

BETWEEN TWO EARTHQUAKES.

The Management of Cultural Property in Seismic Zones.  
Sir Bernard Feilden -  
Director Emeritus ICCROM.

Introduction.

Disasters are untimed events which cause damage, often widespread. They can be divided into two categories, man-made ones which are preventible, and natural disasters which can be anticipated but cannot be prevented. Man-made disasters are war, terrorism including bomb threats, riot and panic, explosions of gas, escape of poisonous gases as at Bhopal and Seveso.

Natural disasters include wind, hurricanes, typhoons, tornados, heavy rain, flooding, dam break, frost, heavy snow, landslips, avalanches, bradiseism and earthquakes. Some warning may be available for high winds and floods giving time for action, but in practice so far no practical warning is available for an earthquake.

Earthquakes are different in degree, in their capacity to kill almost instantaneously due to lack of warning, and in their intensive damage to cultural property often augmented by fire, looting and water damage.

Disaster preparedness is a growing area for study and arouses increased interest. At the level of an institution fire precautions should be the basis but there are also risks from unpredictable natural hazards such as hurricanes, floods and in seismic zones, earthquakes. The techniques of organising preparedness at institutional level are much the same, but with natural disasters often the infrastructure of a community is put out of action so the institution or individual householder will not get support from outside for at least several days. It may be several years before the damage is repaired. It is the size of earthquake disasters which gives them a special dimension which involves national (or federal), provincial and local administrations. It is these administrations which can take major steps in organising disaster preparedness, so saving lives and also cultural property which is irreplaceable. This paper is aimed primarily at administrators because they have the power and the ability to organise preventive measures at all levels of action but it should also be studied by institutions, such as museums and persons responsible for historic buildings, at which level fire precautions can be used as a basis for earthquake disaster preparedness.

Administrators can by actions for preparedness more than halve the damage that occurs in an earth-

quake and this means saving many lives and by rapid decisions and giving appropriate priority to the repairs of historic buildings, they could reduce the cost of necessary work. The key administrators are those working at a local, district or community level in seismic zones. They should be aware that they are living BETWEEN TWO EARTHQUAKES.

Preventive measures can and should be taken at all levels. Small scale efforts at individual institutions can add up to a big overall effect. At the moment of a disaster it is the local effort which counts as it takes some time before national aid can come and even more for international assistance to materialize.

Repair and reconstruction after the last earthquake have to be studied. Lessons can always be learned from other people's tragedies in order to apply the lessons to ones own situation of being BETWEEN TWO EARTHQUAKES.

In seismic zones each State or Federal Government should appoint a disaster relief co-ordinator with a senior assistant responsible for all cultural property, whose duty is also to co-ordinate the work of conservation volunteers.

Disaster preparedness has to combat the natural inclination of the population to say it won't happen here - or at least not in my time. However the only responsible policy is to start now and work gradually and effectively towards full preparedness.

The national organisations responsible for the administration and care of cultural property will all be called the Service in this paper.

A brief summary of the administrative actions before, during and after a seismic disaster to be used as a check list is given below. It should be applied to the local situation working within the administrative methods, planning procedures, patterns of ownership and cultural attitudes of each country.

1. Before Disaster General.

- a) Make full inventories of all cultural resources supported by photographs and photogrammetric records of important historic buildings, sculptures and artistic decoration. Keep duplicate records in a non-seismic place or safe building and prepare seismic survey forms and outline drawings of all important buildings. Pending the release of sufficient resources the individual institution should protect existing documentation and records by collect-

- j) Insure objects as far as possible and classify as replaceable (by obtaining duplicates) or irreplaceable. It should be noted that while insurance may serve a purpose it should be in the context of the last factor to be considered. Efforts should be primarily directed at eliminating or at least mitigating risks of loss in accordance with basic management philosophy, particularly since any cultural properties and artifacts are irreplaceable.

2. Before a disaster - Professional actions.

- a) Geological studies showing zones with higher risk due to underlying site properties and geologic structure. Microzoning is most important.
- b) Seismic Studies including historic records to evaluate return periods of earthquakes with various intensities. Predictions of frequency.
- c) Vulnerability Studies for earthquakes of different intensity. Such studies should relate to the artistic and historical value of the buildings, their furnishings and contents.
- d) Town and Country Plans relating developments to various grades of seismic damage.
- e) Assess risk to infrastructure of roads, drainage, water, gas, electricity, telephones and other installations. Initiate anti-seismic design for these life-lines. Improve life-lines preceded by archaeological investigations when excavation is needed.
- f) Prepare Seismic Safety Plans for individual or groups of historic buildings. Strengthen buildings by stages as and when economic.

3. During a Disaster and Shortly Afterwards.

Priority must be given to saving life and rescue operations with emergency help to persons and provision of tents, blankets, clothing, food, doctors, nurses and medical supplies. These activities however come outside the scope of this review.

- a) Fight fires and prevent looting of works of art. Prevent water damage from rupture of water supply pipes or firefighting.

- ing them and placing them in the safest place available, until more formal plans can be implemented. (A disaster teaches one the importance of inventories and documentation).
- b) Rehearse fire fighting drills at six monthly intervals. Earthquakes have a low probability so integration of earthquake preparedness into preparedness for other hazards such as fire and flood will ensure that they are not neglected. Arrange rehearsals with civil and military authorities at biennial or triennial intervals, which include members of cultural heritage services. Earmark sites for helicopters to bring aid.
  - c) Educate the public in the importance of historic buildings, maintenance and seismic upgrading of vernacular buildings and publish guidelines for local builders in the correct techniques.
  - d) Rationalize ownership of private property by appropriate legislation. One person should be nominated as the Trustee of Cultural Property in order to facilitate any property changes needed, but the onus for nomination must be on the owners.
  - e) Install a national or regional emergency group for protection of cultural property.
  - f) Provide incentives for maintenance and anti-seismic upgrading. Preserve skills and materials needed for maintenance and repair of historic buildings.
  - g) Train architects and engineers in seismic resistant design for historic buildings and in making inspections and reports.
  - h) Organise regular inspections of important cultural resources at appropriate intervals by qualified professionals who should classify work needed under headings IMMEDIATE, URGENT NECESSARY, DESIRABLE, and KEEP UNDER OBSERVATION. Develop a maintenance strategy that includes anti-seismic resistance upgrading in an economical way.
  - i) Prepare portable generators, pumps, vehicles and motor fuel. Allocate seismic resistant buildings to be used as conservation warehouses in a disaster. Provide a mobile conservation laboratory (useful in any case). Establish reserves of conservation materials and emergency boxes.

- b) Protect as much cultural property as possible. Label and take all moveable cultural property to designated warehouses, fumigate and give first aid. (The best methods of fumigation are much under discussion).
- c) Obtain co-operation of local civil and military authorities as soon as possible.
- d) Organise a quick inspection of damage and co-ordinate work of conservators, architects and engineers. Grade damage to buildings.

4. After the Disaster - Short term.

- a) Protect important buildings from the weather.
- b) Set up multi-disciplinary conservation teams and allocate materials and labour to repairs, giving priority to protection against the weather.
- c) Seek international aid through the Government disaster relief co-ordinators office and request any special equipment needed.

5. After the Disaster - Long term.

- a) Organise an in depth assessment of damage with estimates of costs (see Standard Forms in Appendix 7 of the ICCROM/GETTY booklet).
- b) Organise priorities for the repair programme.
- c) Execute structural repairs using teams of architects trained in conservation, engineers historians and archaeologists.
  - (i) Set up multi-disciplinary teams to prepare projects for repair and reconstruction of damaged buildings.
  - (ii) Evaluate alternative schemes balancing risk and vulnerability against degree of intervention and loss of cultural values.
  - (iii) The engineers work must be integrated into the architectural/historical methodology, in accordance with the resolutions of the Skopje 1985 Symposium. (Appendix 9 of the ICCROM/GETTY booklet).
  - (iv) Present schemes for public approval and support.

- v) Execute structural repairs. Note the skills needed for this work are different from those needed for reconstruction of industrial or modern buildings. So, historic buildings are not competing for labour only for materials. The amount of materials needed for repairing damaged dwellings is far less than is needed for new houses. A high priority should be given to repair of historic buildings used as dwellings.

I would like to acknowledge the help I have received from all those who attended the ICCROM/IIZIS seminar at Skopje as well as J.Jokilehto, A.Alva, J.Mailliet all of ICCROM and Pierre Pichard. The Getty Conservation Institute together with ICCROM is publishing a booklet which deals in greater detail with the matters merely introduced in this short paper.

After studying this booklet it is hoped that the State Party in a seismic zone will call a conference in which to allocate responsibility to individuals for the various activities outlined in this paper. It is the duty of ICOMOS professionals who are aware of the preventive steps that can be taken to advise administrators at all levels that damage suffered during earthquakes especially to historic buildings can be reduced dramatically with consequential saving of life in Zones Between Two Earthquakes.

BETWEEN TWO EARTHQUAKES.  
By Sir Bernard Feilden, Director Emeritus ICCROM,  
Architectural Conservation Consultant.  
Abstract.

Earthquakes are different in degree from most other disasters in their capacity to kill almost instantaneously due to lack of warning and in their extensive damage to cultural property often augmented by fire, looting and water damage.

Administrators, by taking steps for disaster preparedness can reduce the damage that occurs in an earthquake and this means saving lives. By rapid decisions after an earthquake they can save historic buildings from the ravages of the weather which can more than treble the initial damage. Historic buildings need specialist skills for their repair so they do not create a competing demand against the reconstruction of industrial and commercial buildings. Repair of the traditional dwellings uses far less material than rebuilding houses, so high priority should be given to reinstatement of the cultural heritage as it is also irreplaceable.

A disaster teaches the importance of inventories and full documentation beforehand.

A policy of upgrading buildings combined with their regular maintenance is recommended. Ill-conceived alterations can greatly damage the seismic resistance of a building. There is a need to educate contractors and supervisors in seismic zones.

There is also a need to train architects and engineers in the art of strengthening historic buildings against seismic threats. Such strengthening must be compatible with the structural system and materials of a historic building. Engineers should always give alternative proposals so that the architect, art historian and archaeologist can evaluate their effect on the authenticity of the historic building.

Town planners must prepare plans for alternative seismic scenarios so that reconstruction is not delayed after the event. Bypasses to historic centres are important as it is these centres that may be blocked by debris in an earthquake.

Fire fighting exercises form a good basis for disaster mitigation. A disaster box should be kept in readiness and a salvage squad organised.

With well maintained historic buildings, having some anti-seismic upgrading, it is possible that the next earthquake will not be too disastrous. Persons living in seismic zones are LIVING BETWEEN TWO EARTHQUAKES.

## ENTRE DOS TERREMOTOS.

Por Sir Bernard Feilden. Director Emérito del ICCROM.  
Consultor de Conservación Arquitectónica.

### Resumen.

El terremoto se diferencia de otros desastres naturales por su capacidad de causar pérdidas humanas, en su condición de evento inesperado, y, por el vasto daño que provoca al patrimonio cultural, frecuentemente aumentado por incendios, vandalismo o el consecuente deterioramiento causado por el agua en estructuras que restan expuestas a la intemperie.

Los cuadros administrativos, mediante medidas de prevención, pueden reducir el riesgo en el daño que podría causar el terremoto y con esto contribuir a salvar vidas humanas. La celeridad con que se decidan acciones luego de un terremoto, contribuye a la protección del patrimonio de la acción devastadora del intemperismo, que puede más que triplicar el daño inicial. La reparación del patrimonio histórico requiere de técnicas especiales, a fin de no crear una demanda de competencia en relación a la reconstrucción de edificios industriales y/o comerciales. La reparación de sistemas constructivos tradicionales requiere menor cantidad de materiales que la utilizada en la reconstrucción de estructuras similares, por lo tanto, debe darse prioridad a la restauración del patrimonio cultural, dada su condición de patrimonio irremplazable.

Un desastre enfatiza la importancia del inventario y de la documentación registrada con anticipación al evento.

Se recomienda una política de mejoramiento de la edificación existente acompañada de acciones de mantenimiento regular. Las alteraciones no planificadas pueden provocar un gran daño a la capacidad de resistencia sísmica de un edificio. Es necesario formar a los supervisores y contratistas operantes en zonas a riesgo sísmico.

Existe, también, la necesidad de formar arquitectos e ingenieros en las técnicas para reforzar edificios históricos contra la acción del sismo. Tales técnicas deben ser compatibles con el sistema estructural y los materiales de la estructura histórica. El ingeniero estructural debe desarrollar propuestas alternativas, a fin de que el arquitecto, el historiador o el arqueólogo, puedan evaluar los efectos de tales propuestas en relación a la autenticidad del edificio histórico.

Los urbanistas deben desarrollar planes que integren diversos escenarios sísmicos a fin que los trabajos de reconstrucción no sufran retrasos luego del evento. Las rutas alternativas a los centros históricos son importantes en la eventualidad de que éstos resten bloqueados por los escombros de las estructuras dañadas por el terremoto.

Los ejercicios para combatir la acción de incendios forman una buena base para la mitigación de desastres. Una caja con equipamiento mínimo para actuar luego el evento debe mantenerse en orden y una escuadra de salvataje debe ser organizada.

Con estructuras históricas en buen estado de conservación que, además, cuenten con algún tipo de refuerzo sísmico, es posible que el próximo terremoto no sea tan desastroso. Los habitantes de las zonas sísmicas VIVEN ENTRE DOS TERREMOTOS.