATION

✓ EXCEPTIONNAL FLOODS WERE REPORTED DURING THE LAST DECADE ALL OVER THE NATIONAL TERRITORY, PARTICULARLY IN THE TENSIFT RIVER BASIN (95-96-97-98);

✓ PROTECTION AGAINST FLOOD IS GROWING AS ONE OF THE MAIN CONCERNS OF ALL SOCIAL AND ADMINISTRATIVE PARTIES : POLITICIANS, CITIZENS, SCIENTISTS AND TECHNICIANS...

CONTENTS

- ✓ PRESENTATION
- ✓ FLOOD CAUSES
- ✓ FORCASTING AND WARNING MEANS
- ✓ EFFORTS OF THE MINISTRY IN FLOOD PREVENTION
- ✓ METHODOLOGICAL APPROACH FOR FLOOD RISK MANAGEMENT

A✓ FLOOD CAUSES

PRESENTATION

- ✓ FLOODS AND THE RESULTING FLOOD INUNDATION ARE ORIGINALLY A HYDROLOGICAL PROBLEM;
- ✓ DURING THEIR GENERATION IN THE AREAS OF HUMAN ACTIVITY, THEY BECOME A TERRITORIAL PROBLEM WITH SIGNIFICANT SOCIAL AND ECONOMIC REPERCUSSIONS;

FLOODS GENERALLY PRESENT TWO ASPECTS :

- ✓ A **VIOLENT AND RANDOM PATTERN** : UNPREDICTABLE PHENOMENA THAT ARE REGARDED AS UNESCAPABLE AND RELATING MORE TO A FORCE MAJEURE ;
- ✓ THE FATALITY CULTURE RELATED TO FLOOD RISKS IS GRADUALLY SUBSIDING FOR A GROWING SENS OF **THE EXISTENCE OF HUMAN RESPONSIBILITIES** :

- THE POPULATION GROWTH RESULTING IN AN UNCONTROLLED CITY DEVELOPMENT;
- LAND USE IN THE PUBLIC HYDRAULIC DOMAINE AND THE CONCENTRATION OF ACTIVITIES IN RIVERBANKS;
- DEPOSITS OF VARIOUS TYPES IN RIVERBEDS;
- IGNORANCE OF RAINFALL WATER DRAINAGE IN COUNTRY PLANNING AND THE PRECARIY OF INFRASTRUCTURE;



ISSYL RIVER IN MARRAKECH : INCREASING NUMBER OF OBSTACLES TO FLOW



•Flash floods and debris flow:

- Very short duration;
- Lacal phenomena;
- Destructive power;



ISSYL RIVER IN MARRAKECH : GRAVEL AND WASTE DEPOSITS ON THE RIVERBED



OURIKA RIVER : OCCUPATION OF THE PUBLIC HYDRAUMIC DOMAINE

FLOOD CAUSES :

- IN THE MOUNTAIN AREA : cobination of two elements:

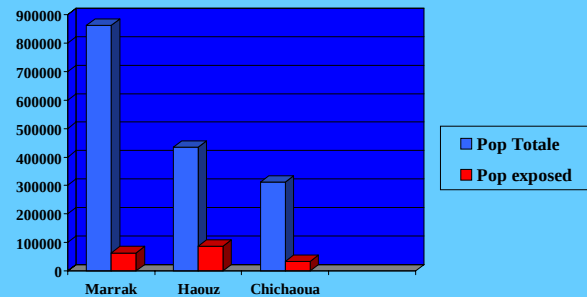
- extreme hydro-pluviometric phenomena (storms, stormy rainfall, violent floods,...)
- physical and geological characteristics (steep slopes, weak or absent vegetation, waterproof soil,...)

- IN THE PLAIN AREA :

- ignorance of rainfall water drainage in development plans;
- land use in the flood inundation area;
- flow into underground water in the bassins surrounding urban areas;

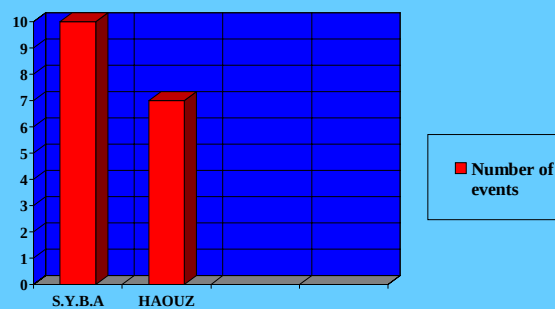
Population exposed to floods by Province

Marrakech : 861,151 (63,885-7.4%) - Al Haouz : 435,099 (87,761-20%)
Chichaoua : 311,799 (33,400-10.7%)



Statistics of important events

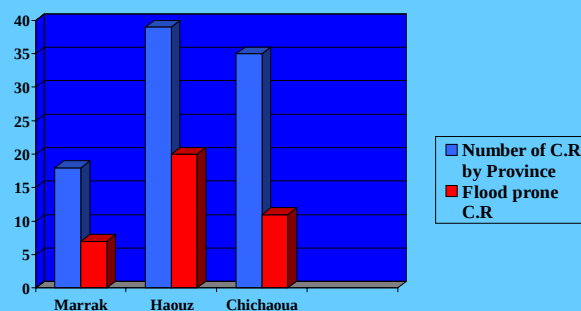
-Sidi Youssef Ben Ali :10 (45 years) - Al Haouz : 7



B✓ FORECASTING MEANS

Statistics of flood prone R.C. by Province

Marrakech :18 (7-39%) - Haouz:39 (20-51%) -Chichaoua : 35 (11-31%)



1-Meteorological forecast:

✓Short and middle term and BMS;

✓Means:

- Synoptic station network (40 stations);
- Satellite picture reception (Météosat and Trios);
- Radiosonde stations : Casablanca, Beni-Mellal, Dakhla, Agadir
- Meteorological radars (Casablanca, Khouribga, Fès, Larache, Agadir);
- Forecasting models:
 - Al BACHIR (Morocco specific);
 - ARPEGE (meteorological model - France);
 - CEP (european forecasting center model);
 - AL MOUBARAK and AL MASSIFA : on going;

2- Hydrologic forecasting :

- ✓ **Empirical formula;**
- ✓ **Probability and statistical methods;**
- ✓ **Hydrological models;**

Problems of non-covered small basins:

- Rare or even no measurement stations;
- Inadéquate extrapolation (unprcise basin curves, high drainage, human activity,...);
- Difficulty of the formulae calibration;

DONNEES HYDRO-METEOROLOGIQUES

- Low accuracy of meteorological forecasts;
- Limited number of flood watch stations;
- Inadequate equipment for rainfall and water level measurement;
- Unavoidable verbal communication errors;
- Ignorance of sediment transport;

- Existence of uncovered areas;
- Lack of data;
- Low reliability of measurement data;
- Time loss;

Flood Forecasting and Warning System

The Ourika basin case (Before 1995):

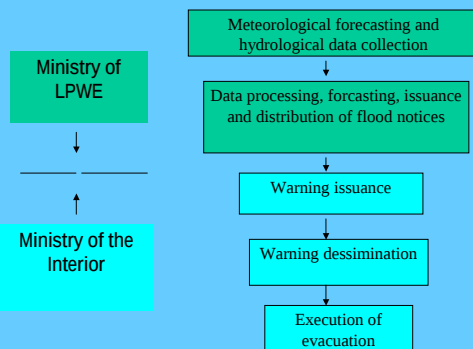
- ✓ **Design of the flood forecasting and warning system;**
- ✓ **Limitations of the system;**
 - Hydro-météorological observation network
 - Data processing and flood and sediment flow forecasting;
 - Warning issuance;
 - Warning diffusion;
 - Evacuation.

DATA PROCESSING, FORECASTING, ISSUANCE AND DISTRIBUTION OF FLOOD NOTICES

- Weakness of the data processing means;
- Insufficient rainfall data for the elaboration of a forecasting model;
- Lack of criteria for flood pre-notices and flood notices;
- Unvoidable errors of verbal communication;
- Ignorance of sediment transport;

- Reliability of forecasting accuracy;
- Possibility of comprehension errors of flood notices;
- Time loss;

Components of the Flood Forecasting and Warning System



ISSUANCE OF FLOOD WARNING

- Lack of procedures for the issuance of flood warning;

- Possibility of comprehension errors of flood notices;
- Time loss;

WARNING DESSIMINATION

- Non reliability of transmission means;
- Unavoidable error of verbal communication;
- Absence of warning equipment;

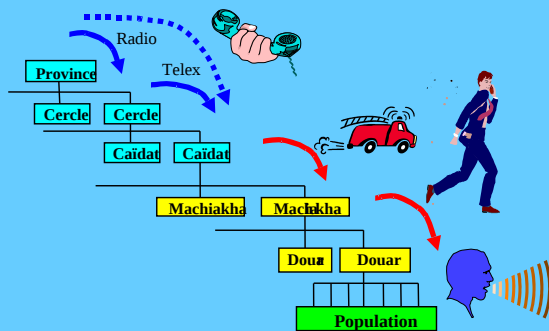
- Possibilité d'erreurs de compréhension des alertes;
- Perte de temps;

EVACUATION

- Absence of an evacuation plan;
- Non-determined evacuation sites (refuges);
- Unsufficient parking spaces;
- Absence of guiding services for tourists;

- Panic and traffic jam;
- Time loss;

WARNING DESSIMINATION PROCEDURE



✓ FLOODS AND THE EFFORTS OF THE MINISTRY FOR THE MITIGATION OF THEIR CONSEQUENCES

TRAFFIC JAM AND PANIC IN THE TOURIST AREAS : Lack of discipline



SETTI FADMA



IRAGHF

FLOODS : Consequences

✓ - Positive aspect :

- Reconstitution of water reserves and improvement of water quality;

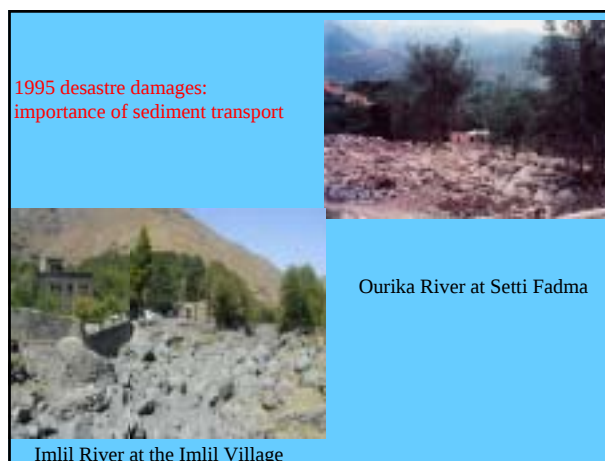
✓ - Negative aspects :

- Human casualties and material loss;
- Service interruption (ONEP, Régies, ONE, ONPT, transport..)
- Denaturation of the environment;
-

Costs of the provisional repair of the damages of the 1996 flood for the road sector in the Tensift region. [DRE / Tensift- Marrakech]						
Road type	Marrakech	Al Haouz	Safi	Essaouira	El Kelaa	TOTAL Tensift (DH)
National roads	180,000.00	230,000.0	-	866,000.00	-	1,276,000.0 (45 %)
Regional roads	126,000.00	300,000.0	217,000.00	86,000.00	-	729,500.0 (26 %)
Provincial roads and + CT	38,000.00	100,000.0	215,000.00	480,000.00	-	833,000.0 (29%)
TOTAL	344,000.0	630,000.0	32,000.0	1,432,000.0	-	2,838,500.0 (100%)



Summary of road cutting points and rehabilitation costs of the road networks of the Tensift region. [DRE / Tensift- Marrakech]							
Road type		Marrakech	Al Haouz	El Kelaa	Safi	Essaouira	Total for the Tensift region
RN + RR + RP + CT	Nbre of cutting points	17	9	11	47	12	96
	Cut duration	1h / 48h	6h / 15j	2h / 2mois	1j / 4mois	3j / 12j	1h / 4mois
	Rehabilitation costs (x1000 DH)	14,305.0 (24.46%)	9,510.00 (16.26%)	575.50 (0.98%)	6,116.00 (10.5%)	27,688.00 (47.4%)	58,494.50 (100%)





1997 flood damages : sewerage design defect / M'hamid-Marrakech)

Efforts made by the Ministry for flood damage mitigation

✓ Protection study:

- Starting of studies for the protection of many cities (Marrakech, Imin Tanout, Essaouira)
- Starting of the study on the National Plan for the Protection against floods ;

Interventions of the Ministry in the Ourika Valley covering météorology, hydraulics and roads

Structural measures

- Creation of the Provincial Directorate of the Equipment of Al Haouz
- Construction of check dams for flood retardation;
- Stabilization of thalwegs and construction of protection walls;
- Implementation of works and road drainage;
- Construction of a 7 km- long track on mountain ridge;
- Provision of parking spaces and evacuation sites near flood prone areas;

Efforts made by the Ministry for flood damage mitigation

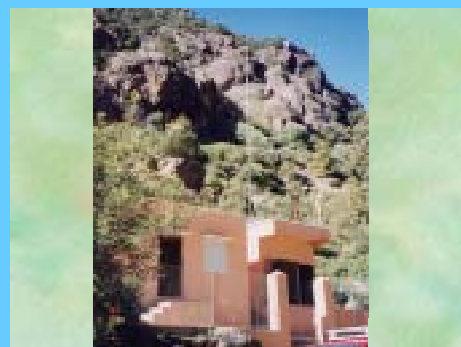
✓ International Coopération (Tensift River Basin):

- Installation of a Pilote FFWS in the Ourika River Basin (JICA) ;
- Development of an approach for protection against the floods of the Issyl River (Karlsruhe University- GTZ) ;
- delimitation activity of mountain risk areas (Innsbrouk University – Austria).

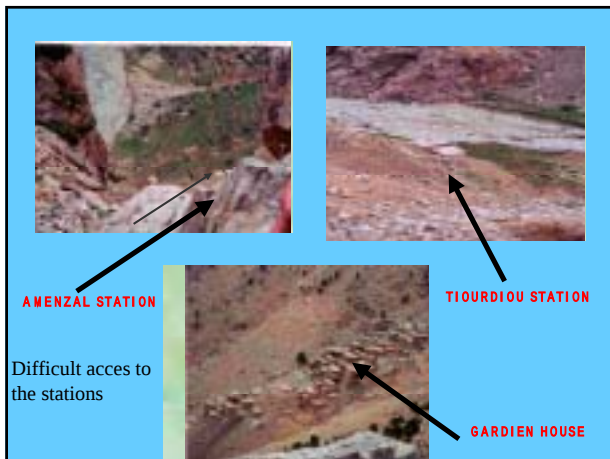
Interventions of the Ministry in the Ourika Valley covering téorology, hydraulics and roads

Structural measures :

- Enhancement of the hydrological and meteorological observation;
- Installation of a flood forecasting and warning system ;
- Identification of inundable areas according to flood frequency;
- Elaboration of guideline for natural disaster management;



Tazitount Flood Watch Station on the Ourika River



FLOOD MANAGEMENT REQUIRES :

- an institutionnal and regulatory framework;
- a powerful hydro-climatologic network;
- a forecasting system;
- a warning and a crisis management plan;



1/ LAW 10/95 : Enhancement of decentralization and deconcentration.

FLOODS ACCORDING TO THE LAW ?

THE INSTITUTIONAL FRAMEWORK NEEDS TO BE CLARIFIED.

✓ - Article 20 : There is a need to identify the degree of the intervention of the Agency and **define the relationship between the Agency, the administration and local collectivities.**

✓ - Article 102 : There is a need to precise **the modalities of joint financing of the operations related to flood fighting activities** within the framework of a partnership project with local collectivities.

D✓ METHODOLOGICAL APPROACH TO FLOOD MANAGEMENT

2/ DEFINITION OF THE PREVENTION SYSTEM:

- ✓ hydro-meteorological watch and warning mechanisms;
- ✓✓ Land use planning and development of the risk areas (control of urbanization, management of rainfall waters in urban areas, delimitation of the PHD...);
- ✓✓✓ Construction of protection works and environment safeguard (development and maintenance of water courses, restauration of river bancs, preservation of spreading and retention areas, development of river basins...);

3/ ELABORATION OF A WARNING AND CRISIS MANAGEMENT PLAN :

- ✓ Inventory of risk areas (data base) ;
- ✓ ✓ Elaboration of clear procedures for crisis management (permanent duty, message reception and transmission, warning dissemination, on-site intervention) ;
- ✓ ✓ ✓ Warning the population and launching of the ORSEC Plan;

5- POST-FLOOD ACTIVITIES

- ABHT:- Flood notice cancellation (Province, DPE) ;
 - Processing of collected data;
 - Report event to the Ministry;
 - Site survey (topography, damages, photos) and hydrological report
- DPE:- On site intervention;
 - Transmission of collected data;
 - Report on the condition to the higher authorities;
 - Joint survey with the ABHT ;

6- EVALUATION REPORT OF THE EVENT :

- follow up, interventions, damages, repair costs, etc.... ;

4/ PROPOSITIONS FOR CRISIS MANAGEMENT

1- FORECASTING:

- DMN : - Timely dissemination of forecasts;
 - Providing a answering machine for users;
- ABHT/PROVINCE/DPE:- Follow up of the meteorological and hydrological situation;

2- METEOROLOGIQUE PRE-ALERT (DMN)

- PROVINCE :- Follow up of the meteorological and hydrological condition;
- ABHT :- Follow up of the condition and meteorological and hydrological watch;
 - Real time data processing;
 - Concertation with DMN;
 - Flood notice issuance (Province, DPE) ;
- DPE :- Constitution of the CP ;



3- FLOOD NOTICES:

- ABHT : - Issuance of flood notices (Province, DPE) ;
 - Follow up of the condition;

4- WARNINGS :

- PROVINCE:- Decision and issuance of warning and evacuation advice
 - Starting of the ORSEC Plan;
- ABHT :- Follow up of the condition of information transmission;
- DPE :- Mobilisation, intervention on site and information transmission ;