

UNITED NATIONS DEVELOPMENT PROGRAMME
GUATEMALA

THE GUATEMALA EARTHQUAKE DISASTER OF 1976:
A REVIEW OF ITS EFFECTS AND OF THE CONTRIBUTION
OF THE UNITED NATIONS FAMILY.

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TABLE OF CONTENTS

	Page
Foreword by Orlando Olcese	
Introduction	
Chapter I — The characteristics and effects of the Guatemalan earthquake of 4 February 1976	1
Chapter II — The emergency phase. Notes on the response to the disaster and the assistance strategy of the United Nations family	18
Chapter III — The problem of rehabilitation and reconstruction	39
Chapter IV — Lessons from the experience. A broad theory of the functions of Government vis-a-vis external assistance group in an emergency situation	63
Annex I	A-I.1
Annex II	A-II.1

FOREWORD

Natural disasters can hit countries suddenly and unexpectedly.

Aside from the suffering that those disasters bring and the mourning of the dead by the lucky ones that survive, the big question that remains is how to cope immediately with the emergency situations they create.

The question of how to deal with disasters in a massive way and how to bring relief to the suffering of the survivors has been the motive of increasing attention by the governments of all countries in the world. In the last few decades most countries have created emergency organizations or some system of civil defence to cope with these disasters. But the accumulated experience is still small and much remains to be learned about how to handle emergencies.

Another phenomenon of the present century is the establishment of many voluntary and non-governmental agencies that have imposed up on themselves the obligation of contributing to alleviate the suffering of the population affected. Likewise, governments of the world are increasingly involved in assisting fraternal nations that are struck by natural disasters.

The United Nations and its related Agencies and particularly the World Health Organization, the United Nations Children's Fund and the World Food Programme have also been providing assistance in the last decades, in cases of natural disasters.

The General Assembly of the United Nations has for some years been aware of and concerned by the suffering caused by natural disasters and the serious economic and social consequences for all, specially the developing countries. It also has been conscious of the varying needs of nations experiencing such disasters, which present new challenges for international co-operation and concerned about the ability of the international community to come to the aid of countries in a disaster situation. At its 2018th meeting on 14 December 1971, the General Assembly

therefore called upon the Secretary-General of the United Nations to appoint a Disaster Relief Coordinator. The Office of the Coordinator, better known as UNDRO, has played an important role in disasters that occurred in different countries in the last few years.

There is still plenty to learn however, on the United Nations side on how best to comply with the mandate of the Resolution cited above.

Nature struck Guatemala on 4 February of 1976 suddenly, unexpectedly and mercilessly.

I was thrown out of bed at three in the morning by the violent shaking. Amidst the rumble of the earthquake, the breakage of more than twenty windows, the crashing of porcelain and furniture, the cracking of walls and structures I tried unsuccessfully to push my youngest children to the safety of the garden. The structures of our house suffered but did not collapse. After 39 seconds the violent shaking stopped. I had been lucky. Thousands of Guatemalans were not.

At the break of day, survivors in various parts of the country looked perplexed and apalled at the 23,000 dead, the thousands more wounded and 250,000 house destroyed. They begun burying the dead and assisting the wounded. Assistance from all over the world started pouring in the following days.

The United Nations family had a role to play in helping these people.

We are here presenting an account of the developments related to the earthquake and of the activities in which the whole United Nations system was engaged during the emergency.

The whole United Nations family in Guatemala dedicated with devotion their time and energies to help their Guatemalan brothers who in an exemplary manner faced the disaster with stoicism and gallantry.

Our purpose is to contribute in further elucidating the role of the United Nations in disaster relief activities.

Dolan

INTRODUCTION

The purpose of this study is to examine the contribution the United Nations family made following the 4 February 1976 earthquake disaster in Guatemala, in the light of the needs that were identified both in terms of relief assistance and for rehabilitation and reconstruction. The emphasis of the study is on emergency relief, and the idea is to evaluate the actual and potential contribution of the United Nations family in disaster situations, on the basis of the Guatemala experience.

The presentation of this document is as follows:

CHAPTER I describes the characteristics of the earthquake on the basis of technical studies that have been made on the subject. It also summarizes the effects of the earthquake in economic and social terms, on the basis of official studies prepared by the Government with the assistance of UN experts.

CHAPTER II narrates the response to the disaster, specially by the United Nations family. It describes the actions immediately taken by the Resident Representative, the internal coordination mechanisms adopted within the United Nations family as well as the coordination with other assistance groups. There is also a presentation of the assistance provided through the United Nations family.

CHAPTER III reports on the problems of rehabilitation and reconstruction. It includes UNDP Guatemala's perspective on the reconstruction process and concomitant technical assistance requirements, as well as notes on the UN family contribution in this stage.

CHAPTER IV is a general discussion, on the basis of the experience in Guatemala, of the most adequate role for the United Nations in the face of a disaster, particularly in the area of disaster relief.

This study was prepared by Orlando Olcese, UNDP Resident Representative in Guatemala, Ramón Moreno, Programme

Officer and Francisco Ibarra, Administrative Officer. It does not represent an official position and does not commit the United Nations Development Programme in any way.

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CHAPTER I

THE CHARACTERISTICS AND EFFECTS OF THE GUATEMALA EARTHQUAKE OF 4 FEB- RUARY 1976

BACKGROUND

1. At 3.03 in the morning of 4 February 1976, an earthquake of surface wave magnitude 7.5 on the Richter scale devastated large areas of Guatemala. This was followed by hundreds of tremors in succeeding weeks, including several fairly strong aftershocks. These additional tremors increased the casualty rate and the hardships and tension of the population.
2. The earthquake resulted from a tectonic displacement along the Motagua fault, one of a group of faults that cuts across Guatemala, and has been described as the worst disaster until that date since the establishment of the Office of the United Nations Relief Coordinator (UNDRO). Its effects have been compared to those of the Nicaraguan (1972), Honduran (1974), and Turkish (1975) disasters combined
3. The most affected area involved some 30,000 square kilometres, with a population of 2.5 million. Some 23,000 people were reported dead and 77,000 wounded. Two hundred fifty-eight thousand houses were destroyed, leaving about 1.2 million people homeless. Forty percent of the national hospital infrastructure was destroyed, and there were also substantial losses in other health facilities.

4. The official estimate for reconstructing housing, the economic and social infrastructure and productive facilities was Q.1.021 million (1 Quetzal = Q. 1 = US\$ 1) in March 1976. As this did not fully take into account the radical increases in prices, notably in construction costs, a general estimate now made by the Reconstruction Committee is that these costs may rise up to Q.2,000 million. These figures may be compared to the Gross Domestic Product (GDP) of Guatemala in 1975, which was Q.3,585.8 million at current prices.

The main features of the earthquake

5. The 4 February 1976 earthquake of Guatemala was the first of a number of severe earthquake disasters in that year. Guatemala itself is a region of high earthquake activity. There are at least thirty six recorded earthquakes in the past 430 years, of which 18 were recorded in the twentieth century. The last major earthquake, of magnitude 6.9 on the Richter scale, occurred in Huehuetenango in December 1955.

6. The basic data of the 4 February 1976 phenomenon are as follows:

Origin time: 0902 43.3 UTC (03 02 43.3 local time)
Latitude: 15.32°N
Longitude: 89.08°W
Magnitude: (surface wave): 7.5
Duration: 39 seconds (approximate)

7. The location of the earthquake epicentre according to the US Geological Survey was some 157 kilometers north east of Guatemala city on the Motagua fault. It was felt over an area of at least 100,000 square kilometres. Other reports indicated earlier that the earthquake was much closer to Guatemala.

8. The ground breakage, which extended to some 230 kilometres, is considered the longest in America since 1906. The total length inferred (from the aftershocks) of the faulting is about 270 kilometers. The main source [9] for the discussion in this

section identifies three major areas which may result in earthquake activity in Guatemala

9. The first is the Benioff zone which extends northeastward beneath Guatemala. This is the area where the Cocos Plate is thrust beneath the Caribbean Plate (see Figure 1, showing the general distribution of tectonic plates). The risks from activity in this area are considered to be minimized due to the great depths of focus of earthquake activity.

10. The second earthquake zone is along the chain of active volcanoes, which includes the vicinity of Guatemala city. This has resulted in damaging but localized shallow depth earthquake in the past, along complexly-related active faults.

11. The third zone is the fault system cutting across Guatemala, which includes the Motagua fault. This is where the 4 February 1976 earthquake occurred. It is described as a left-lateral slippage on the Motagua fault.

12. These last two zones have been much less active than the first, according to the records of the past 30 years, and in the 11 months preceding 4 February 1976 the major fault group which includes Motagua accounted only for some 11% of all recorded regional seismic activity. Figure 2 shows a preliminary seismicity map for Guatemala.

13. In fact, it has been noted that the Motagua fault zone showed no major earthquake since the beginning of the century and perhaps earlier. Actually, the last two major earthquakes on record for the Motagua fault occurred in the later half of the 18th century, showing the very limited activity of the area. It is concluded by the same source that the return period for major earthquakes on the central and Western Motagua fault is at least 200 years.

14. It is theoretically estimated that given the 200-year return period and a 2.1 cm/year displacement along the fault the maximum displacement of a Motagua fault earthquake would be 4

metres. The latest records show a maximum displacement of 3.25 metres, while the average displacement was 1 metre.

The likelihood of a recurrence of a major earthquake

15. The 4 February 1976 earthquake was followed by thousands of aftershocks, many of them substantial, which unnerved large segments of the population, caused continuing damage, and delayed the return to normalcy. Fig. 3 shows the number of earthquakes (mainly minor ones about Mercalli 3) in the 2 days following 4 February, while Fig. 4 plots the trend in terms of intensity.

16. The Chimaltenango area was particularly noted for the intensity of its aftershocks.

17. It is generally agreed (taking into account both theoretical considerations and the postulated 200-year return period) that the likelihood of a major earthquake along the same segment of the Motagua fault in the near future is fairly small.

18. There is a theoretical likelihood of moderate aftershocks, and moderate earthquake activity at the Eastern and Western ends of the fault for years after the 4 February earthquake. This is supported by the moderately strong aftershocks which occurred in the Chimaltenango/Guatemala areas on the Western end of the fault and south of Puerto Barrios on the Eastern end.

19. Another theoretical possibility is that the 4 February 1976 earthquake should generate in the near future earthquakes on segments adjacent to it. This would imply in the East possible earthquakes towards the Caribbean, north of Honduras, where the Motagua fault meets the Swan fault zone. The possibility of earthquake activity to the West depends on the extent to which the Motagua fault continues beyond the Chimaltenango area.

20. Another source[4] holds the theory that, on the basis of 30-45 years recurrence intervals for earthquake activity in Guatemala, certain seismic gaps should be areas of special concern,

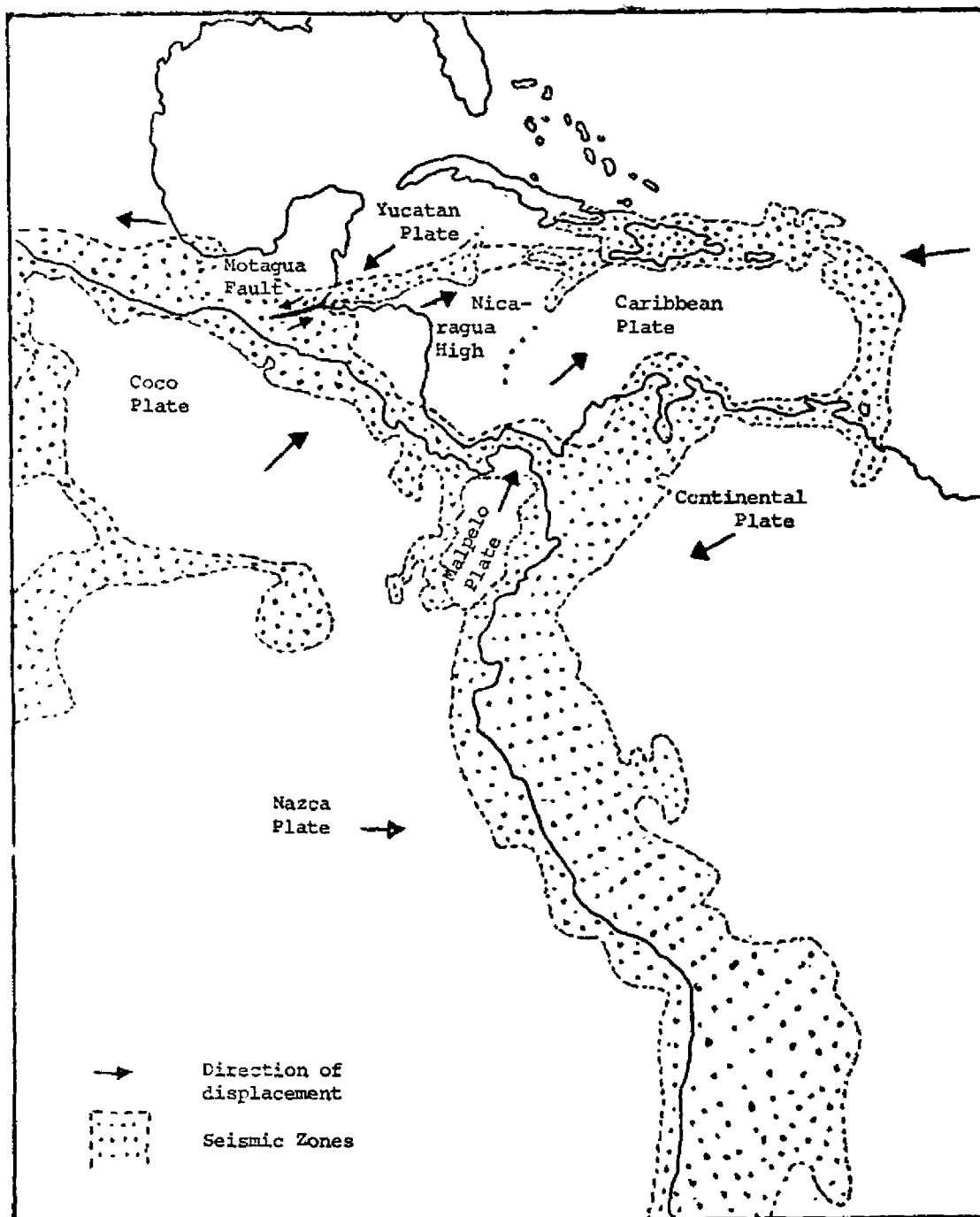


Figure 1. Distribution of Tectonic Plates in Central America.
Source / 14 /

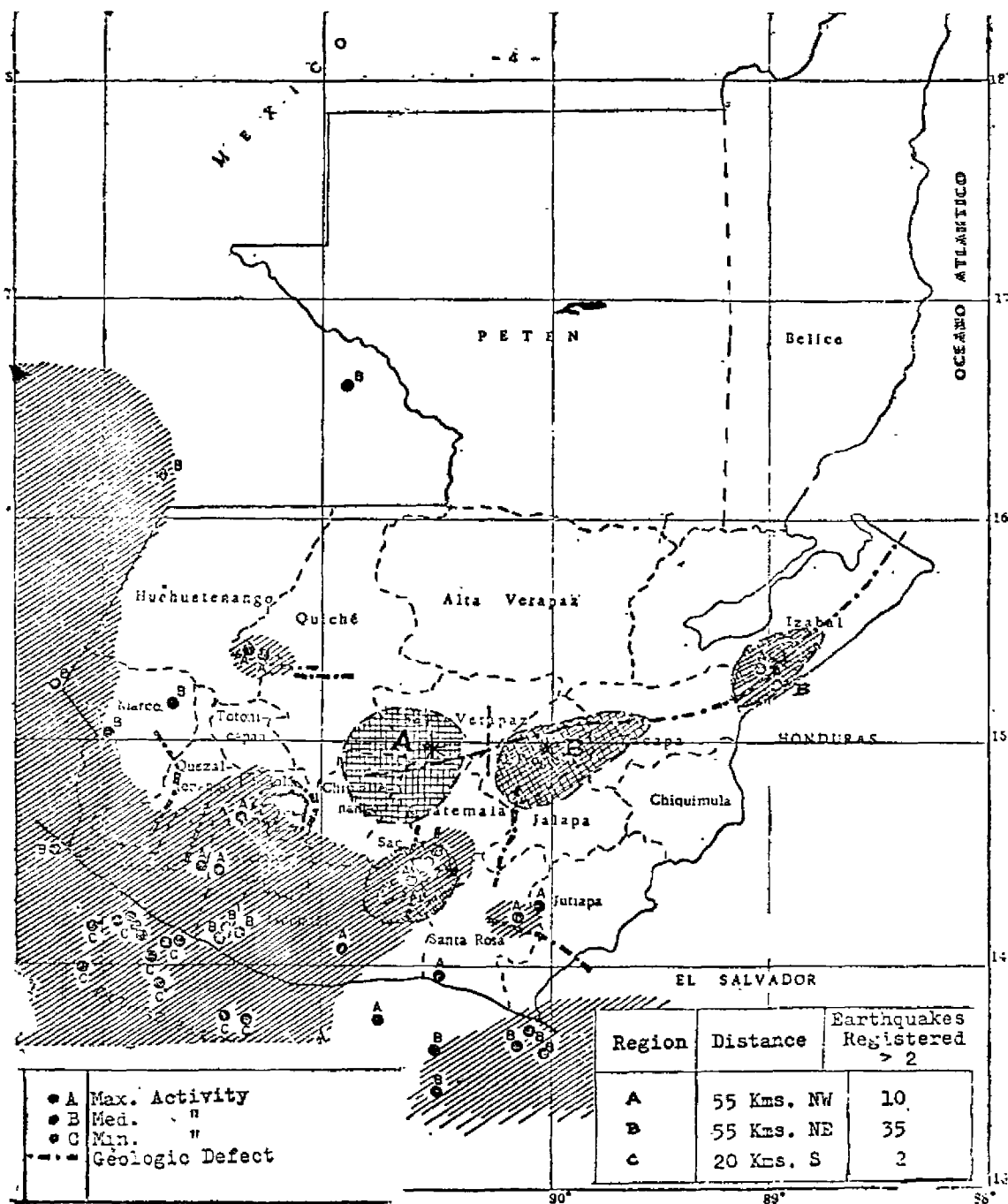


Fig. 2 - Preliminary Seismicity Map for Guatemala
(Source: National Observatory)

as they have not experienced a large shallow earthquake for 45 years or more. This may indicate that Guatemala is entering into a period of increased earthquake activity. This point of view is not so thoroughly substantiated, in relation to the 4 February 1976 event, as the other points made above.

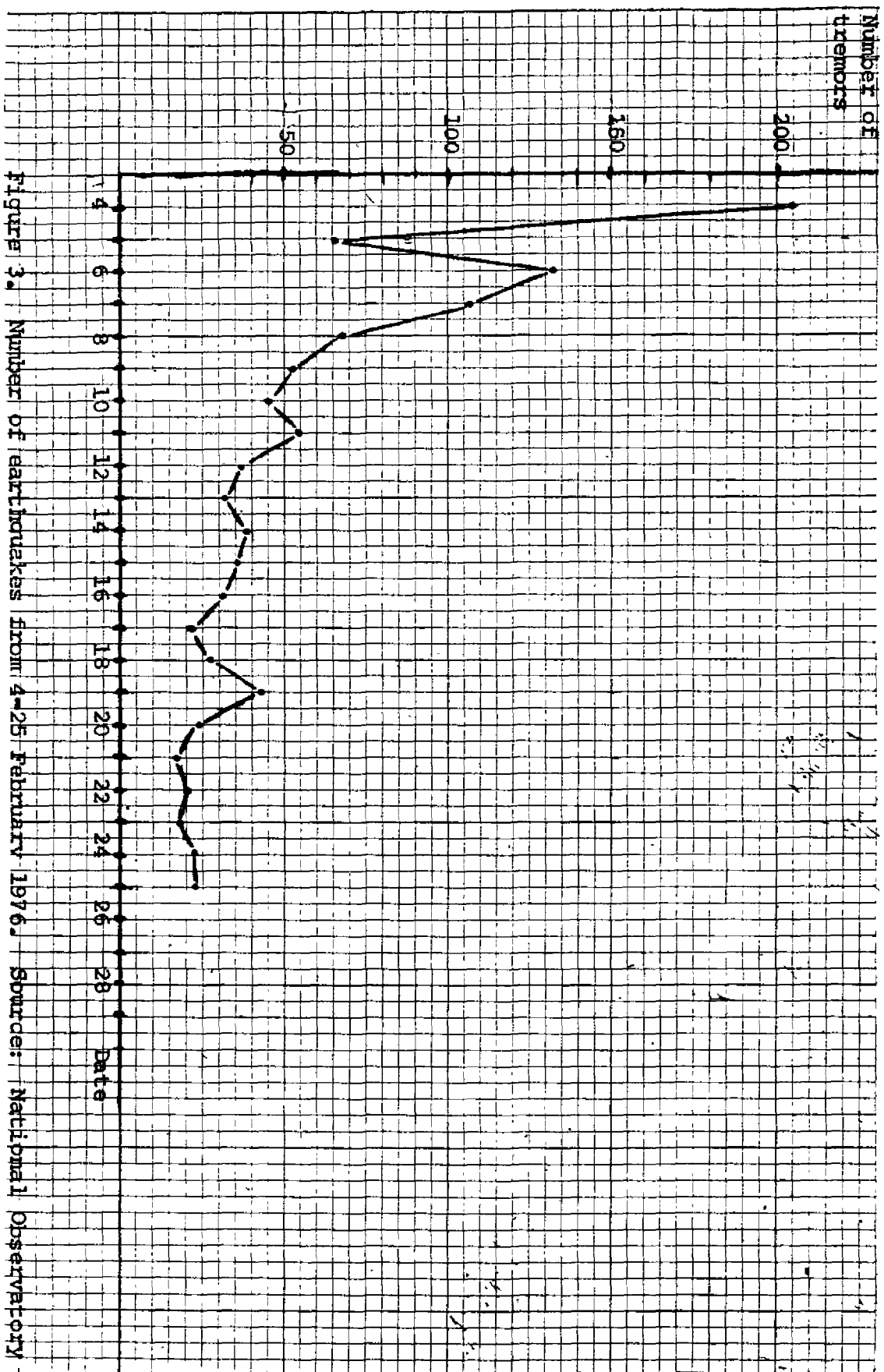
21. The conclusion to be drawn from any possibility of continued earthquake activity in the coming years, is that much more stress will have to be laid on disaster-preventive measures such as earthquake-resistant housing and rational physical planning. We discuss this in Chapter III. A UNESCO/Ceresis consultant/14/noted that:

«As long as people have adobe construction, or those of Bahareque, a habit from former centuries, and since people are allowed to and/or must live in such constructions, there are still many regions in Latin America and elsewhere, where earthquakes of Richter magnitude higher than 5.5 will kill thousands of persons».

22. However, civil engineers visiting Guatemala during the earthquake have pointed out that adobe houses built with a different technique and specially with a good wood structure could stand earthquakes of this magnitude.

The intensity of the earthquake in different areas

23. The damage caused by an earthquake is an indication of its intensity in different locations. So are such occurrences as landslides or surface fissures. Analysis of these data, notably through surveys conducted in Guatemala, are the basis for the design of modified Mercalli intensity distribution maps (Figure 5). In general, it is recognized that the strongest intensity of the earthquake was in the area of Gualan (damage to buildings suggests Mercalli VIII, but surface faulting indicates Mercalli IX) and in the area of Guatemala city (Mercalli XIII or IX, depending on source. (See [9] and [14])). Remarkably, some villages along the fault area showed no damage. Fig. 6 gives an idea of the distribution of damages to adobe type construction in the country.



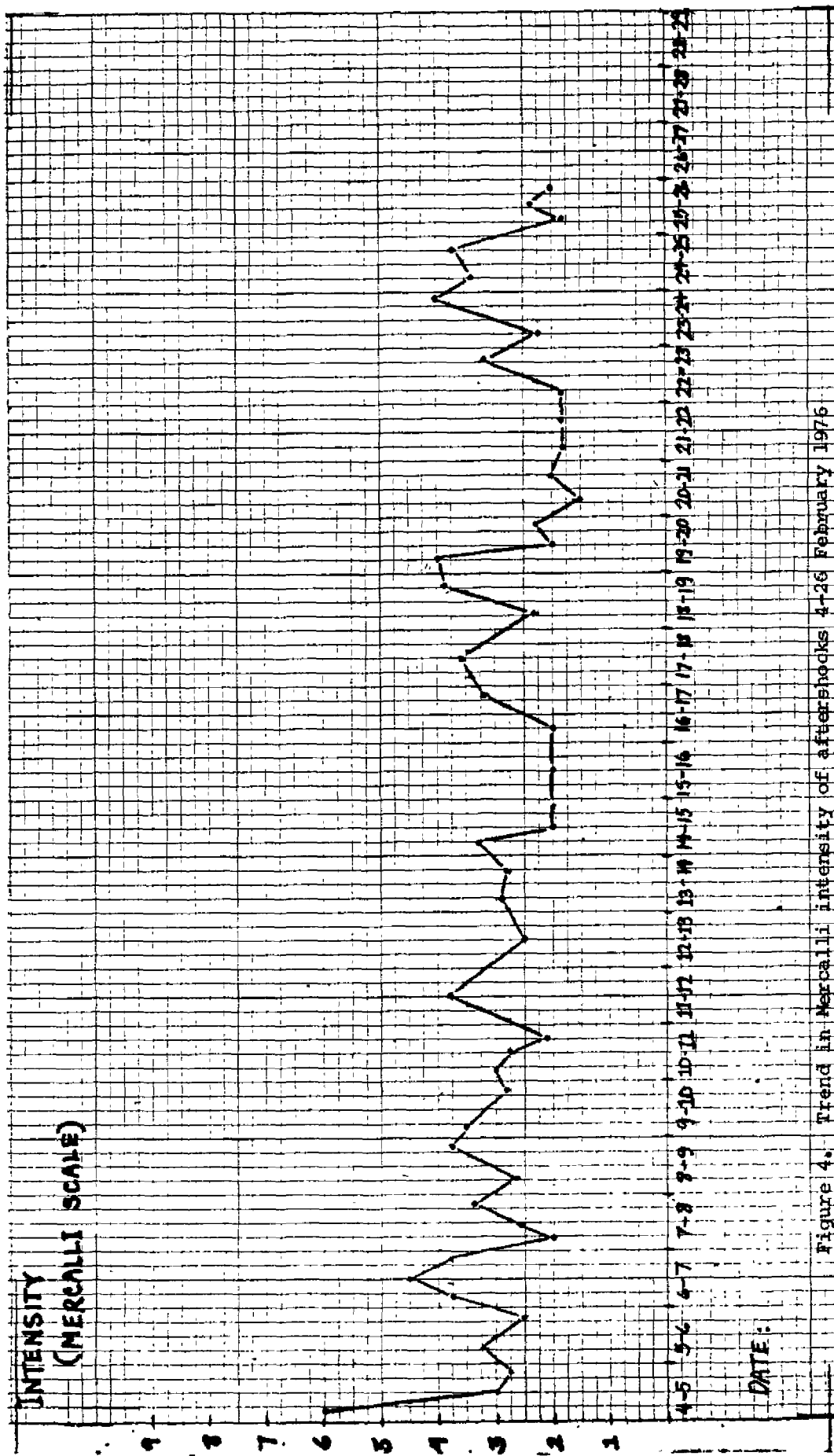


Figure 4. Trend in Mercalli intensity of aftershocks 4-26 February 1976

The damage caused by the earthquake

24. The extent of damage nationally rather defies the imagination. Aerial inspection shortly after the earthquake showed that town after town had been destroyed, that landslides had blocked vital access roads both to the severely affected highlands as well as to the Caribbean coast. On the so-called Atlantic Highway (which connects the Capital to the main ports in the Caribbean), the major bridge at Agua Caliente collapsed, forcing traffic to be re-routed through El Salvador and complicating the relief effort to affected areas in the East. The total amount of soil cleared from the roads as a result of landslides was about two million cubic metres.

25. There were areas where whole sections of land, including farmland, had sunk. This, and landslides of whole sections of mountains blocking streams which created artificial lakes also cut off several areas. The artificial lakes posed a serious hazard, particularly in view of the then approaching rainy season, when they would certainly have given way and resulted in extensive flooding. Fortunately, the government teams undertook immediate clearing operations.

26. The official evaluation [25] of the disaster, prepared with UN assistance, indicates the following losses:

27. *Population* It is estimated that 23,000 people were killed and 77,000 were wounded as a result of the earthquake. A demography analysis carried out by the Directorate General of Census and Statistics, with the advice of a United Nations expert, indicates 56 per cent of the affected population, including a very large proportion of village inhabitants throughout the Central Highlands, are classified as urban. It was noted that the urban population (recall it includes villages) was more affected than the rural population. Male and female sexes are evenly distributed in the affected areas, but the percentage of female population affected was slightly higher than that of male population. More attention had to be given to 90,000 specially vulnerable children, to prevent epidemics.

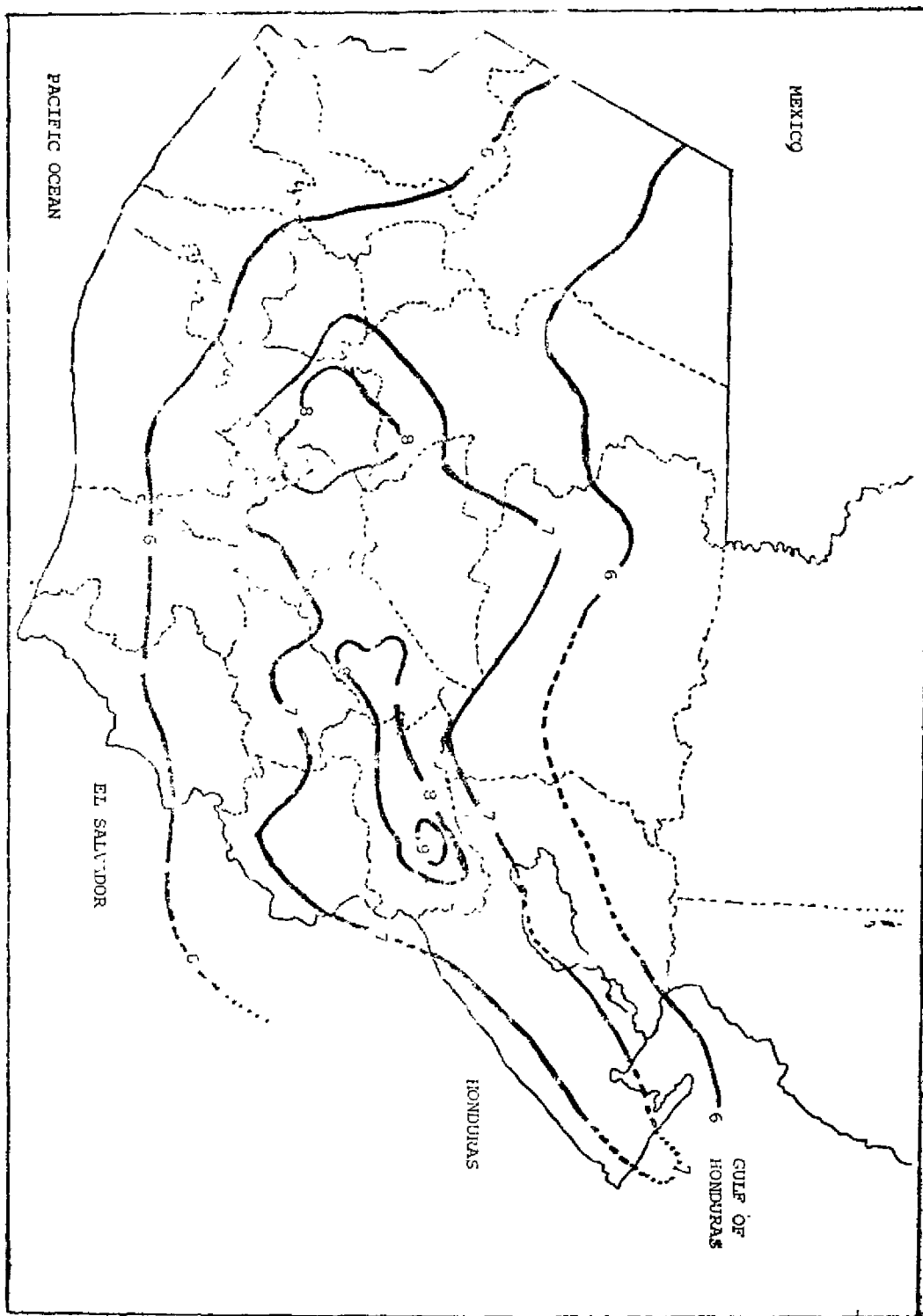


Figure 5. Map showing intensity distribution (Mercalli-Sieberg-Cancun). Source / 14/

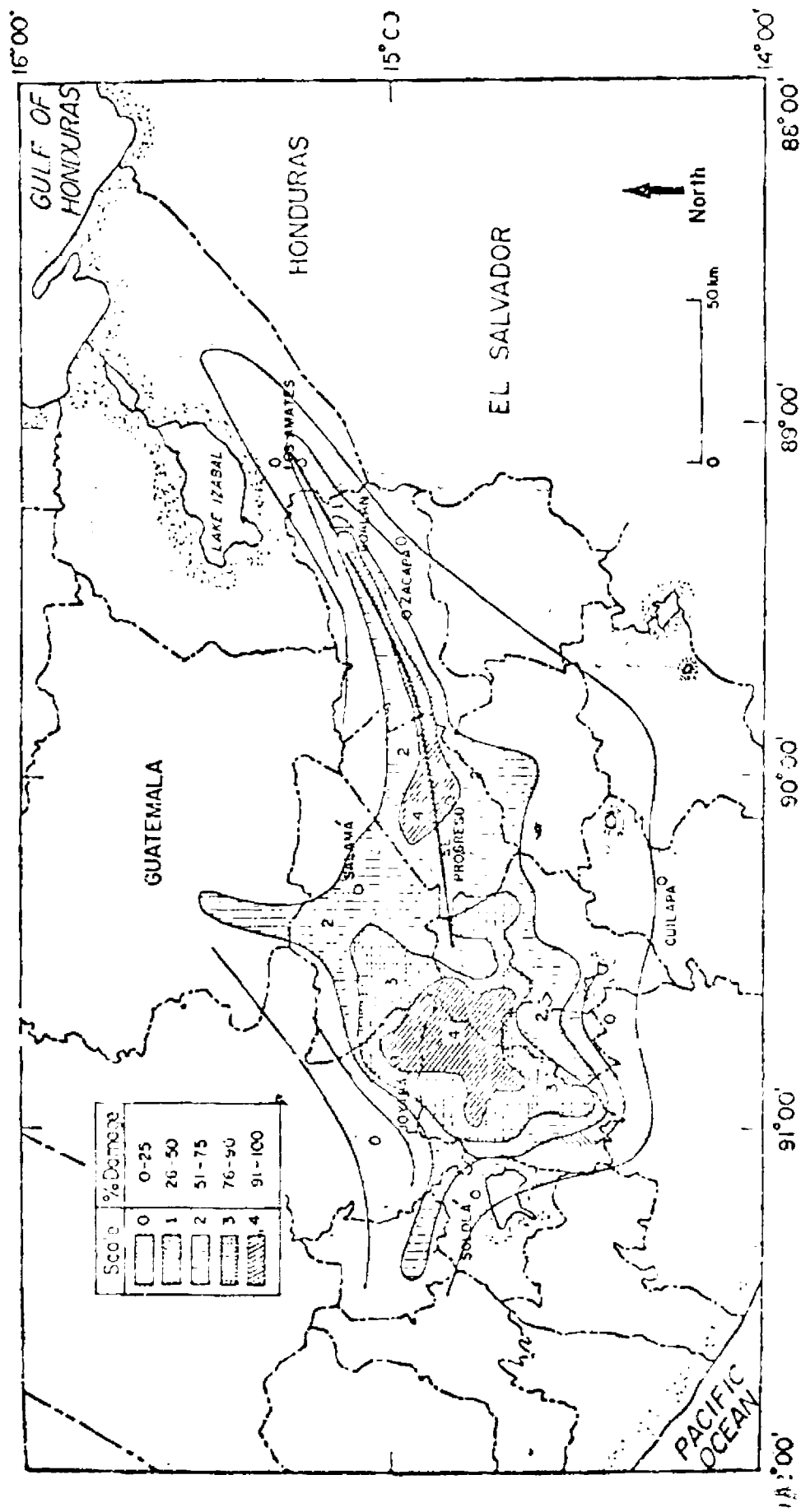


Figure 6. Contour map showing damage to adobe construction in Guatemala. Source /9/.

*Table 1.1 — Population affected and damage to housing by departments
following 4 February, 1976 earthquake*

	Estimated total population as of January 1976	Casualties			Housing		
		Dead	Wounded	Total	In 1975	Number of	
						Houses Destroyed	People Homeless
Guatemala	1 307 833	3 370	16 549	19 919	237 199	99 712	491 765
El Progreso	84 674	2 028	7 817	9 845	18 205	14 403	58 435
Sacatepéquez	108 560	1 652	8 855	10 507	21 980	11 863	64 668
Chimaltenango	245 387	13 754	32 392	46 146	45 477	40 636	184 140
Santa Rosa	18 494	40	291	331	37 697	51	254
Izabal	180 850	73	379	410	5 974	2 799	14 800
Alta Verapaz	50 491	18	953	116	31 636	15 819	78 037
Baja Verapaz	54 986	152	718	242	27 865	45	225
Quiché	152 300	843	5 722	60	6 362	3 116*	3 121*
Huehuetenango	30 044	10	50	6 565	38 109	19 458	91 020
Quezaltenango	80 099	14	228	870	20 824	11 748	50 747
Totonicapán	170 184	27	89	971	10 691	4 709	22 900
Sololá	35 816	110	300	452	30 862	7 909	37 431
Zacapa	125 882	693	1 998	2 691	24 420	15 852	66 056
Chiquimula	68 203	50	378	428	10 465	1 041	4 781
Jalapa	120 315	87	406	493	21 193	7 491	36 131
Jutiapa	111 957	13	48	61	18 276	1 827	8 873
TOTAL	2 946 075	22 934	77 173	100 107	607 235	258 479	1 213 294

* As the implied ratio (about 1:1) of housing destroyed to number of homeless is highly unlikely, one or the other figure is in doubt.

Source: Technical Commission on Evaluation and Planning, March 1976. /25/

23. The urban affected area was one of intensive economic activity, employment being oriented towards industry and services (mainly tourism in the latter case). It may be noted, for example, that the Department of Chimaltenango, where 13 out of 16 municipalities were 100 per cent destroyed (and one more municipality was 90 per cent destroyed) was a major tourist area. The complete change in the appearance of the towns should have an effect on tourist activity in that area, and probably in the income of those communities affected.

29. *Housing* It is estimated that some 258,000 houses were destroyed, valued at Q.600 million (1 Quetzal = Q. 1 = US\$ 1). Costs or value in this discussion always refer to estimated replacement cost. Some 1.2 million people were left homeless by the earthquake.

30. Table 1.1 gives official figures on the population affected and damage to housing. These were prepared by the Technical Commission for Evaluation and Planning. The figures of the Directorate for Statistics /24/ are somewhat higher, as they estimate that about 370,000 houses were seriously damaged or destroyed.

31. *Social Infrastructure* The total cost for repairing or reconstructing in this sector is about Q.219.9 million covering the health, education, water supply and sewage facilities.

32. *Health* The losses in hospital capacity in the capital and other most affected areas represents 40% of the national hospital capacity. Table 1.2 shows the extent to which this sector was affected

Table 1.2

	<i>Losses in Health Facilities</i>		<i>Replacement Cost</i> (000 Q.)
	<i>Damaged</i>	<i>Destroyed</i>	
Hospitals	8	7	52,659.9
Health Centres	3	9	2,382.8
Health Posts	2	53	1,261.0
Health Training Centre	1		296.3
Total	14	69	56,600.0

Source /25/

33. *Education* About 60 per cent of the educational infrastructure was damaged or destroyed. The total estimated cost here is placed at Q. 50.6 million.

34. *Social welfare and community development Centres* Some 11,600 beneficiaries of welfare services were affected by damage to about 45 per cent of existing facilities (public and private). Estimated cost is Q. 7.3 million.

35. *Urban services — water, sewage, etc.* Water services in the capital were completely interrupted following the earthquake. In general, throughout the affected zone, water treatment plants, reception and distribution networks and sewage facilities were quite damaged, the loss amounting to Q. 9.8 million. Services for new settlements increases the cost for the rehabilitation and reconstruction in this sector to Q. 36.1 million.

36. *Damage to government buildings* One hundred and thirty-three buildings of the Central Government and its decentralized agencies were affected, of which 22 were destroyed. The total cost is estimated at Q.15 million. The estimated losses in the municipalities raises this cost to Q.34 million.

37. *Archaeological sites, monuments and churches* The earthquake destroyed priceless cultural treasures. This includes churches representing colonial architectural style as well as Mayan archaeological sites. Restoration cost is estimated at no less than Q.31.4 million.

38. *Damage to economic infrastructure.* The total replacement cost here amounts to Q.77.4 million. This involves the rehabilitation of 400 kilometres of roads, 60 kilometres of railroads, 3 bridges which were destroyed, por facilities (the pier of Puerto Barrios on the Caribbean was destroyed), electric generation, communications and agricultural infrastructure.

39. *Productive sectors* The economic loss to agriculture amounts to Q.8.7 million. Losses were suffered of 5 per cent to the maize crop and 10 per cent to beans, rice, sorghum and wheat. Some losses to horticulture and tobacco in the West were expected due

to damage to irrigation networks. Damage to industry is placed at Q.18.4 million, but supply was not largely affected. On the other hand, about 50,000 artisans were affected by the earthquake, from losses to the handicrafts industry placed at Q.4.1 million. Including services and trade, total damage to the productive sector amount to Q.54.3 million.

The broad economic impact of the disaster

40. We have already noted how the earthquake did not directly damage the productive sector to a large extent. On the other hand, this sector will have to bear a substantial burden in the reconstruction process in terms of generating increased exports, substituting for imports and creating the capital stock to stabilize the economy in the face of pressures created by reconstruction, and to maintain the development course charted out for Guatemala in its 1975-1979 Plan.

41. The official view is that the earthquake critically affected vital social services and infrastructure, which were already deficient before the disaster. The strategy of the Plan was to concentrate Government efforts on the poorest sectors of the population, and fostering development by improving their productivity and expanding such social services as education and health. Reconstruction should involve basically the same approach, as the same target population was affected principally by the earthquake, and damage was also mainly in the economic and social areas the Government plan was trying to strengthen.

42. A basic problem the Government will have to face is the maintenance of economic stability in the process of reconstruction. While reconstruction will certainly result in a substantial increase in economic activity, over the medium-term (the next five years), it will also substantially increase the debt burden, create balance of payments deficits (and a net reduction in international reserves that will create a difficult situation towards 1979) and generate inflationary pressures. These points are discussed only in general terms below, taking into account that the Government has not approved an official position on these matters although preliminary Government data are the basis for the analysis.

43. *Increase in economic activity* The National Development Plan prepared before the earthquake projected a 7.5 cumulative growth rate *per annum* over the 1975-1979 period. This would have implied a cumulative increase in real income per capita of approximately 4.5 per cent *p.a.* It is now considered that for the period 1976-1979, the cumulative growth rate will have to rise to 9.1 per cent. This would involve a growth rate of 9 and 11 per cent *p.a.* in the first two years of Reconstruction, 6 per cent growth in 1978 and 7.6 per cent growth in 1979. Table 1.3 summarizes the foreseen breakdown of this projection.

Table 1.3

Projected Growth rates of GDP, disaggregated (at 1975 prices)

	<i>Annual cumulative growth rate</i>		
	<i>Original Plan</i>	<i>Preliminary Reformulation 76-79</i>	<i>1979 GDP (millions)</i>
Gross Domestic Product	7.5	9.1	5,076.5
Private consumption	6.5	8.3	3,910.6
Government consumption	8.0	7.9	342.2
Private investment	8.4	13.6	831.8
Public investment	10.0	26.6	284.3
Exports	7.0	7.8	1,083.1
Imports	3.0	10.5	1,375.5

Source: Secretariat of National Planning Council/Technical Commission on Evaluation and Planning [33]

44. This effort should be seen in the light of the evaluation of the damages caused by the earthquake [25], which as detailed above, estimated that Q. 1,021 million would be required for reconstruction of which Q. 669.4 million refer to housing; Q. 219.9 million to social infrastructure; Q. 77.4 million to economic infrastructure and Q. 54.3 million to losses in capital stock and inventory in the productive sectors.

45. *Increase in debt burden* As part of the required increase in economic activity shown in Table 1.3, reconstruction will involve a substantial increase in the debt burden. It is preliminarily es-

estimated that the deficit in Government spending will rise almost 6 times from 1975 to 1976 and will stay at about the 1976 range through 1979. Of the public debt in the period 1976-1979, some 56 per cent will be covered on the average by external loans, which are projected at Q. 180 million in 1979. In that same year, the rate of amortization of public debt will have doubled from its 1975 level.

46. *Balance of payments deficits* The main increases in deficit on current account will occur in 1976 and 1977. It is expected that the deficit will reach Q. 470.8 million in 1979. It may be noted in this connexion, that the cost of direct imports for reconstruction is estimated at \$330 million for 1976-1979. Taking into account capital inflows (including credit), new export possibilities (specially in the mining sector), the net decline in foreign reserves in 1979 as compared to 1975 will be close to \$ 40 million.

47. This will make 1978 and 1979 particularly difficult years for the Guatemalan economy, as reserves will be at a level below what is generally accepted as adequate. On the other hand, it is foreseen that the returns from productive investments in the 1976-1979 cycle should improve the situation by 1980.

48. *Inflationary pressures* There is as yet no complete analysis on the impact of the earthquake on prices. We have noted however, that the Reconstruction Committee estimates that inflation will raise the original estimate of the cost of reconstruction to about Q. 2,000 million.

49. Certainly, supply constraints, notably in the construction industry, as well as the deficit financing will generate very strong inflationary pressure. In the case of the construction industry, prices have at least doubled since the earthquake (prices of bricks, for example, have already tripled as compared to prices before 4 February, 1976). The government plans to adopt a series of anti-inflationary measures, which will have to include reforms to increase the tax burden.