RADIUS PROJECT FOR GUAYAQUIL

SECOND SEMI-ANNUAL REPORT (JANUARY 1999)

1. SUMMARY OF ACTIVITIES

During the first year all activities corresponding to the the first stage of the Project have been completed for the "Evaluation of the Seismic Risk for Guayaquil". The main event was the "Workshop on the Seismic Scenario", that took place from January 20 to 22, 1999 for the presentation of the damage estimation results, social impact and economic losses that may occur if an earthquake like the one adopted for the scenario strikes Guayaquil, given the vulnerability conditions of the city's buildings and infrastructure.

The highest seismic risk of the downtown area is the result of four factors: 1) High construction density; 2) Higher vulnerability because of the great amount of very old buildings and infrastructure built without any construction code or without enough seismic design provisions. 3) Greater value and importance given to buildings, infrastructure and equipment used in commercial and financial activities; and 4) Its high population density during commercial hours.

2. DATABASE

With the contribution of the information given by many city institutions to the Municipal Government, and with the results generated by the Project, RADIUS has compiled a "Database" quite complete and up to date for the buildings and infrastructure of the city for the diagnosis of the Seismic Risk of Guayaquil.

The majority of the information is run in a Geographic Information System (GIS), which is a very important tool for the management of the seismic risk of the city.

For the commercial value of buildings, the building is used as calculation unit which gives more versatility and accuracy. For the graphic display of data or results, a graphic unit is used which is related to the numerical database (currently the information is displayed by city sectors, in the future it could be displayed by blocks or lots).

As an example, the building stock of the city is presented in Table No. 1 with the classification of the 12 construction types defined for the estimation of the seismic risk.

Figure No. 1 shows how GIS allows the displaying of the amount and geographical distribution of one type of building stock according to the city sectors.

The inventory of the city's lifeline infrastructure includes all important facilities (seaport, airport, bridges, electricity substations, pumping stations of sewage water, potable water plant and reservoirs, etc.) and main networks.

There is also an inventory of essential facilities such as hospitals, schools, churches, emergency centres (fire stations, police stations, etc.) and government buildings.

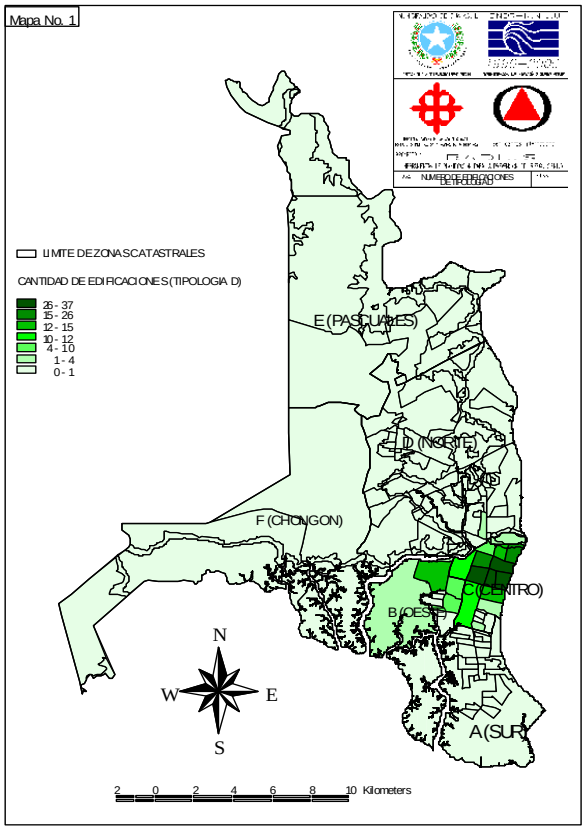


FIGURE No. 1: BUILDINGS WITH TIPOLOGY "D" (GREATER COLLAPSE RISK).

TABLE No.1: BUILDING STOCK

TYPE	DESCRIPTION OF BUILDINGS	No.
A	WOOD OF 1 TO 6 LEVELS IN GOOD CONDITION. – Mainly residential use of 1 and 2 levels (60.980). The most vulnerable ones are those of commercial use, 3 to 6 levels (12).	61.338
B	MIXED (WOOD-BRICK) OF 1 TO 6 LEVELS IN GOOD CONDITION.- Mainly residential use of 1 to 2 levels (12.329).Most vulnerable commercial use, 3 to 6 levels (449).	15.236
C	WOOD OR MIXED OF 1 TO 2 LEVELS IN BAD CONDITION.- Mainly wood residential use (5.966). Most vulnerable are mixed of commercial use (167)	7.355
D	WOOD OR MIXED OF 3 TO 6 LEVELS IN BAD CONDITION.- Mainly mixed of residential use (143). Most vulnerable are mixed of commercial use (75)	259
E	CONCRETE OF 1 TO 2 OF RESIDENCIAL USE.- Mainly buildings in good condition (198.469). Most vulnerable are those in bad condition (873).	199.342
F	CONCRETE OF 1 TO 2 LEVELS OF COMMERCIAL USE.- Mainly buildings in good condition (9.286). Most vulnerable are those in bad condition (103).	9.389
G	CONCRETE OF 3 TO 6 LEVELS OF RESIDENCIAL USE.- Mainly buildings in good condition (8.882). Most vulnerable are those in bad condition (21).	8.903
H	CONCRETE OF 3 TO 6 LEVELS OF COMMERCIAL USE.- Mainly buildings in good condition (2.482). Most vulnerable are those in bad condition (21).	2.503
I	CONCRETE OF 7 TO 13 LEVELS.- Mainly buildings of commercial use. Most vulnerable are those of commercial use (174).	224
J	CONCRETE OF 14 LEVELS OR MORE.- .- Mainly buildings of commercial use. Most vulnerable are those of commercial use (13).	22
K	STEEL OF 1 LEVEL.- Mainly buildings of residential use and in good condition (1647). Most vulnerable are those of commercial use in bad condition (5).	2.262
L	STEEL OF 2 LEVELS OR MORE.- Mainly buildings of commercial use and in good condition (100). Most vulnerable are those of commercial use in bad condition (2).	192

3. EVALUATION OF SEISMIC HAZARD

An extensive evaluation of the Seismic Hazard of Guayaquil has been conducted. The results of this research are in a technical paper of 75 pages, in which the following items are covered extensively:

a) Gathering of relevant information: historical records and chronicles, seismic catalogues and strong motion records of soil (accelerograms);
b) Description, zoning and interpretation of historical damage caused in Guayaquil by the seven most significant earthquakes to strike the city;
c) Estimation of the seismic hazard using probabilistic models, corresponding to the three seismogenetic sources of Ecuador with a capacity to produce earthquakes with Mercalli Intensity greater or equal to VII in Guayaquil;
d) The selection of the adopted EQ for the "Seismic Scenario of RADIUS", equal to an EQ of magnitude Ms = 8.0 next to the northern coast of Ecuador;
e) The distribution of expected intensities in Guayaquil during the "adopted earthquake", on the three type of soils;
f) The study of the associated risks and the identification of the "susceptible zones to landslides as a collateral effect of the earthquake".

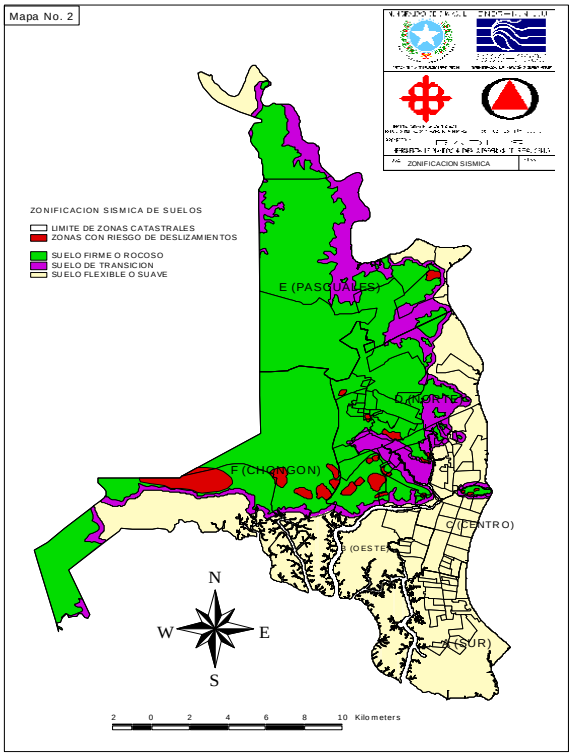


FIGURE No. 2: DISTRIBUTION OF INTENSITIES FOR THE ADOPTED EARTHQUAKE AND ZONES SUSCEPTIBLES TO LANDSLIDES.

The most important seismic parameters of the adopted earthquake are presented in Tables 2 and 3.

TABLE NO. 2 : RETURN PERIOD, MAGNITUDE AND EXCEEDING PROBABILITY OF EARTHQUAKES IN THE COASTAL NORTHERN ZONE OF ECUADOR.

Magtinude Ms > o =	MEAN PERIOD OF RETURN	Pexceed* 10 YEARS	Pexceed* 50 YEARS	OBSERVATIONS
6.5	10.2 years	64.3%	99.4%	Moderate earthquake
7.2	26.1 years	32.3%	85.8%	EQ similar to Bahía 4/8/98
8.0	66.9 years	14%	53%	Adopted EQ for the Seismic Scenario.

*** Probability that magnitude Ms be exceeded within the specified period of time**

TABLE NO. 3 : EXPECTED ACCELERATIONS IN THE SOILS OF GUAYAQUIL FOR THE ADOPTED EARTHQUAKE (Ms = 8.0, seismic source in the northern coastal zone, D = 200 Km).

SOIL TYPE I (ROCK)	SOIL TYPE II (TRANSITION)	SOIL TYPE III (SOFT SOIL)
0.06g	0.06g – 0.15g	0.15g

4. INTERVIEWS WITH IMPORTANT ORGANIZATIONS

Twenty (20) operators of important institutions of the city were interviewed for the preparation of the "Seismic Scenario". These institutions are related to the management of an emergency during an earthquake. The listing of these institutions and the objectives accomplished are detailed in the following paragraphs:

INSTITUTIONS INTERVIEWED:

1. Ecapag
2. Emelec
3. Pacifictel
4. Province Government
5. Subsecretary of Public Works.
6. Civil Aviation
7. Port Authority
8. Municipio de Guayaquil
9. Civil Defense
10. Red Cross
11. Police
12. Armed Forces
13. Fire Department
14. Transit Commission of Guayas.
15. Church
16. Public Education Board
17. Miduvi
18. Innfa
19. Public Health Board
20. Lorenzo Ponce Hospital

OBJECTIVES ACCOMPLISHED:

a) Obtain information
   - Identify specific characteristics of the system and its performance
   - Gather data to be used for the "Scenario of Seismic Damage".

b) Study the potential of mitigation
   - Response and recovery capacity
   - The feasibility of starting actions of risk mitigation.

c) Awareness
- Inform about the project
- Educate and awake interest about Seismic Risk

The gathered information was useful to produce a diagnosis about the capacity of response and recovery of the city in case of an earthquake. See summary presented in Table No. 4.

TABLE No. 4: SUMMARY OF DIAGNOSIS OF LIFELINE SYSTEMS

ITEMS	WATER	SEWAGE	ELECTRICITY	TELEPHONES
1. CRITICAL VULNERABLE ITEMS	* New Plant * Santa Ana Tanks *Acqueduct 42" *Primary Network in soil transition *Distribution Network Downtown	* Pump Stations *Primary Network Parsons *Cross with bridges *Secondary network downtown	*Links to inter-connected system *Substaciones *Primary Network in soil transition *Networks downtown *Light posts	*Tower Cerro del Carmen *Downtown Station *Primary Network *Cable from Downtown to Tower Cerro Carmen *Cable Downtown to a Satellite Station
2. DEPENDENT OF	*EMELGUR *Daule Highway	*EMELEC *PETROCOMERCIAL	*INECEL *PETROCOMERCIAL	*Private Sector *ECAPAG
3. SYSTEM REDUNDANCE	*Good	*Bad	*Good	*Bad
4. RESPONSE TO EARTHQUAKES	*Variable *Hours-days-weeks	*Slow *Days-weeks	*Very Fast *Hours	*Fast *Hours-days
5. RECOVERY CAPACITY	*Slow *Days-weeks	*Very Slow *Weeks-months	*Fast *Hours-days	*Variable *Days-weeks-months
6. EMERGENCY CAPACITY	*None	*None	*Some	*None
7. EARTHQUAKE PLANNING	*None	*None	*None	*None

5. THE EARTHQUAKE SCENARIO

5.1. ESTIMATE OF LOSSES IN BUILDINGS

Vulnerability Factors

The severity of damage depends upon some Vulnerability Factors whose incidence has been studied by groups (schools, hospitals, etc.) and types (A-L) of buildings. These factors increase the risk and are predominant in the downtown area of the city.

Principal factors contributing to the vulnerability of buildings in Guayaquil.

Vulnerability Functions

Based on research of the damage caused by historical earthquakes (including the Bahía earthquake, August 4, 1998), a program of inspections, and on the study of vulnerability relations proposed in other countries, a handful of vulnerability functions were defined for the 12 types of buildings (See Figure No. 3) identified.

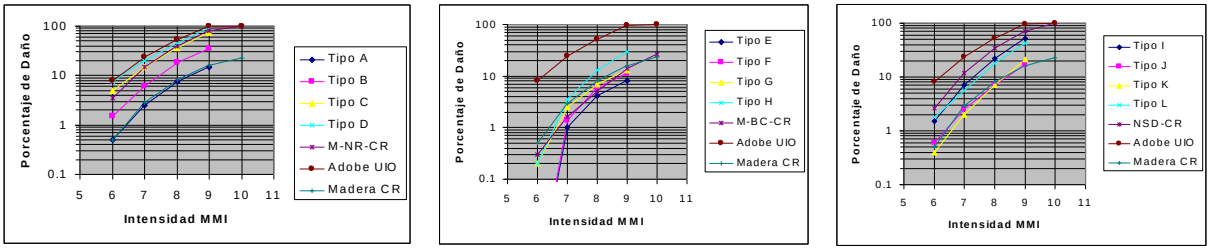
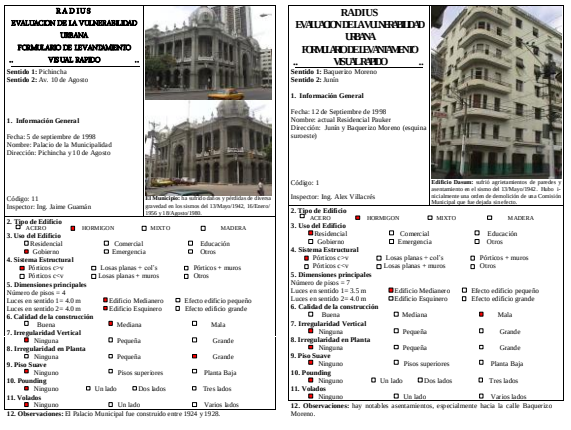


FIGURE No. 3: Vulnerability Functions of buildings: wood, mixed construction (A, B, C, D), concrete (E, F, G, H, I, J) and steel (K, L) for Guayaquil.

Inspections to Buildings

62 RC buildings affected by past earthquakes, 85 wood or mixed houses, 40 RC and 4 steel buildings of 5 or more levels were inspected. This information was used to:

a) Study vulnerability factors and their predominance in groups and types of structures in different zones of the city;
b) Calibrate vulnerability functions and make a diagnosis through indices;
c) Make recommendations to reduce the risk of important buildings.



Nearly 200 files were prepared, from the inspections to study vulnerability factors and the risk of the city.

Quantification of Economic Losses

The direct economic losses are obtained by combining the distribution of intensities, the vulnerability functions and the building stock and its estimated. Considering current market values, the amount of direct losses would be nearly US$ 200 million.

Total losses are estimated to be US $1,000 million, after adding up the losses in building equipment and the indirect losses caused by the temporary or complete suspension of services.

The Seismic Risk

"The results of the damage estimation indicate that there is a 53% probability that, in the next 50 years, economic losses in excess of US$ 1,000 millions will occur in Guayaquil, as a result of an earthquake of magnitude Ms 8 or greater, with its epicentre in the coastal zone of Ecuador".

Interpretation of Results

From the results shown in Figure No. 4, the definition of seismic risk for the city of Guayaquil is:

1. Very low risk in Pascuales and Chongón, due to low building density and value of buildings, and because of the presence of better soils (except in the southern slopes of Chongón – Colonche mountains);

2. Low risk to the North, due to better construction quality and medium building density;

3. Moderate risk to the South and West, due to fair construction quality and high building density of buildings; and,

4. High risk in downtown area, due to high vulnerability of buildings, high density of constructions, and greater building values.

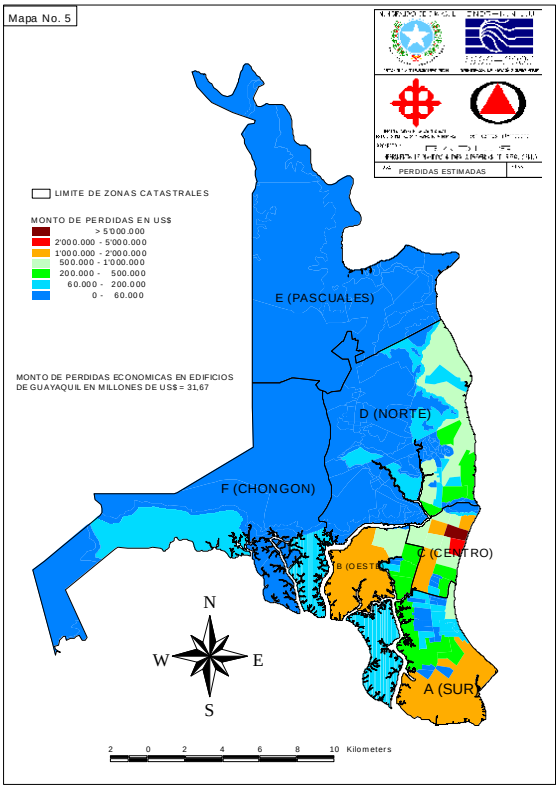


FIGURE No. 4: Amount of direct losses by sectors, as a function of buildings' value.

5.2. DAMAGE TO LIFELINES

Damage Functions

Due to a lack of local information to define new functions or calibrate existing ones, the functions used to calculate the damage estimation of the city's lifelines are those recommended by the American Code ATC-13.

Damage Estimation

As an example, the damage estimation of electricity substations is presented as follows:

1. Applying the appropriate damage function:

Intensity Mercalli MMI at soil types	% average of expected damage
VI	4.93
VII	10.10
VIII	20.37

2. Using the GIS, graphically superimposing the distribution of intensities map with the map of electricity substations.

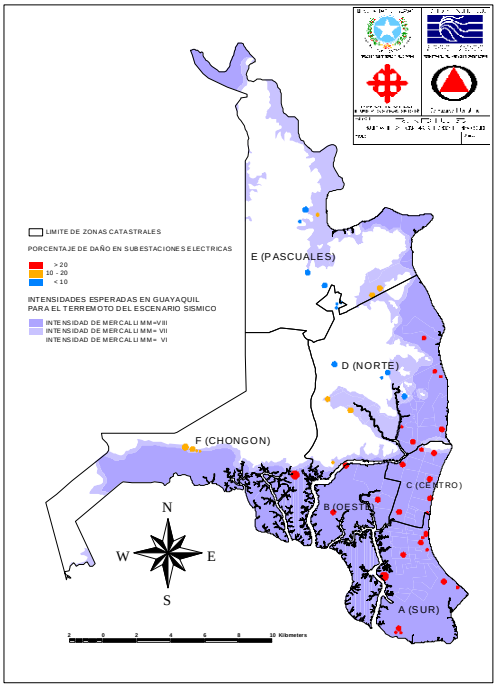


Figure No. 5: Damage to electricity substations

3. The substations are classified according to their zone and intensity; Total = 49

Intensity Zone	Number of substations
MMI = VIII	28
MMI = VII	10
MMI = VI	11

4. The damage in each zone is estimated:

Intensity Zone	Damage to Substations
VIII	5.70
VII	1.01
VI	0.54
Total equivalent damage =	7.25

5. For the estimation of probable losses, the average cost of replacement of a substation is multiplied by the equivalent amount of lost substations. (7.25).

6. The probable impact of damage, is equivalent to the suspension of the seventh part (7.25/49) of total supply of electric energy for the city.

The probable damage for the following lifelines has also been estimated:

a) Main Water Network;
b) Main Sewage System Network;
c) Main Electricity Network;
d) Main Road Network.

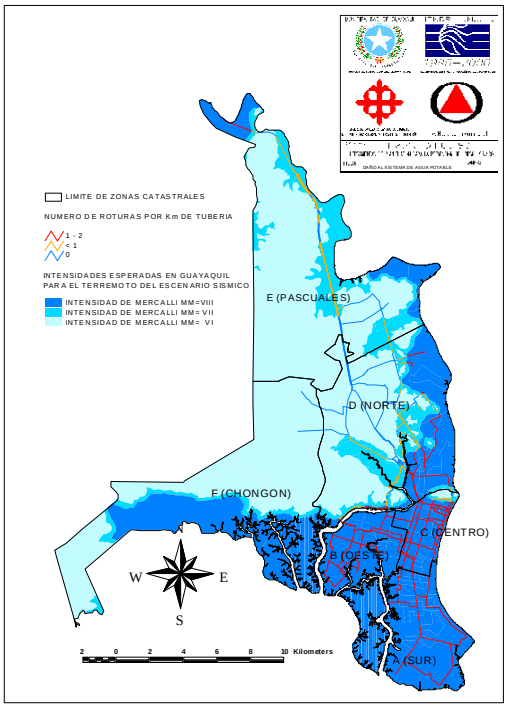


Figure No. 6: Damage to Water Network

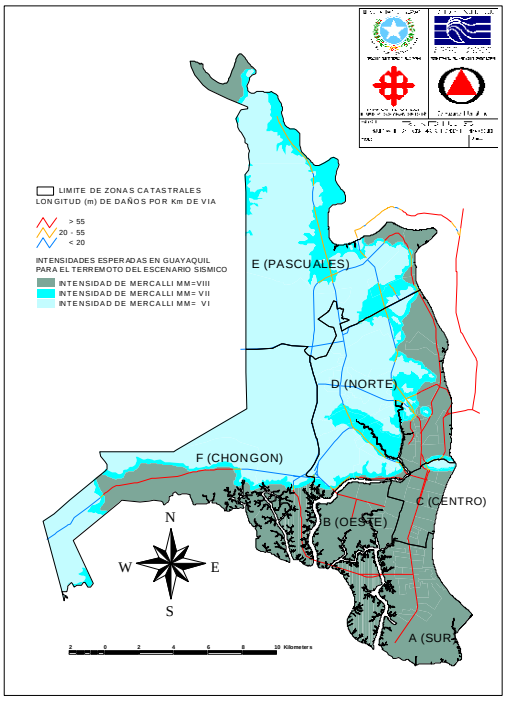


Figure No. 7: Damage to Road Network

5.3. SOCIAL IMPACT

Casualties, wounded and injured

In order to estimate the number of people killed and injured, two procedures have been established:

1. Using data from the earthquake of 13th May 1942, in which more than 100 persons were reported dead and injured from a population of about 180.000 inhabitants, and making a correlation with the current population, we obtain that the number of fatalities would be near 1.000 people. This number may be considered a very low estimate since the vulnerability of the city has increased greatly due to a dramatic increase of population density and the incorporation of heavy construction materials without proper code application.

2. Using factors that depend upon the damage percentage of building types and considering the population density, we get 22,461 deaths and 90,114 people injured. These values may be considered a high estimate and can be used in the planning of the response of the city in the earthquake scenario. See Figure No. 8. Similar estimates were obtained using results observed in other earthquakes of similar magnitudes.

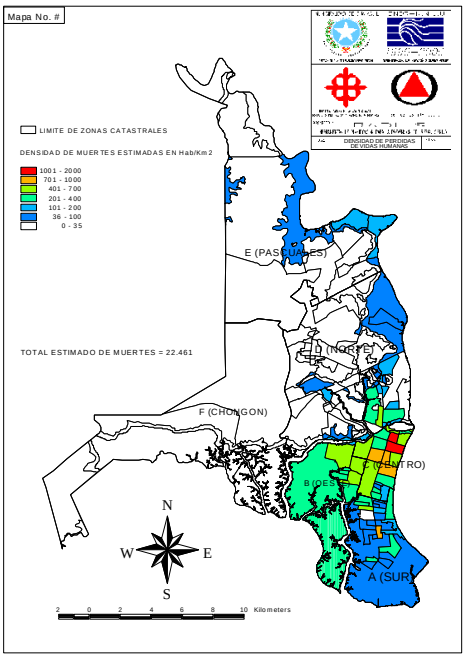


Figure No. 8: Distribution of number of deaths

Similarly, the number of people left homeless was estimated on the basis of the expected damage to buildings and has been calculated to be around 90.000 people.

The recovery process

The fast response and the recovery of essential services of the city will be affected by different situations that are foreseeable; the most important ones are mentioned:

a) Up to 75% of hospitals could be non-operational after the earthquake due to the vulnerability of their facilities. There is an important deficit of public hospitals and welfare hospitals with emergency services (4), ambulances and beds for hospitalization;
b) The provision of temporary or permanent shelter for those affected (up to 20.000) would be very slow, because of the lack of an executive organization. The schools will be used as shelters for more time than normally recommended (one week), but, it must also be considered that up to 10% of the school infrastructure might be severely affected;
c) There might be a partial and significant suspension of basic services during the first week following the earthquake. See Table No. 5.

TABLE NO. 5: RECOVERY OF LIFE LINES AFTER AN EARTHQUAKE.

LIFE LINES	TIME OF RECOVERY TO THE ORIGINAL CAPACITY OF		
	30%	60%	100%
ELECTRICITY	2 – 3 days	1 week	2 – 3 weeks
WATER	1 week	1 month	3 months
TELÉPHONE	2 – 3 days	1 week	1 – 2 months
SEWAGE SYSTEM	2 weeks	2 – 3 months	6 months – 1 year
ROADS	1 week	2-3 weeks	1 – 2 months

5.4. THE EARHTQUAKE SCENARIO IN JOURNALISTIC TERMS

The Earthquake Strikes!

The time is 08h45 on May 5. You have just arrived to your office located on the 10th floor of a downtown building in Guayaquil. Suddenly everything starts to shake, at first very slowly and then very fast. The windows and doors creak, the furniture is moving and you have great difficulty keeping your balance. To the shout of, EARTHQUAKE!" some of your officemates search for protection under the desks, and others run away terrified. Some stagger as they attempt to walk to the elevators. Somebody asks, "Where are the stairs?". Slowly, the movement begins to diminish, while the sound of buildings collapsing is heard. After 2 or 3 minutes the movement has stopped, but you think it seemed like hours.

Minutes Later

Your are on the street, somewhat hurt by the crowd that was coming down the stairs in a hurry. Your hear the screaming of people from inside the buildings, there is no energy in the buildings. There are people running around looking for a safe place among broken glass and debris, and others are helping dead and injured people hit by the impact of fallen brick walls. In the distance you can see dust clouds hanging over other affected areas. You try to call your family but the telephones are not working, and you cannot call the firemen to rescue the people that are trapped in the elevators.

One Hour Later

Your are driving your car and try to get out of downtown via Malecón Simón Bolívar which looks open. However, the traffic has virtually come to a standstill. You wish to go to your children's school in Samborondon County because you want to know what happened to them. Some people passing by warn you that you cannot go through Loja Street because there is a tremendous traffic jam around Hospital Vernaza. You turn on the radio and listen to the news: "The most damage has occurred in the downtown area where many old houses of mixed construction have collapse partially or totally in some cases, impeding traffic from north to south along the following streets: Lorenzo de Garaicoa, 6 de Marzo, Pedro Moncayo and José de Antepara, and from east to west along the streets of Velez and Ayacucho. Fifty large commercial buildings have also collapsed; there is a lot of damage and chaos in the majority of hospitals, some schools and many public buildings. A landslide has cut off traffic on the Via Perimetral near Los Parques Urbanization; another landslide has occurred in the slopes of Bim Bam Bum Urbanization, covering the back of the building out of which INNFA functions. It is reported that many INNFA workers are trapped in that building."

However, one piece of news calms you: it is reported that the northern area of the city has suffered minor damage. You imagine that your wife will be arriving at your home located in that area without any problems. You remember that your mother had an appointment with her doctor in a private clinic which has been reported to be in fair condition, possible able to provide emergency services lacking in the affected public hospitals. Another piece of news worries you: it is reported that there is no traffic moving through the Rafael Mendoza Bridge to Samborondon. The traffic police mobilize wrecking cranes to the bridge in order to move cars that lost control and collided with one another, including one overturned truck; there are many fallen light posts, there are some voids left by the small slabs on the bridge road that broke or jumped out of place. The news reports that there is a traffic jam spanning many kilometres going to that bridge. You wonder, "How are my kids doing?".....

6. THE EARTHQUAKE SCENARIO WORKSHOP

From January 20 to 22, 1999 the "RADIUS Earthquake Scenario Workshop" took place with the participation of 70 representatives of 40 institutions. The Inaugural Act was held in the City Hall and the Workshop Tasks were held at Hotel Oro Verde in Guayaquil.

Inaugural Act

(From left to right): Mr. Guillermo Arguello (RADIUS co-director & DPLAN-G director from The Local Government), Mr. Jaime Argudo (RADIUS Responsible Scientist), Mrs. Gloria Gallardo (Director of The City Promotion Office from Local Government), Mrs. Aase Smedler (United Nations Representative in Ecuador), Mr. Luis Chiriboga (Vice-Mayor of Guayaquil), Dr. Eduardo Peña (former Vice-president of Ecuador), Dr. Carlos Villacís (RADIUS international co-director), Dr. Carlos Ventura (RADIUS regional advisor).

During the Inaugural Act, the authorities highlighted the importance of the Workshop and the Radius Project. Following there are some quotes:

"For the Municipal Government the results of this Workshop will be useful in three important areas: a) The structuring of the new DEVELOPMENT URBAN PLAN OF GUAYAQUIL, shortly to be publicly announced; b) To establish new architectural norms and regulations for construction, and c) The establishing of the PROJECT FOR URBAN IMPROVEMENT AND RENEWAL , in areas prone to natural disasters" **Arq. Guillermo Arguello (Local Co-Director of RADIUS and Director of DPLAN-G).**

"The RADIUS Project tends to achieve that every person in his area of action know what to do and how to act to achieve an effective management in the resumption of services and the fast solution of problems, after the occurrence of a disaster. The combined action of individuals and institutions may cause that even in the case of a major earthquake the consequences would not be catastrophic, thanks to planning and preparedness actions. Guayaquil was chosen for this Project among more than fifty cities world-wide. Why Guayaquil? Because due to the concentration of people, buildings, investments, etc., the impact of an earthquake would trascend beyond just the earthquake itself, affecting the infrastructure of roads, communications, service networks, administration processes, in such a way that the economic situation of the whole country would be broken.". **Ms. Aase Smedler (Representative of the United Nations in Ecuador).**

"I declare this event inaugurated, with much satisfaction, because a program that was created in the UN is taking place in our city. This gives us a hint that the Municipal Government as such, and our city after a great effort from those who make the Municipio, with the leadership of Ing. Febres Cordero, is finally getting the well deserved status of a city in this world. Then, the combination of these actions give a great importance to our country and our own city. **" Sr. Luis Chiriboga Parra (Vice-Mayor of Guayaquil).**

"Earthquakes do not kill; bad construction practices and lack of preparedness and planning are the factors that claim lives of people. The best mitigation is not to create new risk. The solution is in our hands". **Dr. Carlos Villacís (International Co-Director of RADIUS, official of Geohazards International).**

Workshop Tasks

On January 21 and 22, 1999, the Workshop participants gathered to carry out four Tasks:

A) Review preliminary estimates of the damage caused by the assumed earthquake;
B) Describe the effects (impact) of these damages on their institutions;
C) Recommend projects to elaborate an ACTION PLAN dedicated to reducing the effects of an earthquake, and,
D) Suggest how to implement the resulting ACTION PLAN.

Participants from the Emergency Response Institutions, in a plenary session of the Seismic Scenario Workshop of RADIUS.

During "Task A", the officials from Universidad Católica and GeoHazards International presented the results of the studies on the seismic risk of Guayaquil, damage estimates, the diagnosis of the vulnerability of the city's lifeline systems and the expected losses resulting from the adopted probable earthquake.

During the presentation of these results, both organizers and participants of the Workshop expressed their opinions. There were suggestions on how to refine the results of the diagnosis, and also statements about the need to assume future responsibility for the implementation of the Action Plan of RADIUS. Quotes from two participants:

"Two years ago there was a disaster simulation that took place in Centro Cívico with the participation of all the Province Authorities and representatives of Public Institutions. The result was to confirm that we are not prepared to face a disaster. That is why it is very important that we must think about the responsibility we are acquiring for our city. ..... In the same fashion, as we have fought to revive this city after the worst crisis of its history, there is a strong commitment from Mayor León Febres Cordero, a strong commitment from this administration, and a personal commitment from myself to be at the front of this campaign to immediately start an educational process, that allows us to face a natural disaster." **Mrs. Gloria Gallardo Zavala (Director of Civic Promotion, Press y Publicity of M.I. Municipalidad de Guayaquil – Member of Executive Committee of Project RADIUS).**

*"In Guayaquil there are only three general hospitals that are continuously working to full capacity. In the event of an emergency only 50% of the patients can be evacuated. This capacity of usable beds will be reduced to only 10% if we add in the deficit of operating rooms, the damage caused by the earthquake, and traffic jams, which can cause 6 hour delays in the arrival time of medical personnel to hospitals, as it ocurred in Mexico City. This is really frightening, I do not want to think what may occur in our city in the event of an earthquake, because we do not even have the trained personnel for emergencies as in other countries.***". Dr. Gustavo Soria (Hospital del IESS).**

For the carrying out of Tasks B, C and D, five working groups were formed, with the following participants:

GROUP Nº1: (Response to Emergencies)

- National Police
- Army - II Military Zone
- Firemen
- Civil Defence
- Red Cross
- Guayas Transit Commission
- Mass Media

GROUP Nº2: (Lifelines)

- Ecapag (Water & Sewage Systems)
- Emelec (Electricity)
- Pacifictel (Telephones)
- Public Works Regional Office
- Civil Aviation Regional Office
- Airport Simón Bolívar
- FAE (II Air Zone)
- Port Authority
- Inocar (Army Oceanographic Institute)
- Guayas Thermoelectric Unit
- Ecuad. Comm. of Geological Science

GROUP Nº4: (Health Sector)

- Direction of Health
- Public Health Regional Office
- Hospitals from Junta de Beneficencia
- Civil Defence
- IESS

Participants of Group No. 2: Lifelines

GROUP Nº3 (Shelters)

- Education Regional Office
- Miduvi (Ministery of Housing Office)
- Church
- Innfa (Childen Affairs Regional Office)
- Civil Defence
- Diplasede Direction of Education

GROUP Nº5: (Private Sector- Others)

- Fise
- Colegio de Arquitectos
- Insurance Companies Chamber
- Secap
- Universidad Católica de Guayaquil
- Universidad de Guayaquil

Results Obtained

The participants assumed with great responsibility the Tasks of the Workshop. They gave valuable opinions for the better estimation of the impact of an earthquake and the definition of actions to be taken to reduce risks. Ninety short – and long – term projects (90) of short and long term were recommended. Some of them coincide with the following lines of action:

a) Evaluation and strengthening of buildings and dangerous infrastructure;
b) Training of personnel from basic organizations of citizen's protection;
c) Forming groups specialized in rescue actions, paramedics and emergencies. In the Municipal Government the creation of a new Department: Risk and Disaster Management was recommended;
d) Preparedness of the community through campaigns of prevention and mitigation;
e) Planning of the fast response and recovery of services and lifelines;
f) Preparation of emergency plans;
g) Control of usage, acquisition, rehabilitation, modernization and maintenance of equipment, services and various systems;
h) Study and monitoring of geological and seismic risks;
i) Evaluation of urban areas, control on the use of soils, issuance of a construction code.

7. ACTIVITIES OF THE EXECUTIVE COMMITTEE, WORK GROUPS AND LOCAL ADVISORY COMMITTEE.

The Executive Committee of Project RADIUS, is formed by six representatives of the Municipal Government, one member from the UN, two members from Universidad Católica and one member from GeoHazards International; the Committee has worked very hard through ordinary sessions which are held every two weeks and also extraordinary sessions (when necessary) each week. During the first year of the project near 20 sessions have been held, and in each one minutes of the session are prepared and approved.

The Work Groups were formed during the first semester of the Project, and they have been collaborating with good results. Just recently two new Work groups were formed for the promotion of the project and to help the Workshop, incorporating to the groups the following persons: Miss. María Elena Arellano (Universidad Católica), Mrs. Rocío Soria (Department of Civic Promotion, Media and Advertising of the Municipio de Guayaquil), Mr. Augusto Alvarado (Facilitator of the Workshop), Ing. Carlos Romero (Assistant facilitator).
The Local Advisory Committee has not been nominated yet.

8. PUBLIC RELATIONS

The work done and the results obtained have deserved an ample covering by the national and local media. More than 60 press releases about the Project and the Workshop have been covered in newspapers (more than 40), radio (12) y television (10). Below are two examples of complete page coverage or RADIUS in different newspapers.

Proyecto Radius revela deficiencias en construcciones

Guayaquil: Ciudad vulnerable

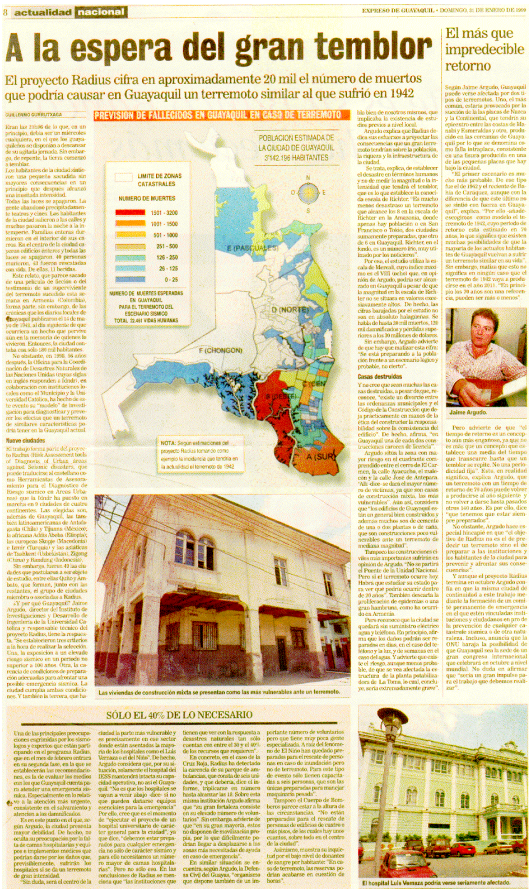
Edificios de servicio público

Líneas vitales

Infraestructura vial

Casas de salud

Diary El Universo, Sunday 24 of January 1999



actualidad nacional

A la espera del gran temblor

El proyecto Radius cifra en aproximadamente 20 mil el número de muertos que podría causar en Guayaquil un terremoto similar al que sufrió en 1942

El más que impredecible retorno

PREVISION DE FALLECIDOS EN GUAYAQUIL EN CASO DE TERREMOTO

SÓLO EL 40% DE LO NECESARIO

Diary Expreso, Sunday 31 of January 1999

9. ACTIVITIES FOR FEBRUARY TO JULY 1999

During the months of February to July 1999, RADIUS will complete its third and last semester with the conclusion of the following activities:

a) A better definition of the Seismic Scenario, incorporating the suggestions of the participants to the Workshop of January 1999;
b) Preparation of the Action Plan and the Management of Seismic Risk with the active participation of the community, represented by more than 40 institutions called to participate in the development of the Plan;
c) Preparation of technical and non-technical publications with the results of the studies conducted about the Risk and the Seismic Scenario; also the publication of the proposed Action Plan and Management of Seismic Risk;
d) Workshop on the Action Plan and the Management of Seismic Risk to be held between June and July 1999 for the validation of the Plan.

10. PAYMENTS RECEIVED DURING THE FIRST YEAR.

Near the end of the first semester of the Project, the Municipal Government received from the IDNDR the first payment of the amount of US$25,000, which corresponds to 50% of the total amount promised by the U. N. for the execution of the RADIUS project. During the first semester of the Project, the Municipal Government has given to Universidad Catolica the following amounts for the technical execution of the Project:

First Semester (February – June 1998).....None		
Second Semester (July 1998 – January 1999).....	US$ 18.750	(1st payment)
	US$ 16.639	(2nd payment)
Total payments up to March1999 =	US$ 35.389 dollars	

The payments correspond to US$ 17,694.50 by the IDNDR and the same amount by M.I. Municipalidad de Guayaquil. The total budget of the Project is US $100,000 (US$50,000 to be given by IDNDR and US$50,000 by Municipio de Guayaquil).

11. MISCELLANEOUS

During the first semester an active co-ordination among the institutions for the solution of problems was necessary. During the second semester, an appropriate framework was established which has resulted in important results. The effort of the members of the Working Groups, the managerial skills of the Executive Committee formed by Major Leon Febres-Cordero and his summoning of the city institutions to assume the challenge of mitigating the city's seismic risk has been fundamental to this process. From the Workshop of the Seismic Scenario held in January 1999, more than 40 institutions with high civic spirit and enthusiasm have responded to this summon and are presently collaborating in the formulation of the Action Plan for the mitigation of the seismic risk of Guayaquil.

12. NAME AND ADDRESS OF THE AUTHOR OF THIS REPORT

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