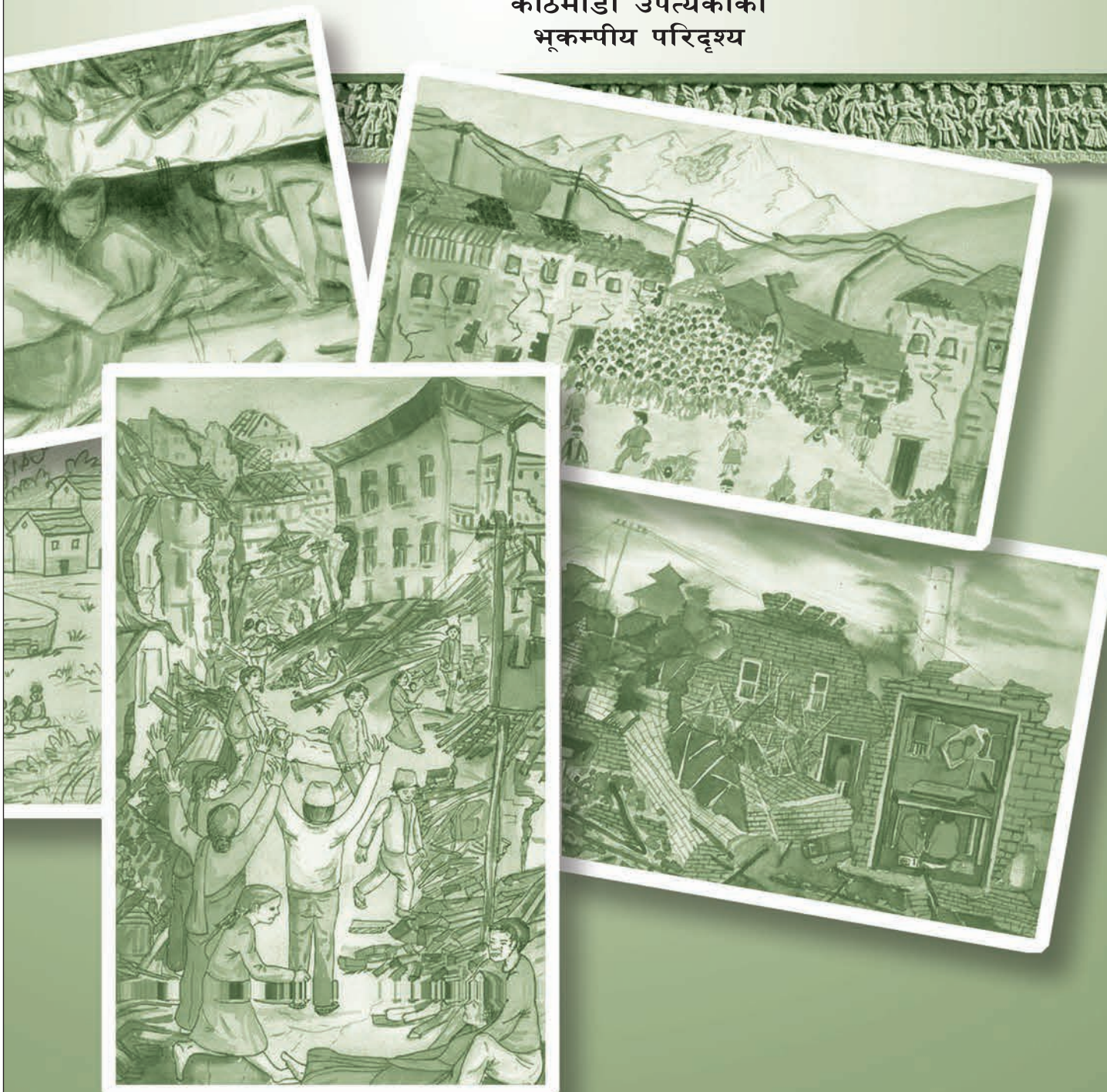


# Kathmandu Valley's Earthquake Scenario

काठमाडौं उपत्यकाको  
भूकम्पीय परिदृश्य



A product of the Kathmandu Valley Earthquake Risk Management Project implemented by National Society for Earthquake Technology-Nepal (NSET) and Geo Hazards International (GHI)

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This scenario was developed as part of the Kathmandu Valley Earthquake Risk Management Project, a subset of the Asian Urban Disaster Management Project (AUDMP). Core Funding came from USAID's Office of Foreign Disaster Assistance (OFDA). Management and implementation of AUDMP came from the Asian Disaster Preparedness Center (ADPC).



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## CAUTION

The following publication describes possible impacts of a potential earthquake to affect Kathmandu Valley. Other earthquakes not evaluated in this study would produce different consequences. This is not a prediction of a specific earthquake, earthquake damage, or consequences. This description is intended only for use in planning and preparedness exercises and in raising awareness of Kathmandu Valley's earthquake risk. The authors, advisors, publisher and other contributors to this report are not responsible for use beyond these purposes.

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GeoHazards International, USA (GHI)**



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# KATHMANDU VALLEY'S Earthquake Scenario

## काठमाडौं उपत्यकाको भूकम्पीय परिदृश्य

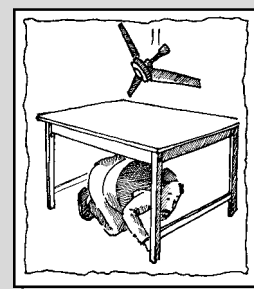
*The following earthquake scenario describes the possible physical damage and social impact due to earthquake shaking similar to that which occurred in the 1934 earthquake of Kathmandu Valley.*

### THE EARTHQUAKE STRIKES !

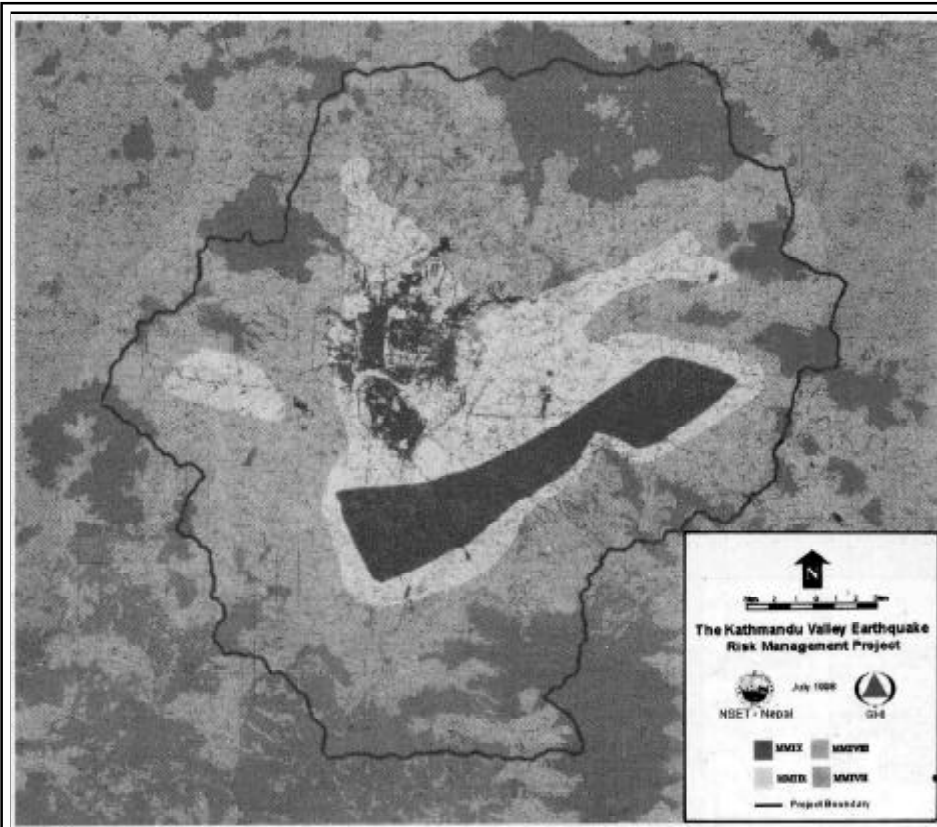
It is a gray winter day. The sky has been overcast since early morning. The people of Kathmandu Valley are feeling cold, but everyone is busy with their work. Schools have re-opened after winter vacation and students are busy with their studies. It is a normal day in Kathmandu Valley.

It is a quarter past two o' clock in the afternoon. All of the sudden, many people feel their seats shaking but they do not understand why. Nobody takes much notice and everybody continues their business. Soon after this, the ground begins violently shaking and there is a strange, low rumbling noise. Everybody gets up and hurries out of their rooms. They see everything around them falling to the floor. Racks and book-cases fall to the ground in offices; hospitals are in total disarray with medicines dumped on the floor and drawers falling to the

ground; and dishes, cookware and food supplies fall to the floor in homes. Window-panes are breaking and buildings are starting to crack.



If you are inside a building when an earthquake strikes, take shelter under a sturdy desk or a table, or stand in a doorway. Stay away from heavy furniture, such as bookshelves, which could fall and injure you. Also, stay away from windows.

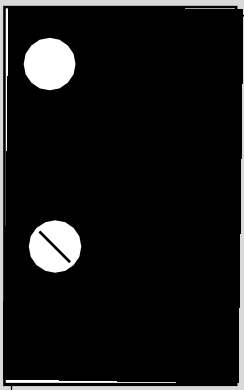


This map shows the different intensities of ground shaking that occurred in the valley in the great earthquake of 1934.

- X: Most well-built masonry and frame structures are destroyed. Many wooden structures and bridges are destroyed. People are thrown to the ground.
- IX: Poorly built masonry structures collapse. All structures are damaged. General panic occurs.
- VIII: Damage occurs to masonry structures. Heavy furniture moves or overturns. People are frightened and have difficulty standing.



If you are inside near an exit when an earthquake strikes, exit the building and find a location far away from buildings, walls, trees, narrow streets and power lines.



If you are inside a vehicle when an earthquake strikes, pull over to the edge of the road and stop. Stay away from buildings, trees, power lines and bridges.

The atmosphere is confusing and frightening. In some places, where people have not been trained how to behave during an earthquake, people start running in all directions, horrified and screaming. Many people stumble and fall, and some even jump out of windows and off verandahs. Lots of people are injured as everyone, trying to save their own life, rushes towards exits. Some people driving vehicles do not know what is happening and cause traffic accidents.

In some offices, schools and hospitals where people have previously conducted earthquake drills and awareness programs, people are scared, but they know what to do when an earthquake strikes and they are not panicking. People who are outside or in the ground story of a building near to open space rush outside to an area away from all buildings, walls, trees and power lines. People who are inside buildings and cannot rush to an open space take shelter under sturdy desks and tables, or in doorways. School children are crouched under their desks, waiting for instructions from their teachers. Doctors and nurses are helping the most seriously ill patients to protect themselves and are preparing to evacuate the hospitals. Drivers in automobiles pull carefully off to the side of the road, waiting for the shaking to stop.

All living creatures are affected by the earthquake, not just humans. Dogs are whining and barking. Cattle, buffaloes, sheep and goats are frightened, running in all directions and crying out.

When the shaking stops, the entire city seems to be stunned. The ground has stopped moving, but the people are still trembling. The air is thick with dust and it is difficult to see what has happened to the valley.

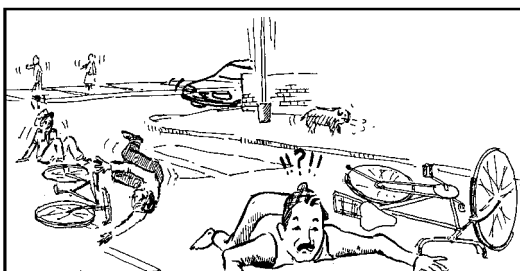
### ONE HOUR LATER

The clock strikes 3:00 in the afternoon. The Radio Nepal news broadcast says, "*Kathmandu Valley was shaken by a high intensity earthquake at about 2:25 P.M. today. The earthquake is believed to have caused massive loss and damage to Kathmandu Valley. Detailed report is yet to be received.*" Only people with battery powered radios hear this report.

Kathmandu Valley looks much different than it did an hour ago. Many buildings have collapsed completely, others remain half-standing. Fallen walls and buildings block the streets in many places. The roads are crowded with damaged vehicles and masses of scared people. In many places, fissures and cracks can be seen in the road, with sand oozing

### *Bhaicha is running ...*

Bhaicha is a friendly, lower middle-class man who works as a clerk in a financial company. He is riding his bicycle on an errand for his branch chief. As he reaches Durbar Marg, his bicycle suddenly loses its balance and he falls over. Bhaicha is confused because his bicycle has not collided with anything, nor has it hit a bump in the road. He notices that other people around him have also fallen down and he is surprised to see that motorbikes and other vehicles are swerving and shaking. While trying to determine what is happening, he hears a low rumbling sound like that of a storm and sees many people running in all directions and he notices the swaying of buildings and trees. Only then he realizes that he is experiencing an earthquake. He leaves his bicycle on the roadside and starts running. He thinks of his family and, forgetting his errand, runs towards home.



It is difficult to run because the ground is still shaking strongly and there are many frightened and confused people in the streets. A house collapses directly in front of Bhaicha, blocking his path. He realizes that he could be crushed by falling debris and starts to move with a little more caution. Bhaicha is scared, but he stumbles on in the direction he thinks is towards home, trying to avoid other people and falling objects. Bhaicha reaches an open space and stops, unsure of where he is. The shaking has stopped, but the collapsing buildings are no longer

recognizable and the air is thick with dust. He takes a deep breath, realizing that it will be difficult to find his way home.



out of them. Such fissures can also be seen at Bhadrakali Corner in Tundikhel, Rangashala, Baneshwor and other places. Fire and clouds of smoke are bellowing out of many buildings in the center areas of each city in the valley, caused by cooking fires overturned by the earthquake or electrical sparks from damaged wires.

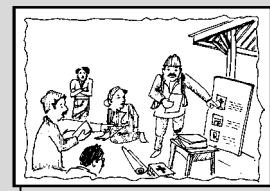
The people of Kathmandu Valley have recovered from their initial shock after the earthquake and are realizing that they are in the middle of a crisis. The first priority of most people is to find out if their families and loved ones are safe.

Some people know exactly where they should go, despite the chaos around them. These people are from families that planned for an earthquake in advance. These families made arrangements to meet at a specific place if a disaster occurred when they were separated from each other. Since the earthquake occurred in the middle of the afternoon, most families were scattered, with some people at office, some at school, and some at home. For people outside of the city center, it is easy to select a safe place to meet that is outside and away from all buildings, walls, trees and power lines. For families which live in the city, many have arranged to meet at Tundikhel, the open air theatre, Ratnapark or other open spaces and there are crowds gathering there now. These people wait anxiously to see which family members can safely come to the appointed meeting place, and which ones are missing. There are many discussions going on amidst all of the families gathered about how to search for missing people, and how to get information about who is safe, who is injured, and which houses have been damaged.

Families that did not plan how to reunite after an earthquake are now panicking. Office-workers are anxious to return home as fast as they can to learn the condition of their family, but they are having difficulty getting from their offices

to their homes. Many roads and bridges are damaged or blocked by debris, and vehicles are useless. Housewives at home are worried about their husbands in the office buildings, their children at school and other family members who were away from home when the earthquake occurred. People whose homes have been damaged do not know whether it is safe to stay near the house, but they are afraid to leave their homes, too, in case their missing family members go there.

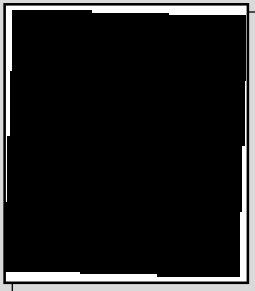
There are many schools which did not prepare for an earthquake and are now suffering. Many school buildings are heavily damaged with children trapped inside of them. The children who are safe are crying from fear. Parents have rushed to the schools to collect their children but the teachers do not know where all of the children are. Some children have left for home already, some children have stayed at school, and the teachers cannot keep track of where all the children are. Many parents are worried and angry because their children have not returned home, nor are they in school, nor can they be seen on the road.



Develop a plan for your family to reunite after an earthquake, in case an earthquake occurs when all family members are not together. It is a good idea to select a site near your home that is outside, away from all buildings, walls, trees and power lines, where everybody will gather.



This photograph shows the damage experienced by the Palace of 55 Windows in Bhaktapur during the great 1934 earthquake. (Photo credit: Shangrila Magazine, Vol. 4, No. 2, April-June, 1993)



After an earthquake, do not move people who are injured unless they are in immediate danger of further injury. If it is necessary to move someone, be very careful. You can make someone's injuries much worse by moving them improperly.

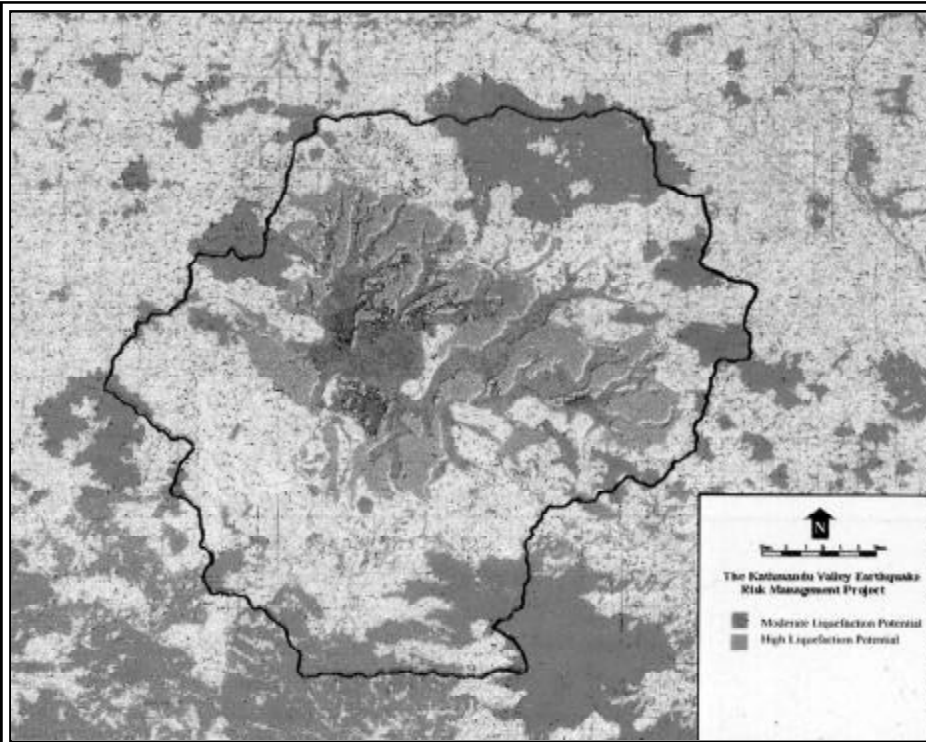
However, in some other schools the teachers are well prepared and have assembled their students in nearby grounds and are keeping strict vigil, not allowing anyone to leave. They are comforting the children and explaining to them what has happened. They are also identifying all of the children who are present and those who are missing, and sending a few teachers and senior students to search for any missing children. When lucky parents whose children are safe come to these schools, the teachers are handing over the children to their parents and assuring them not to worry or panic.

The news of the earthquake has spread by radio to other parts of the kingdom and the world and many people outside the valley are desperate to contact their relatives and friends in the capital to find out if they are okay. However, the earthquake has damaged telephone towers, poles and wires and has cut practically all telecom-

munications service. Even in the few places where telephones continue functioning, nobody has the courage to enter buildings to receive the telephone calls.

There is now a great need for search and rescue activities, fire suppression, medical care and other services. However, little official response can be seen because of the chaos following this event. Telephone lines and electrical power have been disrupted in the valley, making it difficult for emergency response agencies to communicate amongst themselves and coordinate their response to this calamity. However, normal citizens are working to try to save their neighborhoods and friends. As the day progresses, groups of soldiers, police, and fire fighters can be seen joining the residents of each ward in the rescue effort.

The fire brigade is fighting valiantly to put out the fires that are burning in central Kathmandu. However, only two of the brigade's seven fire engines can be used. Two fire-engines were out-of-order even before the earthquake struck. The remaining three engines are trapped in their garages because the earthquake damaged the garage gates and now they cannot be opened. Blocked roads have made it difficult for fire engines to reach many of the blazes and fire fighters are attempting to use long water hoses in areas which they cannot access by truck. This approach is very slow. Fire-engines are also short of water to fight the fires because the engines need to be filled with water from Rani Pokhare, the pond located inside the Zoo



Liquefaction, which occurs when wet soil is shaken by an earthquake, causes the ground to lose its ability to support structures. This map shows areas in the valley which could experience liquefaction.

in Lalitpur. The roads are damaged and crowded with people and rubble, so each time the fire trucks need to fetch water a lot of time is wasted. There are hydrants at various points in the city meant for use at times like this. However, attempts to open the hydrants and pump out water to fill the fire-engines are futile. The water source that supplies them went dry years before the earthquake occurred, and was never replaced.

People from all over the city are bringing the injured to hospitals. Those living near to hospitals have come there easily but those living far away do not know how they will get to the hospitals. Ambulances cannot be called because telephone lines are damaged in most areas. Ambulances could not reach the hospitals because of the clogged roads even if they could be called.

At the hospitals, doctors are having a difficult time managing because the emergency wards have been swamped with injured people. In addition to the many new patients coming to the hospitals, some patients and doctors who were in the hospital at the time the earthquake struck were injured while trying to escape and are in need of medical attention. Many of the injured brought to the hospital have head injuries. Some people were hit by falling flower pots or other objects as they were running in the streets. Others were inside when a ceiling collapsed, a balcony crumbled on their head, or a ceiling fan fell down upon them. There are many others who broke their hands or legs from falling.

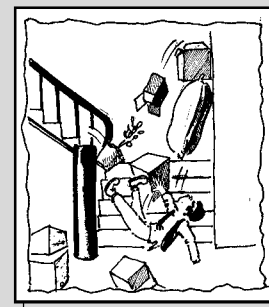
Only the doctors who were on duty when the earthquake struck are at the hospitals now. Some off-duty doctors are trying to reach the hospitals because they know that they are needed, but it is difficult for them to get there because of transportation problems. There is massive crowding at every hospital, especially considering that nearly all hospitals were full before the earthquake occurred. A large

amount of medicines and supplies are broken, spilled or lost. This makes it very difficult for the doctors to treat the wounded. Disruption of the power supply means that machines, such as x-rays, are not working. Hospitals with generators are faring much better than those without. The hospitals are so crowded that the doctors have trouble identifying the most seriously injured patients from those with lesser injuries, and in some places people are being treated in the order they arrive rather than the order of their need.

In almost every ward, local youths have organized themselves to search buildings for injured and buried people. A few wards received training in emergency response before the earthquake, so they are well organized and know how to search for people without injuring themselves or hurting the earthquake victims more than they already are. In most wards, however, the people have no training in rescue operations, so they are working as hard as they can, but they are having difficulties. In some places, buildings that were still standing after the earthquake collapsed while rescue workers were searching inside of them.

Radio Nepal broadcasts a news flash at approximately 5 PM: *"Kathmandu was rocked by a high intensity earthquake today at 2:14:45 PM. According to the Department of Mines and Geology, the earthquake had an epicenter near Rasuwa district about 100 km away from Kathmandu, and measured 8.2 on the Richter Scale. The earthquake is believed to have caused massive loss of life and property. His Majesty's government, Ministry of Home requests that the residents of Kathmandu Valley remain calm, have patience, extend cooperation to each other, and join in the rescue and relief operation if able."*

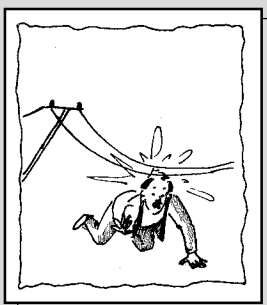
When night falls the valley is completely dark because the electricity



If you are on the upper floors of a building during an earthquake, do not jump from a window or a verandah. Stand in a doorway or near a column and wait until the shaking stops before using the stairs.



If you are outside when the earthquake strikes, do not go into a building.



If you are outside when an earthquake strikes, go to a location far away from buildings, walls, trees, narrow streets and power lines.

system is not operating. Darkness is slowing rescue and relief works but not stopping them. In some areas relief work is being conducted by the light of automobile headlights. Work is being done with the help of electric power from generators, where available, but in many places, generators have been damaged by tipping over in the earthquake. In most areas, people are trying to cope with the

darkness by using whatever torches, lanterns, kerosene lamps, and candles can be found.

The people of the valley are preparing for a long night with little sleep. They are comforting each other and helping one another to find a safe, warm place to rest and food to eat. Many housewives and children are preparing whatever food can be found and bringing it to the laboring rescuers. It has been a devastating day.

### *Bhaicha has no house ...*

The shaking has stopped and, finally, Bhaicha reaches his neighborhood. Everything looks different, and it takes a few moments for Bhaicha to recognize his property. One half of his house has completely crumbled to the ground. Crying, he tries to enter it, but the door is firmly blocked by rubble. He shouts, "Father! Mother!" There is no response. He rushes back to the street, sees his neighbor and asks him if he has seen his parents, wife and children. But his neighbor cannot help Bhaicha because he is busy looking for his own family.

Bhaicha runs towards his field, thinking that his parents and wife could be there. There, to Bhaicha's relief, he sees his mother, aunt and several neighbors. His father is not there. His mother, crying, tells Bhaicha that his father was not feeling well today and stayed at home, his daughter and wife have gone to his in-laws, and his son is at school. He asks his mother and his aunt to stay in the field and not to go anywhere, and starts running towards his in-laws' house.

His son's school is on the way to his in-laws' house, so Bhaicha stops there first to fetch him. He sees that the school building is damaged in many places and both the students and teachers are crying in fear. Bhaicha asks several of the teachers about his son, but there is a lot of confusion and it takes many minutes before he finds a teacher who can direct him to his son. His son is lying in a small open space behind the school. Other students, many of them injured, are also there in the open space. Seeing his father, Bhaicha's son starts to cry. The teacher explains that Bhaicha's son jumped from

the upper story of the school because he was scared during the earthquake and now his leg, and maybe other bones, seems to be broken.

Bhaicha is very worried about his son. It could be urgent to take him to the hospital, but it is also urgent to know the condition of his wife and daughter. It will take him two hours, maybe more because of the damaged roads, to reach the house of his in-laws. First, he decides to take his son to the hospital. But how? The roads are in such bad condition that there are no ambulances, or even regular cars, to take him to the hospital. The only choice is to carry his son all the way there.



Bhaicha needs to rest frequently on the way to the hospital and arrives exhausted, with his son in great pain. There is a huge crowd of injured people and their relatives outside of the hospital. There are very few doctors, so all of the injured people must wait a long time before a doctor can see them. After three hours of waiting, a doctor comes to look at Bhaicha's son, and says that his leg must be x-rayed. This will

require another long wait because the electricity supply has been disrupted, and the emergency generator has to be used for many different machines at once. There is only one technician working because the others have left to find out if their own homes and families are safe.

There is nothing to do but wait for his son's x-rays. He is increasingly feeling worried, hungry, tired, and cold. It does not seem possible to go to his in-laws' today, so Bhaicha prays for the safety of his wife, daughter, and father and prepares to stay at the hospital all night with his son.

## ONE DAY LATER

Before dawn, the people of each ward in Kathmandu Valley have gathered together and started working again. There were several major aftershocks during the night, so no one, including children, slept well because of fear. A few houses which were only slightly damaged by the large earthquake yesterday collapsed during the night because of the aftershocks.

### Rescue Work

The search for trapped victims continues. Some bodies are found buried and lifeless. Some others are found lying unconscious but still living. Sounds of mourning can be heard all around the city. Army, Police and volunteers are mobilized in the rescue work but the task that faces them is extremely difficult and a lack of proper coordination, tools and training is evident. Roads are destroyed and traffic, even pedestrian traffic, is disrupted. It has been very difficult to keep track of who has been found dead or injured. There are almost no tools or equipment, so men are using their hands to clear the roads and to find buried people. Priority has been given to saving the lives of the injured rather than removing dead bodies. Everyone is working as hard as they can, risking their own lives to save others who are trapped, as nervous family members and friends stand nearby.

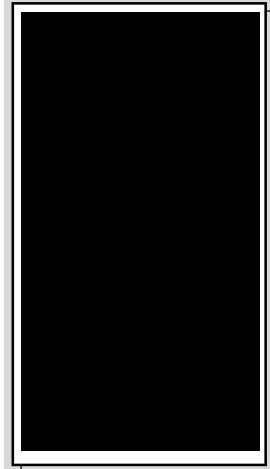
Because of the lack of proper coordination and management, no arrangements have been made for the volunteer rescuers to rest, eat, or be replaced. As a result of this, all of the rescue workers are totally fatigued by afternoon. Residents of each ward are helping to feed workers with whatever they have available, but there is not enough food for everyone.

### Hospitals

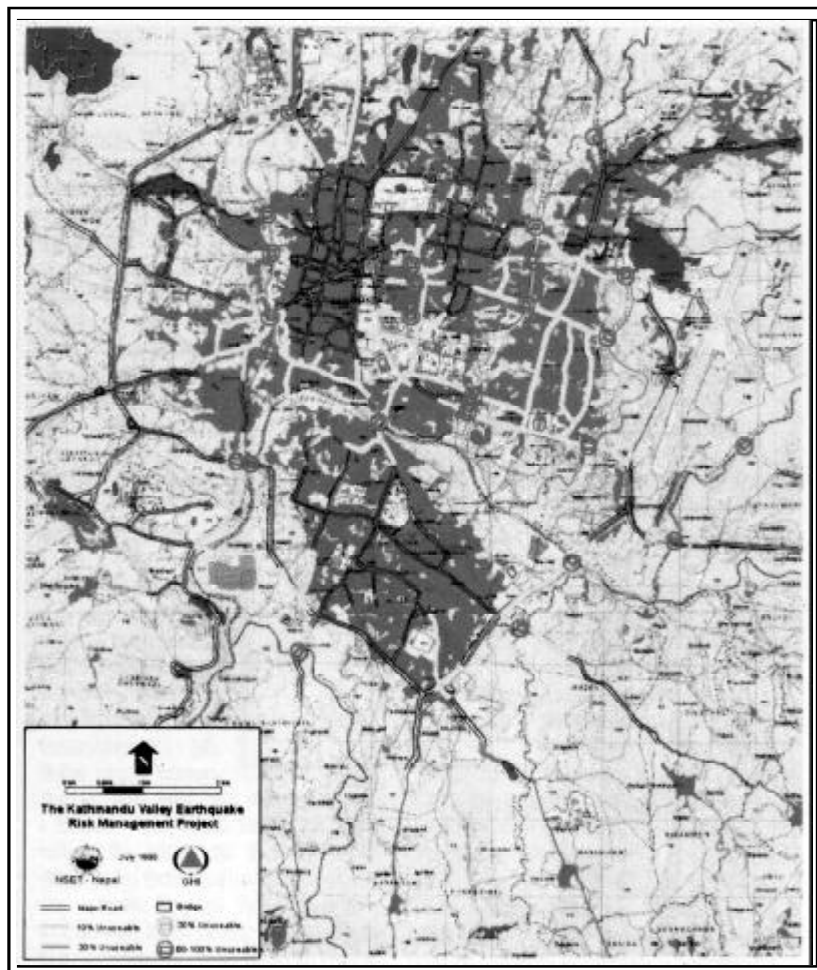
The situation in hospitals is

getting worse today. People from everywhere in the valley are coming in for treatment of earthquake related injuries. Many of the medical staff, including doctors and nurses, are injured and unable to work. Those that are not injured have been working ever since the earthquake struck, with no rest and little food. Many hospitals have cracks in their walls and equipment inside the hospitals is heavily damaged. In this condition, providing proper treatment to the patients is a very difficult job.

Several of Kathmandu Valley's major hospitals have only minor damage, so they are still able to provide good treatment. However, a couple hospital buildings have collapsed completely, and



After the shaking stops, stay in an open space. Be ready to help rescuers by identifying injured people who need help.



Possible damage to Kathmandu Valley roads.





There will be aftershocks, that is, additional earthquakes after the first, large earthquake. Stay away from houses which might be damaged because they could collapse during an aftershock.

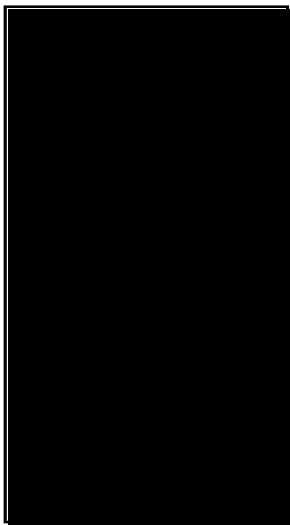
many patients and staff inside were killed. The residence quarters of another hospital have been badly damaged. Luckily, since the earthquake occurred in the day time, no one was inside at the time. Other hospital buildings have suffered varying degrees of damage. Water and sand are oozing out of cracks and holes on the premises of a few hospitals. Others have developed some dangerous looking cracks in their buildings.

In Patan Hospital and Military Hospital, a siren was sounded immediately after the earthquake and, due to previous emergency drills carried out in these hospitals, everyone in the hospitals immediately moved to safe places and no one was seriously hurt.

In other hospitals, which did not prepare for an earthquake by conducting evacuation drills, there were many injuries and a number of deaths. When the earthquake struck, the people in the hospitals started running wildly in all directions. There were almost stampedes for the exits in which some patients, attendants and hospital employees were injured. At Bir Hospital, the main gate on the Southern side was locked when the earthquake struck, making it difficult for people to escape from the building and causing more panic. The gate is now open to facilitate the process of bring injured to the hospital.

Drinking water, electricity, and telephone services have been disrupted in all hospitals. However, Patan Hospital and Military Hospital have adequate drinking water from their reserves and electricity from their generators. Other hospitals either do not have such reserves, or they are not working well.

### *Bhaicha stops talking ...*



In the morning Bhaicha carries his son back home. He has not yet told his son that their house has collapsed. When he sees the collapsed house, his son grabs hold of his grandmother who is waiting for them there and starts to cry. She also bursts into tears. Bhaicha's brother-in-law is there, and Bhaicha immediately asks about his wife and daughter. His brother-in-law does not speak for several minutes, but his face shows that something is wrong. Bhaicha begs him to tell what happened, and after some moments he tells the tragedy. Yesterday, when the earthquake occurred, Bhaicha's wife tripped while running down the stairs and was seriously injured. She died at midnight. His daughter, luckily, is safe, but both Bhaicha's father-in-law and mother-in-law were

killed in the earthquake. Bhaicha is stunned with disbelief at this news. Other people from the neighborhood come to console him and tell him that many people have suffered as much as he has. No one knows whether or not Bhaicha's father is safe. They advise him to search for his father. Maybe he is trapped in the house but still alive. Maybe he was away from the house and is injured so he cannot walk back home.

With tears in his eyes Bhaicha begins to search for his father. His mother has already gone to many places where her husband would sometimes go during the day, but there is no trace of him. Everyone fears that he might be buried beneath the debris of the house. At last, at noon, with the help of the

*(continued)*

The Military Hospital, T.U. Teaching Hospital, Birendra Police Hospital and Bhaktapur Hospital which own open space around their buildings, have started pitching tents to hold additional injured patients. This is very helpful, but it has been difficult for them to provide adequate medical attention, bedding, blankets and medicines for these extra people.

The loss of medicines and medical equipment during the earthquake, due to spillage and cabinets tipping over, is being felt severely. In particular, the shortage of oxygen, blood, plaster materials and x-ray equipment is causing many problems.

### *Transportation*

Both paved and unpaved roads are affected by the earthquake. The road from Koteshwor to Kirtipur has developed cracks in many places and some portions of the road have subsided, making traffic and pedestrian movement dangerous. The

road around Tundikhel has also developed many cracks which are oozing sand and water. Traffic movement is almost impossible. Broken tree branches block the road. The road between Bhadrakali and Singhdurbar has also subsided, bringing traffic to a complete halt. Many of the narrow roads in the center of Kathmandu are completely blocked with rubble and unusable.

Bridges are badly affected by the earthquake. The Manohara river bridge on the old Thimi route has been completely destroyed, while the Manohara river bridge on the New Thimi route is partially damaged. The old bridge at Thapathali that links Kathmandu and Lalitpur has shifted and may not be stable. Only pedestrians can cross it. The new bridge at Thapathali is being kept open only to ambulances, fire engines, army vehicles, police, government officials, media reporters and rescue teams.

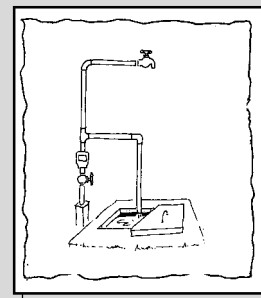
Likewise the bridge on the Koteshwor, Patan route (ring road), Sinamangal bridge, the bridge on the route to Lubhu and the Gaurighat bridge near Guhyeshwori have been completely destroyed making traffic movement impossible. The bridges on the roads to Gorkarna and Balaju are partially damaged. The ground at one end of the Bagmati bridge near Tinkune has sunk, and so, although the bridge is okay, it cannot be accessed.

### Drinking Water

People are having difficulty finding enough drinking water today. There is no drinking water in the houses, but many roads are flooding with water flowing out of broken pipes. Household water tanks are either damaged by the earthquake or running very low due to the added strain of serving relatives and neighbors. The reservoir and water treatment plant in Bhaktapur have been badly damaged. According to the engineers it could take over a month to fix these facilities. The

people of the ancient city are, therefore, queuing up at natural stone spouts for their drinking water.

The pumping station at Nakkhu has been completely destroyed, while those at Banddha, Mahankal and Balaju have also been affected by the earthquake. Since the electricity supply has been cut off it is impossible to get the pumping stations operating again. Water reservoirs in the northern part of Kathmandu have developed cracks and the leakage of water is adding to the water shortage problem. Many traditional wells have suffered considerable damage. Water from natural stone spouts is quite dirty, but it is gradually becoming cleaner as the day passes. People have started queuing up at these spouts. In a couple of areas, water spouts that have been dry for years started flowing again. The people from Tebahal, Khichapokhari and New Road, and those who have been sheltering at Tundikhel since last night are gathering in large numbers at Sundhara for drinking water.



Water stored in underground tanks is more likely to be available after an earthquake than water stored in tanks on the roof of a building.

*(continued)*

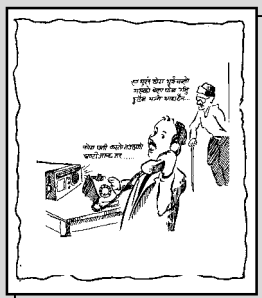
police and some volunteers, he finds his father, dead, crushed under the rubble. On seeing the body, his mother, son and aunt are overwhelmed with grief and they begin to cry again. There is no one to comfort them because everyone they know has suffered their own losses.

Bhaicha, always talkative, now has nothing to say. He has lost almost everything in the earthquake. His house, now destroyed, was recently built and Bhaicha is still heavily in debt from the expense. His in-laws who have always helped him in times of need have also lost their house. Worst of all, he has lost his father, his wife, his in-laws, and undoubtedly many other loved ones.

Bhaicha now must perform funeral rites for his father and his wife at the same time. All of his relatives have not yet been informed of the deaths. There is no one who has time to inform them, and probably none of

them could spare time to help Bhaicha even if they knew. Bhaicha takes his father's body to the riverbank for cremation with the help of a few others. His father is covered with a bed sheet which was pulled out from the rubble of the house, as no other cloth can be found. There are many families with dead loved ones at the bank of the river. There is shortage of firewood for cremation and no priest to consecrate it. Some people at the river are talking about collective cremation. At first, Bhaicha feels uneasy when he hears the idea. Soon, however, he sees how desperate the situation is, and Bhaicha agrees that it is the only way. After his father is cremated with the bodies of several others, he goes to his in-laws for the cremation of his wife.

Now, Bhaicha has no home, no wife, and no father. His mother is broken-hearted with grief. His son is injured and in pain. Bhaicha does not know what to do.



Only use telephones and roads in the first few days after an earthquake if it is an emergency. These services need to be kept free for use by emergency workers.

The drinking water tanker services of the water supply corporation and private sector have not been able to operate. The damaged roads and bridges mean that they have not been able to fetch drinking water from the sources or distribute it. Lack of drinking water is beginning to become a serious problem for many families.

### ***Electricity***

The Electricity supply, which was damaged in most parts of Kathmandu Valley, is still not working. In many places the entire power supply system has been completely destroyed. The sub-stations at Bhaktapur and Lagankhel have been completely destroyed, while the sub-stations at Kathmandu have also been affected by the earthquake. Many of the electricity poles in the urban and rural areas have broken or tipped over. Snapped electricity wires are lying here and there on the ground. In many places transformers have fallen off of their poles. Electrical short

circuits have caused fires and a few people have been electrocuted. Because of this, Nepal Electricity Authority has turned off all of the electricity in Kathmandu for the time being in order to prevent further accidents.

### ***Telephone***

Telephone service has also been disrupted due to the earthquake. The Sundhara and Chabahil exchanges of Nepal Telecommunications Corporation have serious damage, but they are repairable. The Gongabu exchange has suffered more damage. Most of the telephones in Balaju, Naya Bazar, Samakhushi, Thapathali, New Road, Tripureshwor, Naya Baneshwor, Koteswori, Sinamangal and in some other areas are out of order. A few telephone lines are still working, but all functioning lines are very busy. There are long queues of people waiting to use some of the few working telephones.

### ***Food Supplies and Markets***

It is beginning to look like there may be a shortage of food in the valley, in addition to the shortage of water. A lot of food was buried or spilled during the earthquake yesterday. Almost all shops in the market are closed. Nothing is available. Many housewives have been searching through their damaged homes for any food, sweeping up grains that have spilled on the floor. Children are in an especially miserable condition due to lack of food, since they do not have the patience of adults.

Because of the lack of electricity, the Dairy Development Corporation and other private dairies have not been able to produce milk. They have not been able to distribute the milk they have in stock either due to transportation problems. Also, they are worried about distributing the milk they have in stock because there is not enough



This photograph shows damage caused to a road in Costa Rica after an earthquake in 1991. Similar damage could occur in Kathmandu Valley when the next earthquake strikes. (Photo credit: Sam Swan, with permission from EERI)

to meet the demand, and selling small quantities of milk might cause fights or riots. Taking advantage of this situation, a few people are buying milk from the dairies secretly and selling it in the black market, charging far more than the usual price. Demand for readymade food such as beaten rice, lakahmari, noodles, etc. is very high. Families which stored such foods in easily accessible places before the earthquake are having an easier time now.

Almost all of the houses and shops in the major market places of Kathmandu – Bhotahity, Ason, Indrachowk and Chhetrapati – and in other areas are damaged or destroyed. None of them are open. Some shopkeepers are secretly selling their goods at high prices. It has been announced over the radio that food grain sales depots will be set up in various places by the District Administration Offices, Municipalities and Nepal Food Corporation, but nobody knows when this will happen.

### ***Mass Communications***

Since the electricity has been cut off and everything is in chaos, no newspapers are published today. Some of the printing press buildings have been destroyed. Some of the journalists on duty in various places have been injured. Those journalists who survived unhurt are busy collecting information on the impact of the earthquake, the extent of loss and damage caused by it and taking pictures. Due to the power cut and the damage caused to its Phulchoki station, Nepal Television has not been able to operate its transmission service today, either.

Radio has become the only means of mass communication now. People are listening to battery operated radios. Radio Nepal has shortened its broadcasting time, but it is airing frequent notices concerning the earthquake. Because of a lack of necessary preparation and knowledge

about what kind of message should be given to the people following such a disaster the radio program managers and producers seem to be in a confusion. Rastriya Samachar Samiti, Radio Nepal and the foreign media correspondents in Kathmandu are running after the latest information about the loss of life and property caused by the earthquake, but disruption in traffic and telephone service, and poor coordination is making news collection difficult and incomplete.

Deeming it improper to broadcast entertainment or musical programs in such a time of crisis, Radio Nepal is airing religious hymns and devotional songs.

### ***Cremation***

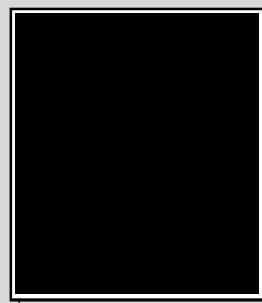
The cremation of dead bodies is a very big problem. Dead bodies are everywhere, but there is no proper cloth to cover them. Therefore, any cloth that can be found, including bed sheets and curtains, have been used as a 'Katro' to cover the corpses. Not enough priests are available to perform the cremation rituals. The most critical problems are that there are too few people to carry the crops up to the Ghats, too little space for cremation, and not nearly enough fire wood. There is a large queue of crops in every ghat, including Pashupati Arya Ghat, Kalmochan Ghat, Shova Bhagawat, Indrayani, Bishnumati, Shankhamul, Hanuman Ghat and others. It is necessary to conduct group cremations to conserve the ghat space and fire wood, but most bereaved families have trouble accepting this nontraditional idea. Some families, understanding the crisis, have accepted the idea of group cremation rather than no cremation.

### ***The Condition of People***

Because of this catastrophe, the people of Kathmandu Valley are in a state deep tragedy. Every family has been touched by the disaster. Some are facing

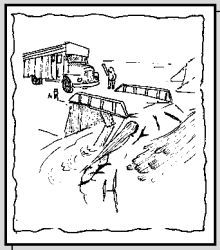


A battery operated radio is usually the best way to get information after an earthquake. Store one in a safe place in your home.



It is a good idea to store an "emergency kit" in your home with all the supplies you will need if an earthquake, or another disaster, occurs.

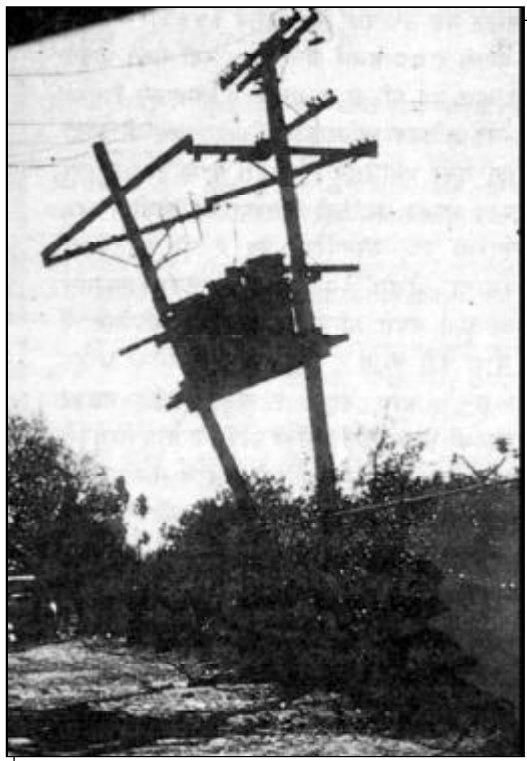
You should store the following items: food and water adequate for at least one day for your family, a battery operated radio with extra batteries, a torch or candles and matches, first aid supplies such as bandages and basic medicines. Store all of these items together in a location that should be accessible even if your home is damaged.



Roads and bridges are often weak after an earthquake. Be cautious if you need to drive heavy vehicles.



The first priority of rescue workers after an earthquake is usually to make sure that important emergency facilities are safe, such as hospitals, schools and police stations.



These electricity poles and transformer were damaged in an earthquake in 1971 in California, USA. Similar damage could happen in many places during Kathmandu Valley's next earthquake, resulting in power outages for up to a month in some parts of the valley.

(Photo credit: Steinbrugge collection, EERC, UC Berkeley)

the sorrow caused by the death of their family members. Some people are facing the tragedy caused by the collapse of their house, where they invested their lives' savings. All of this sadness is overwhelming, but most people are too busy dealing with the aftermath of this crisis to think too much about their losses yet.

The devastating earthquake has not spared the religious and archaeological sites. Many temples where the residents of the valley worshipped just one day ago have been destroyed. This damage weighs particularly heavily on many peoples'

hearts. Luckily, some temples and monuments, especially those which were renovated recently, have not been damaged seriously. There are many people at these temples now.

Every one is regretting the lack of open space. There is a big problem in the city core finding areas for the temporary settlements, treatment camps, and other essential emergency arrangements. People are wishing that more planning had gone into building the cities in the valley, but that wish is too late.

## ONE WEEK LATER

One week after the earthquake, the residents of Kathmandu Valley are still feeling very unsettled. There have been several aftershocks during the week, and some slightly damaged houses have collapsed completely during the aftershocks. The winter rains are making things worse.

Preliminary data now shows that the death toll from the earthquake is about 30 thousand and the number of seriously injured victims is over 80 thousand. Some people argue that these figures greatly underestimate the casualties. The percentage of buildings which have been damaged significantly is estimated at about 60 percent in Kathmandu, 60

percent in Lalitpur, 75 percent in Bhaktapur and 60 percent in the valley as a whole. Houses with more than two stories and built using concrete pillar construction have suffered the most damage. Arrangements have been made to collect more complete numbers of those killed and seriously injured at community police posts, but this is a difficult task since records were not well kept in the chaotic days right after the earthquake.

Reports are coming in that the devastating earthquake caused extensive damage outside Kathmandu Valley as well. The Tribhuvan highway has been damaged in many places and the Prithavi highway and the Araniko highway have also been damaged, mainly because of landslides. This, combined with difficulty accessing Tribhuvan airport, has caused many delays in transporting goods and aid from outside the valley. The earthquake has also caused extensive damage at Nuwakot, Dhading, Kabhrepalanchowk and Sindhupalchok districts.

Some of the most essential services damaged by the earthquake have been repaired and brought into operation again within this week. The most important roads have been cleared of debris.



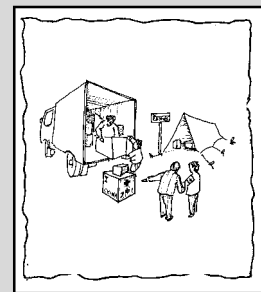
Damaged bridges are a larger problem, but since it is winter and the rivers don't have much water, temporary arrangements have been made for crossing the rivers in a few locations. Only a small amount of the valley's usual traffic is on the roads these days because nearly all business activities have stopped. A policy has been adopted not to allow vehicular movement unless it is essential, so most of the traffic is related to official business. There are more motorcycles and bicycles on the streets than cars. Public transportation is not operating.

Drinking water supply is not yet sufficient but it has improved since the day after the earthquake. Tankers have started distributing water in many places, but there is not enough for everyone and this is causing some quarrels. Some water pipe lines which were not severely damaged have been quickly repaired and are supplying drinking water to certain areas. The people of the valley have not been able to wash their clothes or take a bath throughout the week. Luckily, the cold winter weather makes this an insignificant problem. Even those who are mourning the death of their nearest relatives are managing with only one or two mugs of water for their ritual bath.

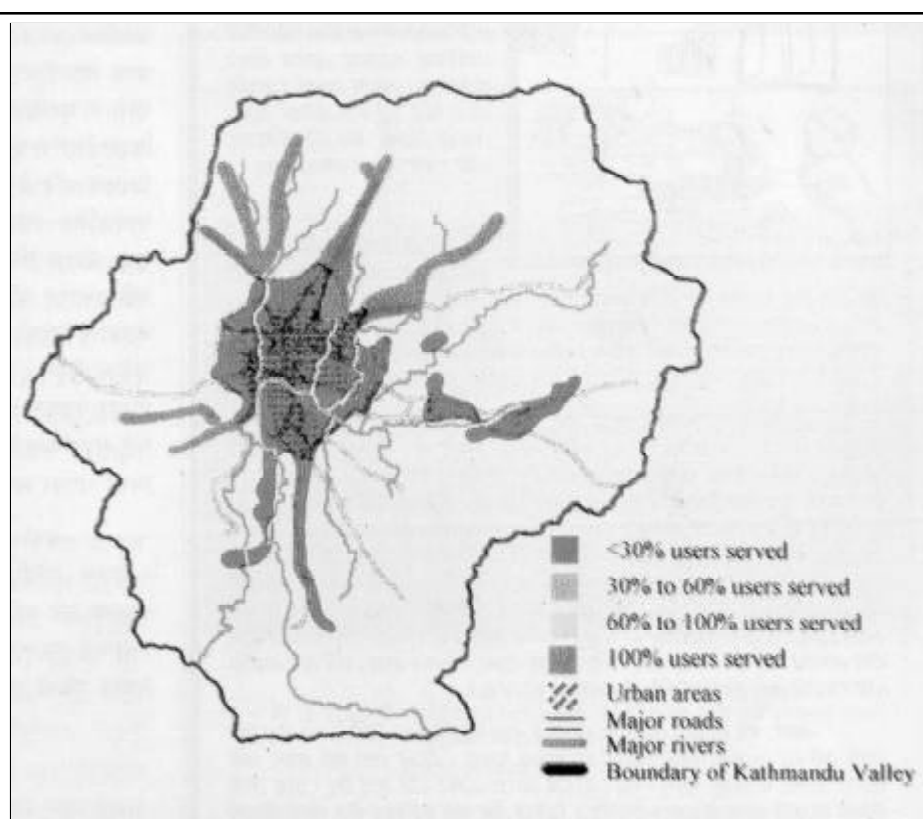
Electricity supply is also not fully resumed. After repairing some broken trans-

mission lines, poles and transformers the electricity is available again in many neighborhoods, but priority has been given to hospitals, rescue camps, police stations, and public places rather than private households. City residents are still using torches, candles, and oil-lamps. Similarly, telephone systems are being repaired and many critical locations, such as police and army stations and hospitals, have operating telephones now.

Hospitals have been extremely busy this entire week. The number of incoming injury cases has dropped now. Some of those admitted to hospitals with serious injuries have already returned to their homes after necessary treatment, but many patients are still not out of danger. Some seriously injured people died this week while undergoing treatment. Most of those killed in the disaster are found to have died from serious head injuries. Some



People who know foreign languages other than English can help the relief effort after an earthquake by identifying medicines and supplies sent by non-English speaking countries. Be prepared to help.



Possible water supply after one week



People who volunteer to help the army and police in the rescue effort should be very careful when entering damaged houses. Wear protective helmets.

others died of cardiac arrest caused by the shock they experienced when the earthquake struck. Many people who were not injured are now suffering from colds and fevers due to the cold weather and poor living conditions.

Patan Hospital, Military Hospital, T.U. Teaching Hospital, Bhaktapur Hospital and Police Hospital are still operating treatment camps in tents on their premises. An acute shortage of tents is affecting all the hospitals, especially the Mental Hospital at Lagankhel which is unable to

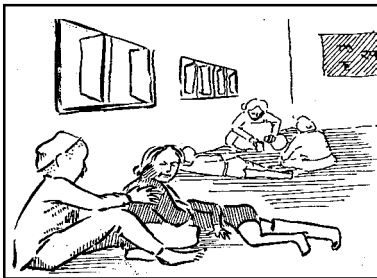
use any of its buildings. This is unfortunate because many people, traumatized by the disaster, are seeking admission to this hospital. The 50 bed institution cannot cope with the increased number of patients, and has stopped accepting cases. Private hospitals and nursing homes are also receiving earthquake victims in large numbers, and these hospitals are as overwhelmed as government hospitals. Both government and private hospitals are still suffering from the lack of adequate doctors, medicines and medical equipment. Because of a shortage of people who speak foreign languages other than English, many of the desperately needed medicines sent from abroad by non-English speaking countries are lying at the hospitals useless because no one can identify what they are.

Some shops are open now but prices are very high and very few supplies are available. The demand for basic foods is very high, but they are in short supply. Sales of grains are being coordinated by a joint effort of the District Administration Office, the Municipalities and the Nepal Food Corporation. This effort has been very helpful to the residents of Kathmandu Valley. Some other organizations, such as the Federation of Nepalese Chambers of Commerce and Industry, Nepal Chamber of Commerce, Rotary Club, Lions Club, Leo Club, Marwadi Service Committee, etc., are also distributing food, with priority given to children.

The Dairy Development Corporation and other dairies have started distributing milk in the market today. This is a great relief to children and elders. The prices are quite high, but they are lower than they were on the second and third days after the earthquake.

The search for the buried victims has slowed because the likelihood of finding anyone alive is very low by this time. More bodies continue to be found as the

### *Bhaicha gets a blanket*



Bhaicha cannot live in his house anymore, so he is taking shelter at a primary school nearby. His mother and injured son are staying there with him. His daughter has gone to stay with relatives outside of Kathmandu Valley. Many families from the neighborhood are packed into this tight space.

There are many temporary shelters like this around the city now, and all of them are crowded. There is no running water or electricity, and the condition of the toilets is terrible. Worse than this, it is winter and there are not enough blankets to keep everybody warm at night. Like Bhaicha, many families lost all of their possessions, including bedding and clothing, under the rubble of their houses. It will take a lot of time and money for everyone to start over again.

Today, the Red Cross distributed some blankets brought from abroad to the families in the school where Bhaicha is staying. There were only enough blankets to give one per family, so Bhaicha gave his to his mother and his poor son. A few people took two blankets by cheating, which caused some small fights. The families which did not lose their homes and many groups from abroad are collecting relief materials, like clothes, to help the earthquake victims. However, since it is winter and most of the families in Kathmandu Valley are strongly affected by the earthquake, there are not enough supplies for everyone who needs them.

Bhaicha does not have any money. He has some money in the bank, but his cheque book and all of his other documents were lost in the earthquake, so he can not withdraw the money. Bhaicha cannot remember his account number either, so there is no way for him to access his account. In any case, computers at most of the banks are not working well, due to the electricity failure and damage to the computers, and the bank employees cannot tell how much money is in each person's account. Many people are angry at the banks, and many, like Bhaicha, are suffering because they cannot access the cash they need to start rebuilding their lives.

massive amounts of rubble are slowly being moved. The owners of destroyed houses are busy sorting through the rubble for their belongings.

Many people whose houses have been damaged by the earthquake are taking shelter at temporary camps. Schools and other large buildings are being used to house people, while tents, plastic tarps, and corrugated metal sheets are being used for shelter in open spaces. All of the camps are overcrowded. None of the families have sufficient space. Proper provisions have not been made for drinking water, toilets or sanitation at these camps. Although it is winter, insects are abundant. Many people have fallen sick, and the winter rains are making everything uncomfortable.

Various relief materials are beginning to arrive from inside and outside the country. The Central Disaster Relief Committee is actively engaged in collecting and distributing relief materials, coordinating and directing the District Disaster Relief Committees, Nepal Red Cross Society, Royal Nepal Army, Nepal Police, and many other organizations. There have been many complaints about how long it has taken to get relief materials and how these materials are now being distributed. Some of the materials which are available are not necessary. For example, there is an oversupply of toilet paper, but very few blankets, which are badly needed.

Some attempts have been made by officials to sell the relief materials received from abroad, to replace them with similar Nepali made products, and to provide the Nepali products to earthquake victims. Victims, hearing only that foreign relief goods are being sold rather than distributed, are very angry. There are constant reports that clever officials are keeping these well-made foreign goods for their own use. Some people are making public speeches

about this and causing uneasiness among the population.

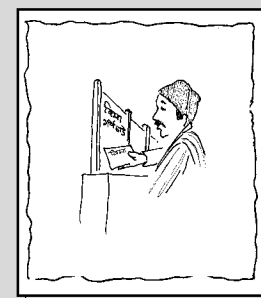
All the people in Kathmandu Valley are grieving and sorrowing deeply, but many are worried about their safety and the safety of their belongings which survived the earthquake. Some people are reported to be stealing and looting from damaged houses and shops. In some neighborhoods, such people have been caught and severely beaten by the local people. Most of the police force is busy with the rescue operation. Therefore, there are no police available for security. The authorities are trying to get additional police forces from outside of the valley to help, but they have not arrived yet. Local youth groups are guarding some neighborhoods in the meantime.

A few newspapers have been published today for the first time since the earthquake, in short editions. They are carrying heart-rending news and pictures on the massive loss of life and property caused by the earthquake. They also contain information, such as lists of hospitalized people, to help separated friends and families reunite. Radio Nepal has been broadcasting various information about the earthquake, including where relief materials are available. Television transmission has resumed in the places where electricity is available. Nepal Television is broadcasting programs on the impact of the earthquake.

Though transmission time is still reduced, Radio Nepal and Nepal Television have started to present a few entertainment programmes again. In several of the temporary shelters, televisions and radios have been put in a central locations, and these entertainment programmes are helping children and families to forget about the trauma of the earthquake for a few moments.



Move flower pots off of the tops of walls and away from the edge of ledges. Flower pots are likely to fall during an earthquake and could injure people.



Consider buying earthquake insurance for your house.



Diseases spread easily in temporary shelters if people are not careful about sanitation.

## ONE MONTH LATER

Day to day life of the people of Kathmandu Valley is slowly getting back to normal after the earthquake. Now, there is not much fear that an earthquake will occur again soon and people are no longer panicking. It has been officially confirmed that 40 thousand people died and 95 thousand people were injured in the earthquake. The number of dead also includes those dying weeks later from conditions caused by the earthquake, such as serious injuries or kidney failure.

Meanwhile, the winter session in Parliament has begun. The Parliament House was damaged by the earthquake, so the House session is being held at the Birendra International Convention Hall. The primary focus of the session is the earthquake. The session has adopted many bills and resolutions concerning rescuing victims, relief efforts, loans, and reconstruction. The government has been severely criticized by the media and prominent citizens for not preparing adequately for the earthquake since it was well-known that

Nepal is a highly seismic area. The government conceded that the devastating earthquake destroyed much of the development made in the past 20 years in Kathmandu Valley and surrounding districts. The government has expressed its commitment to the House that, hereafter, immediate, short-term, and long-term measures will be adopted to ensure that an earthquake will never again devastate the Kathmandu Valley as seriously as last month's event.

Business and government offices have reopened and are slowly becoming active again. A few schools have resumed classes, but many schools were destroyed or are being used as temporary shelters, so most children are still missing their studies. People taking shelter in schools or tents are worried about their future. They are not sure when their houses will be reconstructed or how they will pay for the reconstruction. The government has decided to provide loans to earthquake victims according to resolutions made in the Parliamentary session, but it could take months to set-up the procedures. Victims who do not have any other resources except the loans are simply waiting. Those who insured their houses have started queuing up at the insurance companies, better off than the rest.

Repair and reconstruction of government buildings and other public structures are under way. There is a shortage of construction materials for the repair and reconstruction work. Priority has been given to repair and reconstruction of roads, bridges, electricity, drinking water and telephone facilities. As a result of the repair work to-date, it is now possible to drive to most parts of the valley, but traffic is very heavy since many alternate routes are still closed. Heavy vehicles are required to use



Relief materials, such as food, water and blankets, should be distributed equally to everyone after an earthquake.



After the 1934 earthquake, thousands of Kathmandu Valley residents stayed in temporary shelters for months.  
(Photo credit: Shangrila Magazine, Vpl. 4, No. 2, April-June, 1993)

diversion routes rather than cross the bridges currently under repair. Repair planning is just beginning for the bridges that were completely destroyed.

Repair work on electricity and telephone facilities is nearing completion. These services have resumed in most parts of Kathmandu Valley. Areas where electricity and telephone infrastructure was badly damaged, such as Bhaktapur, still have only limited access to these services. The water system is still not functioning in most areas, and tanker trucks or long walks to water sources are becoming part of families' routines.

Most of the quake victims who required hospitalization have already returned to their families. Only the seriously injured ones are still undergoing treatment. However, the number of patients suffering from pneumonia, common colds, fevers and respiratory problems is increasing in the hospitals. These patients are mostly people who have been sleeping outside in the cold weather or in crowded shelters.

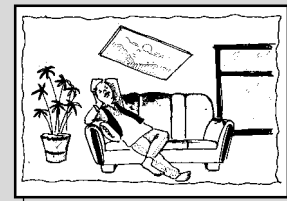
Relief materials are still coming in from inside and outside the country. Now they are being collected and distributed to the victims in a well-planned manner. There are still some complaints, but the efficiency of the relief effort has improved dramatically. Many countries and international agencies are providing grants and loans to His Majesty's Government in aid of the quake victims. This money is helping to fund the rebuilding effort.

Mass communication media have started functioning almost as usual. Radio Nepal and Nepal Television have resumed their usual programs. Newspapers have started coming out regularly, although they are still somewhat shorter than usual. Earthquake related news is making the headlines but other issues also have started appearing in the press. Those cinema halls

which did not suffer much damage have started to show one film per day. Many religious programmes are being conducted around the valley to help people handle their grief.

Law and order has been restored in the valley. Theft and looting cases have been brought under control. The black market of essential goods has mostly disappeared.

The people of Kathmandu Valley are now beginning to restart their lives. The pain from the earthquake can still be seen everywhere, but it is becoming bearable.



Objects can fall during an earthquake and injure people. Place large and heavy objects on lower shelves in your home. Make sure that there are no heavy objects hanging above your bed or places where you usually sit.

### *Bhaicha is angry*



Bhaicha's mother has fallen ill, like many people at the temporary camps. The cold and rainy weather has given her a high fever. A lot of children are suffering from coughs and colds, and many elders have developed respiratory problems. Bhaicha's daughter, still staying with relatives, is reported to have pneumonia, along with her cousins. Everybody's spirits are low.

Nowadays, there are a lot of speeches being delivered in Bhaicha's neighborhood. Many familiar and unfamiliar people come and talk of big things. They give advice on how to be safe from earthquakes. But Bhaicha becomes angry when he hears them talk. He asks himself, "Where were these people who know all of these things when we needed them? What were they doing before the earthquake? Why didn't they tell us these things beforehand?" If his wife had known what to do during an earthquake, she might not have tripped down the stairs and died. If the information about what should and should not be done during an earthquake had been taught at school, his son might not have been injured, and the lives of some of the students who died in the earthquake could have been saved.

A common topic now is how to construct earthquake resistant houses. Listening to this makes Bhaicha even more sad. Had he known about these things before building his home, he could have built it to be earthquake resistant. His home might not have collapsed and his father would still be alive. The more he thinks about what these people are saying, the sadder and angrier Bhaicha becomes. Bhaicha does not want to listen to these people now.



## SIX MONTHS LATER



The procedure to distribute government loans after an earthquake needs to be simple in order to be fair to everyone.

Life in Kathmandu Valley is now slowly coming back to normal. People have not yet forgotten the distress which started six months ago, but everyone is busy rebuilding their lives. The traditional six-month ritual in houses where family members died in the earthquake has been completed.

During these six months the people of the valley not only suffered, but they learned many things about themselves. The youths and social organizations in the valley showed incredible dedication to the community during the past six months. Starting immediately after the earthquake, they were busy in rescue work, aiding the relief effort and helping to

reestablish society. Even unemployed and neglected youths, previously looked down upon, were involved in this work. This surprised the local people and the respect for these youths has suddenly increased in society as a result of their courageous and difficult work. Also, strong bonds have developed between the community and police and military personnel. People now feel that they are like their own family members after seeing their great courage in the rescue work.

The debris of collapsed buildings has not been completely removed yet. In fact, although the main roads have been cleared, only a quarter of the total debris has been removed. Heaps of broken bricks, mud, and cement can be seen all over the valley. Even inside houses one sees broken pillars, fallen verandahs and broken portions of cement slabs. People are sifting through the piles of debris to find materials to use in rebuilding their homes.

Offices, education institutions, and cinema halls have started working as usual. Most schools are in session again, although many are holding their classes in tents since their buildings have not been rebuilt yet.

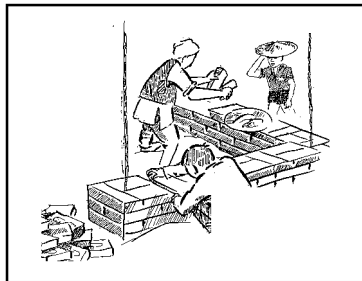
Services like drinking water, electricity, telephones, roads, transportation,

### *Bhaicha left his job*

Six months ago today, Bhaicha lost his father and wife in the earthquake. His life has changed a lot in these months. The major change is that he left his job as a low-level employee in a financial company. After the earthquake, many depositors withdrew their savings at financial companies as a result of the economic crisis following the disaster. The loans held by the company could not be collected as a result of the earthquake. Therefore, many financial companies reached a state of bankruptcy, including Bhaicha's company. His company let go a great number of its staff, and Bhaicha was one of them.

But Bhaicha did not sit idle. Two months after the earthquake occurred, new construction and re-construction projects began at a great pace. There was a huge demand for manpower and construction work in all sectors of society. Bhaicha's father used to work as a mason when he was young. His father's elder brother was also a skillful mason. Following this tradition, Bhaicha, after losing his job, decided to work as a mason. As there is a great demand for masons at this time, Bhaicha is now very busy.

Governmental bodies and organizations like the National Society for Earthquake Technology-Nepal are running training programs on the technology of constructing earthquake resistant houses. Bhaicha



participated in one of these training courses and acquired some practical knowledge of earthquake resistant construction technology. This has helped him to find work easily.

Bhaicha constructed a temporary house for his family using the bricks and wood from his collapsed, old house. This has helped everyone to feel more comfortable, but he and his family still feel the grief caused

by the earthquake. His mother often cries, remembering her husband. Every night she has nightmares about the earthquake and, once healthy and robust, she now falls sick regularly. She has difficulty eating and sleeping properly since the earthquake.

The earthquake also shattered the dreams of his school going son. He was a promising football player. He was always a matter of pride in his school and "Tol" (hometown) matches. After seeing his special talent in football the school decided to send him to train with a special coach. Now, however, it seems that his leg will always be too weak for running. His dream to become a professional footballer has ended.

The younger daughter of Bhaicha has just started to utter some words. This little girl lost her mother's lap forever due to the earthquake. She calls her grandmother "mama". As there is no one to look after her in Bhaicha's home, she almost always stays with her mother's family these days.

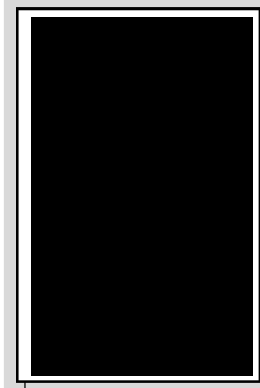
hospitals, and the market have improved. Most of the problems of drinking water in Kathmandu and Lalitpur have been solved. In Bhaktapur, only half of the population has reliable access to drinking water. During last May and June there was a scarcity of water in Kathmandu Valley due to the damaged system and the dry season. This caused many problems. But, now, since the rainy season has begun, water is readily available. There are problems, however, with the water being unhygienic and contaminated which is causing higher than normal levels of disease.

Similarly, the electricity supply system is functioning much better. Electricity supply has reached its pre-earthquake state in Kathmandu and Lalitpur. In Bhaktapur most areas have electricity services. Likewise, telephone service has been restored in most areas of the valley. Road transportation in the Kathmandu Valley has not been completely restored, but the major traffic routes are repaired. The Kathmandu-Bhaktapur

trolley bus service has resumed. This has helped people to feel like life in Kathmandu Valley is becoming normal. Reconstruction of damaged bridges and roads is still underway.

Reconstruction work of homes and offices is taking place rapidly now. Due to a severe shortage of construction materials people have not been able to begin rebuilding as quickly as they would like to. Long-term temporary shelter camps have been established in residential areas. These new camps are much more comfortable accommodations for the displaced families than the tents and schools which were used previously, but these camps restrict the ability of the neighborhoods' residents to rebuild. Thousands of families who have nowhere to go are living in camps located on land where others would like to begin rebuilding.

The government has begun distributing loans to the earthquake victims. People have started reconstructing their damaged houses with the help of these

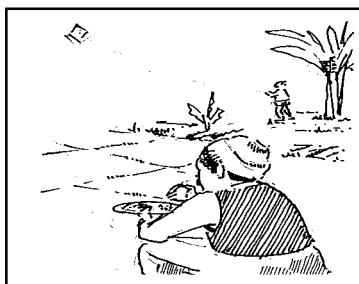


It costs almost the same amount to build an earthquake resistant house as it costs to build a non-earthquake resistant house. If you are planning to build a new house, consult professionals about how to build your home as safely as possible.

### *Bhaicha's Dashain and Deepawali festivals*

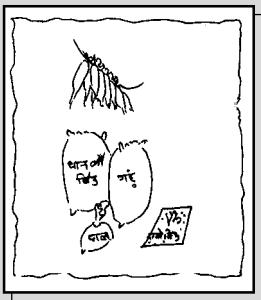
Like many other families in Kathmandu Valley, Bhaicha is not celebrating this year's Dashain festival. It seems that everyone in Kathmandu Valley is dressed in mourning and sad at heart, so it does not feel like the great Dashain-Deepawali festival has come at all this year. This Dashain is not like the past years when everyone was full of red "Tika" on their forehead and yellow "Jamara" on their head because either those giving blessings or receiving the "Tika" are in mourning. Similarly, for the Deepawali festival, very few people will be seen with "Rainbow Tika" on their forehead. Most of the people in the Kathmandu Valley, who used to be busy preparing goat, sheep, buffalo, duck, etc. for meat during Dashain, are celebrating a vegetarian Dashain this year. No one has the enthusiasm for a festival.

Bhaicha does not want to leave his house during Dashain-Deepawali. He does not feel like celebrating because he is

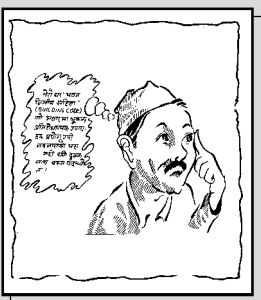


concerned about improving the days ahead and securing the future of his children. In previous years, when Bhaicha used to spend lots of money during the holiday season on frivolous things, his wife used to plead with him to be more frugal. Now, he remembers her words and understands the value of her advice.

The earthquake has changed Bhaicha. He used to be a jolly, carefree fellow. Now, he feels strong and determined to face any kind of hardship for the future of his children. As he is sitting in the courtyard of his temporary house chewing fried soybeans and bitten-rice thinking these thoughts, he sees a red kite flying in the sky above. He follows the kite string down to the ground and sees his own son flying the kite. This makes him smile and think that maybe his family will be all right.



Farmers should store seeds, grains and vegetables in safe places so that they will be available even after an earthquake.



Building a seismically resistant house will help keep your family and possessions safe in an earthquake.

loans. There are complaints that the loans are insufficient and that the procedures to acquire a loan are unnecessarily difficult. One big problem is that the earthquake seriously damaged the “Charkhal Adda” of Kathmandu, where the land records of Kathmandu district are kept in the Land Tax Office and the Land Reform Office. Many land ownership certificates in the hands of the land owners have also been destroyed or burned to ashes in the fire sparked by the earthquake. This has become a big problem for people wanting to use their land ownership certificates as collateral for loans.

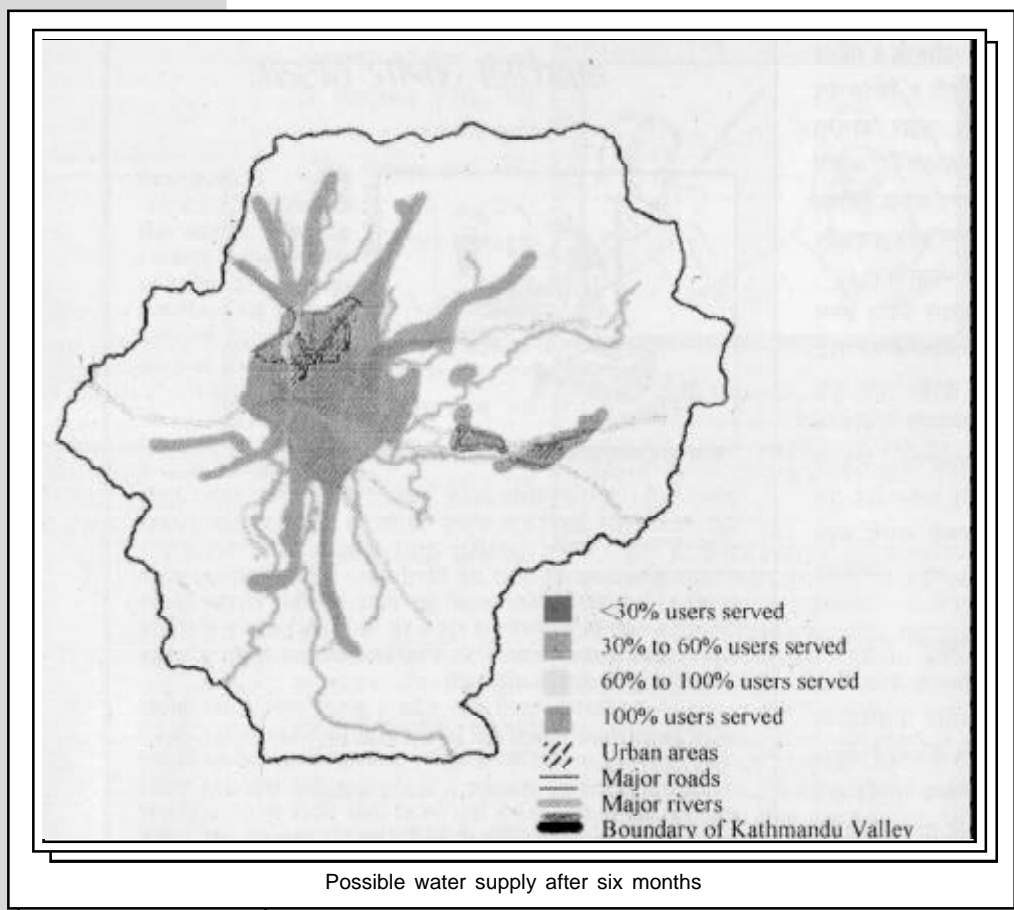
The monsoon has begun. This has both positive and negative effects. Farmers are very busy in the paddy fields planting rice. There was a scarcity of rice seeds because the rice stored by the farmers was spoiled by the earthquake. HMGN and other countries have helped the farmers to get sufficient supplies of seed

for planting. No one wants a bad harvest in the year after the earthquake because that could lead to a famine. Farmers were concerned that there would be no rain during the time of sowing rice-seedlings, but continuous rain has encouraged them.

The rain, however, has been causing trouble to those living in temporary shelter camps. Leaking roofs have wetted mattresses and blankets. The rain has also slowed reconstruction and renovation works. Some heaps of debris have been washed away, but dirt and puddles have appeared everywhere. Rivers in the valley are overflowing and landslides in the villages are worse than normal this year.

Some people are following the building code while reconstructing their damaged houses, and some people are not. The government is especially active in following the building code for all of its construction and efforts are being made to

carefully inspect the construction of publicly important buildings such as schools, universities, hospitals, cinema halls, etc. to make sure that the building code is followed. Communication media is extensively publicizing the building code and earthquake resistant construction technology. Government and non-government groups are organizing training programs on this topic. Everyone feels that Kathmandu Valley is about to get a new look.



## **ONE YEAR LATER**

Until yesterday, Kathmandu Valley was full of people clothed from head to foot in white. Today, the city has gone back to many different colors. People who lost their father, mother, or husband in the earthquake have completed their yearly mourning.

This one year period has brought many changes to Kathmandu Valley. The major change is the way Kathmandu Valley looks. Places inside the valley, like Ason, Indrachowk, Bhotahity, Bhedasingh, Thahiti, Nardevi, Chhetrapati, Wotu, and Makhan, which were very congested and narrow before the earthquake, have now been rebuilt with wider roads. Most of the houses in these areas were damaged by the earthquake, so construction work is being conducted with a new city development plan. All of the new houses are being built to conform to the building code, and there are many open spaces being left in each ward. When the Mayor of Kathmandu proposed this development plan, some people did not want to follow the city plan or the building code. They wanted to construct houses in their own way. Now, most people agree to follow the plan, realizing that attention should be given to a possible future disaster and that the present provides a unique opportunity to develop the city safely.

Before beginning reconstruction in the valley, a lot of effort was given to remove the debris scattered everywhere following the earthquake. Only 60 percent of this debris was removed during this one year period. Old bricks, mud, and cement can still be seen lying in some places. A number of unusable, damaged buildings are still standing, reminders of what happened a year ago.

Many of the hundreds of thousands of people made homeless by the earthquake are still living in temporary camps today. People with money have already reconstructed their houses, but most others are

living with relatives or in the camps. Construction work in Kathmandu Valley following the earthquake is going on at full speed, but it will take many years before Kathmandu Valley's housing stock is completely rebuilt.

The electricity supply system of Kathmandu Valley, damaged by the earthquake, is now functioning at almost 100 percent of its pre-earthquake efficiency, even in Bhaktapur. There are still some repairs to be made, but the service is mostly reliable now. Telephone services in Kathmandu and Lalitpur were restored completely nine months after the earthquake, but it took one full year to do the same in Bhaktapur.

More time is still needed in Bhaktapur to restore the water supply system to its state prior to the earthquake. Reestablishment of the water supply system in other places of the valley was completed within this one year period. Water supply experts expect that it will take an additional year and a half to completely repair the water supply system in Bhaktapur.

Most of the roads and bridges damaged by the Earthquake in Kathmandu Valley have been renovated and are in working condition. A new bridge has been



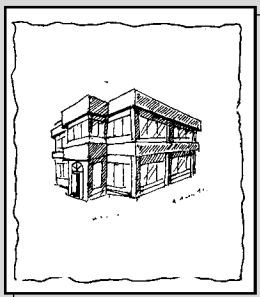
Construction of non-earthquake resistant buildings must be stopped immediately.



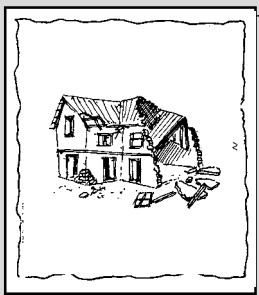
Training sessions in earthquake resistant construction should be offered regularly.



"New Road" in Kathmandu was built after the 1934 earthquake. It was designed to be a wide, safe place for future generations. Today, this street is growing narrower, overcrowded and less earthquake safe. (Photo credit: M. M. Khan, Photo Concern, Kathmandu)



A house which looks nice from the outside is not necessarily strong on the inside.



Remember, earthquakes do not kill people. Poorly constructed buildings do.

constructed at Guheswori- Gauri Ghat. A new concrete bridge over the Manohara River on the old way to Sanothimi is under construction. Construction work on roads and bridges under the permanent plan will continue for years to come.

The market situation, including food supply, has become normal. The increased demand for needed construction materials such as cement, brick, wood, iron rods, and sand, has not yet been adequately met. The price of such goods is very high. Laborers, masons, carpenters, overseers, engineers and planners are all very busy. Everyone is now interested in the technology of earthquake resistant construction, especially the government and other public bodies. The reconstruction work is helping to rebuild the country's devastated economy.

Various media sources are reporting news of donations and loan assistance received from different countries and donor agencies to help reconstruct the damaged infrastructure of Kathmandu Valley and to help plan the new development. Organizations such as the UNDP, UNESCO, USAID, JICA, KOICA, GTZ, World Bank, Asian Development Bank,

United Mission to Nepal, Lutheran World Federation and others are making contributions and starting projects to give new life to Kathmandu Valley.

The earthquake has taught many lessons to the residents and leaders of Kathmandu Valley. All of the municipalities in the valley are now being rebuilt to consider the effects of earthquakes, and all government organizations are allocating staff to work towards preparing for future disasters, including disasters other than earthquakes such as floods. Lessons on natural disasters and safety drills have been added to school curriculums. The army, police, and other government and non-government groups are developing plans to work together to respond efficiently the next time a disaster strikes the valley. Organizations are planning training programs in earthquake resistant construction and why it is necessary, to make sure that the hard lessons of this earthquake are not forgotten by future generations. The city is being rebuilt in a much more earthquake resistant fashion. All of these activities are creating new hope and confidence for the people of Kathmandu Valley.

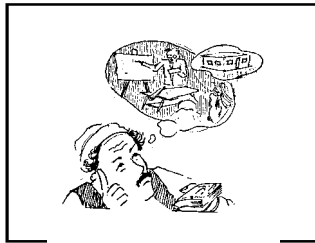
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### *Bhaicha is constructing a new house*

A year has elapsed since Bhaicha lost his father and wife in the earthquake. He solemnized the annual rituals of their death, as did his neighbors. After performing the annual rituals, Bhaicha feels better. He remembers all of the events of the past year, and he thinks that he has changed a lot. Before the earthquake, he thought of himself as a free spirit who did whatever he liked. But now, he thinks that he has become mature and has to shoulder great responsibility. In the last year, he finds changes taking place not only in himself but also throughout the Kathmandu Valley. The narrow lanes of the past have been widened. New houses have been built at the sites where there were old houses before the earthquake struck, and many more new houses are being built at new sites. In the past, Tundikhel was the only open space one could find in Kathmandu, but many such open areas can be found now. Many of the families staying at the temporary camps have been able to leave the camps. The affluent among them have built earthquake resistant houses. Those who are not so prosperous are living in temporary homes and are gathering together enough money to build their own houses.

Bhaicha has worked as a mason this year and earned some money. He

has taken a government loan for the earthquake victims and is building a new house for his family. He is determined to build himself an earthquake resistant home using the knowledge he gained from training sessions on construction and the experience he has gained while working this past year. He has learned that it does not cost much to build houses that are resistant to earthquakes. The only thing you need is the knowledge of how to do it.



With the passage of time, the wounds caused by the earthquake have diminished but not totally disappeared. His mother has become frailer this year. She appears old and weak. His son, now in the eighth class remains unable to play football, so he has turned his attention towards table tennis. Bhaicha's daughter is still staying with her maternal uncle. He does not want to trouble his in-laws by having his daughter always stay with them, but his in-laws have a different idea. They are thinking of Bhaicha getting married again so that he can take care of his family. Therefore, they are planning his marriage with one of their relatives. Bhaicha has asked them to wait until the construction of his new house is complete...



## Managing Kathmandu Valley's Earthquake Risk: *The Kathmandu Valley Earthquake Risk Management Action Plan*

Earthquakes are an unavoidable part of Kathmandu Valley's future, just as they have been a part of its past. As described by the *Kathmandu Valley's Earthquake Scenario*, a large earthquake near the Kathmandu Valley today would cause significantly greater human loss, physical damage, and economic crisis than caused by past earthquakes. With the valley's burgeoning population of almost 1 1/2 million people, uncontrolled development, and a construction practice that has actually degraded over the 20th century, the valley is becoming increasingly vulnerable to earthquakes with each passing year. The Kathmandu Valley Earthquake Risk Management Action Plan aims to manage and reduce this growing earthquake risk.

The purpose of the Kathmandu Valley Earthquake Risk Management Action Plan is to assist His Majesty's Government of Nepal, concerned agencies, and the municipalities in Kathmandu Valley to reduce Kathmandu Valley's earthquake risk over time by identifying, coordinating and focusing risk management activities. The plan outlines objectives, strategies, and specific initiatives to fulfill this purpose. It also provides background information on Kathmandu Valley's risk from earthquakes, the current status of earthquake risk management in Kathmandu Valley, and the development process of the plan.

The National Society for Earthquake Technology – Nepal (NSET) has taken responsibility for creating and implementing this plan. NSET, a multidisciplinary professional society, promotes awareness of earthquake risk and implementation of seismic risk reduction projects in Nepal. For more information about The Kathmandu Valley Earthquake Risk Management Action Plan, please contact NSET.

### *Plan Objectives*

The plan focuses on eight specific objectives to achieve its purpose of reducing Kathmandu Valley's risk over time. These objectives are

- Improve emergency response planning and capability.
- Improve awareness of issues relating to earthquake risk.
- Integrate seismic resistance into the process of new construction.
- Improve the safety of school children and school buildings
- Improve the seismic performance of existing buildings.
- Improve the seismic performance of utility and transportation systems.
- Increase experts' knowledge of the earthquake phenomenon, vulnerability, consequences and mitigation techniques.
- Prepare for long-term community recovery following damaging earthquakes.

### *Plan Implementation Strategy*

NSET is responsible for implementing this plan, or in other words, conducting activities that increase the likelihood of success of the specific initiatives included in this plan. The specific initiatives will be implemented by other local institutions. NSET's activities to implement this plan include the following:

- Building Support for the Plan and Earthquake Risk Management in General
  - Using transparent and inclusive processes
  - Making decisions rationally
  - Using open financial policies
  - Building relationships with other groups
  - Raising general awareness
  - Educating decision makers through awareness efforts
  - Conducting regular public hearings
  - Formally presenting plan to government
  - Informing the international community of Kathmandu Valley about the plan

- Supporting Individual Initiatives
  - Coordinating initiatives
  - Planning initiatives
  - Arranging technical support
  - Conducting peer review of initiatives
  - Seeking external funding for organizations implementing initiatives
  - Publicizing successful initiatives
- Keeping the Plan Current
  - Monitoring the initiatives annually
  - Evaluating the objectives and strategies periodically
  - Creating a new edition of the plan periodically

### ***Initiatives to Start Now***

The plan includes a short list of initiatives which are urgent to implement now. These initiatives focus on meeting the plan's objectives. NSET will actively aid and promote the implementation of these initiatives. These initiatives are

1. NSET will request HMGN to (1) constitute the National Disaster Management Council (NDMC) headed by the Prime Minister; and (2) direct the NDMC to define an integrated national disaster management system.
2. Once constituted, the National Disaster Management Council should (1) provide guidance for the preparation of new (or revision of existing) integrated emergency response plans and (2) direct all relevant organizations to prepare emergency response plans.
3. NSET will work with the Ministry of Science and Technology to develop a comprehensive program to raise public awareness about earthquake risk and mitigation options.
4. NSET will work with the municipalities and districts in the valley to create Disaster Management Committees, and to design a program of activities, including public awareness programs, for these committees.
5. NSET will request the Ministry of Housing and Physical Planning to (1) constitute the Building Council and direct it to draft the rules and procedures for implementing and enforcing the building code, and (2) formally adopt requirements to implement and enforce the building Code.
6. NSET will work with the Ministry of Housing and Physical Planning and others to prepare training materials and provide training for building inspectors, masons and engineers on applied aspects of design and construction of buildings to conform to the Building Code.
7. NSET will manage and coordinate the "School Earthquake Safety Project" which will (1) inform selected communities about the vulnerability of their schools and what can be done to reduce the risk; (2) prepare school-specific plans for improvements in seismic safety; and (3) mobilize community support and resources to improve the safety of the school buildings.
8. NSET will create information products to explain what non-structural hazards are and how to mitigate them in typical Nepali homes and offices.
9. NSET will encourage the Nepal Telecommunications Corporation to assess the vulnerability of its system to earthquakes, identify the most vulnerable elements, and develop a program to improve its performance after earthquakes.
10. NSET will encourage engineering institutes to develop and offer short courses for practicing engineers on earthquake engineering principles and procedures.

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## **CAUTION**

The preceding publication describes possible impacts of a potential earthquake to affect Kathmandu Valley. Other earthquakes not evaluated in this study would produce different consequences. This is not a prediction of a specific earthquake, earthquake damage, or consequences. This description is intended only for use in planning and preparedness exercises and in raising awareness of Kathmandu Valley's earthquake risk. The authors, advisors, publisher and other contributors to this report are not responsible for use beyond these purposes.

**National Society for Earthquake Technology-Nepal (NSET) and  
GeoHazards International, USA (GHI)**



## भूकम्प प्रविधि राष्ट्रिय समाज-नेपाल

११३३ देवकोटा सडक, महादेवस्थान, बानेश्वर, पोष्ट बक्स नं. १३७७, काठमाडौं, नेपाल, फोन नं. (९७७-१) ४४७४१९२, ४४९०३५९ फ्याक्स नं. (९७७-१) ४४९०९४३  
E-mail: [nset@nset.org.np](mailto:nset@nset.org.np), Website: [nset.org.np](http://nset.org.np)