

## **The Algerian Earthquakes of May 2003: Some precedents for reconstruction**

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Algeria is a country the size of Western Australia and ten times the size of the United Kingdom. The majority of its population of 30 million people, together with the capital Algiers, are concentrated within the fertile regions between the northern slopes of the Atlas Mountains and the southern coastline of the Mediterranean Sea. It is here also that the majority of earthquake fault-lines are. The extensive and much more sparsely populated remainder of the country continues to the south of the Atlas ranges, with a chain of towns bordering the northern fringe of the Sahara Desert - Timimoun, El Golea, Ghardaia, Ouargla, and Touggourt, and ends with Tamanrasset alone in the far south, 1550 kms (970 mls) from Algiers. This extensive and contrasting geography belies a recent history of intensive and bitter war and insurrection which have not only caused the deaths of hundreds of thousands of Algerians, but have been an instigator of population movements that have served to increase urban populations historically vulnerable to earthquakes.

### **Earthquake history**

Earthquakes in Algeria, including the "small" ones, are comparatively frequent occurrences, the names of some towns and cities recurring in comprehensive incidence tables - recurrence obscured only by a change of name to accompany subsequent reconstruction. The aggregated total of deaths and injuries indicates a long-established requirement for the implementation of strategies for earthquake disaster reduction - methodologies for which were being established half a century ago.

Since 1716, when the city of Blida was destroyed killing more than 20,000 people(see Table), there have been more than one hundred recorded damaging earthquakes. All of these have been in the area north of the Atlas mountain range and plateaux, and most have been in the region west of the city of Algiers. The names recur of some towns and cities having been damaged: Oued Fodda, Ténès, Cherchell, Blida, Oran, and Mascara. There are six references to earthquakes and tremors having affected Orléansville, the former name of El Asnam, between its foundation in 1843 and the 1954 R6.4 and R6.2 earthquakes on consecutive days. More than 1,200 people were killed, 5,000 injured, and 2,000 houses and huts (*ghourbis*) in the city and neighbouring villages were destroyed (Rothé1954; Lewis, 1982).

Plans for the reconstruction of Orléansville (to be El Asnam) in much the same location were published in 1955 and actual reconstruction followed, coinciding with the first years of the Algerian War of Independence. Twenty-six years later, in October 1980, the city of El Asnam, together with its surrounding rural areas, was destroyed by earthquake once again - the first major earthquake experience for Algeria's independent government. 1,500 people were killed;

almost 15,000 dwellings were destroyed, and 148,000 people were made homeless. A further 775 deaths, 18,300 destroyed dwellings, and 183,216 homeless were caused in other affected towns and villages (UNCHS, 1981) in a directly affected area of over 3000 square miles (7,770 sqkm). El Asnam was again reconstructed - and renamed as Chleff (Lewis, 1982).

### *The earthquakes of May 2003*

The R6.7 and the R5.8 (twice) earthquakes of the 21st, 27th and 29th May 2003, to the east of Algiers, has caused damage in the eastern districts of the capital and in many towns and villages (eg: Ain Taya, Boumerdes, Reghaia and Thenia), and the deaths of 2,251 people (another 1,200 are listed as "missing"); 10,243 were injured and 200,000 made homeless. Tsunamis damaged the Mediterranean island tourist and fishing resorts of Majorca, Menorca and Ibiza (Guardian & [www.reliefweb.int](http://www.reliefweb.int)).

### **Building construction**

The identification in Algeria of the need for earthquake-resistant building construction is not new. Half a century ago, in 1954, the then Director at the University of Strasbourg of the Bureau International de Séismologie, Jean-Pierre Rothé, concluded:

*"Si les secousses séismiques n'ont pas pu compromettre l'essor de la colonisation, il convient cependant qu'administrateurs et architectes aient l'attention attirée sur la sismicité de l'Algérie, afin de pouvoir dans les nouvelles constructions, prendre toutes dispositions utiles. Tous les trente ou quatre ans, un séisme d'une magnitude supérieure à 6 peut se produire en un point quelconque des chaînes actives et entraîner des dégâts importants."*

*"Le séisme d'Orleansville a cruellement souligné la nécessité de réaliser en Algérie des constructions anti-séismiques. Au moment où j'écris ces lignes, une commission du Ministère français de la Reconstruction élabore, avec la collaboration des géophysiciens, un règlement destiné aux architectes et fixant les coefficients de sécurité à respecter. La douloureuse leçon ne sera pas perdue" (Rothé, 1954).*

(If earthquakes are not to compromise the progress of colonisation, it would be appropriate for the attention of administrators and architects to focus on Algeria's seismicity, so that they are able to adopt preventive measures. Every thirty or forty years, an earthquake of magnitude greater than R6 occurs at whatever point on active faultlines, and causes significant destruction.

The Orleansville earthquake has cruelly underlined the necessity of achieving earthquake resistant construction in Algeria. At the moment as I write these lines, a French Ministry Commission for Reconstruction is working out, with the collaboration of geophysicists, regulations destined for architects establishing coefficients of safety to be applied. This sorrowful lesson of failure (of Orleansville) will not be lost).

Were the now politically unacceptable reference to "colonisation" to be expressed as "development", the statement would read as relevant now as it was half a century ago; now even more "douloureuse" is the scarcity of evidence that anything has changed since.

Once again, poor standards of building construction are being blamed for the collapse of many buildings in numerous towns and villages, including fifty-seven apartment blocks and a ten-storey block of 78 apartments/flats in Reghaia. (Guardian & reportedly shown on Morocco television:

www.reliefweb.int).

A previous article (Lewis 2003, *an expanded version of Lewis 2001*) has described in detail why building construction is so often exposed as inadequate by the earthquakes it fails to resist, and what range of measures are necessary so as to counter what often appears to have been habitual, normal and frequently intentional inadequacies of building construction quality. As urban populations increase exponentially, temptation also increases to “cut corners” to get buildings erected quickly - and to give way to temptations to make more money by undercutting, or ignoring, specified structural requirements. Reinforced concrete construction is not inherently earthquake resistant; it requires structural modifications and rigorous control to make it so. The article focused on Turkey, also where recent earthquakes have recurred but, before it appeared in print, the May 2003 earthquakes have occurred in Algeria.

### **Reconstruction for earthquake damage reduction in development**

Shortly after the El Asnam earthquake of October 1980, a programme of reconstruction was created by a team of Algerian architects, engineers and geographers supported by multidisciplinary inputs from a team from the United Nations Centre for Human Settlements (UN Habitat) (Lewis & Mokrane, 1981). The reconstruction programme was to be closely compatible with political and development policies in Algeria at that time - for agrarian revolution, self-management (*autogestion*) and localisation (Sutton & Lawless, 1978). It was also compatible with development for self-reliance as a counteraction to dependency and population movement to urban centres.

Not only was there more chance of a reduction of vulnerability to direct earthquake impact, but secondary effects of deprivation and homelessness would also be reduced by the increased availability of localised resources and infrastructure. As they became available, data from seismic micro-zoning could be incorporated into rural development planning.

A planning model was proposed, to be adjusted through the process of preliminary application, incorporating data on population and its distribution, resources and activities, and on earthquake (and other) hazards. With appropriate socio-economic data, application of the model indicated areas of vulnerability by degree. With the incorporation of technical, economic and institutional measures (also identifiable from the model) vulnerability could be reduced, and earthquake disaster reduction could be an integral component of housing, settlement and development generally. Judgements could be applied where quantifiable data on hazard remained unavailable but, at the same time, application of the model assisted the identification of specific information requirements. The model was applicable at *wilaya*<sup>1</sup>, *daira*<sup>1</sup> or *commune*<sup>1</sup> level; application at *commune* level would more closely integrate urban/rural balance (Lewis, 1982).

The Algerian War of Independence was fought from 1954 through to 1961 (Lewis, 1994), during which migration to urban centres increased. El Asnam (Orléansville as it then was) was

destroyed by earthquake in 1954, its reconstruction ensuring the city as being a centre of population growth, which reached 105,000 in the *daira* by 1966, and increased by 48 percent to 156,000 by 1977, 11 per cent greater than the population increase of the *wilaya* as a whole (ONRS, 1980). El Asnam was destroyed by the R7.7 earthquake of October 1980. (Lewis, 1999 pp 33).

The prevailing issue of a large proportion of population concentrated in the intensely earthquake-prone area of Algeria between the Atlas Mountains and the Mediterranean coast, means that identification of fault lines and of localised earthquake risk assessment has to be regarded as a crucial pre-requisite for any reconstruction, or further new construction, throughout this region of Algeria.

Reconstruction has a metaphorical as well as a physical meaning. It is concerned with policies, systems and processes as much as with infrastructure that those systems both require and make possible. It is also concerned in a social as well as a physical sense. Not only is reconstruction a matter of the rebuilding of destroyed and damaged physical and social infrastructure, but with modification of the previously existing, where that is necessary for the achievement of equitability and the reduction of vulnerability (Lewis, 1999: pp 151-152).

Diffuse and pervasive programmes of rural development may also be required to achieve or maintain reconstruction and development balance between urban centres affected by destruction, and rural areas, both those affected and those not affected by earthquakes. Account has to be taken of existing social, administrative, institutional and commercial systems as well as their physical infrastructure. Such a programme would be designed to increase considerably services of all kinds for rural areas.

A peaceful conclusion to the recent internal conflicts is a further pre-requisite to such a necessarily extensive and pervasive development programme, as it is for so many other objectives. The results of localised earthquake risk assessments, when compared with current population distribution, will show earthquake vulnerability - and become the working basis for programmes for earthquake vulnerability reduction.

The work that this entails, now in the aftermath of the May 2003 earthquakes and as envisaged each time in the aftermath of the 1954 Orléansville earthquake and of the 1980 El Asnam earthquake, cannot recommence soon enough.

#### TABLE

Year	Region/city/town/magnititude	Deaths	Injured	Homeless
1716	Blida	20,000		

1790	Oran		3,000		
1825	Blida		7,000		
Numerous e'quakes; no recorded deaths more than 10.					
1954					
9 September	Orleansville R6.7	1,400	14,000	300,000	
10 September	R6.2			people	
1965	no data				
1973	no data				
1980 October	El-Asnam R7.7	4,500	8,000	33,300 dwellings	
				331,200 people	
1989 October	Tipaza	30	400		
1994 August	Mascara R5.6	172	288	150,000 people	
1999 December	"north-west"	28	175		
2000 November	R 5.8				
2003 ? May	Setif R3.6				
2003 May (twice)	Boumerdes R6.7 R5.8 R5.8	2,251	10,243	200,000	

Notes:

1. Rothé lists 98 "destructive earthquakes" between 1716 and 1949
2. Refugee/population movements in 1975 and 1992

## Footnotes

[1] The *wilaya* is the equivalent to a French *departement* and is subdivided into *daira* which are composed of *communes* incorporating village localities

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<http://www.radixonline.org/algeria2.htm>