

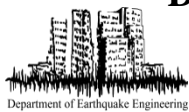
**PRELIMINARY REPORT ON  
OBSERVATIONS FROM 16 APRIL  
2013 IRAN EARTHQUAKE  
(PAKISTAN SIDE)**



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## INTRODUCTION

A strong earthquake occurred in Iran on 16 April 2013 at 3:45 pm local time. The magnitude of earthquake was 7.8 on the Richter scale whereas its focal depth was 82 km (USGS 2013). The epicentre of the earthquake was 83 km East of Khash in Iran (EERI 2013). The effects of earthquake were felt over a large region including Iran, Pakistan and India. In Pakistan, Mashkel was the nearest habituated town which lied within 100 km radial distance from the epicentre near the border of Iran (Fig. 1). The town was badly affected by the earthquake where building damage and life loss was reported. In order to gather the information on these losses, a reconnaissance team from the Department of Earthquake Engineering at NED University of Engineering and Technology visited the area. The team comprised of the following members: (1) Prof. Muhammad Masood Rafi, Chairman, Department of Earthquake Engineering; (2) Mr. Aftab Ahmad Farooqi, Associate Professor, Department of Civil Engineering; and (3) Mr. Shahid Hussain, Laboratory Engineer, Department of Earthquake Engineering.

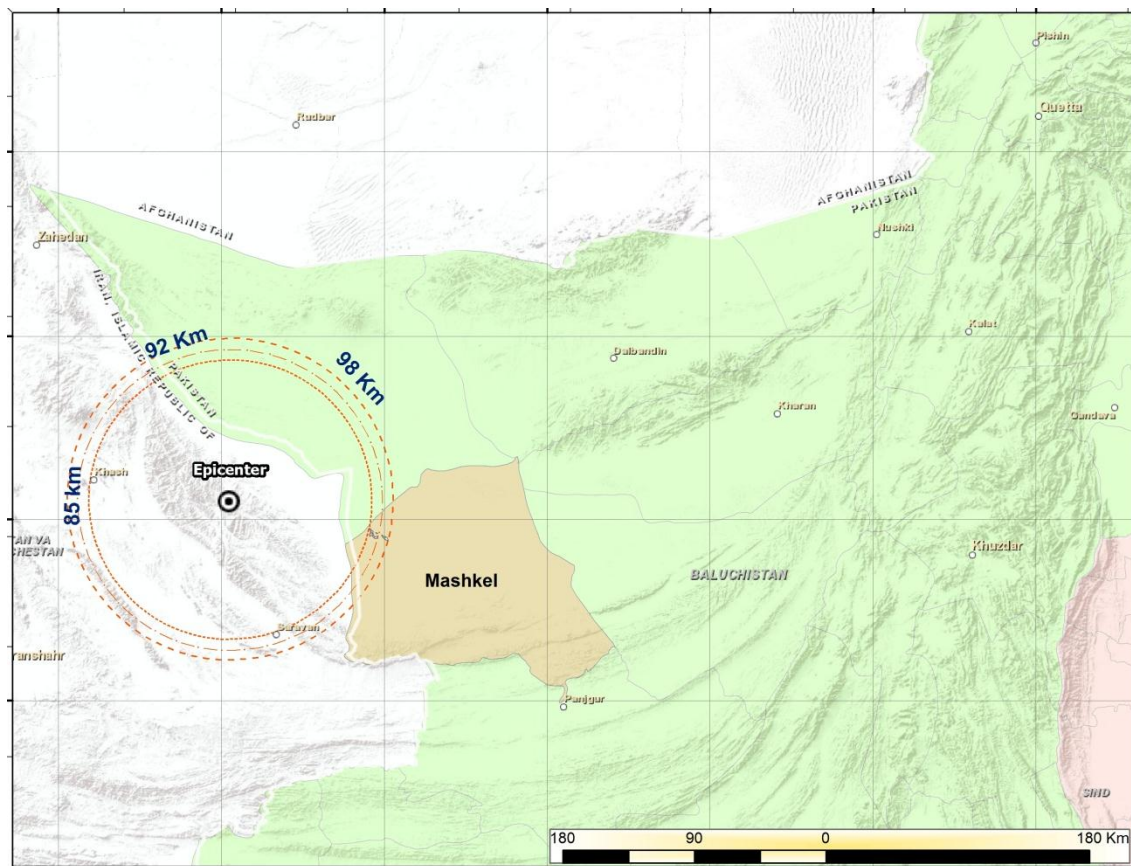


Fig. 1(a) Earthquake affected region of Mashkel

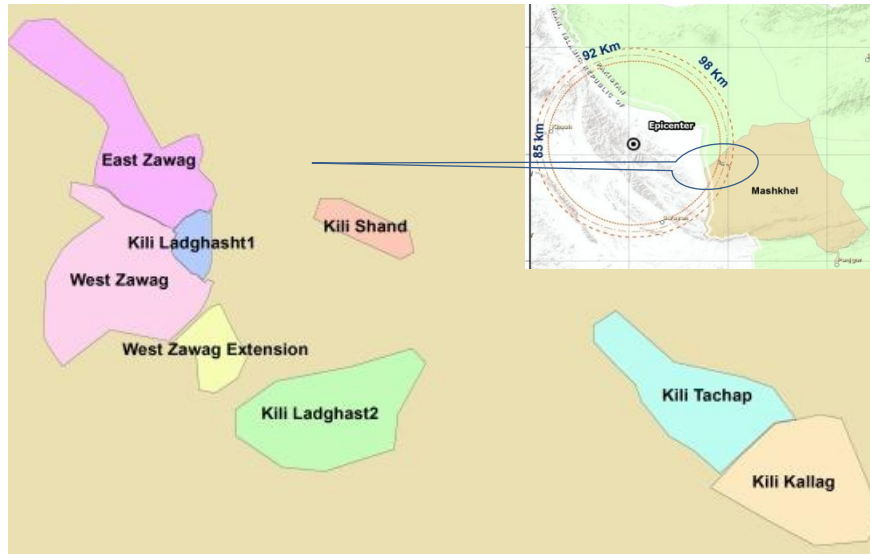


Fig. 1(b) Towns visited for damage reconnaissance in Mashkel

### TOWN OF MASHKEL

Mashkel is a thesil of Washuk district in Baluchistan. The city area is also named as Mashkel. It lies at 467 km South-West of Quetta. The area is a plain terrain consisting of desert and is covered by date palm trees (Fig. 2). The journey to the Mashkel city took nearly 12 hours from Quetta on the tortuous unpaved roads. The visiting team installed a strong motion instrument to record possible after-shocks. The instrument was installed in the evening of 20 April 2013 and was remained in place until the morning of 22 April 2013 when the team departed from the site on completion of work. A large area of Mushkel was surveyed by the team and the information was recorded using questionnaires. Two types of questionnaires were employed to collect the information regarding earthquake intensity and building damage. The survey was carried out on 21-22 April 2013 and the following areas and sites were visited

- |                                   |                   |               |
|-----------------------------------|-------------------|---------------|
| 1 East Zawag                      | 4 Kili Ladgasht 1 | 7 Kili Tachap |
| 2 West Zawag                      | 5 Kili Ladgasht 2 | 8 Kili Kallag |
| 3 Frontier Corps (FC) Headquarter | 6 Kili Shand      |               |

The Mushkel city consists of East and West Zawag. FC Headquarter lies in the East Zawag region whereas other areas are in the outskirts of the main city. Kili is a local word which is used for village. Of all the aforementioned kilis, Kili Kallag is the largest with a building population of over 450 houses. The buildings in all other kilis were less than 100.



Fig. 2 A view of date palm trees in Mashkel

### **CONSTRUCTION TYPES**

Adobe was found to be the predominant construction type in the region. This is owing to the remoteness of the area from any industrial city which makes the availability of modern construction materials difficult and costly. Nevertheless, a little proportion of block masonry and reinforced concrete (RC) construction also exists. The details of these have been discussed in the forthcoming sections.

### **OBSERVATIONS ON DAMAGES**

#### **Earthquake Intensity**

Based on the data gathered by the Department of Earthquake Engineering, initial estimate of earthquake intensity on Modified Mercalli Scale for the region affected by the earthquake is illustrated in Fig. 3. The detailed analysis of the data may, however, indicate some changes which will, subsequently, be communicated separately in any future publication.

#### **Seismological and Geotechnical Aspects**

As mentioned before, a strong motion instrument was installed in a building in East Zawag. However, after-shocks were not recorded during the stay of the survey team in the area. Cracking or any other distress in the ground was also not visible.

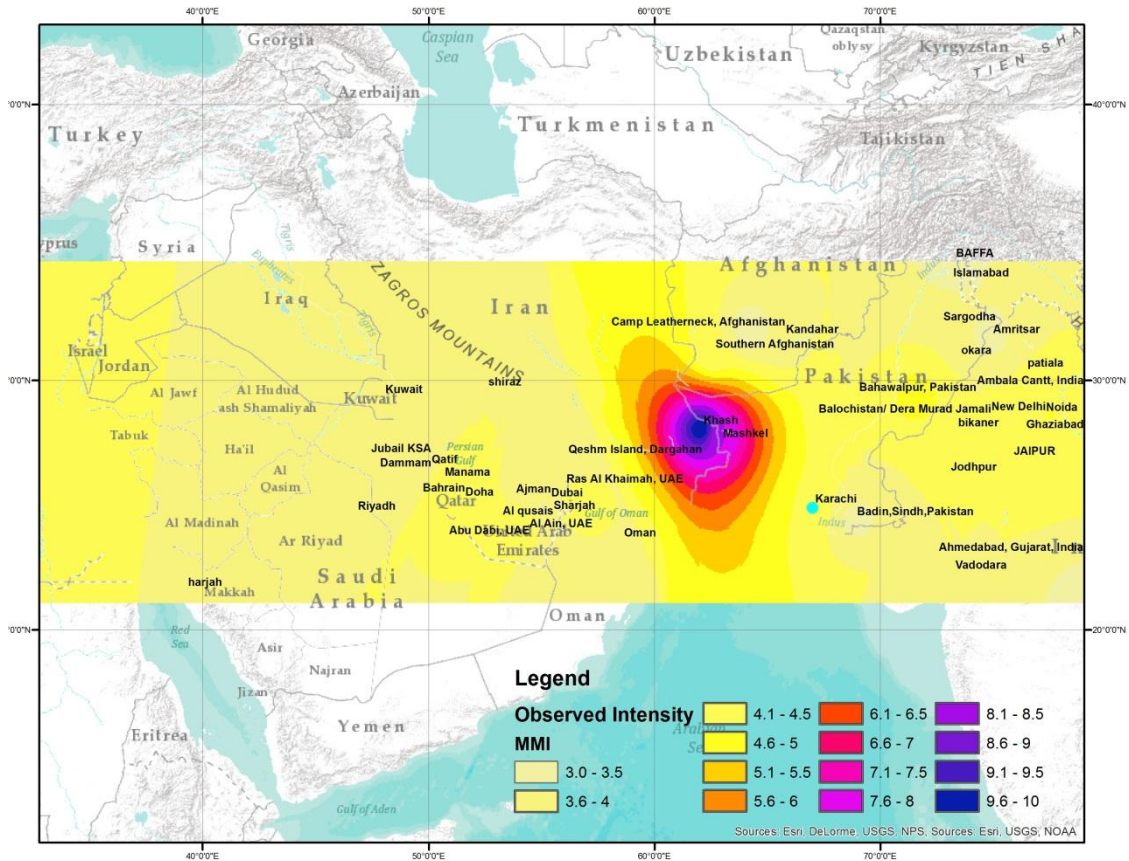


Fig. 3 Intensity distribution around the affected region (analysis done by Mr. Muhammad Ahmed)

### Infrastructure Damage

The infrastructure facilities in the area consist of electric poles and sewerage lines. Ground wells are the major source of water supply and the roads are non-existent in the region. Insignificant damage was observed to any of these infrastructure facilities in the affected areas. Except West Zawag, no damage to electric poles was observed (Fig. 2). All poles were, however, damaged in West Zawag (Fig. 4). The wells were also functional in the area. Similarly, telecommunication infrastructure was also intact and the mobile phones were functioning satisfactorily.

### Building Damage

In respect of material types, RC buildings performed well and were undamaged (Fig. 5). Minor damage to block masonry houses was observed in the Mashkel city area (Fig. 6). The adobe buildings performed poorly, as can be expected and suffered huge losses (Figs. 7 and 8). According to some of the reports (these are not verified by the team) nearly 45,000 people were affected in Mashkel out of a total population of 48,000 whereas 5,470 houses were damaged.



Fig. 4 Broken electricity poles in West Zawag



Fig. 5 View of a RC structure of a mosque in West Zawag



Fig. 6 Cracking in block masonry building in FC Headquarter



Fig. 7 Damaged adobe buildings in East Zawag



Fig. 8 View of damages in West Zawag

In respect of surveyed area, East and West Zawag suffered the maximum damage and most of the adobe buildings collapsed in these parts (Figs. 7 and 8). A historical adobe castle in the FC Headquarter was also heavily damaged (Fig. 9). Building damages in the kilis varied. Most of the building damages were noted in Kili Kallag. These damages include from cracking in the wall to the complete building collapse (Figs. 10 and 11). Minor damages were observed in the rest of the kilis (Fig. 12).



Fig. 9 View of damaged castle in FC Headquarter in Mashkel



Fig. 10 Visible crack in walls in adobe buildings in Kili Kallag



Fig. 11 Damaged adobe houses in Kili Kallag



Fig. 12 An adobe house in Kili Tachap after the 16 April 2013 earthquake

#### **ACKNOWLEDGEMENT**

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