

SEISMIC HAZARDS AND RISK PREVENTION IN ALGERIA

The progress achieved since 1980

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PLAN PRESENTATION

1- General evolution of national Policy in the fields of Disaster Reduction and Management.

2- The particular case of earthquakes, Technical and scientific developments

Part 1:

General evolution of national Policy in the fields of Disaster Reduction and Management.

The Algerian experience in the field of Natural and Technological disasters Reduction has begun after the major earthquake of EL Asnam of 10th of October 1980 (3000 dead people and more than 3 billions of US Dollars of damage) and was enriched after the very damaging Boumerdes earthquake of 21st may, 2003.

◎ In this presentation, the National Policy in the fields of Disaster Reduction and Management will be presented with the different aspects as:

- The main goals.
- The implementation mechanisms.
- The main achievements and progress.
- The new legal and regulatory tools and mechanisms.
- Global evaluation and perspectives

1- THE NATIONAL POLICY OF DISASTER REDUCTION AND MANAGEMENT

- ◎ **The national policy of disasters reduction and management emphasizes on the national and local institutions and deals with the two fields of disasters reduction and organization of interventions and rescue.**
- ◎ **The measures undertaken deal with institutional, regulatory and organizational aspects, the listing of capacities and the increasing of scientific, technical and operating intervention potentials.**

1-1 THE NATIONAL POLICY GOALS:

- **The goals and the actions aim especially at:**
 - ❖ **Strengthening of the knowledge, identification and assessment of the hazards and risks.**
 - ❖ **Information and public education**
 - ❖ **Reinforcement of the institutional capacities.**
 - ❖ **Encouragement of the collaboration policy and the concertation between the institutions and bodies concerned by the assigned goals.**
 - ❖ **Promotion and development of multiform cooperation at regional and international level.**

1.2- THE IMPLEMENTATION MECHANISMS OF THE NATIONAL POLICY AND THE PROGRAMMES:

- ⦿ **The institutions in charge of the implementation are:**
 - **At the central level, they are entrusted to the ministry departments.**
 - **At the local level, the missions of following and controlling the application of the programme of actions are entrusted to the local authorities of the wilaya (departments) and municipalities with the technical assistance of the deconcentrated services of the ministries.**
- ⦿ **Variable levels of execution but this remain globally insufficient.**
- ⦿ **We must also note that there is a persistant shortage in the field of the coordination of activities.**

1.3- ACHIEVEMENTS

National achievements and current activities related to Main Goals:

- **Seismic survey telemetered network by CRAAG (32 stations in 1990-92)**
- **Network of earthquake strong motion recorders (300 accelerographs installed through the national territory.**
- **10 mobile seismographs at CGS and 10 others at CRAAG for aftershocks recording (they have fully been used during the Boumerdes earthquake aftermath .**
- **mobile and fixed equipments for dynamic testing of structures at CGS Center, including a very modern shaking table of 6m x 6m with 6 degrees of freedom**

b) – Hazards or risks assessments at national level by most of the concerned sectors with variable accuracy levels

- Seismic hazards maps at national and regional levels (iso-accelerations maps)
- Seismic microzoning maps of 30 cities of the regions of Chlef, Algiers, Mascara and Ain Temouchent, and many Important works sites (dams, electrical energy plants and hospitals...)
- Seismic vulnerability assessment of some strategic buildings.
- Seismic vulnerability and risk assessment for the central part of Algiers
- national map of desertification sensitiveness.
- Index map of vegetation performed for the potential regions of locu reproduction (south of Algeria and the northern parts of Niger and Mali).

c) – Structured plans for risks reduction or detailed plans for disaster management

In the field of the disaster reduction policy, the Algerian government has adopted in 29 may, 1985 " **a national plan of disaster prevention and organization of intervention and rescue**".

It has been followed by the enactment of **two decrees** which codified this policy :

- ❖ The **decree n°85-231** of 25-08-1985 related to the **organization of intervention and rescue** in case of disaster.
- ❖ The **decree n°- 85-232** of 25-08-1985 related to **disaster reduction**.

In this framework, **some plans of prevention** have been elaborated at the national and local levels. We can mention as examples:

- ⦿ plans of prevention of forest fires
- ⦿ national plan against desertification
- ⦿ national plan for locust fighting
- ⦿ national emergency plan against sea pollution (named "PLAN TEL BAHR NATIONAL").
- ⦿ plans of prevention and intervention in economical and industrial facilities areas.

d) – Easy access to the rapid (or early) warning systems at global, national, regional or local levels:

Rapid warning systems exist in some sectors or fields such as:

- ⦿ National system of warning by radio for forests fire
- ⦿ National rapid warning system for massive outflows of hydrocarbons.
- ⦿ National rapid warning system by radio for outflows or bursting of dams .
- ⦿ Pilot system for prediction and warning for floods in the basin of Sebaou river (region of Tizi Ouzou)
- ⦿ Specific rapid warning systems for the huge industrial areas (petrol and petro- chemical areas in particular.)
- ⦿ Meteorological warning system for prediction and prevention of storms and strong winds.
- ⦿ rapid warning system (divided in 3 levels according to the magnitude of the event and to the vulnerability of the concerned region) for earthquake or early warning for floods (these systems are in process of formal and official setting).

e) — Promising start for public education process

- Several sectors have at their disposal public education programs.
- However their efficiency are variable and globally not satisfactory
- Sectors of forests and environment have concrete and continuous actions particularly oriented toward the scholar population .
- Some activities of sensitiveness and information are organized by NGO's

The **methods** used for **the diffusion of information** are generally:

- ◉ Leaflets and posters
- ◉ Conferences, meetings and exposition at schools level
- ◉ Advertising spots in tv and radio .
- ◉ These actions will certainly receive a new impulse with the creation of a "**national commission of communication related to major risks**". (decree n° 04-181 of 24 June 2004)

Concerning **the training**, we should note the introduction of the **teaching of the 2 modulus** entitled " structural dynamics" and " earthquake resistant design of structures" since 1984 in the numerous existing civil engineering institutes and high schools.

- ◉ It has also been proceeded in 2004 to the elaboration of **education programmes** at the third year of the middle level (**the ninth year of education**) of a **matter** related to "**the environment and natural disasters**". The pedagogical and didactic supports are being elaborated.

f) — New interest from insurance sector for natural disasters

In this field, the efforts have lead to the publication of the " **Ordinance of 26 august, 2003 related to the obligation of insuring the natural disasters and to the indemnification of victims**" (in force on 1st September, 2004).

1.4- NEW LEGAL AND REGULATORY FRAMEWORK

- Two recent major disasters contributed to new awareness and new impulse to the programmes and the actions

The first one was the huge flash floods of 10 Nov, 2001, that have hit Bab El Oued (a populous district of Algiers City) and other regions of the country and have resulted in 900 dead or missing people and about 1 billion of US Dollars of damage.

The second one was the very strong earthquake (Magnitude 6.8) of 21 May, 2003 that has badly stricken the very populated regions of Boumerdes and Algiers in the central part of the country and that resulted in 2300 dead people and more than 3 billions of US Dollars of damage.

- As a consequence the government has updated and strengthened the National policy and also the legal and regulatory framework.

- Enacting on **25 Dec. 2004** of the “**Law related to major risks reduction and management in the framework of sustainable development**”.

This law, in addition to the requirements dealing with all the aspects of the reduction and the management of major disasters that have to be considered by the institutional bodies, the communities and all the stakeholders, require in its item 68 the setting up of the “**National Delegation for Major Risks (NDRM)**” .

The missions of this National Delegation are of “advising, assessment, and coordination of actions aiming at reducing the impacts of major disasters on the economy of the country and the security of people and property”.

Enacting of “**Ordinance (law) of 26 Aug. 2003 related to the obligation of natural disasters insurance and to indemnification of the victims**”. This law is in application since 1 Sept., 2004 with, as a first step, the insurance of earthquake and floods risks concerning all buildings and, in some cases of contents also.

- ⦿ Enacting of “ **Law 04-05 of 14 Aug., 2004, modifying and supplementing the law 90-29 of 1 Dec., 1990, related to land management and urban planning**” .

It deals with a better definition of the hazards and the hazards prone areas where building is forbidden or limited, but, above all, it stipulates two (2) very **important requirements**, that are:

Immediate demolishing of all new construction without legal permit.

Compulsory Introduction, in addition to architectural lay-out signed by an architect, Compulsory Introduction, signed by a civil engineer, in the technical file presented with the demand of building permit.

Enacting of “ **Arrêté (Ministerial Decision) of 4 Janv. 2004 of Ministry of Habitat and Urban Planning approving the new Earthquake resistant building Regulations RPA 99 / Reviewed 2003**”.

At Institutional and Organisational levels, in addition to the creation of National Delegation for Major Risks, we can mention three other items:

- ⦿ The setting up by the Decree 02-232 of 08 Aug., 2003 of the **“National Crisis Management Centre (CNAD)”**; it is in charge of “permanent monitoring and survey of different major risks and assistance to the Authorities in the management of the crisis related to major disasters
- ⦿ Setting up of **“National Agency for Earth Sciences”**, by the decree 04-194 of 15 Jul., 2004;
- ⦿ Setting up by the decree 04-181 of 24 June, 2004 of the **“National Commission of communication related to natural and technological major risks”**.

2- REGIONAL AND INTERNATIONAL COOPERATION

- **Setting up of National Committee of IDNDR** (1990-1999) with its various activities related to cooperation aspects
- **“Project for improvement of the natural disasters insurance system”** has got the support of German Government. The achievement of this project can be considered as a **“success story”** in the field of co-operation.
- **National experts** integrated UN regional and international activities and institutions, organization of African Unity (OAU) experts Committee, Maghrebian, Arab, Europe-mediterranean and African projects dealing with major risks reduction as for the seismic risk reduction and the locust fighting.
- As for the seismic risk, we can mention the projects **“Seismed”** (1990-1991), **“Radius”** (1998-1999) and **“Risk-UE”** (2001-2004) and the fruitful exchanges between Maghrebian in the framework of **“Earthquake Engineering Maghrebian Association”**.
- **Locust fighting** is the field of the International co-operation in the region where Algeria plays an essential part.

- ⦿ We have to admit that **results expected were globally not met** because, the **non-existence of international financing mechanism**; that remain to be done for the future.
- ⦿ In the meanwhile, we **must promote exchange and technical assistance** relations at **regional and sub-regional scales**; this will allow closest collaboration between the different potential partners, optimisation of the use of existing potentials in the least developed countries, and foster the emergence of locally available and mobilizable expertise.
- ⦿ Finally, for the case of **natural disaster emergency**, it would be highly wished to organize **regional mechanisms of solidarity and mutual help** so that a country which is badly stricken by a major disaster, could urgently benefit from effective intervention and rescue assistance of other **neighbouring countries**.

PART 2

**Technical and scientific
developments**

On the technical and scientific aspects,
institutions that operate in this field are:

CRAAG: The Centre for Research in Astronomy
Astrophysics and Geophysics

CGS: Earthquake Engineering Center

CTC: National organisation of Technical control of
constructions

Universités: Training and Research

Etc.

CRAAG: The Centre for Research in Astronomy Astrophysics and Geophysics

(interior ministry)

Principal missions:

- Research in the fields of Astrophysics and Geophysics.
- Public service in the field of seismic monitoring.

CGS: Earthquake Engineering Center

purpose is to develop, implement and disseminate scientific knowledge in earthquake engineering to contribute to the reduction of seismic risk in Algeria.

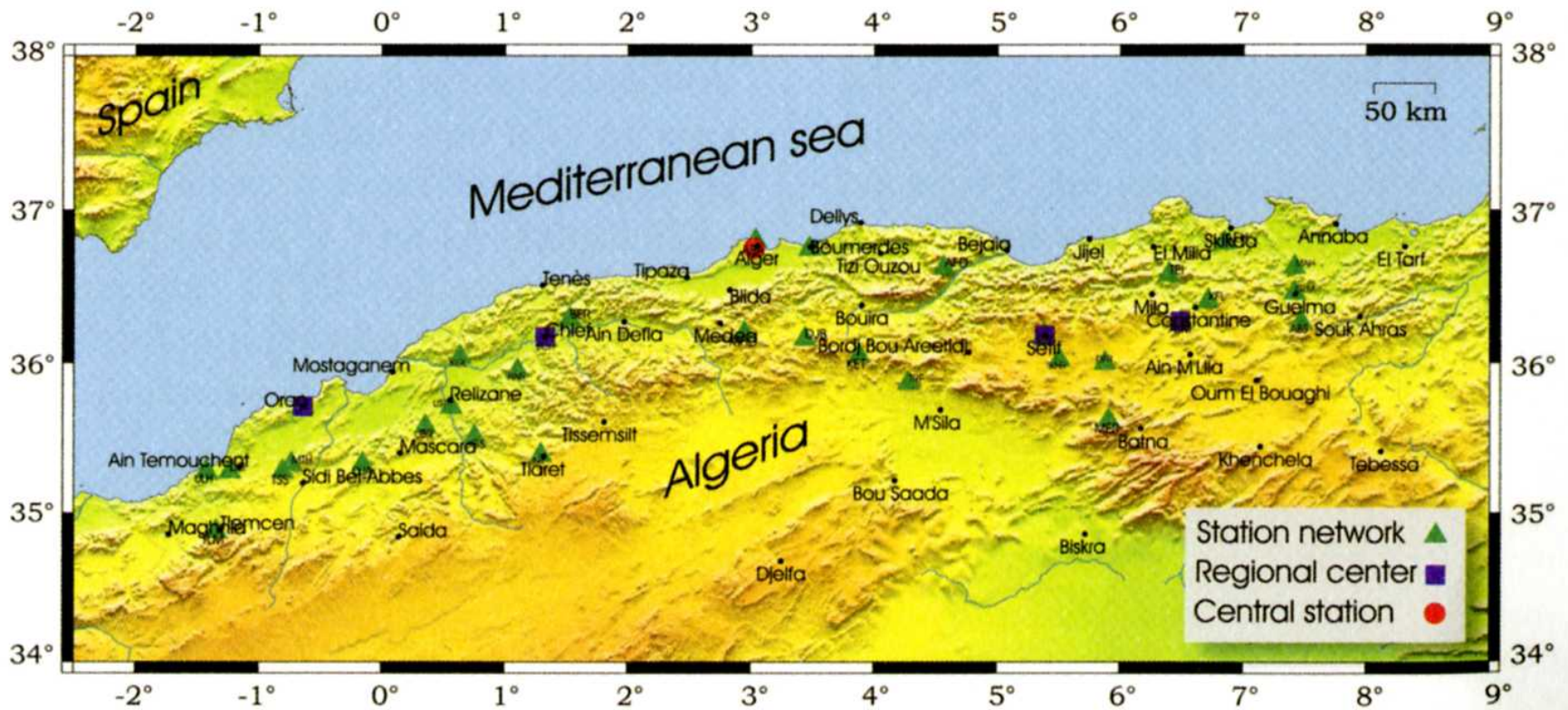
- seismic hazard and risk studies
- development of standards and rules for constructions

Universités: Training and Research

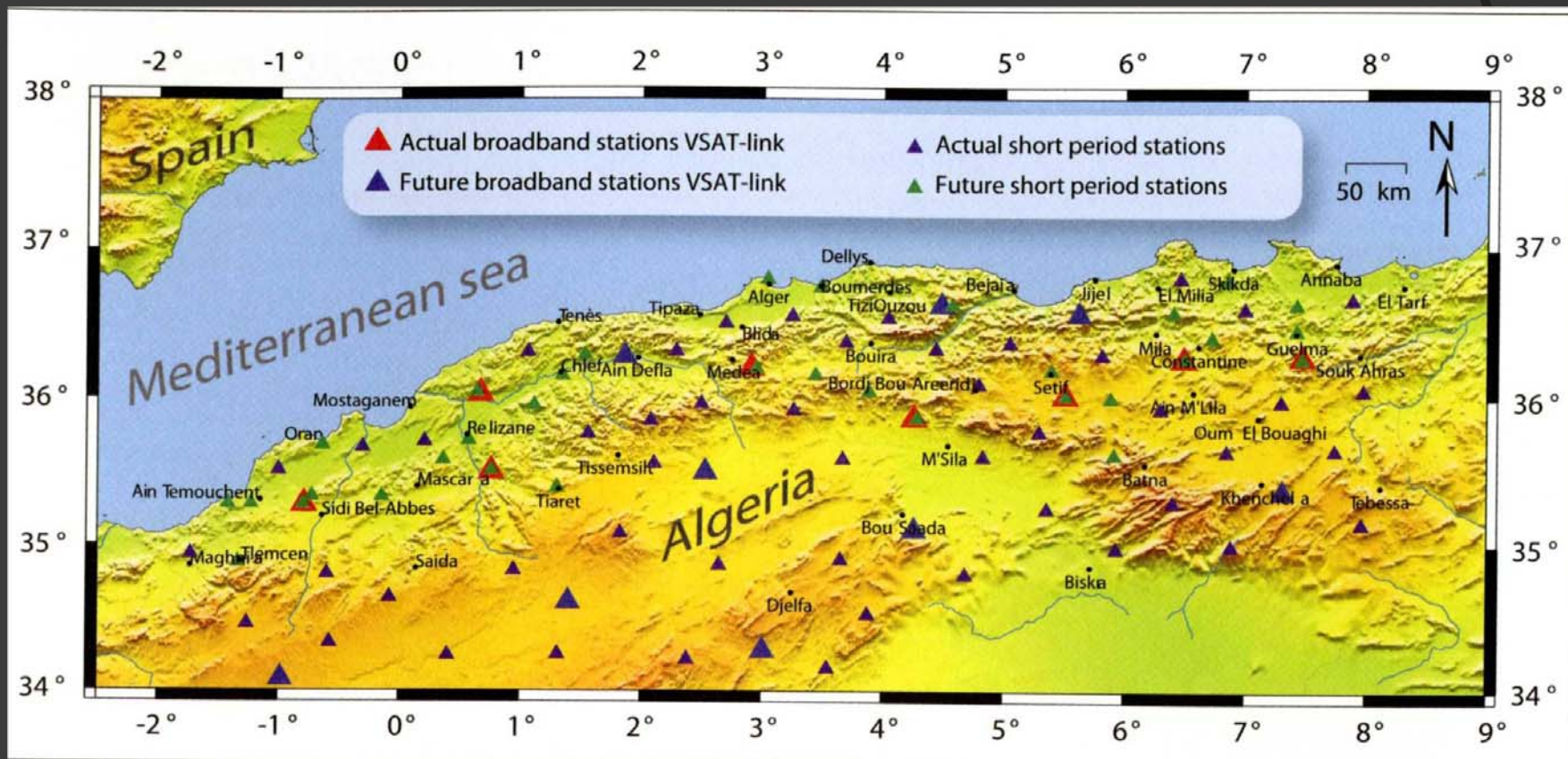
example: **Faculty of Civil Engineering at the University Houari Boumedienne.**

- Training of engineers in engineering civil: supported by courses in the field.
- Research and post graduate Training and PHD in the field (Laboratory LBE)
- Specialized training PGS (post graduation, 18 months with diploma) for senior civil protection.

CRAAG network

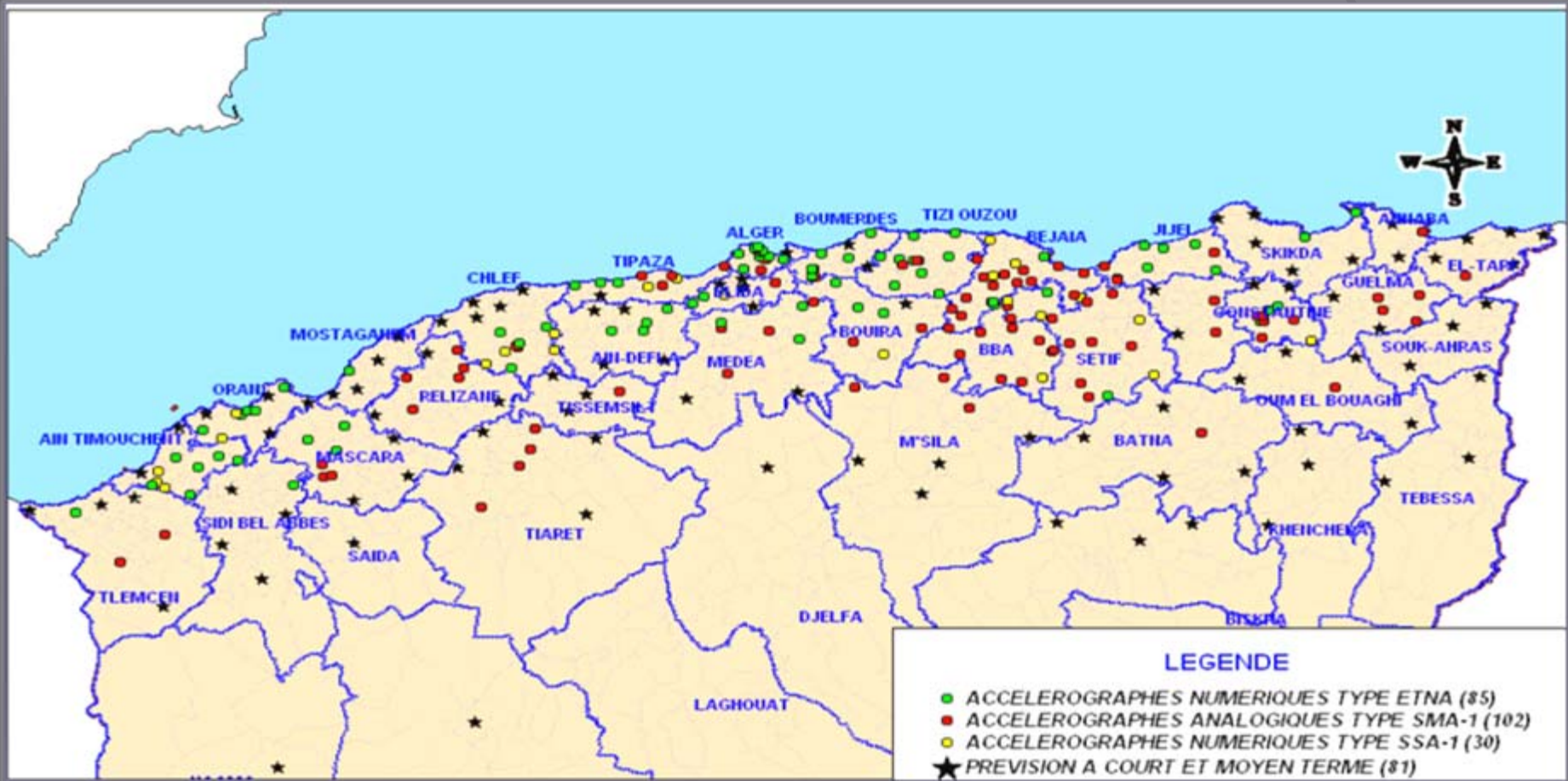


Futur CRAAG network



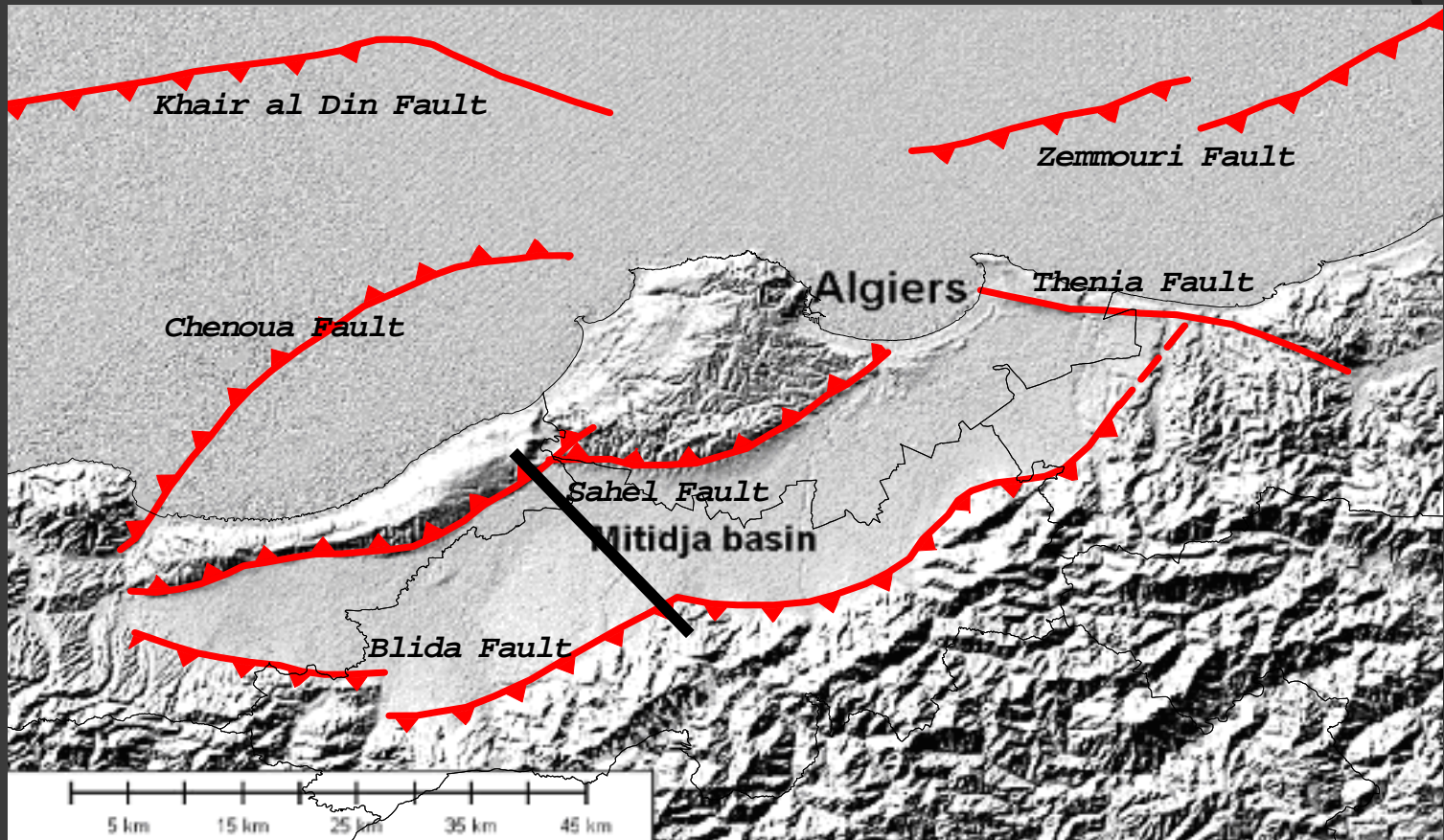
- ◎ SGS activities program
 - Earthquake Hazard
 - seismic micro-zoning
 - Vulnerability of strategic works
 - Seismic risk urban fabric

CGS network

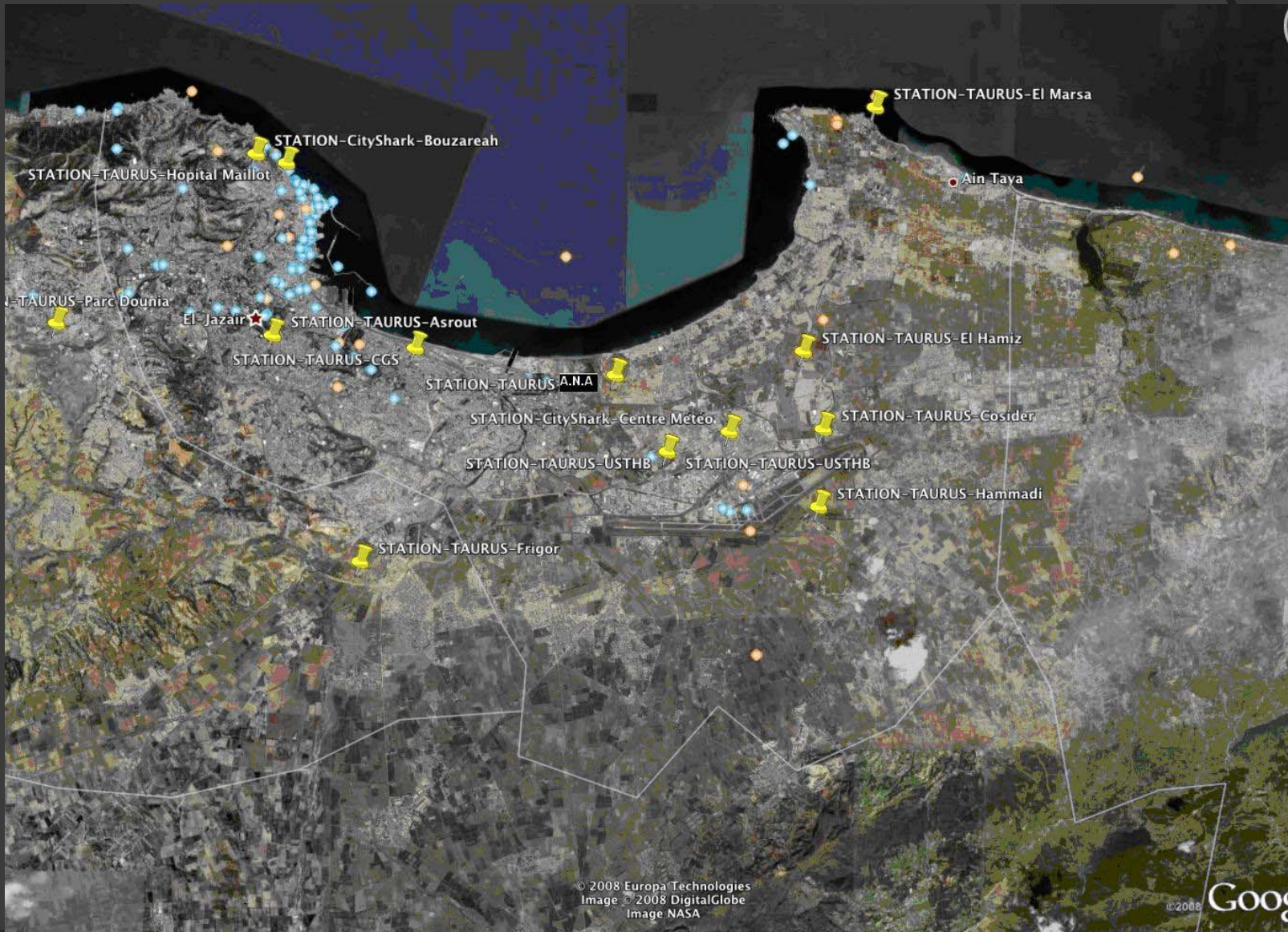


Type Station	Opérationnelle (%)
ETNA (125)	85 (68%)
SSA-1 (40)	30 (75%)
SMA-1 (170)	102 (60%)
Total (335)	217 (64.8%)

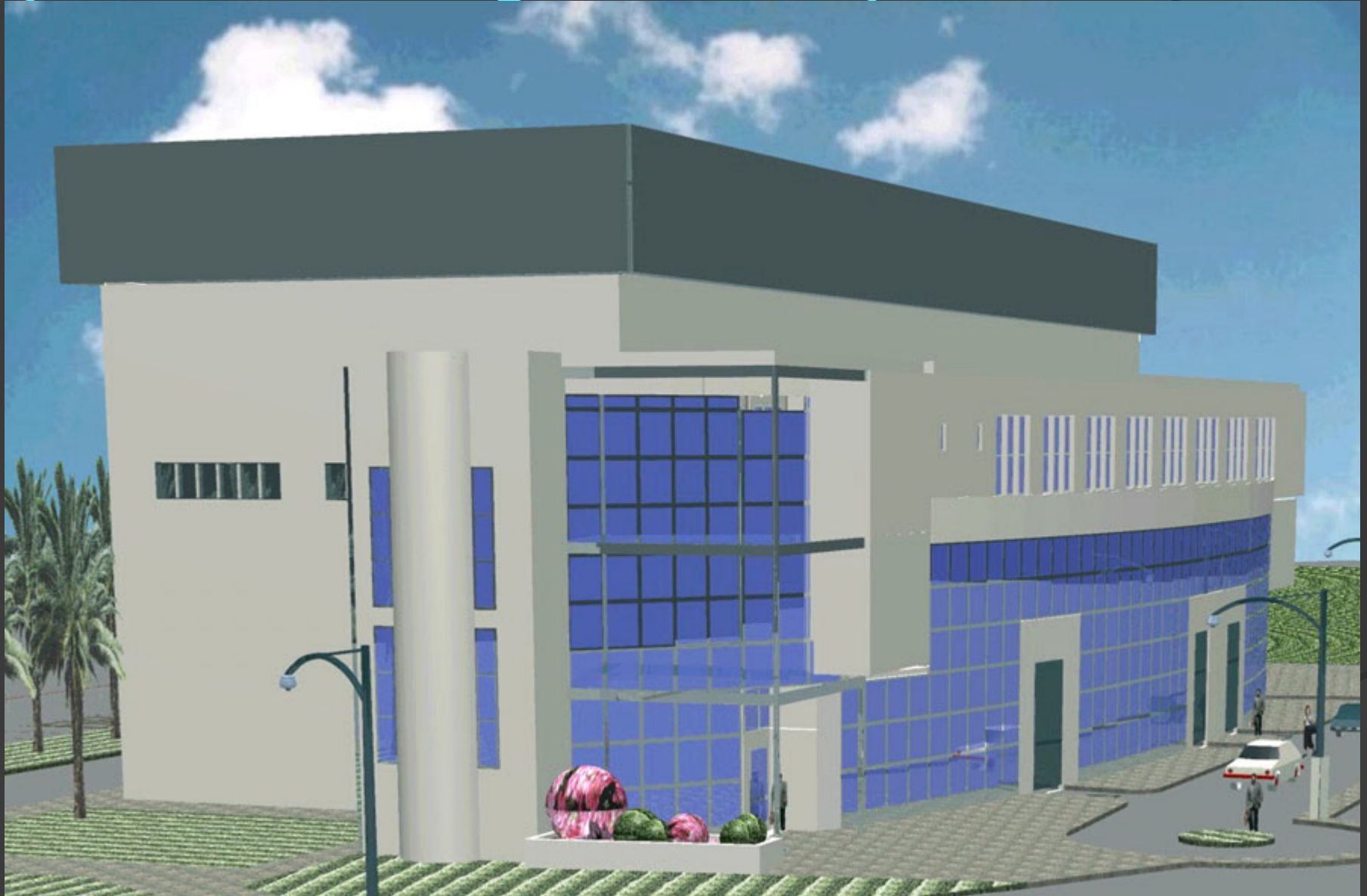
Study of seismic risk in the basin Neogene Mitidja. Effects of sites and evaluation of seismic velocities



Research project on : the objective is to obtain an order of magnitude of experimental effects of site, and anticipation of a numerical modeling



Dynamic testing laboratory



***CGS – SIX DEGRÉS DE LIBERTÉ
SERVO HYDRAULICQUES***

Table Specifications

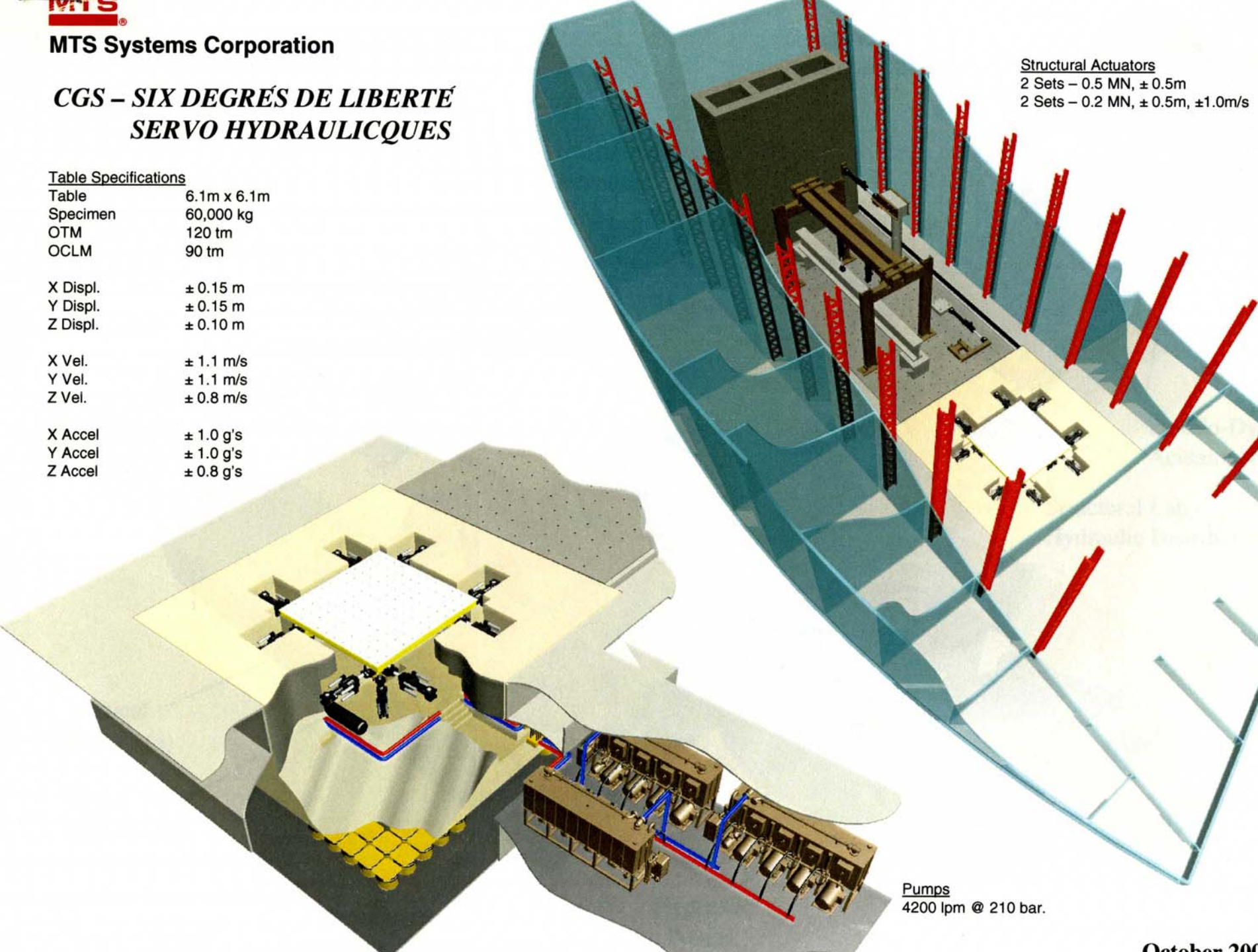
Table	6.1m x 6.1m
Specimen	60,000 kg
OTM	120 tm
OCLM	90 tm

X Displ.	± 0.15 m
Y Displ.	± 0.15 m
Z Displ.	± 0.10 m

X Vel.	± 1.1 m/s
Y Vel.	± 1.1 m/s
Z Vel.	± 0.8 m/s

X Accel	± 1.0 g's
Y Accel	± 1.0 g's
Z Accel	± 0.8 g's

Structural Actuators
 2 Sets – 0.5 MN, ± 0.5m
 2 Sets – 0.2 MN, ± 0.5m, ±1.0m/s



Pumps
 4200 lpm @ 210 bar.

● The CGS has established **Technical Regulations**

- Rules Algerian Earthquake "RPA99 / Version 2003"
- Guide To Earthquake Construction Of Houses And Buildings Related Individual
- Technical Recommendations For The Repair And Strengthening Of Works:
 - Catalogue Of Repairs And Building Works
- Precautions • Earthquakes: How To Include In Case Of Earthquakes "
- The Rules Of Calculation And Design Of Concrete Structures CBA93
- The Rules Of Execution Of The Work Of Construction Works In Concrete
- Rules Of Calculation And Design Of Steel Structures
- Practical Calculation Of Metal Structures
- Recommendation For Implementation Of Steel Structures:
- Design And Design Of Steel-Mixed Concrete Structures

REGLEMENTATION

REGLES PARASIMIQUES

Séisme d'El Asnam (Orleanville) 1954

AS55 → PS62 → PS69

Après le séisme d'El Asnam de 1980 :

RPA81

RPA88

RPA99

Après le séisme de Boumerdes de 2003

RPA99/Version 2003

Ministère des Travaux Publics

RPOA (ponts et tunnels)

MINISTERE DE L'HABITAT ET DE L'URBANISME

DOCUMENT TECHNIQUE REGLEMENTAIRE

D.T.R. - B.C. 2.48

**RÈGLES PARASIMIQUES
ALGÉRIENNES
RPA 99 / VERSION 2003**

MINISTERE DE L'HABITAT ET DE L'URBANISME

**CATALOGUE
DES METHODES DE REPARATION
ET DE RENFORCEMENT
DES OUVRAGES**

MINISTERE DE L'EQUIPEMENT ET DU LOGEMENT

**RECOMMANDATIONS TECHNIQUES
POUR LA REPARATION
ET LE RENFORCEMENT DES OUVRAGES**

الاحتياطات من الزلازل



كيفية التصرف في حالة وقوع الزلازل

المديرية العامة
للحماية المدنية



المركز الوطني للبحث المطبق
في هندسة مقاومة الزلازل

PRECAUTIONS SEISMES



Comment se comporter en cas de Séisme

Centre National de Recherche Appliquée
en Génie Parasismique - C. G. S.



DIRECTION GENERALE DE LA
PROTECTION CIVILE (D.G.P.C.)

Abritez
vous
sous
une
table



إحتبئوا
تحت
طاولة

Placez-vous
dans
l'embrasure
d'une
porte



إبقوا في
إطارات
الأبواب

إجتنبوا الجبس ومزخرفات الشرفات التي يمكن لها أن تسقط.

EVITEZ

Eclats
de verre
de fenêtres
et de
glaces.

Les lieux
où peut se
produire
un
incendie;

Les
armoires
et meubles
hauts qui
peuvent
tomber



إجتنبوا

انكسار
زجاج
النوافذ
والمرايا.

إجتنبوا
الأماكن
التي
يمكن
أن
تحدث
فيها
حرائق.

إجتنبوا
الخزانات
والاثاث
العلي الذي
يمكن
أن يسقط.

Les plâtres, décorations de balcons qui peuvent tomber.



إذا كنتم تسكنون في عمارة
لا تأخذوا المصعد لأنه يمكن
أن يتوقف في منتصف
الطريق.

Si vous habitez dans un
immeuble, ne prenez
pas l'ascenseur, vous
risquez d'être bloqué.

3.2- RECOMMENDATIONS AND PERSPECTIVES

- ◉ The activities that have to be undertaken for 2005-2015 period would aim at solving constraints and difficulties previously experienced, and at developing a large and sustainable series of actions in the field of disaster reduction.
- ◉ we can mention the following actions:

Rapid kick-off and development of activities of the “National Delegation for Major Risks NDMR” and the “National Centre for Crisis Management NCCM/CNAD”.

Process of implementation of the law of Dec. 2004.

Setting up of provincial and local “Disaster Reduction and Management Committees”.

To progressively take into consideration the various local hazards

To design and implement specific projects aiming at disaster reduction at national and local levels

- To foster regional and international cooperation following available opportunities, particularly through “pilot projects” including real technology transfer.
- Develop at a higher scale public education actions.
- Integrate the National Plan of Action in the global framework (ISDR) to benefit, at least for informational aspects, from the experience of all other countries.

3- CONCLUSION AND PERSPECTIVES

3.1- GLOBAL EVALUATION

- ⦿ Period of the last 25 years was globally positive.
- ⦿ **Among the positives aspects:**
 - ❑ Existence of official Policy and programmes confirmed and strengthened by the law on “ Major Risks Reduction and Disaster Management enacted on 25 , December,2004.
 - ❑ Existence, and strengthening by new settings up, of a great number of institutions and specialized Establishments.

- ❑ Existence of **permanent or punctual activities** in the field.
- ❑ Existence of **National Committee for IDNDR** that had given a new impulse to the animation and coordination of actions .
- ❑ **These activities will be amplified by the National Delegation for Major Risks.**
- ❑ **Valuable experience in most categories of risks.**
- ❑ **Valuable human potential and high level expertise.**
- ❑ **Growing involvement of NGO's** in disaster reduction activities.

◎ **Insufficiencies or reasons of unsatisfiedness:**

- ❑ **Insufficiency in intersectorial approaches** in the implementation
- ❑ **Insufficiency of physical and financial means** for activities improvement and intensification,
 - **Insufficiency in public education activities**
 - **Insufficiency of International cooperation in this field**