**TAIEX Workshop (57272): Strategies Related to Major Natural Risks and Human Disasters**

**Workshop Conclusions & Recommendations**

Following up on the TAIEX Workshop on Strategies Related to Major Natural Risks and Human Disasters‏ that took place in Beirut on the 15th and 16th of October 2014 with the co organization of the Industrial Research Institute, various recommendations have been drawn up by the experts.

The Post seminar recommendations provided by the experts tackled some of the technical as well as institutional issues related to management of natural disasters and its prevention, in particular those related to earthquake proof construction norms and practices.

The recommendations can be summarized as follows:

1. **General recommendations for the preparation for Natural Disaster events.**

Development of a **civil protection agency** or a central **core crisis center** whose role is to:

1. Mobilize and coordinate the action of different entities providing different natures of help: fire brigades, civil protection, army, air force helicopters, in case of a dramatic event taking place (plane crash, train out of rails with chemicals, earthquake, floods, tsunami…).
2. Establish a smart decision process by clearly identifying the relevant political and technical persons responsible in case of disasters, and consequently dividing the burden of responsibility among various responsible parties. In the same context, and depending on the type of disaster, to identify international or regional organizations or countries that could provide the needed assistance.
3. Study intervention plans before events take place: network of responsible persons with all coordinates available to all, access roads and procedures.
4. Perform live exercises or simulacrum or disaster scenarios in order to prepare institutions as well as the public to face potential occurrence of disasters such as earthquakes or large fires: How to behave and where to go, and what protective measures to take.

* **Other recommendations:**
* Prepare the city/ community for an event (for example, information panels, emergency signs, escape routes, etc.)
* Create knowledge in the academia on civil protection matters; include in the curriculum of basic education, since pre-school, notions on risks and consequent behavior for each type of event. Children learn fast and teach parents and family what they learn at school;
* Develop risk communication techniques according to different target audiences;
* Knowing that risk perceptions are very distinct / different among groups of people, such as experts, scientists, authorities and common citizens, it is important for a society to have the insight that allows the information to reach the pretended goals; thinking specifically in the case of Lebanon, foreign people, refugees, and people subjected to more violent experiences, may have different risk perceptions which could lead to less awareness, for example in case of an earthquake (low probability event);
* Allow information to flow bottom up, openly from citizens to scientists and / or authorities. In the same manner, allow information to flow top down, from scientists to civil protection authorities and vice-versa;
* Experience has shown that citizens are the first civil protection agents, since authorities become victims as well and ordinary citizens provide the first help themselves, family, neighbors, and other fellow inhabitants.

Recommendations related to specific disasters:

**B- Earthquakes**

1. **Recommended Implementation procedures:**
* Improve the quality check on constructions at all stages from design to
execution in order to insure their compliance with the required standards.
Lifetime infrastructure and industrial plans should have more strict
regulatory and control measures to improve their seismic resilience.
* Conduct risk assessment for the different major cities and urban
agglomerations of the country, as well as local contingency plans.
* Implementation of mandatory technical monitoring on strategic sites not subject to work such as hospitals, schools, fire stations should be decided as quickly as possible in order to put them in compliance with the standards.
* Public authorities shall put in conformity all tunnels and bridges which are crucial for the rescue operations, if an Earthquake hazard occurs.
1. **Standards and regulatory policy**
* Natural risks regarding safety of people need to be covered by national regulations since the probability of occurrence is generally rather low and when they occur it is necessary that buildings (or other civil works) are well designed and maintained in order to provide the adequate level of safety. The free market cannot properly deal with that.
* Review the seismic design provisions of the building code of Lebanon in particular the Peak Ground Acceleration value and the seismic zoning of the country.
* Lebanon to join the activity within CEN (Comité Européen de Normalisation) either as a full member or as an observer. The suggestion of linking to CEN rather than US or Japan is justified by the great vicinity, which facilitates participation to meetings.
* Lebanon to establish committees on the various technical aspects for earthquakes (steel structures, concrete structures, resistance of structures to earthquakes, Fire Resistance).

 **3- Information awareness and capacity building**

* Improve and build human capacity in the construction industry, by
introducing earthquake-engineering courses to civil engineering programs at
universities, and by proper training of professional labor and workers in
the field.
* Review strategies for gathering and dissemination of basic data in proper
formats, essential for any earthquake risk analysis in the country.
* An awareness program to be established and to be submitted to citizen for at least the great cities of Beirut, Tripoli, Jounieh, Saida, and others.
* Civil Defense have to assess the road mapping available in Lebanon and propose for at least the great cities as Beirut, Tripoli, Jounieh, Saida, etc…to be linked by a safety chain of roads used only by rescuers when a natural disaster occurs.
* Authorities to implement simulation exercises on earthquakes in pilot areas to develop practical skills.
1. **Prevention and forecasting of earthquake disasters**

- When evaluating the seismic hazard of a region, earthquake sources need to be identified and fault behaviour (slip rate, recurrence times, etc.) needs to be characterized to extend the earthquake record. For that purpose, several techniques can be used, combining present-day measurements (e.g. geodesy and instrumental seismicity) with historical seismicity, archaeoseismology and geological data (e.g. paleoseismology). Earthquake-induced phenomena, such as landslides, liquefactions, surface faulting, ground shaking and tsunamis should also be considered.

* Using all this knowledge about earthquake sources in a region and combining it with other data (e.g. magnitude-frequency relationships for the sources, attenuation of ground motion with distance from source) seismic hazard maps can be produced. These maps can then be used as input for different design or risk assessment purposes.
* However, considering that Earthquakes don’t occur on simple fault structures, but on fault systems that can be very complicated, leading to complex interactions among faults that no simple deterministic model can explain; and considering that in some cases, earthquakes come in clusters and that in other, they rupture large sections of faults, combining segments that had not been known to move together in previous seismic events; and considering that there is also the problem of earthquakes occurring on unknown faults, mapping areas as low and high seismic risk has not always been valid in forecasting the occurrences of earthquakes and fundamental notions on earthquake behavior have been challenged. (e.g., Wenchuan 2008, Haiti 2010 and Japan 2011 earthquakes) Accordingly, Seismic hazard assessment has to address these complexities and incorporate the new findings on earthquake behaviour to produce more realistic models.
1. **Fire safety**
* To provide some freedom in designing a building, since the main purpose of the building is not the fire safety but to perform adequately the activity planned within this building, the relevant national regulation need to be a performance-based code (which gives fire safety objectives to be reached) rather a descriptive code (which explains how to construct the building).
* However, since it could be too time consuming to make fire safety engineering analysis (to prove that adequate fire protection provisions are used to fulfil the fire safety
* objectives) for every building constructed regardless of its size, it is possible to add to the regulation a descriptive part (deemed-to-satisfy solutions) for some typical simple

buildings. In this way the user of the regulation would have the choice to either fulfill the descriptive solution which should lead to a slightly more expensive cost for the building, but should be less expensive for the design work, or a fire safety design which will be more expensive but can lead to a cheaper building.

**Conclusion**

The bulk of the activities as well as the exchanges that took place at the level of the Lebanese and external experts provided valuable input which has highlighted **the need for Lebanon to have an institutional tool for the global management of its major natural and human disasters.**

Legal and judicial issues should be thoroughly studied for that purpose. The existing fragmented and partial local experiences in the fields of institutional disaster management should be screened, unified and improved in order to constitute a continuous, adequate and modern service tool; without this tool and the national strategy that should follow, it will be difficult to maximize the utility of external assistance.

In terms of construction norms it was agreed that **Lebanon should modernize and customize its earthquake preventive construction norms** while referring to International standards mainly EU norms viewing the vicinity of Europe; this of course could happen after conducting a general census as to the actual buildings status in Beirut and the regions with a special focus on strategic sites. The census can also be used to allow the adequate update of National legislation in that aspect.

Finally, it was generally and strongly agreed that there is a **need to develop awareness related to the issues of earthquakes** and their impact not only at the General public level but also at the Professional and Academic level.