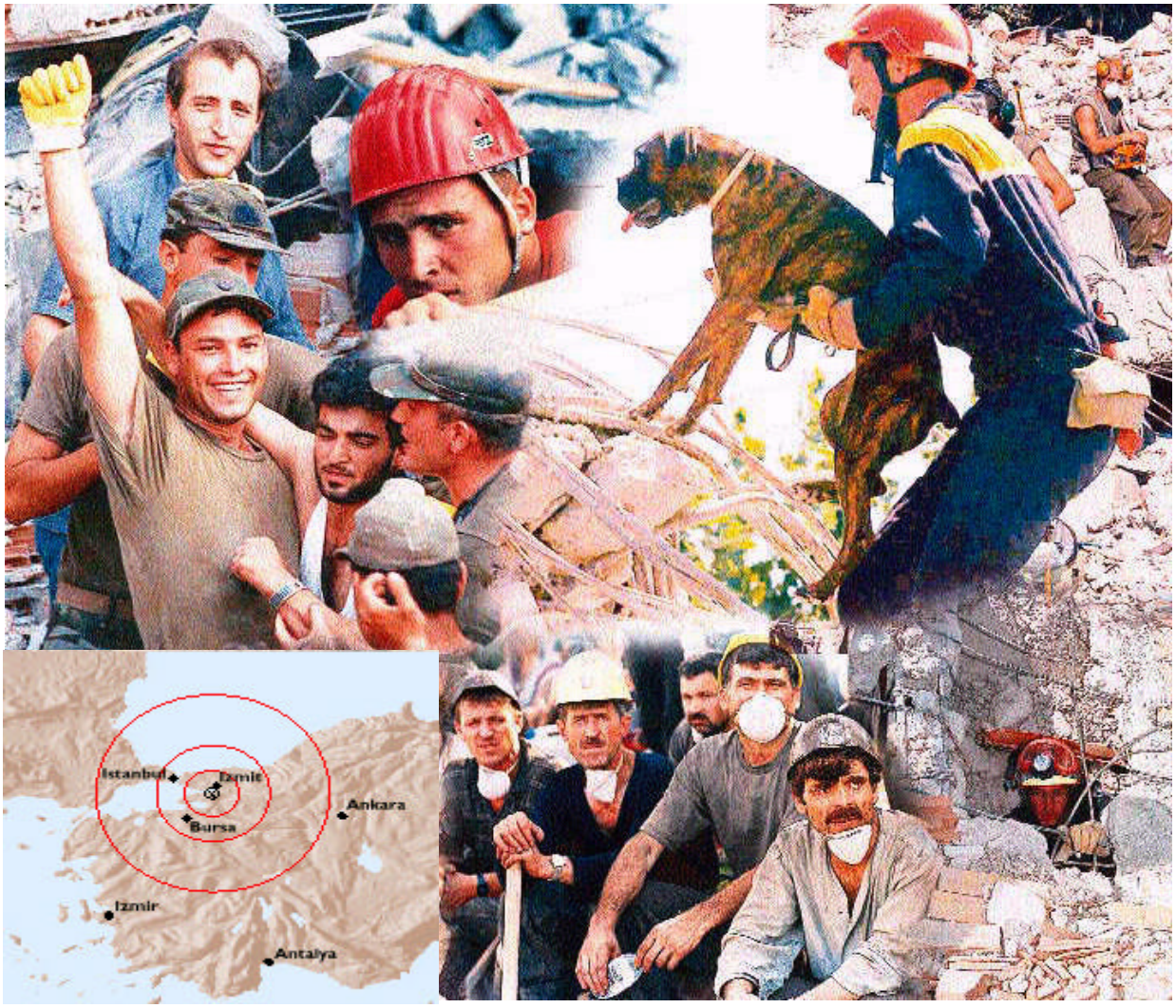
Turkey

Marmara Earthquake Assessment



Europe and Central Asia Region of the World Bank


Istanbul
Izmit
Bursa
Ankara
Izmir
Antalya

TURKEY

MARMARA EARTHQUAKE ASSESSMENT

September 14, 1999

Turkey Country Office
The World Bank

TURKEY

Marmara Earthquake Assessment

CONTENTS

TURKEY

Marmara Earthquake Assessment

Preface

On August 17, the Marmara Region of Turkey was hit by a massive earthquake. The World Bank was invited by the Government to help prepare an assessment of the cost of reconstruction and the impact of the earthquake on the economy. Two World Bank teams were mobilized very rapidly to assist the Government in this effort.

The Marmara Earthquake Emergency Recovery team began work on August 24 and completed an earthquake damage assessment. The team was comprised of Piotr Wilczynski (team leader, ECSSD), Nedret Durutan (ECCTR), Catherine Stevens (ECSSD), Christophe Pusch (ECSSD), Alcira Kreimer (TWURD), Richard Lacroix (ECSSD), Ralf Schwimmbeck (EMTOG), Dejan Ostojic (ECSEG), Anders Halldin (ECSSD), Eugene Gurenko (ECSIN), Amy Evans (ECSSD), Michael Mertaugh (ECSHD), Betty Hanan (ECSHD), Richard Andrews (Consultant), and Sven-Ake Blomberg (Consultant).

The second team began work on September 1 and completed an earthquake economic assessment and synthesized the two reports. The team was comprised of James Parks (Team Leader, ECCTR), Ismail Arslan (Deputy Team Leader, ECCTR), Abebe Aemro Selassie (IMF), Mark Sundberg (ECSPE), Jeanine Braithwaite (ECSPE), Tunc Uyanik (ECSFP), Nevin Turk (IFC), Insan Tunali (Consultant), Mediha Agar (ECCTR) and Pinar Baydar (ECCTR).

Both teams completed their work on September 10. This report, coordinated by James Parks, presents their findings. The report has been prepared under the overall guidance of Ajay Chhibber, Country Director.

The World Bank teams worked very closely with government agencies, and consulted widely with the private sector, non-governmental organizations, universities, other international agencies. The teams would like to thank the Undersecretariat of Treasury for coordinating their work.

The findings will need updating as more information becomes available. They represents our best estimates and conclusions at this point and are made available to help Government formulate an overall and comprehensive approach to the reconstruction and recovery from the earthquake.

World Bank
September 14, 1999

Turkey: Marmara Earthquake Assessment

A. Executive Summary

1. On August 17, 1999 an earthquake measuring 7.4 on the Richter scale at 3:00 am. devastated the Marmara region of Turkey. Over 15,000 lives have been lost and there is extensive damage to Turkey's industrial heartland. As the region digs out of the rubble, it is clear that a major reconstruction effort and recovery plan is needed. International support for Turkey for the immediate relief effort has been rapid and generous. As Turkey looks ahead to rehabilitation and reconstruction, substantial international financing is needed. This preliminary assessment outlines the likely impact of the earthquake on the economy and the cost of reconstruction and recovery. It also highlights the key issues that need to be addressed to reduce the costs of future natural disasters in the country.

2. **Methodological Approach.** In assessing the impact of the Marmara earthquake on the Turkish economy, the Bank's teams have looked at three channels: (i) direct costs, (ii) indirect costs, and (iii) secondary effects. Direct costs refer to the physical damage to capital assets and inventories which can be attributed to the actual impact of the disaster. Indirect costs refer to flow effects including output losses and foregone earnings as well as the cost of emergency relief efforts. Secondary effects concern the short and medium-term impact of the disaster on overall economic performance such as the implications for the fiscal accounts and the balance of payments. Secondary effects also include the influence on the incidence of poverty as well as shifts in government policy to respond to the impact of the disaster on the economy including macroeconomic balances and inflation. While important, the direct costs do not tell the whole story about the full impact of natural disasters and say little about the underlying factors which may exacerbate or minimize the economic effects such as the structure of the economy or the quality of the Government policy response. Therefore, it is not possible to measure the impact of natural disasters in terms of a single financial figure.[1]

3. **Caveats.** In interpreting the teams' findings, it is essential to keep in mind two factors. First, given the scope of the earthquake and the need to prepare a rapid assessment, the teams were not able to focus in detail on the impact on all sectors of the economy nor could they consult with the entire range of public and private organizations. Therefore, there may be some gaps in the coverage of the assessment. Furthermore, the data available in the aftermath of the earthquake are preliminary and incomplete. Many of the key statistics continue to change daily. There are also a number of important inconsistencies in the data. Under these conditions, the teams were obliged to make a number of critical assumptions concerning key parameters which affect the results. Where relevant, these assumptions are made explicit in the report and further details are given in the Annex. For many key indicators, the teams have concentrated more on establishing reasonable ranges than on determining point estimates. In addition, the teams have identified several important areas for follow-up survey and analytical work.

[1] For a more detailed presentation of this methodological approach, see "The Economic Impact of Natural Disasters in the Philippines", Charlotte Benson, OECD Working Paper 99, June 1997.

4. **Key Findings.** The estimated costs of the earthquake are summarized in the table below. In terms of direct costs, it is very difficult to estimate the total wealth lost at this stage given the limited information gathered to date. In particular, detailed survey data of capital and inventory losses in the housing and enterprise sectors are not yet available. On the basis of the partial data available (see para. 6), the Bank team estimates a range for the wealth loss of US$3-6.5 billion. (1.5 percent-3.3 percent of GNP). In terms of indirect costs, the Bank team estimates that the earthquake will reduce GNP in 1999 by 0.6 percent-1.0 percent, equivalent to US$1.2-2 billion. This estimate assumes that at least part of the output loss in the affected region will be made up by increased production elsewhere in the economy. In the year 2000, GNP growth is expected to exceed baseline forecasts by some 1 percent of GNP due primarily to reconstruction activity. This optimistic scenario for 2000 is predicated on substantial external financing for reconstruction costs, otherwise reconstruction activity may run up against domestic financing constraints. With regard to secondary effects, the earthquake is estimated to impose an additional fiscal burden of between US$3.6-4.6 billion spread over the 1999-2000 period equivalent to 1.8 percent-2.3 percent of GNP. The fiscal costs could rise substantially if Turkey decides on a major relocation program. The earthquake is projected to generate a widening of the current account deficit by a total of some US$3 billion over the 1999-2000 period, equivalent to about 1.5 percent of GNP, largely as a result of increased economic activity arising from the reconstruction effort. The external financing of this additional current account deficit is expected to come from long-term credits and concessional funds provided by international financial organizations and Turkey's bilateral partners.

5. The earthquake has had a huge social impact. The fatality rate from the earthquake is in the range of 14.3 per thousand depending on the affected province. This is more than five times Turkey's natural annual crude death rate. Injury rates are also very high and many of the survivors are traumatized by their ordeal. An estimated 400,000-600,000 people have been left homeless. The Ministry of Education estimates that about 114,000 school-aged children are homeless as a result of the earthquake. Employment losses in the affected areas are estimated to range from 20 percent to nearly 50 percent. Addressing these social costs will impose an added burden on Turkey's social protection system over the next 16 months.

Table 1: Impact of the Marmara Earthquake: Summary Indicators

Economic Indicators 1/	1999 (US$ bn)	Share of GNP	2000 (US$ bn)	Share of GNP	Total (US$ bn)	Share of GNP
Direct Costs						
Wealth Loss	3 to 6.5	1.5% to 3.3%			3 to 6.5	1.5% to 3.3%
Indirect Costs						
Impact on Output	-2.0 to -1.2	-1.0% to -0.6%	1.4 to 2.4	0.6% to 1.1%		
Emergency assistance	-0.4	-0.2%	-0.2	-0.1%		
Secondary Effects						
Current account balance	-1	-0.5%	-2	-1.0%	-3	-1.5%
Fiscal impact	1.9 to 2.3	0.9% to 1.1%	1.7 to 2.3	0.8% to 1.1%	3.6 to 4.6	1.8% to 2.3%
Social Indicators For Affected Region due to Earthquake		Mid-Point	Range 2/			
Fatality rate	(per 1000)	7.0	2.5 to 14.3			
Injury rate	(per 1000)	15	4.6 to 27.7			
Homeless persons			400,000-600,000			
Job losses	(% of labor force)	30.9	20.4 to 48.1			

1/ All estimates based on preliminary data.
2/ Range across affected provinces.
Source: World Bank staff estimates.

6. **Damage Estimates by Sector.** Based on the available data it is possible to estimate roughly upper and lower bounds for the direct costs (i.e., wealth losses) incurred by each sector. These estimates are summarized in Table 2. The preliminary estimates for the various infrastructure sectors have been prepared by the Marmara Earthquake Emergency Recovery (MEER) team. For the housing sector, the lower bound is given as the low-end replacement cost estimated by the MEER team which is based on very modest (80 m2) apartment construction. This replacement cost does not include lost belongings and may be well below the market value of the destroyed housing units. The upper bound is computed by doubling the high-end replacement cost estimate. For the enterprise sector, the lower bound is based on the total enterprise insurance claims expected by the insurance industry and then assuming a 50 percent coverage rate on average. To this number is added the estimated inventory losses of microenterprises. The upper bound is based on losses reported to the local chambers of industry in the affected region. It is important to stress that these figures for the enterprise and housing sectors represent very rough estimates which must be verified by detailed surveys of the affected area[2].

[2] These estimates do not include damage to the naval base in Golcuk for which no information has been reported.

Table 2: Marmara Earthquake Preliminary Damage Assessment

Sector	Damage Assessment (US$ million)	
	Lower Bound	Upper Bound
Housing	1,100	3,000
Municipal Infrastructure	70	70
Environment	n.a.	n.a.
Roads, bridges, and highways	78	78
Ports	12	12
Railways, railcar factory	72	72
Telecoms	38	38
Electricity	82	82
Oil and Gas (includes Tupras Refinery)	387	387
Enterprises (rounded)	1,100	2,600
Education	100	100
Health	37	37
TOTAL	**3,076**	**6,476**

Note: Estimates are extremely preliminary based on incomplete data.
Source: Staff estimates.

7. **Government Response.** The Government's initial emergency response to the earthquake has come under severe criticism. Some of the criticism is perhaps too severe as the demands of this emergency would have initially overwhelmed virtually any emergency response system in the world. The Turkish system had performed reasonably well in responding to previous smaller-scale disasters like the 1998 Adana earthquake. Exacerbating the situation was the widespread demand for information which overwhelmed the already damaged telecommunication system. The heavy human toll and extensive material damage have also put a spotlight on the lack of effective enforcement of Turkey's building codes and the inadequate coverage of earthquake insurance in the housing sector. Moving forward, there are three areas that need urgent attention as Turkey rebuilds: (i) upgrading the emergency response system, (ii) implementing more effective mechanisms to enforce building codes, and (iii) introducing a national compulsory disaster insurance system.

8. The initial macroeconomic policy response of the Government has been appropriate and effective. The Central Bank intervention in the days following the earthquake helped calm markets and prevent a financial panic. The submission to Parliament of a supplemental tax package to help meet the budgetary cost of responding to the quake signaled Turkey's intent to maintain fiscal discipline. The subsequent adoption and enactment of major pension reform legislation in the days after the disaster helped confirm the Government's commitment to stabilization and reform. The Government has moved quickly to work with its international partners to mobilize substantial external financing for emergency relief and reconstruction. To date, up to US$3 billion in exceptional external financing has been tentatively identified. The Government is also moving to organize the reconstruction effort including defining the institutional arrangements and organizational structures to support implementation of the reconstruction program. Moving forward, it will be critical for the authorities to sustain the momentum for stabilization and structural reform which is essential to provide the confidence to financial markets that the

increase in the budget deficit needed to support relief and reconstruction will be temporary and that the budget will return to a sustainable path.

9. **Recommendations.** The Bank teams have formulated the following recommendations for consideration by the authorities in three categories:

Economic and Social

a) To the extent possible, the Government should try to mobilize external financing to meet the fiscal burden arising from the earthquake while continuing to implement the fiscal adjustment required to underpin the stabilization program. To the extent that external financing cannot meet the full fiscal burden, the Government should consider additional revenue measures and/or expenditure reductions in order to avoid the need to finance part of the burden through domestic markets.

b) It is important that the Government ensure effective coordination of external assistance related to balance of payments financing and reconstruction efforts. A focal point is needed to coordinate international financing for reconstruction. The Treasury would be the logical focal point for this coordination.

c) With respect to the Government's credit subsidy program, the Bank team recommends to explicitly limit the beneficiaries to small and micro enterprises/persons who experienced damage to their workplace. In addition, the team strongly recommends that the Government reduce substantially the interest rate subsidy element of the program. This would allow access to credit to be increased without expanding the fiscal burden.

d) Reconstruction efforts should not be used to create opportunities for further financial assistance to the already delinquent borrowers of the state banks. It is recommended to exclude from the deferral/restructuring scheme the stock of loans which have been already classified as doubtful prior to the earthquake, in order to avoid major moral hazard to the system.

e) The Government should consider policy options for those earthquake victims who are not covered by the social insurance system. The major groups are: children, uncovered adults (mostly women) and the elderly over the age of 55. The Government has two basic options for social assistance in the aftermath of the earthquake. The Government can offer a universal benefit to all of those who are not covered by social insurance. Alternatively, the Government could try to target the benefit to the most needy.

f) In order to have accurate estimates of the damage incurred by firms and households, it is recommended that the authorities carry out detailed surveys in the affected regions.

Rehabilitation and Reconstruction

g) In order to ensure an efficient and least-cost solution to temporary housing needs, it is recommended that a mix of options which can meet the needs of the displaced

population be explored. The unit cost of prefab housing is estimated to be four times the cost of using existing alternative accommodation.

h) Before embarking on a major reconstruction program, it is recommended that comprehensive geological surveys be carried out to determine the feasibility of reconstructing on the existing sites and the extent to which relocation will be needed. **The reconstruction cost estimates presented in this report do not include relocation costs which could prove to be very substantial.**

i) Effective implementation arrangements with clear areas of responsibility under a comprehensive plan are essential to ensure rapid, cost-effective and high quality reconstruction program. Interagency coordination is critical.

Future Disaster Mitigation and Institutional Strengthening

j) Turkey must urgently upgrade its emergency response system in order to be prepared for large scale natural disasters in the future.

k) The Government must strengthen the enforcement of building codes throughout the country. Stiffer penalties and an effective building supervision and licensing system is urgently needed.

l) The Bank team recommends that the Government consider the options for implementing a national compulsory disaster insurance scheme. Compulsory insurance will also create incentives for better enforcement of building codes.

Figure 1: GNP Growth (%)

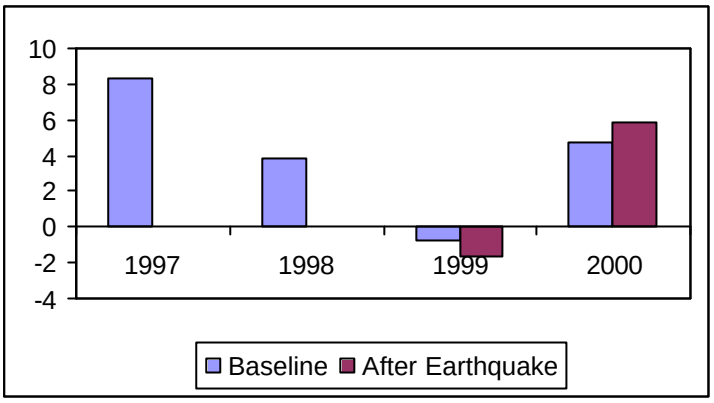


Figure 2: Current Account Balance (% of GNP)

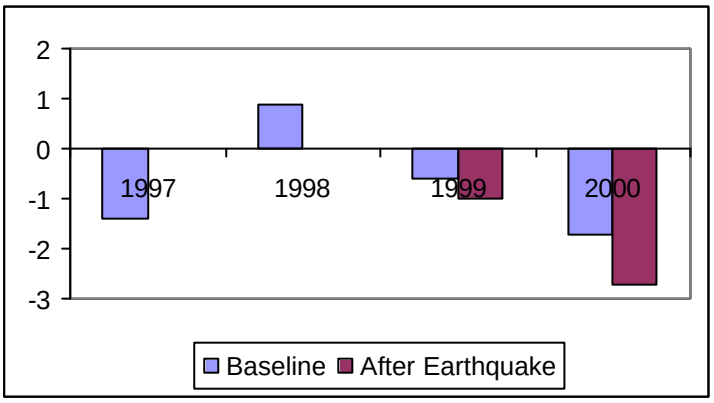
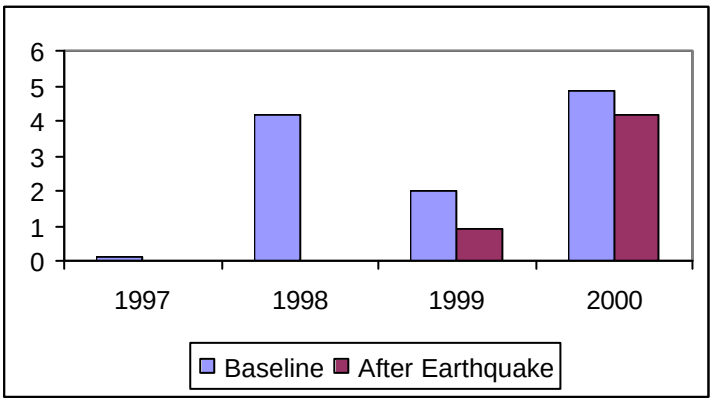


Figure 3: Primary Budget Balance



1/ Baseline for central Government budget for 1999-2000 taken from concluding statement of July SMP review. Fiscal impact is mid-point of estimated range.

Section I: Background and Overview of Marmara Earthquake Zone

A. The Earthquake and Initial Emergency Response

10. On August 17, 1999, a severe earthquake produced extraordinary damage to the area of the Marmara Sea. Areas of peak damage include the cities and regions of Kocaeli (Izmit and Golcuk), Iznik (Nicea), Gebze, Sakarya (Adapazari), Yalova and Duzce. As of September 9, the total death toll reported is 15,370 with about 24,000 injured. A preliminary analysis indicates that the length of the segments of surface breaks approach 200 km. In Degirmendere, the land level dropped by 17m and is believed to have dropped 25m under the Sea of Marmara. The epicenter of the earthquake was near Golcuk. The magnitude has been rated by the U.S. Geological Survey as 7.4 on the Richter scale, with intensity according to the Modified Mercalli Scale reaching X-XI. It lasted 45 seconds and has been followed by over 1000 aftershocks, some as high as 5.6 on the Richter scale. Damage was caused by the surface fault opening and shaking, inundation in areas that subsided, and liquefaction of the soil under buildings.

11. The earthquake created the most difficult emergency management crisis faced by any nation in recent history. The earthquake struck at 3:02 a.m., causing catastrophic damages over a wide geographic area. Communications systems linking the affected municipalities with outside agencies and organizations were destroyed. Thousands of residents were trapped in devastated buildings, including many of the officials who would be expected to provide the initial response efforts. Essential emergency response resources were either destroyed or severely damaged.

12. The impact of the earthquake was particularly severe as the event was of a high magnitude, it occurred while the population was sleeping, it affected a very densely populated area, it hit buildings and structures that had not been built according to earthquake reduction practices and mechanisms, and it took place in an area of unstable soil conditions. The time and magnitude of the event are factors that could not have been changed. However, had the construction and location of buildings integrated earthquake safety concerns, the losses could have been significantly reduced.

13. The demands of this emergency would have initially overwhelmed virtually any emergency response system in the world. The Turkish disaster response system, which had performed reasonably well in previous events like the 1998 Adana earthquake and the 1998 floods, was wholly unable to meet the demands created by the August 17 crisis. The extent of the damage caused by the Marmara earthquake overwhelmed the capacity of the government to respond.

14. Immediately after the earthquake, three critical elements of the national infrastructure failed. The main fiber optic cable between Istanbul and Ankara was cut just east of Izmit where the cable crossed the fault. This link formed the backbone of the telephone connections into the earthquake region. At the same time, two main substations on the electric power grid were damaged and dropped off line causing a widespread power blackout across Turkey. Also an overpass on the motorway between Izmit and Ankara collapsed.

15. Confounding the situation was the widespread demand (bordering on panic) for information from the region. As the nation became aware of the quake, families outside the impacted region began to call the area to learn of the fate of loved ones. This massive demand, including from widespread cellular telephone use, caused the damaged system to fail completely. When phones failed, people got into their cars and drove to the region, further clogging the roads.

16. Efforts to respond began immediately. In three provinces the damages were catastrophic, virtually incapacitating local response capabilities. The earthquake was felt in Ankara, leading to quick actions by the key ministries. The General Directorate of Civil Defence (GDCD) officials arrived at their offices and dispatched rescue units to the affected area in trucks at 05:30 a.m. But with jammed roads, a destroyed bridge, and the fact that the vehicles didn't have radios, they didn't arrive until evening, were uncertain where to go, and, ultimately, had little effect. The GDCD began to alert all the provinces and request information about roads, water supply, gas electricity, damaged buildings using three fax machines. With the degradation of the phone system, and the efforts to return messages to the GDCD, this effort took three hours. The Health Ministry mobilized 139 ambulances and 110 doctors to the region by 06:30 a.m.

17. By 04:30 a.m. the General Secretary's crisis center in the office of the Prime Minister (PMCC) was organized, with the crisis monitoring committee in place by 06:30 a.m. Key ministries established crisis centers around Ankara and regionally. However, all communications to the affected area were down by this time. The only information came from media teams in the devastated areas. The PMCC directed Turkish Telecom to send satellite telephones to the affected area. These were sent by road and arrived 17 hours after the quake. With the arrival of satellite telephones and repair of the severed fiber optic cable, electric power was restored in the affected region within 48 and communications within 63 hours after the quake.

B. Impressions from Site Visits

18. The team visited the cities of Izmit, Golcuk, Yalova, Adapazari, Duzce, Bolu, and Istanbul, and flew over various other smaller towns and villages in the area. In addition, team specialists spent a number of days in the area discussing damage to specific types of structures and installations. Although the views from the air were useful for assessing the extent of some of the most serious damage, the real impressions were gained from the ground where the extent of the damage shocked even those with extensive experience with earthquake devastation. Some brief impressions were as follows:

?? In Izmit, the team was informed that approximately 14,000 housing units had collapsed; water, sewerage, roads, schools, hospitals health centers were damaged.

?? In Golcuk, there was significant damage to much of the center of the city and parts of the naval base. Damage was reported to ports and private piers, and most of the waterfront park was underwater. However, no major damage to industrial enterprises was reported. It appeared that many of the buildings which suffered total collapse were of substandard construction, given the proximity of buildings which

had remained standing. However, significant damage was also due to the location of the buildings directly over the fault line itself.

?? Yalova is located directly on the water and its main industry is tourism. A high proportion of the damaged housing consisted of second homes and the number of homeless in the city, while significant, was much lower in proportion to the loss of housing stock than in other cities. No information was provided concerning water or sewerage, but damage to telecommunications and electricity supply appeared limited. The necessity to provide temporary housing outside the city or to construct temporary housing for those rendered homeless is not clear given the quantity of vacant holiday housing in the city during the winter.

?? The damage in Adapazari was so extensive that first impressions suggested that the whole of the city center would require rebuilding – and possibly in an alternative location, though the few buildings with foundations adapted for the soil structure were virtually undamaged. The main problem resulted from the liquefaction of the ground underneath buildings which had been built without the necessary pile foundations. Hence, many of the buildings had sunk several meters into the ground, and pavements and roads had buckled up. Only 15 percent of the city was supplied with water. The team estimated that the rebuilding of this city would require more time and more careful planning than the other areas which it visited. Rebuilding in the same location would require much higher cost/quality construction.

19. Other cities visited, such as Bolu and Duzce, also suffered significant damage. In addition to the cities, it was clear from the air that apartment buildings in villages and small towns had also collapsed completely, which would indicate that other buildings had also suffered damage. No estimates for the extent of the damage in rural areas are available anywhere at the present time.

C. Economic Overview of the Earthquake Zone

20. **Kocaeli.** The damage in Kocaeli is concentrated in three districts, the Merkez district that harbors the province center Izmit, Gebze and Gölcük. The first two are to the north of the Gulf of Marmara. Gölcük is to the south and on the fault line that gave way. In 1997, Merkez and Gebze respectively contained 38 and 34 percent of Kocaeli's resident population, while Gölcük contained 11 percent. Since the city of Gölcük is a summer resort, its population at the time of the earthquake must have been significantly higher. The presence of a large naval base is likely to have been a major boon to the local economy. The epicenter of the earthquake being nearby, the facilities of the base have suffered significant damage.

21. By contrast Izmit (Merkez) and Gebze's economies rest on an industrial base. Almost all of Kocaeli's manufacturing industry is concentrated along the narrow strip from Gebze to Izmit. To put things in perspective, in 1997, Kocaeli accounted for 3.8 percent of the establishments, 5.1 percent of the workforce, and 15.3 percent of the value added in Turkish manufacturing. With some exceptions (most notably Tüpras, Turkey's largest refinery) large manufacturing establishments did not suffer major damage and are expected to resume normal production within one or two months (see partial list in the Annex). Based on anectodal evidence, the earthquake has exacted a heavier toll on small and medium enterprises. Many of these supply inputs to large

companies in the area. Available data indicate that firms with less than 10 workers account for 95 percent of Kocaeli's manufacturing establishments and about 35 percent of the workforce.

22. **Sakarya.** The Merkez district which contains the province center Adapazari appears to have received the brunt of the blow, at least in terms of human casualties. In 1997, Adapazari and its villages contained 49 percent of Sakarya's resident population. About one-half of the inhabitants of Merkez lived in villages. Sakarya province on the whole may be characterized as the vegetable and fruit basket of the Marmara region. In 1997, it accounted for 1.1 percent of the establishments, 1.2 percent of the workforce, and less than 1 percent of the value added in Turkish manufacturing. TV and news reports from Adapazari concentrated on collapsed modern multi-story (5,6, even 7 floors) apartment buildings and underscored the urban focal point of the tragedy. Many of the collapsed and damaged buildings had 'soft' ground floors, occupied by business establishments. Based on site visits, the team's impression is that the earthquake wiped out entire sections of modern urban Adapazari, and inflicted huge losses on the urban small business community (largely retail businesses). Satellite imagery corroborates this view.

23. **Yalova.** Although it is the smallest of the provinces on the worst-hit list (with 164,000 year-around residents in 1997), Yalova suffered a disproportionately high death toll when entire housing complexes collapsed. The city, after which the province is named, as well as the neighboring towns that dot the coastline, were popular summer resorts. After the earthquake the mayor of Yalova was quoted as saying that the city was home to six times as many people as the resident population during the summer months. Now that the poor quality of the geological foundations of many of the housing complexes has become public knowledge, Yalova is not likely to regain its pre-earthquake popularity as a summer resort. This will surely bring the local construction boom to a halt and deal a stiff blow to the retail and service sectors of the local economy.

24. The earthquake's immediate economic impact will be felt in at least two other provinces, Bolu and Istanbul. Two districts of Bolu, Düzce and Gölyaka suffered significant damage. Düzce (like Adapazari) benefited from being on the Ankara-Istanbul highway. As in Adapazari, the earthquake appears to have exacted a toll on the small- and medium-scale establishments. In the much smaller and rural Gölyaka the housing stock appears to have been damaged significantly. The housing stock in Avcilar, a poor suburb of Istanbul that experienced uncontrolled expansion in the 1990s, also took a heavy blow. Early indications are that Istanbul will experience a redistribution of population from districts that have unstable geological foundations to those sitting on rock beds. Compared with those already discussed, the earthquake's economic consequences in the remaining three provinces affected (Bursa, Eskisehir and Zonguldak) appears to be less severe.

Section II: Economic Assessment

A. Introduction

25. The Bank team's primary objective was to evaluate the impact of the Marmara earthquake on the Turkish economy over the remainder of 1999 and during 2000. The team carried out the assessment from three specific perspectives: the macroeconomic implications (growth, inflation, balance of payments, and fiscal accounts), the effect on the enterprise and financial sector (including the insurance industry), and the social dimension (the human toll, employment losses and the increased burden on social protection programs). On the basis of its findings, the team also formulated some relevant recommendations, notably with respect to the authorities' policy response so far.

26. It is important to underscore that the team's findings are preliminary and subject to further revision as more detailed data become available. The size of the affected region and the complexity of the regional economy explain why the data currently available on the impact of the earthquake are preliminary and incomplete. Damage estimates vary widely and survey data for enterprises and households in the region are still being collected. Under the circumstances, the team was obliged to make a number of critical assumptions the validity of which will have to be tested over the coming weeks and months. These assumptions are highlighted in the text below and the methodologies and data used are presented in the Annex. In addition, several proposals have been made for follow-up work to obtain a more detailed and accurate picture of the economic consequences of the earthquake.

B. Macroeconomic Implications of the Marmara Earthquake

27. The earthquake hit just as Turkey's economy was recovering from a sharp downturn in the wake of the Russian crisis. During the July 1998 to June 1999 period, GNP contracted by 1.6 percent relative to the same period a year earlier. Starting in the second quarter of this year, however, there was clear evidence that the economy was emerging from the slump. Aside from endangering this nascent recovery, the earthquake (and additional fiscal burden that it will impose) came as the Government was implementing essential economic reforms including development of an ambitious macroeconomic stabilization program requiring strong fiscal adjustment. This assessment of the macroeconomic implications of the earthquake covers the impact on growth, inflation, government debt servicing obligations, the balance of payments and the fiscal accounts.

28. **Lessons from Mexico and Japan.** The magnitude of the earthquakes that struck Mexico City in 1985, Kobe (Japan) in 1995 and northwestern Turkey on August 17 are broadly similar (Table 3). The Turkish earthquake has, however, wrought greater cost in terms of loss of lives: over 15 thousand confirmed deaths so far compared with 6½ and 9½ thousand deaths in Japan and Mexico respectively. This section looks at the experiences of Mexico and Japan as a starting point for assessing the likely macroeconomic consequences of the Turkish earthquake.

Table 3: Earthquakes in Mexico, Japan and Turkey

	Mexico	Japan	Turkey
Date	Sep. 1985	Jan. 1995	**Aug. 1999**
Severity (Richter Scale)	8.1	7.2	**7.4**
Loss of lives	9,500	6,430	**15,135**
Buildings destroyed (dwellings in the case of Mexico)	40,000	180,000	**46,039**
Material Damage (% of GDP)	2.7 – 3.5	1.5 – 2.0	**1.5 - 3.3**
Earthquake related fiscal burden (% of GDP)	. . .	1.0	**1.8 - 2.3**

29. The impact of the earthquakes on output in Mexico and Japan were generally limited. In Japan, GDP in the quarter in which the earthquake occurred declined by 0.5 percent. However, economic activity picked-up thereafter and in calendar 1995, real GDP growth was higher (1.4 percent) than in 1994 (0.7 percent). Moreover, in 1996, GDP growth accelerated to 4.1 percent, in large part due to a fiscal stimulus package, a big component of which was directed at reconstruction expenditures in the Kobe region. Of the material damage estimated at 1.5-2 percent of GDP, the Government appears to have shouldered around half this amount.

30. In Mexico, the adverse consequences the earthquake were swamped by the negative effects of the decline in international oil prices which occurred just before the twin earthquakes hit Mexico City in September 1985. Thus, the recession that began around the time the earthquake occurred is attributable primarily to the decline in oil prices rather than the earthquake. The material damage from the earthquake was estimated at some 3 percent of GDP by the World Bank. The cost borne by the budget is more difficult to discern. The domestic public sector borrowing requirement was expected to increase by 0.3 percent of GDP in the last quarter of 1985 simply for the tasks of demolition, rehabilitation and, to a lesser extent, reconstruction.

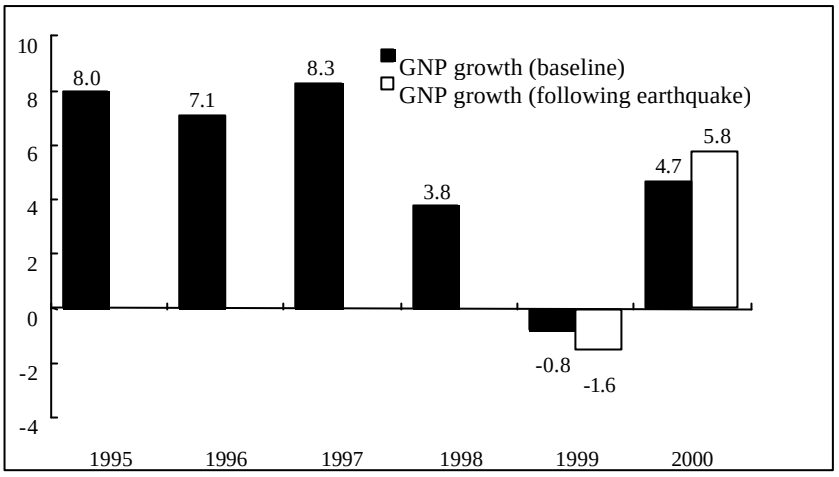
31. **Potential Implications for Output in Turkey.** This section attempts to assess the extent to which growth in 1999 and 2000 could be affected by the earthquake. In the case of Turkey, the area most severely hit by the earthquake accounts for about 7 percent of GDP. In addition, some of the outer suburbs of Istanbul have also been hit quite hard. The city including its suburbs accounts for nearly a quarter of national output. Extensive damage to electricity power lines and a key refinery has also entailed some disruption to economic activity, albeit temporary, across a large swath of an economically important part of the country. Small and medium scale enterprises have also suffered greatly. However, early indications are that the damage to larger industrial enterprises has been limited.

32. Since the earthquake has hit Turkey's "industrial heartland", the consequence for output may prove to be more severe than in either Mexico or Japan. The findings—which suggest that relative to the baseline, GNP could be 0.8 percent *lower* in 1999 and around 1 percent *higher* in 2000—are subject to a large degree of uncertainty as they depend on assumptions which still have to be confirmed by enterprise level data. Using approximately the same methodology, different analysts have arrived at a relatively wide range of estimates (negligible – 2.5 percent) for the decline in GNP relative to their baseline projections for 1999. The preliminary projection prepared by the State Planning Organization (SPO) is for GNP growth in 1999 to be some 1 percent below the baseline due to the earthquake.

33. A starting point for assessing the magnitude of the output loss that the earthquake may entail is the contribution to GDP made by the affected region. The four regions affected most severely by the earthquake (Kocaeli, Sakarya, Bolu and Yalova) account for some 7 percent of GDP. The team assumes that these regions will make no contribution to value added to the industry and service sectors for the rest of Q3 and that production thereafter to pick-up only gradually reaching normal levels in Q3 2000 (a full year after the earthquake). At the same time, the team's estimate takes into account the likelihood that the production loss in the affected region will be partially off-set by a pick-up in production in other parts of the country. There is, for example, anecdotal evidence that a significant part of the production loss due to the temporary shut-down of Tüpras's refinery in Izmit will be offset by increased production in other refineries across the country. The low levels of capacity utilization in most other sectors due to the cyclical position of the economy should permit part of the loss in production in the earthquake affected region to be picked up elsewhere in the economy relatively easily. In the projections, it is assumed that a third of the production loss in the affected region will be offset by increases in output elsewhere. At the same time, it is possible that the stimulus to increase production in other regions of Turkey could be offset at least in part by the adverse impact deriving from reduced output of intermediate goods in the affected region. However, the estimates do not include this latter effect.

34. Based on the assumptions outlined above and using the latest baseline projections prepared by the Bank, simulations suggest that GNP growth could be 0.8 percent lower than in the baseline for 1999 (Figure 4). In 2000, expenditures related to the reconstruction effort, as well as the lower starting point, are expected to generate higher growth than in the baseline. Assuming that public investment expenditures will be US$1.5 billion higher relative to the baseline, this will lift projected GNP growth in 2000 from 4.7 percent to 5.8 percent. Sensitivity analysis made by varying the underlying assumptions suggests that the effect on growth could be in the range of -0.6 percent to -1 percent for 1999 and +0.6 percent to 1.1 percent in 2000. It is important to note that there are at least three other channels through which the earthquake could affect economic activity. First, to the extent that the Government is unable to finance the reconstruction effort by mobilizing additional revenues and foreign financing, recourse to domestic financial markets will push interest rates higher raising borrowing costs and crowding out private investors. This will have adverse implications not just for Turkey's fragile public finances, but may also retard the fledgling economic recovery that was underway. Second, the above analysis neglects negative consequences due to the collapse in demand from those affected directly by the earthquake which could have a negative impact on output. Third, the earthquake could affect tourism revenues for the remainder of 1999.

Figure 4: GNP Growth (%)

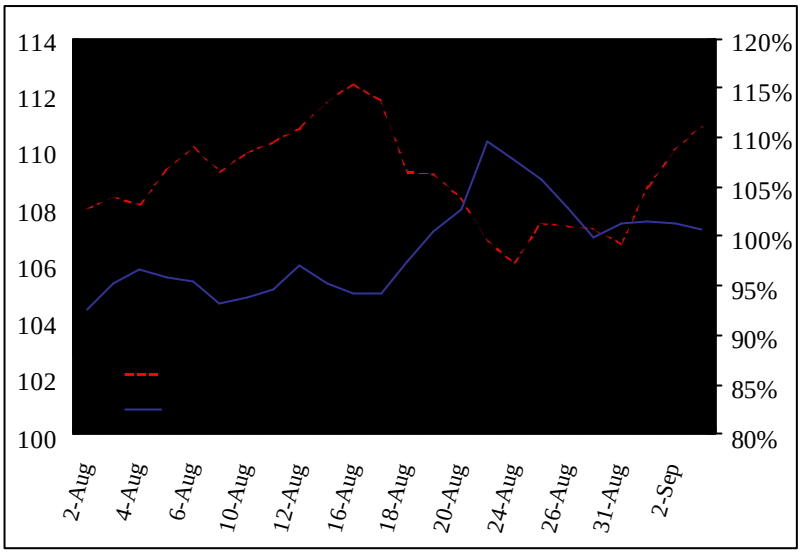


35. **Inflation.** As a negative supply shock, the earthquake could in principle be expected to induce a price rise. While it is too early to gauge the full impact on prices, as yet, there is no perceptible impact on the country-wide aggregate price index. The wholesale and consumer price indices for August which are based in part on surveys completed after the earthquake show no sign of a spike in prices, including in the most severely affected regions. Indeed, price increases in the affected regions appear to have been below price increases in other regions. However, according to the State Institute of Statistics, only partial data collection was possible in the regions affected by the earthquake, and the below average price increases in the most affected regions are likely to reflect this fact. Increased demand pressures arising from reconstruction could have an impact on inflation in 2000, particularly if external financing falls short.

36. **Interest Rates and Government Debt Service.** Having averaged some 95 percent in the first half of August, the secondary market interest rate on the most actively traded treasury bill jumped to 110 percent a week after the earthquake (Figure 5). By and large, this reflected two factors. First, capital outflows amounting to around US$1 billion (see below), which led to tighter domestic monetary conditions. Second, concern that the earthquake will entail a large fiscal burden. A related concern was the possibility that the earthquake may hamper the momentum for reform that had built-up over the summer months. The Government's quick passage of the pension reform bill upon the re-opening of parliament after a week long closure in the wake of the earthquake appears to have reassured investors and interest rates have since declined to below 100 percent.[3] The Central Bank of Turkey (CBT) has also partially recovered the foreign reserves that it lost.

[3] Spreads on Turkish Government Eurobonds also increased by some 80 basis points in the immediate aftermath of the earthquake but have since declined to the levels of early August.

Figure 5: T-Bill Rates and Central Bank Reserves



37. Determining whether the earthquake has had or will have a durable impact on domestic interest rates depends on two key factors: first, whether the earthquake has induced an increase in the risk premia associated with Turkish assets and second, whether it will lead to an increase in domestic borrowing by the Government. While interest rates are presently higher than they were before August 17, CBT officials and market participants are of the view that the earthquake is unlikely to have led to an increase in risk premia. The initial upward shift in rates evident in Figure 2 can be partly attributed to the increase in the withholding tax on repurchase transactions that came into effect on September 1, 1999. However, if the Government were obliged to finance earthquake related expenditures in the domestic market, this would exert upward pressure on interest rates in the coming months. Avoiding this outcome will depend on the Government's ability to mobilize tax revenues and/or reallocate expenditures to meet any spending needs arising from the earthquake which cannot be covered by external financing.

38. **Balance of Payments.** As noted above, in the week following the earthquake, the CBT lost reserves of the order of US$1 billion. While most of these losses have subsequently been recovered, the earthquake is likely to have further implications for the balance of payments. With regard to the current account, the decline in production in the affected region and disruption to the Izmit port, is expected to lower exports by around US$500 million relative to the baseline scenario in 1999 (Table 4) and a more modest US$250 in 2000. An expected drop in tourism revenues could magnify this loss by around US$200 million in 1999. Imports, on the other hand, are projected to increase quite sharply in 2000, reflecting the positive stimulus to domestic demand from reconstruction activity.[4] The team has not attempted to estimate the impact on workers' remittances or other private transfers which is expected to be positive.

[4] The implied income elasticity of imports underlying this projection is well within the range of elasticities observed in Turkey over the past decade.

39. Cumulatively, these developments are projected to widen the current account deficit by 0.4 percent of GNP in 1999 and 0.8 to 1 percent of GNP in 2000. Relative to the preliminary baseline projection by the IMF staff, this would imply a current account deficit in the range of 2.7 percent of GNP next year. This projection assumes that the required additional external financing will be available. Otherwise, further policy actions will be needed to contain the increase in the current account deficit which could slow the reconstruction effort. Provided that the widening of the current account deficit remains temporary, concerns about sustainability should not arise. Nevertheless, developments in the current account will bear careful monitoring in the coming months.

40. With regard to the capital account, most components are expected to remain broadly unchanged relative to the baseline with the exception of privatization revenues which are assumed to be US$150 million lower relative to the baseline. In particular, it is assumed that the outlook for portfolio investment is unlikely to have been altered significantly relative to the baseline scenario. According to the CBT and market participants, the capital outflows in the immediate aftermath of the earthquake reflected non-resident investors pulling out of the fixed income market. Since then, no additional outflows have been evident. Indeed, there have even been some capital inflows, allowing the CBT to recover more than half of the initial reserve loss. However, it is not yet possible to conclude from this that the trend of strong capital inflows witnessed in the weeks leading up to the earthquake has resumed. Assuming the Government's commitment to economic reform remains firm and given the relatively high rates of return on Turkish Lira assets, the outlook for portfolio investment should remain favorable.

41. The additional external financing required in 1999-2000 to maintain reserve accumulation as projected under the baseline is estimated at slightly over US$3 billion. At some US$23 billion, the CBT's gross reserves are adequate to deal with most types of current account shocks, but less adequate in the event of a major capital account shock. In the baseline scenario, reserves were projected to increase substantially in the coming months so that by end-2000 they would be approximately equal to the stock of short-term debt. The projected widening of the current account deficit as a result of the earthquake and lower privatization proceeds will alter this picture. It is expected that the additional external funds would come from official creditors and be used to finance earthquake reconstruction efforts by the Government.

Table 4: Summary Balance of Payments

Baseline and Post Earthquake Scenarios (US$ Billions)

		Baseline		Post-Earthquake	
	1998	1999	2000	1999	2000
Current account balance	1,872	-1,075	-3,630	-2,008	-5,663
(percent of GNP)	0.9	-0.6	-1.7	-1.0	-2.7
Trade Balance	-14,332	-12,413	-16,628	-13,113	-18,010
Exports	31,220	29,078	30,281	28,567	30,031
Imports	-45,552	-41,491	-46,909	-41,680	-48,041
Services (net)	10,477	5,476	6,899	5,243	6,248
of which, interest (net)	-2,342	-3,209	-3,066	-3,242	-3,170
Private transfers	5,568	5,480	5,707	5,480	5,707
Official transfers	159	382	392	382	392
Capital account balance	545	7,535	7,799	7,535	7,649
Direct investment	573	545	645	545	645
Portfolio investment (excl. privatization)	-6,057	450	-500	450	-500
Public Sector (incl. Central Bank of Turkey)	-1,221	1,895	5,680	1,895	5,530
Privatization	250	500	1,500	500	1,350
Borrowing (net)	-1,933	1,225	3,600	1,225	3,600
Bonds (net)	-261	1,979	4,500	1,979	4,500
Loans (net)	-1,672	-754	-900	-754	-900
Central Bank of Turkey (net)	462	170	580	170	580
Domestic Money Banks (net)	1,935	2,272	631	2,272	631
Other Private Sector (net)	5,315	2,373	1,343	2,373	1,343
Errors and Omissions	-2,197	131	0	131	0
Overall Balance and Change in Gross Reserves	220	6,591	4,169	5,658	1,986
Projected financing gap relative to the baseline 1/	...	...	...	933	2,183
Cumulative gap					3,116
Memorandum items:					
Gross reserves	19,893	26,484	30,653	26,484	30,653
in months of importsof G&NFS	3.9	5.5	5.7	5.3	5.7
Gross Reserves (in percent) 2/	51.4	60.9	70.4	59.4	70.4
Short-term debt/foreign reserves	137	116	107	119	107

1/ The total external financing needs of the budget arising from the earthquake could exceed this amount.

2/ Central bank foreign reserves divided by the end-period short-term debt plus MLT debt repayments falling due in the year.

42. **Fiscal Impact of the Earthquake.** In the recent period prior to the earthquake the Government had initiated fiscal reform measures in support of a macro-stabilization program under discussion with the IMF. Fiscal targets for 1999 and 2000 have been agreed with the IMF. Agreement was also reached on further prior actions for access to an IMF standby arrangement in support of the Government's stabilization and reform efforts. Pension reforms aimed at gradually reducing the large deficit of the social security system were passed shortly following the earthquake. The underlying parameters of the government's fiscal program need to be reexamined with a view towards addressing the fiscal impact of the earthquake, and implementing further measures to safeguard the government's stabilization program. This section aims to estimate the near term impact on the consolidated public sector deficit. These efforts suffer from more than the usual amount of statistical uncertainty. There is still a severe shortage of reliable information on the amount and severity of damage sustained by businesses, housing stock, municipal infrastructure, and by the population. New information continues to change these estimates almost daily, and revisions will no doubt continue to occur well after the work of reconstruction has commenced.

43. The overall fiscal impact of the earthquake is estimated to result in an additional burden on the budget in the range of US$3.6 to US$4.6 billion as shown in Table 5. The lower bound estimate includes disaster mitigation measures aimed at strengthening institutions and insurance markets to better prepare for future natural disasters. Adding contingencies would bring this total to US$4 billion. In addition, considerable uncertainty surrounds the estimates of the fiscal burden arising from housing reconstruction and rehabilitation. Taking an upper bound estimate for housing costs (para. 51) would bring the total fiscal burden to US$4.6 billion. These costs are estimated to be evenly borne during the remainder of 1999 and during 2000, representing between 1.8 and 2.3 percent of GNP cumulatively over this period.

44. The largest direct cost to the budget will be through reconstruction costs arising from damage to the housing stock of the region, estimated to total $620 million. Costs from infrastructure replacement and rehabilitation are estimated to add a further $400 million to pressure on the budget in 1999-2000. Total damage (wealth loss) from both items significantly exceeds this amount, but the burden of reconstruction is shared with the private sector. Revenue losses and credit programs represent one third of total estimated costs of the earthquake during 1999-2000, totaling US$1.3 billion. These arise from four principal sources: (i) reduced tax revenues from the region due to the negative output shock, (ii) losses from a tax payment deferral announced by the Government, (iii) credit subsidies for loan refinancing and new loans to small and medium enterprises which sustained damage in the region, and (iv) postponed non-tax revenues from public enterprise privatization. Additional costs are expected from emergency assistance to the population and associated compensation for loss of life and disability, totaling an estimated US$540 million, mostly falling on the 1999 budget. This includes costs for temporary housing for the estimated four to six hundred thousand people left homeless by the quake. These estimates represent costs related to capital stock replacement and mitigating the huge human costs of the earthquake. **A much larger fiscal burden could arise if large scale relocation of people and infrastructure is determined to be necessary**. This report has not been able to assess the need for major relocation efforts, thorough cost-benefit analysis of options by the Government is recommended.

45. To help finance the fiscal burden, approximately US$3 billion in external assistance has been tentatively identified including the World Bank, IMF, and other institutional and bilateral donors. This would leave a residual financing requirement for earthquake related needs of up to US$1.6 billion in 1999-2000 (excluding any major relocation costs). Domestic borrowing to close the remaining fiscal gap would be very costly given the extremely high real interest rates on T-bills and crowding out of private investment at a time of high credit demand. Supplemental tax legislation awaiting consideration by the Parliament in October could generate up to US$1.2 billion in additional revenue.[5] This could leave a residual financing gap of up to US$400 million which would have to be covered by additional external financing if available or through domestic revenue mobilization. In any event, the Government

[5] This estimate does not include estimated revenues from the alternative military service payment program recently tabled, or from Article 13 of the pending tax package pertaining to, inter alia, taxation of stock exchange and Competition Council activities.

should avoid financing earthquake costs through domestic borrowing which would put additional pressure on domestic interest rates.

Table 5: Estimated Fiscal Impact of the Marmara Earthquake

	1999 ($ mn)	2000 ($ mn)	1999-2000 Total ($ mn)	1999 (TL trn)	2000 (TL trn)	1999-2000 Total (TL trn)	Cumulative share of GNP (%)
I. Revenue loss and credit programs							
Estimated tax losses from Marmara region	577.3	-113.6	463.7	273.0	-63.7	209.3	0.24%
Estimated non-tax revenue loss	0.0	150.0	150.0	0.0	84.2	84.2	0.07%
Estimated lost social security contributions	158.6	-34.4	124.2	75.0	-19.3	55.7	0.06%
Cost of credit refinancing	39.5	100.3	139.9	18.7	56.3	75.0	0.07%
Credit subsidies for rehabilitation lending	282.5	126.0	408.5	133.6	70.7	204.3	0.20%
Subtotal	**1057.9**	**228.4**	**1286.3**	**500.3**	**128.1**	**628.4**	**0.65%**
II. Housing Rehabilitation							
Housing reconstruction costs	**155.7**	**467.1**	**622.8**	**73.6**	**262.1**	**335.7**	**0.30%**
III. Infrastructure Rehabilitation							
Transport Infrastructrure	64.8	97.2	162.0	30.6	54.5	85.2	0.08%
Electricity and Telecoms Rehabilitation	53.2	33.2	86.4	25.2	18.6	43.8	0.04%
Energy sector rehabilitation costs	2.6	10.1	12.7	1.2	5.6	6.9	0.01%
Public infrastructure rehabilitation costs	17.5	52.5	70.0	8.3	29.5	37.7	0.03%
Education facility rehabilitation	51.7	48.4	100.0	24.4	27.1	51.6	0.05%
Health facility rehab and emergency care	9.3	9.3	18.6	4.4	5.2	9.6	0.01%
Subtotal	**199.1**	**250.6**	**449.7**	**94.2**	**140.6**	**234.8**	**0.22%**
IV Social Assistance Costs							
Emergency assistance	54.9	64.7	119.6	25.9	36.3	62.3	0.06%
Cost of temporary housing	289.9	101.3	391.2	137.1	56.8	193.9	0.19%
Compensation for death and disability	30.5	0.0	30.5	14.4	0.0	14.4	0.02%
Subtotal	**375.2**	**166.0**	**541.3**	**177.5**	**93.2**	**270.6**	**0.27%**
V. Disaster Mitigation							
Disaster insurance system development[3]	100.0	400.0	500.0	47.3	224.4	271.7	0.24%
Emergency response institutional dev't[3]	55.0	55.0	110.0	26.0	30.9	56.9	0.05%
Subtotal	**155.0**	**455.0**	**610.0**	**73.3**	**255.3**	**328.6**	**0.29%**
VI. Public borrowing costs							
Interest on additional public borrowing[1]	**0.0**	**130.2**	**130.2**	**0.0**	**73.0**	**73.0**	**0.06%**
Total Fiscal Impact	**1943.0**	**1697.2**	**3640.2**	**918.9**	**952.3**	**1871.2**	**1.78%**
VII. Contingencies							
Contingency provision[2]	253.9	157.9	411.8	120.1	88.6	208.7	0.20%
Incremental upper bound housing costs[4]	118.5	473.9	592.3	56.0	265.9	321.9	0.28%
Subtotal	**372.4**	**631.8**	**1004.1**	**176.1**	**354.5**	**530.6**	**0.48%**
Total (Upper Fiscal Bound)	**2315.3**	**2329.0**	**4644.3**	**1095.0**	**1306.8**	**2401.8**	**2.27%**

Source: Official Government sources; World Bank staff estimates.
1\ Borrowing costs based on full financing from official foreign sources.
2\ Contingency allowance (15%) for uncosted items and underprovisioning (environmental costs, demolition, municipal offices, relocation, etc.).
3\ Details and cost estimates from World Bank MEER mission report, September 1999.
4\ Higher housing cost estimates based on preliminary higher damage estimates and higher eligibility assumptions (75%).

46. **Revenue Loss and Credit Subsidy Costs.** The main revenue loss arises through the policy announced shortly after the earthquake granting tax deferrals to individuals and businesses affected by the earthquake. In addition, a credit subsidy package was announced which includes: (i) a subsidized deferral of debt service payments for one year applicable to debt owed by parties adversely affected by the earthquake and outstanding to the three leading state banks, and (ii) new subsidized

credits. Details of the tax deferral and credit subsidy program have not yet been fully clarified, although the basic elements have been announced.[6]

47. **Impact on Government Revenues.** The net impact on tax revenues is estimated to total close to US$460 million for both fiscal years, with only partial recovery of deferred 1999 tax liabilities in 2000. This accounts for 60 percent of total revenue and social security contribution losses. There are three sources of this tax loss: (i) the short term slowdown in growth resulting from the quake, (ii) more long term losses due to businesses or individuals that have sustained irretrievable damage, and (iii) the imputed cost to government from the tax deferral due to inflation (the 'Tanzi effect'). In addition, forgone tax revenues from reduced tourism during 1999 are estimated to total around US$32 million as tourism and demand for conference facilities is expected to decline in Istanbul and surrounding areas. The main burden of the tax loss will be felt during 1999. During 2000 it is estimated that there will be a modest increase in revenues over baseline arising from collection of deferred 1999 taxes. However, only a small portion (about one-fourth) of the lost revenues are expected to be recoverable due to the loss of tax records and losses arising from severely damaged businesses.[7] Non-tax revenues of the Government will also be reduced through delayed privatization of state enterprises in the region, including the Tüpras oil refinery although alternative firms for privatization may be prepared. It is estimated that foregone privatization revenues will total $150 million in 2000, but will be recovered the following year. Finally, reduced contributions to the social security system are estimated to increase the consolidated public deficit by a further $159 million in 1999.

48. **Credit Subsidy Program.** All liabilities outstanding to Halk Bank, Ziraat Bank, and Emlak Bank by businesses that have suffered from the earthquake are to be rescheduled on subsidized terms and new subsidized loans will be extended. The cost from this rescheduling arises from the delayed repayment of loans and the reduced interest rates at which the loans will be repaid as well as from interest rate subsidies for new loans. These losses do not include the original duty losses that would have been reported by state banks in the absence of the Marmara quake.

49. The total stock of outstanding debt held by the three banks to be rescheduled in the affected regions is estimated to total TL 121 trillion. The additional losses arising from rescheduling these debts at more highly subsidized credit terms is estimated to be TL 75 trillion. Significantly larger losses are likely to arise if the Government proceeds with unrestricted new lending at subsidized rates to the region. New credit demand following the quake is difficult to estimate. Most apartment buildings in the region are constructed with small service establishments and shops in the bottom floors that sustained heavy damage. It is estimated that 6000 shops were destroyed, 1500 service establishments, and hundreds of enterprises. The total credit required by these businesses (shown in Table 7) is based on state bank estimates of their existing client demand. Total demand is estimated at US$380 million (TL 180 trillion), about three-fourths of which would be disbursed in 2000. By contrast, the

[6] Provisions for debt rescheduling are provided in Government Decision No. 23800 promulgated August 28, 1999 and annexed to Decree no. 99/13233. Provision on tax deferrals are provided in the Ministry of Finance circular dated September 1, 1999.

[7] Tax liabilities on business that have lost one-third or more of total assets are to be entirely forgiven according to Tax Procedure Law, Article 115.

state banks have estimated a considerably higher demand for subsidized credit for all potential clients in the region, on the order of TL four to five hundred trillion. It will be important for the Government to constrain total lending through this mechanism to only the most deserving parties. Otherwise, diversion of resources to non-quake related activities is likely to occur. Every TL 100 trillion in new credit is estimated to cost the central government budget approximately TL 72 trillion in subsidies and TL 100 trillion in transfers through Halkbank for onlending, or TL 36 trillion in subsidies through Ziraat Bank.

50. **Reconstruction of Destroyed Housing Stock.** Earthquake insurance for housing is not developed in Turkey, in part due to the implicit insurance provided through state guarantees to replace owner-occupied housing losses. Thus the bulk of replacement costs fall on the public budget rather than being financing through risk pooling in a developed insurance industry. The most recent estimate by the Ministry of Public Works and Reconstruction shows 35 thousand houses were destroyed and 80 thousand damaged by the earthquake, however this number is changing daily. Table 6 provides cost estimates of housing damage using these figures. On the basis of cost parameters estimated by the MEER team, the full cost of reconstruction borne by government is US$620 million, three quarters of which is expected to fall on the 2000 budget. Rehabilitation cost estimates distinguish between three levels of severity of damage. Housing that has collapsed or is too heavily damaged to be inhabitable will need to be demolished and rebuilt at an estimated cost of US$20,000/unit. Housing with moderate damage is estimated to cost US$8,000/unit for repairs, and light damage reparable at US$3,000/unit. These estimates also draw on the Adana earthquake experience, and are adjusted to reflect higher replacement costs and additional costs of heating.

51. Considerable uncertainty surrounds these estimates and a full accounting of housing stock damage will have to await completion of survey work currently underway. The mission has prepared an upper bound estimate for the fiscal cost of housing stock rehabilitation of US$1.25 billion. This upper bound estimate is based on increasing two key cost parameters. First, more recent but not yet officially confirmed estimates of housing stock damage are used.[8] Second, a higher estimate of houses eligible for public restitution under Disaster Law 7269 is assumed.[9] This upper bound estimate would raise the total fiscal impact of the earthquake by some $600 million. Therefore, the total fiscal impact is estimated to range between US$3.6 to US$4.6 billion.

[8] Updated press reports that have yet to be confirmed by the Ministry of Public Works and Reconstruction show just under 51 thousand houses destroyed, 51 thousand with medium damage, and 61 thousand lightly damaged.

[9] Under Disaster Law 7269, eligibility for public provision of housing reconstruction is limited to dwellings which are owner occupied and are the primary residence of the inhabitants. Based on preliminary MEER mission estimates of owner occupied dwelling meeting government criteria, the eligibility rate is estimated to cover 55 percent of total housing units. For the upper bound estimate 75% has been assumed.

Table 6: Estimated Permanent Housing Reconstruction Costs

(updated by the Ministry of Public Works as of Sept 9, 1999) [2]

Damage	Number of units	Share eligible [1]	Units eligible	Cost per unit [4] ($)	Total cost ($ mns)	1999 [3] ($ mns)	2000 ($ mns)
Collapsed/Heavy damage	35,074	55%	19,291	20,000	385.8	96.5	289.4
Medium damage	37,803	55%	20,792	8,000	166.3	41.6	124.7
Light Damage	42,805	55%	23,543	3,000	70.6	17.7	53.0
TOTAL	115,682	55%	63,625	9,788	622.8	155.7	467.1

Notes:
1\ Eligibility estimated based on ratios of ownership and rental (MEER mission).
2\ Data provided by the Ministry of Works and Reconstruction, General Directorate of Disasters
3\ Expenditures are apportioned evenly over 16 month period through end 2000.
4\ Unit cost for reconstruction and repairs are estimated by the World Bank MEER mission.
Land costs are excluded. Adding estimated land cost based on per unit land from Adana reconstruction and assuming half of land is state, half purchased at $22/m2, adds $31.5 mn to the total estimate.

52. **Electricity, Energy and Telecommunications Infrastructure.** Costs for repair and replacement of damaged electric power distribution facilities is estimated at US$48 million. Most of the electricity infrastructure losses reported are concentrated in power transmission and distribution systems. Transmission substations sustained equipment and building damage, an estimated 3400 distribution towers and 490 km of overhead lines were damaged or destroyed, and there was extensive damage to underground cable lines. There was little or no damage to the thermal power plants and hydropower plants in the six provinces affected, and damage to the regions 39 industrial power plants has yet to be fully assessed.

53. The damage reported to oil and gas production facilities was substantial, but the fiscal impact is estimated to be a modest US$12.7 million due to insurance coverage of the damage sustained by the Tüpras refinery. Costs arising from pollution abatement along the shoreline due to oil and chemicals discharged into the Sea of Marmara are estimated at US$5 million. Modest oil and gas pipeline damage was sustained (about US$2 million) and damage to municipal distribution systems is estimated at US$5 million. Telecommunications damage is estimated to total US$38.4 billion, including transmission lines, station damages, buildings, and network repair necessitated by the quake. These estimates are from Turkish Telecoms and need further assessment.

54. **Transport Infrastructure.** The total estimated cost of repairing the assessed damage to transport infrastructure is US$118 million, two-thirds of which is due to damage sustained by the railway system, railcar factory, and rolling stock. The earthquake caused damage to streets in the heavily hit communities, extensive damage to many sections and structures of the Istanbul-Ankara motorway (about 49 km in length), and scattered damage along 410 km of district roads and provincial highways. In addition, there was substantial damage to railway track and installations, the train wagon manufacturing facility in Adapazari, and port facility in Derince. The railcar manufacturing and port facilities are not expected to be operable until extensive reconstruction is completed through 2000.

55. **Educational Infrastructure.** Damage to school facilities is estimated to cost the state US$107 million in rehabilitation and targeted support. Around 25,000 children will need to be transported to different school facilities for double shift classroom instruction in existing facilities that remain operational. Rehabilitation of the estimated 22 primary and 21 secondary schools damaged by the earthquake is assessed at US$46 million. In addition, support for text books, uniforms, food, and supplemental payments to teachers are estimated to cost an additional US$55 million through the 1999-2000 school year.

56. **Health Infrastructure.** From field visits and interviews with officials in the affected districts, the MEER team health specialists estimated that 28 health centers and 10 hospitals sustained damage from the earthquake. Rehabilitation costs include reconstruction of severely damaged sites, repair work, deployment of temporary prefab units, and replacement of damaged medical equipment. Costs for this work are estimated to total US$19 million, 60 percent of which will be disbursed during 2000.

57. **Municipal Infrastructure.** Damage to municipal infrastructure includes office buildings, water supplies, wastewater treatment, streets, and other structures. Careful survey work to estimate the total damage to these facilities is underway, but preliminary estimates by local offices (as reported to the SPO) suggests total damage of around US$70 million. Most of these expenditures are assumed to be made during the 2000 fiscal year.

58. **Social Assistance Costs.** In the immediate wake of the earthquake there has been a tremendous demand for immediate emergency assistance to the affected population. An estimated four to six hundred thousand people have been rendered homeless, at least fifteen thousand fatalities have occurred, and a further 24,000 people were injured. It is estimated that the cost of emergency assistance to the population for tents, food, sanitation services, health care and other immediate needs will total US$107 million. Further assistance will be provided to individuals and families that have suffered fatalities or injuries. Compensation for loss of life and disability is estimated to total US$30 million provided the Government adopts the lump-sum payments to victims proposed by SPO (see section D).

59. **Temporary Housing Costs.** The largest component of immediate social assistance costs is the estimated US$391 million that arises from provision of temporary housing pending reconstruction and repair of destroyed housing stock. There is a wide range of cost estimates for these outlays due to the cost variance of options facing government. The estimate used here is based on a mixture of reliance on highly costly temporary housing units (US$8,000/unit) and less costly relocation options to existing facilities in nearby areas (US$2,160/unit equivalent). It is estimated that 30,000 temporary housing units would cost a minimum of US$240 million and accommodate around 120,000 people. This cost does not include additional infrastructure requirements, such as heating which could significantly raise costs. Use of existing buildings would cost an estimated US$151 million for the remaining 280 thousand left homeless. To the extent that existing infrastructure can be used to accommodate the homeless without excessive disruption to families and communities, this is the preferred option (at a cost differential of 4 to 1) and would conserve scarce public resources.

60. **Disaster Mitigation Costs.** Insurance industry coverage of earthquake damage exists in Turkey, but it is not well developed. Recommendations for developing insurance industry coverage for natural disasters is described by the MEER team. Developing an efficient disaster insurance system is estimated to cost US$500 million. Another central recommendation of the MEER team is to strengthen the capacity of Government to respond to national emergencies. A detailed proposal for emergency response institutional development is developed in background work prepared by the MEER team. The cost of this proposal is estimated as US$220 million and could be fully operational by end-2000. These cost estimates are preminary pending appraisal of the recommended disaster mitigation programs.

C. Impact on the Enterprise and Financial Sectors

61. **Damage Estimates for the Enterprise Sector.** It is not yet possible to estimate with precision the extent of material losses incurred in the enterprise sector. Estimates from various sources range up to US$4.5 billion, but definitive data are not available. The team estimates damage in the enterprise sector to be in the range of US$1.1 to US$2.6 billion based on reports from the insurance industry and chambers of industry in the affected region. The Bank is conducting a survey in the region to collect data which will make it possible to estimate the losses arising from the SME and micro-enterprise sector. However, some selected data are available on certain categories of enterprises. It should be noted here that for some regions it was not possible to get the breakdown of information according to different categories of enterprises.[10]

62. **Major Industries Located in the Earthquake Region.** Overall, in the earthquake struck region the main industries according to the value added created are:

- oil refineries,
- manufacturing, assembling and repair of motorway vehicles,
- iron and steel and basic metal industry, and
- production of synthetic fibers and yarn, and weaving and finishing of these products.

In Kocaeli, the major industries include petroleum refining, manufacturing of tire and tire reinforcement materials, iron and steel, basic metal industry, and production of paint and varnish-lacquer. In Sakarya, the most important industries are manufacturing, assembling and repair of motorway and railway transportation vehicles; animal slaughtering facilities; and soil based industries. While Yalova is largely a tourist center, it does have industries including production of synthetic resin, plastics, synthetic fibers and yarn, as well as weaving and finishing, and cellulose paper and cardboard manufacturing.

[10] According to various chambers of industry, generally accepted categorization of enterprises is as follows: (a) Companies employing more than 250 persons are categorized as “large enterprises”; (b) Enterprises employing 10-250 people are referred as “SMEs”; and (c) Retail shops, merchants, craftsman and artisans with less than 10 employees are considered as “micro-enterprises”. The first two groups can be members of chambers of industry. The third group of entities can be members of chambers of commerce or other types of cooperative arrangements.

63. **Large Enterprises.** Information from the Istanbul Stock Exchange (ISE) concerning listed companies may be a useful indicator of the impact of the earthquake on large enterprises located in the region. According to the ISE, 17 listed companies reported damage totaling US$150 million, most of it being related to loss of inventory. The MEER team's assessment indicates greater damage for the large enterprises in the region. For example, a total of $350 million damage was estimated for Tüpras alone. The SPO estimates a total of 15 percent capital loss for the four state owned enterprise located in the region. Other agencies, such as Kocaeli chamber of Industry, Istanbul Stock Exchange, etc., have damage estimates which differ widely. The precise damage numbers will only be available following the finalization of the damage assessments by the individual enterprises and/or insurance companies.

64. **Large Enterprises and SMEs in Kocaeli.** According to Kocaeli Chamber of Industry (KCI), out of a total number of 1,127 enterprises in the province, 46 percent are located in the severely hit districts of Merkez, Gölcük, Korfez and Karamursel. The number of total enterprises broken down by the districts of Kocaeli is shown in the Annex. KCI conducted a quick canvass of their members which indicated that 40 percent of the companies located in the districts of Merkez, Gölcük, Korfez and Karamursel had significant damages. Around 10 percent of the damaged companies recorded very heavy losses of capital stock and inventory, and on average, report that it will take about 6 months to get back to their normal operations. According to KCI, 214 companies reported significant damage. Overall, based on the data from enterprise reports and site observations, the KCI estimates a total of US$2.5 billion capital loss in Kocaeli. As quoted by the KCI, the most severe damage occurred in state owned enterprises in the region. The team was not able to obtain independent verification of these figures.

65. **Large Enterprises and SMEs in Sakarya.** Sakarya Chamber of Industry (SCI) has 350 members, most of which are exporters. Out of this number, 120 of them (34 percent) reported to have significant damages. In 52 of the seriously damaged firms, an assessment was carried out and the total loss was found as $37 million. However, given that damage assessments are not yet finalized for many larger enterprises, the Chamber of Industry estimates an average of $1.5 million loss for each of the affected 120 companies. This amount includes the loss in infrastructure, machinery, equipment and inventory. As a result, for 120 enterprises, the total loss reaches to $180 million. Of this loss, $37 million (only 20 percent) is expected by SCI to be covered by insurance. Total loss to be absorbed by industry is estimated by SCI to be $144 million in total. Once again, the team could not independently verify these figures.

66. Many large enterprises and SMEs in the region are very much concerned about the possible loss of qualified employees due to migration to other parts of the country. In order to stop this loss, some medium and large-scale industrialists have already provided temporary shelters, food, and other basic facilities for their workers and their families, which are very close to the workplace. The objective is to provide an initial safe environment for workers' families. In addition, some enterprises are planning to build permanent housing for their employees.

67. **Microenterprises in the Region.** Microenterprises were the hardest hit by the earthquake. While the total capital stock and value added of the microenterprises might be relatively limited, their large number could bring their total loss to

significant levels. Based on the site visit/observations of the MEER team, a total of 6,000 small shops (employing less than 5 persons) were estimated to be severely damaged by the earthquake. The total number of services (employing 5-10 persons) damaged was estimated to reach 1500. Based on these estimates, a total cost for restoring the working capital of these enterprises can be derived (Table 7).

Table 7 : Working Capital Needs of Microenterprises

	#	Proposed working capital* ($ 000)	Total Cost ($ m)
Shops	6,000	5,000	30
Services	1,500	35,000	53

*A working capital sum to get the businesses of the ground. The cost of the premises, containers or prefabricated outlets is not included in this assumption.

68. According to chambers of industry and insurance companies, insurance coverage is very limited among micro-enterprises. As a result, the losses to be claimed from insurance are negligible. Overall, microenterprises are undercapitalized and have limited access to funding. On the other hand, the loss/decline of production capacity of small and micro enterprises would have adverse affects on larger firms which are dependent on intermediate inputs from microenterprises, as well as an important social impact. Therefore, there is a strong case for state support to microenterprises for reconstruction.

69. **Insurance Sector.** In Turkey, there are 41 insurance companies underwriting property and engineering hazards, including earthquakes. The insurance industry has divided Turkey into 15 earthquake assessment zones. The distribution of the number of earthquake insurance policies and their monetary values among these zones is shown in the Annex.

70. The gross retention of Turkish insurance companies is around US$24 billion (out of total insurance coverage of $102 bn). However, the vast majority of this is reinsured internationally. It is estimated (by Milli Reasurans) that net retention of domestic insurance companies in the zones affected by the earthquake is only around US$25 million. Through use of the 'excess of loss system' and proportional treaties, most risk is born by reinsurers, such that roughly 95% of the total losses from the earthquake are expected to be covered by international reinsurers. Total domestic insurance industry reserves (equal to around US$27 million in 1998) should be adequate to cover domestic losses. However, insurance premia in the affected region will likely rise sharply after the quake, perhaps by as much as $200 million over the next 3 to 5 years, serving to repay reinsurers for part of their current losses.

71. So far, 8,500 earthquake-related claims have been submitted to Milli Reasurans (Turkey's dominant reinsurance company) by insurance companies. The estimated total damage with respect to these policies is around US$450 million. The overall total estimated damage claims to the insurance companies is expected to be around US$750 million, of which 10-15% would be related to households and some US$50 million would cover profit losses. Since the majority of the policy coverage is reinsured by foreigners, the timing of the payments of claims to the beneficiaries is basically dependent on the funding capability of the foreign insurers. The settlement process is expected to start by the end of September 1999, and around 70-80 percent of the claims should be settled within two months.

72. The insurance companies are expected to start payments for claims following finalization of their damage assessment. The actual payments would be made around 2 to 3 months to the beneficiaries. In other words, the insured enterprises will not have access to these funds for a minimum of two months. The major problem for these enterprises is the lack of liquidity needed to start up their repair or reconstruction work for the buildings, replacement or rehabilitation of the damaged machinery, replacement of damaged input/output inventory, and payment of their accrued liabilities. One alternative would be for commercial banks to provide bridge financing to these enterprises up to 60-70 percent of the confirmed damage by the insurance company, against a pledge of the total receivable for collateral. However, the team's initial findings indicate limited willingness on the part of the commercial banks to accept insurance policies as collateral.

73. **Assessment of the Banking Sector.** The overall direct (cash) and indirect (non-cash) credit exposure of the banking sector to the economic entities who are recorded in the commercial code in the earthquake region as of June 30, 1999 (Izmit, Adapazari, Yalova provinces and partially Istanbul) are below:

Table 8: Banking System Total Exposure

PROVINCE	CASH LOANS	
	% Share in Total (Turkey)	Total Disbursed (TL Trillion)
KOCAELI/ IZMIT	1.20	174.6
ADAPAZARI	0.33	46.8
YALOVA	0.02	3.1
ISTANBUL 1/ (PARTIAL)	1.48	216.5
TOTAL	3.03	441.0

1/ This figure represents the loans to companies in the above provinces from commercial bank's Istanbul branches. This figure underestimates total exposure due to loans on-lent from company headquarters outside the region.
Source: Central Bank.

74. A total of TL 441 trillion in direct loans is outstanding in the region (about US$1.0 billion). However, it should be noted that, these numbers do not include individual loans and loans to most craftsmen, merchants, and artisans through credit cooperatives funded by Halk Bank, as well as loans to the Agricultural Credit Cooperatives funded by Ziraat Bank. Rough estimates made by Halk Bank and Ziraat Bank indicate a total of 10.8 trillion TL (US$25.7 million) and 15.6 trillion TL (US$37.0 million) in disbursements through cooperatives, respectively. According to the Banks Association, aggregate individual loans are around 10-11 percent of the total loans to enterprises. However, this ratio is assumed to be around 15-20 percent for the region, due to its relatively higher per capita income level. Based on this, the individual loans would be around TL 88.4 trillion (US$210.5 million). Of this amount, the individual loans are roughly US$8.1 million for Ziraat, US$1.7 million for Halk Bank, and US$32.8 million for Emlak Bank. Based on these figures, the total cash loans of commercial banks in the region are roughly estimated to be not more than US$1.5 billion. This figure represents the total exposure of both state and private banks. It is expected that about one third of clients (representing US$500 million) would be directly affected by the earthquake. Around 60 percent of this amount are loans extended by private banks. Due to the Government's subsidized

credit program, the impact of the earthquake on the state banks is expected to be much larger and will be reviewed separately.

75. **The State Banks.** The Government issued a Decision on August 28th annexed to Decree no: 99/13233 which stipulates the coverage and implementation procedures to be applied to existing loans and new loans for economic agents active in the affected region. According to the Decree, the outstanding debts to Ziraat Bank, Halk Bank and Emlak Bank owed by individuals and firms whose enterprises, movable or immovable assets have been damaged by the earthquake--as assessed by provincial commissions--would be deferred for three years. Based on limits to be defined by the banks, new loans will be provided to applicants who comply with the above criteria for loan deferral. The cities covered under this scheme are Istanbul, Kocaeli, Sakarya, Bursa, Bolu, Yalova and Eskisehir.

76. The process and conditions for deferral/rescheduling of existing loans is as follows. Once an economic agent files an application, the damage is assessed/verified by the provincial damage assessment commission. Currently, the Decree allows any person to apply within three months following the earthquake and to be eligible for deferral/rescheduling of an existing loan to the three state banks as a result of any magnitude of damage to any movable or immovable asset following verification by the provincial commission. Theoretically, every current borrower could be eligible for deferral/rescheduling of their existing loan. Loans will be deferred for three years with a grace period of one year for both principal and interest. The interest rate will be half of the current interest rate applied.

77. Eligibility requirements for the new loan program are also very broad. The current clients of the three state banks, clients of other banks, and economic agents that have not borrowed before from any bank, but are located in the earthquake zone can apply to Ziraat, Halk or Emlak Bank[11] within 3 months, as long as they have a damage assessment report verified by the provincial commission. Ziraat and Emlak can provide new working capital loans for up to one year, and investment loans up to 5 years with a grace period of one year for both the principal and interest. The interest rate will be half of the current interest rate applied according to the type of loan. Ziraat Bank will provide new loans only to agricultural sector and Emlak Bank for housing. Halk Bank can provide new working capital loans at an interest of 20 percent.

78. The treatment of the revenue loss of the state banks will be as follows:

BANKS	CURRENT STOCK	NEW LOANS
HALKBANK	The difference between the commercial interest rate and interest applied to the existing loans will be calculated and requested from the Treasury as duty loss.	Funds will be allocated to Halk bank from "Development and Support Fund (GDF)" for this purpose. Halk Bank will receive a 4% service fee from the interest revenue of 20%.
ZIRAAT BANK	The difference between the commercial interest rate and interest applied to the existing loans will be	The difference between the commercial interest rate and interest applied to the existing loans will be

[11] Emlak Bank management informed the team that their situation vis-a-vis the new loans was not defined clearly in the Decree, and therefore, open for interpretation.

	calculated and requested from the Treasury as duty loss.	calculated and requested from the Treasury as duty loss.
EMLAKBANK	The difference between the commercial interest rate and interest applied to the existing loans will be calculated and requested from the Treasury as duty loss.	The difference between the commercial interest rate and interest applied to the existing loans will be calculated and requested from the Treasury as duty loss.

79. Total stock of existing loans of Halk Bank and Ziraat Bank, as of 8/31/1999, in the cities affected by the earthquake is presented in the Annex. The total cash exposure of Halk Bank is approximately TL 19.3 trillion. Halk Bank management initially estimates that 70 percent of this total would be rescheduled. The total cash exposure of Ziraat Bank is TL 26.8 trillion, excluding Istanbul Avcilar region. However, Ziraat Bank management has decided to interpret the Decree to its fullest extent. According to management, Ziraat Bank's total exposure in the 7 provinces affected from the earthquake in the amount of TL 140.3 trillion would need to be rescheduled. Ziraat Bank officials' estimate of almost 100 percent rescheduling is motivated by the broad eligibility and very favorable deferral/rescheduling terms of the announced program. The total loans to be deferred by Emlak Bank is estimated by management to be TL 57.7 trillion (US$150.6 million) as shown in the Annex. Therefore, as estimated by their management, the total amount of loans to be restructured by the three state banks is roughly around TL 212 trillion (US$505 million).

80. The team recommends that the stock of loans which were already classified as doubtful prior to the earthquake be excluded from the deferral/restructuring scheme. Otherwise, this would provide an earthquake premium to delinquent borrowers and impose a significant moral hazard on the system. Once the total doubtful loans prior to the earthquake are deducted, for Emlak Bank, the total expected deferrals according to management will be equal to around TL 44.9 (US$117.2 million). Data on doubtful loans for Ziraat and Halk Bank were not obtained by the team. It should be noted that the above figures do not include credit card debt and the potential of conversion of some off-balance sheet items to on-balance sheet exposure in the three months after the earthquake, which may then need to be treated as cash loans and thus eligible under the credit subsidy program. In addition, there is no clear justification for Ziraat Bank to reschedule loans in the seven provinces concerned for clients that have not been affected by the earthquake.

81. The expected incremental nominal fiscal cost of the new subsidized credit scheme would be around TL52.3 trillion for the year 1999, and TL127.0 trillion for the year 2000. The details are shown in Table 9. As mentioned above, the set of potentially eligible clients for this scheme includes every legal entity and individual person who has filed a damage claim in three months following the earthquake regardless of the size and nature of the damage. There is a risk that this situation could create distortions and promote misallocation of scarce public funds. Therefore, there is strong need to re-define the eligibility criteria in order to ensure that only economic agents that have suffered real material damage and who do not posses any other mean of compensation (such as insurance) will be eligible for support within certain pre-determined limits and subject to transparent screening criteria.

Table 9: Incremental Duty Loss

BANKS	CURRENT STOCK (TL Trillion)		NEW LOANS (TL Trillion)	
YEARS	1999	2000	1999	2000
HALKBANK[12]	2.3 [13]	6.8	24.0[14]	42.0
ZIRAAT BANK[15]	7.5 [16]	22.6	9.6 [17]	28.7
EMLAKBANK[18]	8.9 [19]	26.9		
TOTAL	18.7	56.3	33.6	70.7

Source: State Banks

82. The Treasury pays the difference between the commercial interest rate and the subsidized interest rate to state banks to compensate for the difference which is defined as the duty loss. It should be noted that there are additional costs of this subsidized credit program to the state banks which will not be covered under the duty loss scheme. The duty losses are applied to the subsidized credits funded by the state banks' own resources. However, the duty loss calculation is based on simple interest rates, which does not reflect the true opportunity cost to the state banks. In reality, state banks accrue interest on their commercial loans on a quarterly basis. Therefore, the actual interest rate applied to commercial loans are the compounded interest rate. As a result, the simple interest rates applied by the state banks in the duty loss calculation are 110 percent, 120 percent, and 135 percent for Ziraat Bank, Emlak Bank and Halk Bank, respectively. However, the corresponding compounded interest rates would be 164 percent, 186 percent, and 220 percent. Based on this, the additional cost of the subsidized credit scheme in the form of lost revenues would be around TL 68.1 trillion to the state banks.

83. **Private Banks.** The majority of private commercial banks announced that they would reschedule their loans to affected economic agents in the region without charging penalty interest. The terms of the rescheduling will generally be for up to three to six months on average at current interest rates. The expected short-term losses for the private commercial banks will mainly result from write-offs of loans which have become uncollectable due to the quake. The extent of write-offs will vary from bank to bank. While some banks quoted no likelihood of any loans to be written-off, others quoted up to 3 percent of their portfolio. If one assumes that on the

[12] Based on figures provided by Halk Bank management.
[13] TL19.3 trillion*70%*50% /3
[14] TL100 trillion*(nominal cost of funds (88% for 1999 and 58% for 2000)-nominal interest revenue 16%)/3
[15] Based on figures provided by Ziraat Bank management
[16] TL63 trillion*(weighted average of interest 71.73/2)%/3
[17] TL80 trillion*(71.73/2)%/3
[18] Based on figures provided by Emlak Bank management, no new loans to be disbursed by Emlak Bank. Emlak Bank management informed the mission that the bank did not participate in any subsidized credit scheme, until this time. The mission has been informed that currently the average TL interest rates applied to Emlak's existing portfolio is 120%. This rate is 24% for US$ denominated loans and 26% for DM denominated loans. The duty loss calculation will be based on the difference of the market rate and half of the above rates. However, Emlak Bank management expects additional losses to be incurred by the bank, since the market reference rate will not include the compounding effect on the nominal interest rate.
[19] TL44.8 trillion*(120%-60%)/3

average 1.5 percent of the total loans of the private banks will be expected to be written-off, this would be equal to around TL 5.2 trillion (US$13.5 million[20]).

84. **Conclusion.** While **t**he recent earthquake will have adverse effects on the insurance and banking sectors in Turkey in the short term, these can be contained as long as the Government's financial sector reform program remains on course and the new credit subsidy program is carefully designed and prudently managed. The most significant impact on the insurance sector will be in the form of lost revenues due to increased risk premiums for Turkey and decreased commissions from foreign re-insurers. In the case of the banking sector, the developments following the earthquake indicate the following risk factors:

?? Further deterioration of the non-performing loan portfolios of the commercial banks, which in turn would affect the capital adequacy of the system;
?? Additional distortionary impact of the Government's decision to provide substantial interest rate subsidies through the state banks;
?? Further worsening of the financial situation of state banks basically due to increased maturity mismatch, and liquidity squeeze created by the decision defer the existing loans up to 3 years;
?? Additional pressure on the interbank interest rates resulting from increased liquidity requirements, notably those of the state banks arising from the Government's request to provide new loans;
?? Increased risk of default.

Overall, the apparently limited exposure of the financial sector to the earthquake would indicate that these risk factors can be managed with the proper policy stance by the authorities. This situation demonstrates the critical importance of sustaining implementation of comprehensive financial sector reform in Turkey.

85. **Recommendations.** Although the Government's subsidized credit program is open to all damaged enterprises, it is very likely that small and micro enterprises would not have sufficient support. This is basically due to the broad definition of beneficiaries on one hand, and the limited funding facilities of the Government, on the other. As a result, since larger enterprises would have more capacity to gain access (collateral, connections, etc.) they are likely to have priority access to credit in practice. To avoid this, the team recommends to explicitly limit the beneficiaries to small and micro enterprises/persons who experienced damage to their workplace. In addition, the team strongly recommends that the Government consider reducing substantially the interest rate subsidy element of the program. This would allow access to credit to be increased without expanding the fiscal burden.

86. It is very important that the reconstruction efforts of the Government not be used to create opportunities for further financial assistance to the already delinquent borrowers of the state banks. It is recommended to exclude from the deferral/restructuring scheme the stock of loans which have been already classified as doubtful prior to the earthquake in order to avoid major moral hazard to the system.

[20] $1.5billion*60%*1.5%

D. The Social Dimension

87. **The Human Toll.** A complete count of the deceased, injured and unaccounted for individuals is yet to be compiled. To provide a rough idea of the human toll, in this section, statistics available as of 9 September 1999 were used for estimated death and injury rates. The table below gives the estimated death and injury rate per thousand inhabitants based on 1997 population registration data.

Table 10: Human Toll of The Earthquake

		1997 Pop.	Death Toll	Death Rate	Injuries	Injury Rate
				Per 1000		Per 1000
Istanbul	Avcilar	214,621	976	4.55	3,547	16.53
Kocaeli	Merkez+Gebze+Gölcük	979,171	8,648	8.83	9,211	9.41
Sakarya	All Districts	731,800	2,627	3.59	5,084	6.95
Sakarya	Merkez (central district)	356,129	2,627	7.38	5,084	14.28
Sakarya	Adapazari	183,265	2,627	14.33	5,084	27,74
Yalova	Yalova (central district) 1/	546,312	2,501	4.58	4,472	8.19
Yalova	All Districts 1/	983,496	2,501	2.54	4,472	4.55

Resident population multiplied by a factor of 6 to estimate summer population.

88. In the absence of district-specific death and injury data, the team has relied on assumptions based on where the earthquake's effect appears to have been concentrated. In Istanbul, the population of Avcilar, the worst hit area, was used. In Kocaeli, the populations of the three worst-hit districts, Merkez, Gebze and Gölcük were combined. In Sakarya, the team computed three sets of estimates, using in turn the populations of all the cities in the province, Merkez district only, and Adapazari proper. In Yalova, two sets of estimates were computed using six times the population of Yalova, and six times the population of all the cities in the province. The factor of six was used to take into account the population surge in the summer.

89. To put the numbers in perspective, in 1994 the crude death rate was 2.49 per thousand in Sakarya, and 2.25 per thousand in Kocaeli. Evidently the estimated death rates are substantial. Since earthquake related casualties were concentrated in dwellings, deaths and injuries are likely to have been non-selective of age and sex. By contrast the crude death rate is selective, because mortality is much higher for infants and the elderly, and somewhat higher for males of all ages than for females. This suggests that the earthquake exerted a heavy toll on a segment of the population that is not expected to be struck under normal circumstances – namely, school aged children and adults in their productive ages. Rescue experts indicate that, based on experience, up to a third of those pulled from underneath the rubble may subsequently die from internal injuries. The President of the Turkish Confederation of The Handicapped was quoted that 40 percent of the injured may be permanently handicapped suggesting that there will be additional human costs down the road.

90. **Estimated Job Losses in Kocaeli, Sakarya and Yalova.** Information on the economic characteristics of the earthquake regions of Kocaeli, Sakarya, and Yalova was combined with other information to generate estimates of job losses (Table 9) in the following fashion. Employment estimates for the three areas were based on the 1997 labor force estimate for total Turkish employment of 20.8 million. For Kocaeli,

the information from the economic characteristics section of the share the region accounted for in total Turkish employment (5.1 percent) was multiplied by the total employment figure to generate the estimate of Kocaeli employment, and similarly for Sakarya (1.2 percent). For Yalova, the ratio of total Turkish employment to the Turkish population (63.5 million) was multiplied by the Yalova permanent population of 164,000.

91. Information on self-employment in Kocaeli and Sakarya was given in the section on economic characteristics, amounting to 60,000 in Kocaeli and 70,000 in Sakarya. Self-employment in Yalova was estimated based on the Sakarya ratio of self-employed to total employed. Employment in small & medium enterprises (SME) was estimated based on the information that SME employment in Kocaeli was 35 percent of the workforce or 371,000. This share was assumed to be the same in Sakarya. For lack of other information and to reflect the touristic nature of employment in Yalova, it was assumed that SME employment there was 70 percent of the total. The biggest question is what share of self- and SME employment jobs will be lost permanently. For these initial estimates, it was assumed that 50 percent of such jobs would be lost permanently. These preliminary estimates will have to be verified on the basis of more detailed data.

Table 11: Job Loss Estimates

(in Thousands)	**Turkey**
Total Population	63,500
Total Employment	20,800

	EQ Zone	**Kocaeli**	**Sakarya**	**Yalova**
Employment	1,364	1,061	250	54
Estimated Job Loss	321	216	79	26
Percentage	23.5	20.4	31.6	48.1

92. **The Added Burden on Social Protection Programs.** This section of the report evaluates the impact of the earthquake on the Government's social protection system. The Government is expecting social insurance to cover some of the compensation for the loss of life and disability resulting from the Marmara earthquake. The pension law was amended to offer special provisions for the earthquake victims (see below) and was signed into law by the President on Sept. 7, 1999. Estimates for social insurance benefits provided in this section are not high, but those not covered by the social insurance system will have to rely on social assistance, which will increase costs. Additionally, the Government may opt for some type of one-time lump sum payments to the earthquake victims for death and permanent disability resulting from the quake (estimates provided below). This one-time lump sum compensation would be additional to any benefits provided from social insurance.

93. Overall, the rate of coverage of the employed by the three main social security systems (the ES for civil servants, the SSK for workers, and Bag-Kur for the self-employed) seem to be high according to most sources. The World Bank in its living standards assessment report states that almost three-quarters of the population is an insured member or an immediate relative of an insured person. The earthquake zone is a very well-developed region and one region, Kocaeli, provides 15 percent of the

value-added in manufacturing for the country. These areas are likely to have high rates of coverage of workers. For the purposes of estimating the social insurance costs, it is assumed that 85 percent of the deaths and disability among breadwinners resulting from the earthquake would be covered under the social insurance system because they occurred to an insured member. There are two components of costs to the social insurance system: the premium reduction and the actual benefits which will be paid out.

94. The earthquake amendment to the new pension law provides for more generous eligibility among those enrolled (estimated as 85 percent of the workforce in the earthquake zone) by reducing the period of mandatory contributions for eligibility for survivor and disability benefits. Under the previous system for survivor benefits, ES system civil servants had to have 10 years of paid contributions for eligibility, SSK system workers had to have 5 years and Bag-Kur self-employed 3 years. For disability pensions, ES required 10 years, SSK 5 years, and Bag-Kur 5 years. Now, the earthquake amendment to the new law reduces the period of required employee contributions to only one year, with the social insurance funds or the Treasury making up the required premiums to fit the system objectives. For example, an earthquake disabled person enrolled in Bag-Kur would have to pay only 1 year of premiums while the Treasury made up the missing four years of payment for eligibility for the disability benefit. So, coverage of premia is one component of the victim compensation cost to the Treasury. However, the Government is at a very preliminary stage of calculating the cost to the Treasury, which will depend on the length of service of the victims which in turn will require much more time for this information to be collected. Therefore, an estimate for this component was not made.

95. The second component is the actual payments made for loss of life and disability. The ES and SSK provide for survivor benefits consisting of a one-time lump sum payment upon death and a monthly benefit thereafter for the immediate family of the deceased. Bag-Kur does not provide a lump-sum payment, only a monthly benefit. According to the law, the lump-sum benefits are calculated as one month of most recent salary times the number of full years that premiums were paid by the enrolled. The monthly survivor benefits are a percentage of the old-age pension that would have been paid to the deceased. The old-age pension itself is based on the number of days that premiums were paid and a coefficient for wages. Some of the earthquake victims were young adults, so they would not have paid much into the system, and their monthly survivor benefit would be at or close to the minimum old-age pension. We will assume that the average survivor monthly benefit would be 46 million TL, based on some preliminary Treasury calculations about the size of survivor benefits in SSK.

96. At this early stage after the earthquake, there is no information on the age-gender distribution of the deaths and injuries, much less on whether a given victim was enrolled in one of the social insurance plans and the length of premiums paid. The Government is still in the process of identifying the dead and injured. As a result of the lack of information, many assumptions must be made to come to an estimate of the cost of compensation for loss of life and disability.

97. Survivor benefits are estimated as follows. First, the age-structure for the general Turkish population is assumed to hold true for the 15,370 deaths that occurred

(data as of September 9, 1999). The Turkish population is 37 percent children under 18, 52 percent aged 18 to 54, and the remaining 11 percent are the elderly 55 and over. This produces an assumption of 8,024 adult deaths. Of these, half are expected to be women who have a much lower labor force participation than men, so it was assumed that 60 percent of adult deaths would have been breadwinners (mostly males), yielding an estimate of 4,815 breadwinner deaths. Of these, 85 percent are expected to be covered under social insurance, for a total of 4,092 survivor benefits to be paid out. These benefits include lump-sum payments for ES and SSK enrolled, and monthly benefits (which were assumed to equal 46 million TL). For the lump sum calculation, we assume that ES and SSK workers had an average length of premiums paid of 12 years, so this was multiplied by the gross average wage to get an estimate of the lump sum payments for ES and SSK.[21] No lump-sum payments were calculated for Bag-Kur, although one policy option for the Government would certainly be to offer a lump-sum compensation to Bag-Kur as well as to those who are not insured.

98. Disability benefits are estimated as follows. First, it was assumed that 40 percent of the injured (23,954 as of September 9, 1999) would be permanently disabled. There is simply no other information about the extent of disability available at this early juncture. Next, it was assumed that 60 percent of the permanently disabled would have been breadwinners and that 85 percent of these were covered by the social insurance system, producing an estimate of 4,887 eligible for disability payments. Based on some partial information from the Treasury and ES, SSK, and Bag-Kur, the average disability pension was estimated at the level of TL 81 million per month, close to the level of the minimum old-age pension.

99. **Social Assistance.** The Government must consider policy options for those earthquake victims who are not covered by the social insurance system.[22] The major groups are: children, uncovered adults (mostly women) and the elderly over the age of 55. The Government has two basic options for social assistance in the aftermath of the earthquake. The Government can offer a universal benefit to all of those who are not covered by social insurance. Alternatively, the Government could try to target the benefit to the most needy. There are pros and cons to both approaches. A universal benefit is administratively simple and can quickly be initiated, and would require only the most basic of documents (death or injury certificate). The problem with such a benefit offered to all is that there may be some victims of the earthquake who were not insured by Government social assistance but are not especially needy. Also, a flat benefit paid to all uninsured would be more expensive than a targeted benefit in terms of amounts paid out per recepient, but has a much lower administrative cost to implement.

100. The advantage of a targeted benefit is that in best practice only the needy would benefit and the costs would be less. However, targeting comes at a significant administrative cost and might be difficult to implement under the emergency earthquake conditions. Furthermore, social assistance is relatively underdeveloped in Turkey and the Government's direct involvement is limited to the General

[21] Among those insured, the breakdown is ES 20 percent, SSK 50 percent, and Bag-Kur 30 percent, so lump-sum payments were only calculated for 70 percent of those covered by social insurance.

[22] On September 10, 1999, the Government announced it would pay a one-year rent subsidy of TL 100 million per month, per household at an estimated cost of US$288 million.

Protectorate for Children, Disabled, and Elderly (SHÇEK, see below), so targeting may be too much of an administrative burden especially under the emergency conditions.

101. **Assessing Vulnerability.** Although all of the earthquake victims are facing traumatic losses, including the loss of loved ones, injuries and disabilities, and the loss of homes and businesses, certain groups are more vulnerable than others. Logically, those who were poor and vulnerable before the earthquake will be the least likely to have financial assets after the earthquake. The poor in Turkey, who rely on their labor as their primary asset, will be especially vulnerable to job losses in the self-employed and SME sectors. In particular, those who are not enrolled in one of the three Government social insurance programs are particularly vulnerable to lost breadwinners and disability. During visits to tent cities in Adapazari, victims identified uncertainty about their future as their heaviest psychological burden.

102. If the Government wanted to explore targeting, it has a data base available that could be used to calculate a scoring system for assessing need. This data base is the 1994 Household Income and Consumption Expenditure Survey of the State Institute of Statistics. Using this information, it would be possible to establish the correlation between household consumption and indicators (predictors) of consumption such as household size and composition, household location, housing characteristics, education and employment of the household head and consumer durables. A scoring formula could be estimated that could be used in local social assistance offices or SHÇEK social workers to assess vulnerability.

103. **Social Assistance Options.** This section presents estimates for benefits paid to all earthquake victims, including those not covered by social insurance. In the 1992 Erzincar earthquake, the Government gave one-time payments for loss of life (1992 TL 50 million) and disability (1992 TL 10-30 million depending on degree of disability). The Government may decide to offer a similar scheme with amounts approximately adjusted for inflation to equal TL 500 million for loss of life and 200 million for (average) disability. The State Planning Organization (SPO) was working with one-time lump-sum compensation figures of US$1,537 (TL 676 million) for deaths and US$750 (TL 334 million) for injuries. Multiplying by the number of deaths and injuries generated an estimate of US$42 million, which corresponds roughly to the SPO overall estimate of US$50 million.

104. However, it does not seem likely that the Government would pay for every injury incurred, but rather for disability only. As noted above, only 40 percent of the injuries are expected to result in permanent disability. Lump-sum payments of US$750 per disabled would amount to a total of US$7.2 million. The lump-sum payment of US$1,573 for death would amount to a total of US$23.3 million, and the combined total one-time lump-sum compensation would amount to US$30.5 million dollars or 14.4 trillion TL (Table12).

Table 12: Estimated Compensation for Death and Disability

(In trillion TL)	**1999**	**2000**
Social Insurance		
Survivor Benefits	10.1	1.8
o/w lump -sum	9.5	0.0
o/w monthly	0.6	1.8
Disability Benefits	1.6	4.8
Social Assistance		
Lump Sum Option (500 or 200 million TL)	6.6	0.0
Lump Sum Option (1,537 or 750 US $)	14.4	0.0

105. **Emergency Child Protective Services.** SHÇEK is the Government agency responsible for 18,000 children at risk in Turkey. It runs a system of orphanages and boarding schools, as well as homes for the elderly and training centers. SHÇEK staff were quickly mobilized to help following the earthquake, and there are currently about 100 staff volunteers in the 22 largest tent cities in the earthquake zone where they are helping to establish kindergarterns and play centers for children, as well as food for vulnerable children.[23] SHÇEK estimated that approximately 1000 children will be orphaned or at special risk due to the earthquake.

106. SHÇEK has also recommended to the Government that a system of community centers be set up in the camps to facilitate social integration and to involve the newly homeless population in activities. At this early stage, life in tent cities is very difficult and there is little for the inhabitants to do except to worry about the future and mourn their losses. Community centers would help to solve this need. Additionally, there were several SHÇEK institutions (3 orphanages and 1 elderly home) which were destroyed and need to be rebuilt. A rough estimate of the cost of constructing 3 orphanages, 1 elderly home, 10 community centers, and 2 training centers is 5.1 trillion TL.

[23] SHÇEK staff costs (salary and other costs, including transportation) are estimated as TL billion 320 for 1999 and 960 for 2000.

Section III: Preliminary Damage Assessment

A. Introduction

107. In response to the earthquake, a Bank team was dispatched within the week to work with the Government to assess the extent of the damage, to prepare reallocation of funds under existing Bank projects to meet emergency recovery needs, and to identify new investments to assist with disaster recovery. In addition, the Government requested that the Bank organize a comprehensive recovery plan to guide the reconstruction effort.

108. The main objectives of the Bank mission were: (i) to conduct a preliminary assessment of the magnitude of the disaster, (ii) to work with the relevant authorities to help improve information and communications to support an ongoing and fuller damage assessment to take place, (iii) to begin to identify the early reconstruction priorities and most urgent interventions, and to begin to identify appropriate partners for support and cooperation (governments, NGOs, private sector, multilateral agencies), and (iv) to consult with the Government concerning the development of a better emergency response strategy for the future. The figures presented in this preliminary damage assessment are a combination of the most recent figures provided by the Government and the assessments of the Bank team.

109. This assessment covers the following sectors:

- housing
- education
- health
- municipal infrastructure and environmental damage
- transportation
- telecommunications
- energy

Table 13: Summary of Initial Assessments

Sector	Reported/Assessed damage	Estimated replacement cost of damages (US$ 000)	Notes
Housing	35,074 housing units completely destroyed or needing replacement 37,803 medium damage 42,805 light damage Only 29% of buildings suffered no damage at all.	1,100,000–1,600,000	Government figures as of 9/9/99 Does not include relocation of cities which could add significantly to the costs.
Education	43 schools were destroyed and 381 schools damaged. There is a need to provide textbooks, school uniforms, trauma counseling and other basic support to displaced teachers and students	100,000	
Health	11 hospitals experienced damages; 28 health centers were totally destroyed while 20 others were heavily damaged. Several pharmacies have also been destroyed	37,000	Does not include contributions from bilaterals, intl.org and NGOs.

Infrastructure	Includes water supply, wastewater treatment, public buildings (except schools, roads and medical facilities)	70,000	Assumes 50% of infrastructure destroyed or heavily damaged
Environment	Effects of sewerage, dumping of rubble, chemicals	No figures available	
Roads, bridges and highways	Includes motorways, main highways and municipal roads No damage to forest roads	78,000	
Railways + wagon factory	Heavy losses on 60 km of track Wagon factory destroyed (also responsible for maintenance)	72,000	In Adapazari
Ports	Derince port facilities partially destroyed (2 cranes and 2 wharves)	12,000	
Telecomms	Buildings, national and regional infrastructure	38,400	Based on Turkish Telecomm figures
Electricity	Power generation, transmission and distribution	82,000	
Oil and Gas	Includes Tupras refinery, environmental damage, national and municipal gas distribution systems	387,000	

B. Assessment by Sector

110. **Housing.** Information concerning the state of the housing stock following the earthquake is being updated continuously. As more becomes available through the regional and local governments, the General Directorate of Disasters (GDDA) and the Ministry of Public Works. The estimate of housing reconstruction needs is based on the September 9 figure on housing damage provided by the General Directorate of Disaster (see Table 6). Over time, and based on the experience of the Adana earthquake, we anticipate that the damage assessment figures will continue to be revised downwards.

111. **Municipal Infrastructure.** The preliminary estimate of $70m in damaged municipal infrastructure is based on an assumption of 50 percent destruction of public buildings (roads, schools and hospitals are estimated separately), water supply, sewerage, gas, and power distribution in Adapazari, Izmit and Yalova provinces. Relocation of entire cities or parts thereof would add very significantly to the cost of municipal infrastructure.

112. **Health Sector.** While the overall physical damage to hospitals and health centers was modest compared with the overall destruction of the earthquake, the impact on health services is significant. A limited number of health structures in the areas were actually destroyed, others have been damaged to varying degrees. Non-emergency care has been temporarily suspended in various facilities. The immediate health need following the earthquake was for emergency treatment of those suffering a range of injuries, particularly fractures and crush injuries. Many of the heath facilities affected by the earthquake were not equipped to handle either the numbers or the case management complexity of many of the injured. The most seriously injured cases were evacuated to hospitals in Istanbul, which was much less affected, and Ankara. The initial response phase has now largely passed although an aftershock on September 1 resulted in a spate of leg fractures caused through people jumping from buildings. Overall, the patient loads at hospital to which people were referred after the earthquake are now diminishing although there is still a core of the most seriously injured. Their care and rehabilitation--especially those who had limbs amputated--will clearly take some time. The Ministry of Health (MOH) reports that overall 100 temporary health centers were established immediately after the

earthquake to provide first aid and other urgent curative needs. Substantial number of health personnel arrived in the region from abroad. Some are now preparing to leave since daily patient visits to the foreign managed health services facilities are dropping. The Ministry of Health has mobilized 2,600 health staff in various categories to serve the emergency area, many on a rotating basis. Once the external assistance leaves, an added burden will likely remain for the Turkish health staff, especially while people are living in tents.

113. The population is experiencing psychological trauma from the earthquake and subsequent after shocks which continue to impact several areas. In all places visited, the health personnel and people themselves reported a number of people suffering from post-traumatic symptoms. Health personnel and patients in several locations were afraid to enter health facilities and in several cases health services were operating from tents.

114. Of the nine provinces involved, five sustained substantial damage to hospitals and health centers. Of the 47 public and private hospitals, 12 (26 percent) were damaged with the degree of damages ranging from minor to major. All have had to change the role and scope of service delivery due to changes in health care needs driven by the disaster and facility limitations caused by damage or restricted access to the site. These hospitals account for 45 percent of the available beds, provide approximately 50 percent of all inpatient and outpatient services, 50 percent of all deliveries, including 3 of the 4 blood transfusion centers, provide 62 percent of haemodialysis services and account for some 45 percent of all patient bed days (1997 data). Combined with the initial increase in patient acuity from trauma, the subsequent medical support to people living in temporary accommodation, the longer term rehabilitation of traumatic injury and the ongoing psycho-social dimensions of the disaster, the effect on health services has been major. This will be further compounded by the upheaval created by temporary patient and hospital accommodation, site demolition and construction. Staff are also enduring the same tragedy as their patients including death of relatives, friends and colleagues. (Fifty five health staff - 3 percent of total health personnel in the area - died as a result of the earthquake). High acuity patients have been transferred for treatment at major sites in Ankara and Istanbul and extra emergency and primary health care teams have been established in areas of high need.

115. Prior to the earthquake there were 523 private pharmacies in the area. Out of this number, no information is available on 313 pharmacies, 38 have been destroyed and 124 damaged, leaving 129 pharmacies seemingly intact. In damaged hospitals, pharmacy tents have been placed in hospital gardens. Both functioning private pharmacies and hospital pharmacies are currently open 24 hours a day and patients are allowed to obtain their prescription medicines for free. The pharmacies appear to be well stocked and have enough capacity to serve the population, the majority of which has access to the dispensing points. According to the Ministry of Health and other sources, there is no immediate shortage of drugs since MOH has transferred drugs to the region from four warehouses located at Istanbul, Ankara, Izmir and Bursa. The demand for pharmaceuticals in the affected provinces has now generally returned to pre-disaster levels. MOH estimates the total value of the pharmaceuticals currently in warehouses at US$1.5 million, excluding the donated medicines.

116. **Education.** The earthquake destroyed or damaged many primary and secondary schools in five provinces and fifteen subprovinces of Western Turkey. A total of 22 basic education schools (grades 1 through 8) and 21 secondary schools (grades 9 through 12) were destroyed or irreparably damaged and too dangerous to restore to use. Another 267 basic education schools and 114 secondary schools were damaged and require rehabilitation.

117. All of the earthquake-damaged schools were intensively used prior to the disaster. All but five basic education schools were used on a double-shift basis, and class sizes in general were large. Unless there is a very large number of departures from the earthquake region, the destroyed and irreparably damaged schools need to be replaced with new seismically safe schools, and the other damaged schools need to be repaired. Teams of engineers, architects, and Ministry of Education provincial authorities assessed the damages in each basic education school and secondary school in each of the earthquake area. The estimated cost of building replacements for destroyed and irreparably damaged schools is US$28.0 million. The estimated cost of repairing damaged but functional schools is US$11.4 million – a total of US$39.4 million. An estimated 90 percent of the cost of this activity is for civil works and 10 percent for furniture and equipment for newly constructed and rehabilitated schools.

118. A total of 547,000 students were enrolled in the destroyed and damaged schools, and about 21,000 teachers taught in those schools. There were about 25,000 students and 590 teachers in the destroyed and irreparably damaged basic education schools, and about 11,000 students and 550 teachers in the destroyed and irreparably damaged secondary schools. The Ministry is in the process of reassigning these 37,000 students and teachers from destroyed and irreparably damaged schools to other schools in the vicinity. The reconstruction of destroyed and irreparably damaged schools is expected to take at least one complete school year. During this period, the Ministry plans to bus the majority of the temporarily reassigned students to their temporary schools. There are also likely to be conditions of severe crowding in the schools which receive the students from the earthquake area – either through reassignment to other schools or through spontaneous relocation – thus requiring additional teachers and other resources. Relocation of families from the earthquake area could also necessitate the reopening of rural schools which had recently been closed due to dwindling enrollments.

119. The Ministry estimates that about 114,000 school-aged children are homeless as a result of the earthquake. Some of these will have left the earthquake zone together with their families to stay with relatives elsewhere in Turkey. In other cases, some children will need assistance for the coming school year because their fathers have lost their jobs, or because of other serious disruptions in their household situation resulting from the earthquake. The Ministry plans to provide support for approximately 100,000 children expected to remain in the area, including textbooks and other educational materials, school uniforms and basic clothing, and nutritional supplements to about 100,000 preschool students, basic education students, and secondary school students. About 1,500 teachers are homeless as a result of the earthquake. The few teachers without spouse and children will be temporarily housed in existing hotels for teachers (*öğretmen evi*) or in-service training centers with boarding facilities. But teachers with children and spouse will be temporarily housed

in other premises such as vacant primary schools in the vicinity of the schools where they will be teaching.

120. **Environmental Damage.** Environmental impacts associated with the Marmara earthquake include impacts of broken sewerage systems, spillage of oil from the Tupras refinery (dealt with under Oil and Gas), and pollution of surface waters including the Marmara Sea. No detailed information has been provided about the status of the *sewerage systems* in affected cities yet. However, it must be anticipated that the systems have been fractured in many locations and therefore could pose a serious risk for pollution of ground and surface water, including drinking water supplies. Since the piping for sewerage and potable water are normally located in the same trench, contamination of potable water can happen easily.

121. In Adapazari, the *municipal waste water* is currently diverted into the River Sakarya, while the water supply is provided from Lake Sapanca. The water supply is out by nearly 90 percent, and the risk for contamination of the potable water through contamination between the two piping systems cannot be excluded, though there are no reports of incidents so far. In Yalova, in contrast, coverage is estimated at 85 percent, so the damage to infrastructure is clearly not nearly as severe. The *discharge of untreated waste water* creates a large load of organic substances in the receiving water bodies, which for Kocaeli and Yalova is the Marmara Sea, and for Sakarya is the Black Sea. The pollution will cause a temporary decrease in the oxygen content in the water and affect the aquatic life severely.

122. During the first days after the earthquake, *debris and rubble* were disposed of directly into the available surface waters: River Sakarya for Adapazari, and Marmara Sea for Izmit, Golcuk and Yalova. The rubble is mainly from collapsed and damaged apartment buildings and is basically construction material mixed with personal belongings such as cloths, furniture, household equipment, white wares, and food. In addition, the rubble contains products and inventories from small shops located in the damaged buildings. Hence it will also contain small amounts of chemicals, paints, solvents. However, this should not create any significant additional damage to the water bodies. From an environmental perspective the disposal from damaged small and medium scale industries is of greater concern as they might be using significant amounts of chemicals which could also be hazardous for the teams and contractors engaged in the clean-up activities. The Government plans to identify hazardous wastes and dispose of them properly during the demolition process. The *leakage of chemicals* at the Aksa plant was stopped within a couple of days. The soil around the tanks must be considered as polluted and will require special treatment.

123. **Transportation: Roads, Railways and Ports.** The earthquake caused damage to large parts of the *streets* in the heavily hit communities, especially in Adapazari, damage which will be further increased as large earthmoving equipment is brought in to clear the debris. It also caused substantial damage to many structures of the *Istanbul - Ankara motorway* on a section of some 49 km and damage to some of the structures on 410 km of the state *and provincial highway/road network* at limited locations. Little or no damage is expected to have been caused to the forest roads in the region. The Ministry of Forestry is, however, assessing the situation on site and has so far reported that more than 90 percent of the roads are intact.

124. Substantial damage was found to the *railway track and installations* on one 61 km and one 29 km long section of the double track railway between the Istanbul region and Adapazari and on a section of the southbound double track from Beskopru train stop towards Bilecik.

125. The TCCD affiliated Tuvasas *train wagon manufacturing/repair facility* in Adapazari sustained severe damages to structures and equipment and will be unable to operate for a substantial length of time. The annual manufacturing capacity of Tuvasas wagon factory was reported to have been some 100 - 200 new wagons, but only part of the capacity has been used lately by TCCD due to budget constraints. The wagon factory provides employment for some 1,200 workers and 200 office employees. A large part of the components used at the factory were also being subcontracted and supplied by local private workshops. The TCCD operated *port* facility in Derince, which handles some 2 million tons of cargo annually, suffered heavy damage to docks, cranes and warehouses, including cracks and severe subsidence. Neither the Derince port facilities, the Tuvasas factory facilities nor any of the products on the production line were insured.

Table 14: Costs for Damage to Transportation Infrastructure

(US$ 000)	Estimated Cost	Notes
Motorway	32,000	Surface, bridges, toll booths
State Highways	16,000	Surface and bridges
Municipal roads	30,000	Estimate
Railway	14,000	Track and installations
Rail factory and repair facility	58,000	Includes loss of almost completed rolling stock and building
Port (Derince only)	12,000	Piers, equipment etc
Total	**162,000**	

126. **Telecommunications.** The failure of the telecommunications infrastructure was a major factor in the massive problems in rescue and recovery in the early days after the earthquake. It suffered major damage that might have not caused the loss of the entire systems if prompt actions could have been taken. However, with the severe overloads following the news of the quake, the system collapsed. The *national telecommunications system* suffered one critical failure: the main fiber optic link between Istanbul and Ankara was cut where it crossed the fault just east of Izmit. This 155-MHz SONET connection carries the bulk of the traffic between these two cities and provides one of Turkey's gateways to the rest of the world. The link was repaired within 24 hours.

127. The *regional telecommunications systems* experienced considerable damage. A large portion of this was due to the destruction and damage to facilities and the resulting damage to equipment contained within. For instance, many batteries, which assure back up power supply, were broken and need to be replaced. Some trunk connections within the region were also damaged due to earth movement or falling structures. The local loops (connections between the switch and the user) were damaged to a greater extent by earth movement or falling buildings. It is expected that the removal of rubble and the general reconstruction will further damage or destroy these connections. It is highly likely that a large portion of the cabling in the

region will have to be replaced. The destroyed buildings will have to be replaced and damaged buildings repaired or replaced. There are a number of older switches (Cross Bar) in the area which were thrown off their foundations. They will probably have suffered some damage. They are beyond their useful life and should be replaced with newer digital switches. This also lightens the load placed on the buildings and may help in building repair.

128. Turkish Telecomm has carried out a preliminary damage assessment, which has been provided to the Bank, but this information has not yet been verified. Turkish Telecom's estimate of damages is summarized as follows.

Table 15: Estimates for Costs of Damages to Telecommunications Sector (from Turkish Telecom)

(US$ 000)		
Location		**Estimated Costs**
Station		3,688
Transmission		962
Network		22,000
Cable TV System		4,800
Office Equipment		910
Buildings		2,321
		Sub-Total: 34,881
Stations that are damaged or may be found to be damaged as of August 28, 1999 are:		
Center	**Station Area**	**Estimated Cost of Damages**
Adapazari- Merkez	14,000	1,680
Bolu- Golyaka	3,000	27
Bolu-Hacisuleymanli	600	54
Izmit	1,000	90
Duzce	12,000	1,440
		Sub Total : 3,534
		TOTAL : 38,415

129. **Electric Power Sector.** Before the earthquake the region accounted for about one quarter of electricity demand in Turkey and daily consumption was reduced by about 8 percent of the total consumption in the country before the earthquake. The main power generation facilities in the region were not damaged. The main damage occurred in the power transmission and distribution facilities. Repair of the power transmission facilities is largely completed and will be finished by mid September, but in power distribution facilities will take longer and will depend on the overall progress of reconstruction of the region.

130. The electric *power* supply *system* in the area affected by the earthquake consists of the following facilities:

?? Electric power generation plants owned by TEAS[24], independent power plants (IPPs) and industrial power plants;
?? High voltage (HV) electric power transmission system owned by TEAS; and

[24] TEAS and TEDAS are stated owned companies, which were established after the split of Turkish Electric Power Company (TEK) in 1994.

?? Medium voltage (MV) and low voltage (LV) electric power distribution facilities owned by TEDAS and affiliated distribution companies.

131. Electric *power generation system* in the area affected by the earthquake is spread over six provinces (Sakarya, Kocaeli, Bolu, Bursa, Eskisehir and Istanbul). The system consists of: (i) four thermal power plants with the total installed capacity of 3623 MW owned by TEAS, (ii) five hydropower plants with the total installed capacity of 280 MW owned by TEAS, (iii) three IPPs with the total installed capacity of 452 MW, and (iv) 39 industrial power plants with the total installed capacity of 965 MW.

132. No damage was reported in power plants owned by TEAS and IPPs. It appears that the available capacity of these plants was not affected by the earthquake. The condition of power plants owned by industrial producers is not known as of August 30, 1999, but it is most likely that these generating plants suffered a similar degree of damage as the corresponding industrial facilities. The power transmission facilities affected by the earthquake are located in eight provinces (Sakarya, Kocaeli, Bolu, Yalova, Bursa, Eskisehir, Bilecik and Istanbul).

133. The other damages which occurred in *transmission substations* include breakage of transformer bushings, breakage of surge arresters, damage of disconnectors, movement of transformers and damages to substation buildings. Most of these damages are under repair or have been isolated so do not pose a serious treat to the substation operation.

134. The *power transmission network* in the area affected by the earthquake comprises 1766 km of 380 kV lines and 2015 km of 154 kV lines. No damage has been reported to the transmission lines which span over 2361 towers at 380 kV level and 3362 towers at 154 kV level. A detailed analysis of tower structures planned by TEAS should provide more information about possible weak spots caused by the earthquake.

135. The distribution of electricity in the earthquake area is conducted by five power distribution companies: SEDAS (Sakarya Elektrik Dagitim A.S. covers Sakarya and Bolu provinces), KEDAS (Korfez Elektrik Dagitim A.S. covers Kocaeli province), YEDM (Yalova Elektrik Dagitim Muessesesi), BEDAS (Bogazici Elektrik Dagitim A.S. covers European part of Istanbul province) and AKTAS (private distribution company which serves Anatolian part of Istanbul province). Distribution companies in other provinces affected by the earthquake (Bursa, Eskisehir, Zonguldak and Tekirdag), as well as AKTAS, did not report significant damages to the power distribution facilities.

136. A preliminary assessment of damage caused by the earthquake to the power distribution facilities in SEDAS, KEDAS, YEDM and BEDAS is shown below:

Table 16: Summary of Damages of Power Distribution Facilities

	Status of Power Distribution Facilities				Equipment
Type of Equipment	**Total Before**	**Destroyed**	**Degree of Damage**		**Replaced**
	Earthquake	**Earthquake**	**Large**	**Small**	**as of 8/30/1999**
1. Distribution Transformers					
Urban Areas					
Number of MV/MV Trafos	212	3	11	9	13
Installed Capacity MVA	2962	25	105	20	34
Number of MV/LV Trafos	11681	444	375	821	257
Installed Capacity MVA	9379	120	219	2170	142
Rural Areas MV/LV					
Number of Trafos	4979	145	77	177	61
Installed Capacity MVA	851	23	13	22	26
2. MV Distribution Lines					
Length of Underground Cables (km)	2901	122	715	179	0
Overhead Lines					
Length (km)	14779	490	220	82	0
Number of Towers	137643	3435	600	1650	1050
3. LV Distribution Lines					
Length of Underground Cables (km)	6003	430	875	1766	0
Overhead Lines					
Length (km)	141686	1075	490	2660	80
Number of Towers	524532	7949	250	18150	3000
4. Trucks	364	7	6	58	0

137. The heaviest damage occurred in the *low voltage (LV) distribution network* which supplies individual consumers at 0.4 kV level. About 600 medium voltage to low voltage (MV/LV) distribution transformers were destroyed and about 450 MV/LV transformers sustained large damages which can not be repaired at the site. Also, about 1000 MV/LV distribution transformers suffered smaller damages that can be repaired at the site.

138. The first priority in repairing distribution facilities in the earthquake area is the restoration of electricity supply to the household consumers and construction of temporary distribution network in "tent villages" which shelter most of the population that lost their homes. The industrial consumption in the hard hit areas, such as Izmit and Adapazari, remains very low[25] due to several factors including the loss of lives of workers and damages to the production facilities.

139. A preliminary *estimate of cost in the electric power sector* due to the earthquake is given in the table below. The cost consists of two main components: (i) cost of damaged power facilities which have to be replaced or repaired in a short term to provide normal electricity supply to the areas affected by the earthquake, and (ii) cost of adjustments of regional power facilities to meet new standards of power supply in the longer term.

[25] The daily peak load in Izmit is currently about one third of the peak load before the earthquake.

Table 17: Cost Estimates for Power Sector

Item	Cost of Emergency Program (US$ million)	Cost of Longer-Term Adjustments (US$ million)	Total Cost (US$ million)
Power Generation	0.0	0.0	0.0
Power Transmission	1.5	10.5	12.0
Power Distribution	21.0	49.0	70.0
TOTAL	22.5	59.5	82.0

Fiscal impact estimate (Table 5, Part 1) includes US$25.5 of longer-term costs falling in 2000.

140. The estimated cost of damages (about US$22.5 million) is based on the assessment of physical damages to the power facilities in the region. The estimated cost of longer term adjustments (about US$59.5 million) is subject to change depending on the policy decisions by the Government on the reconstruction of the region and findings of technical and economic studies which are required to determine new standards and policies in the power supply sector.

141. **Oil and Gas.** *Tüpras* refinery is, with 10.5 MTA production, the largest refinery in Turkey. It was initially constructed in the 1960's and upgraded in the 70's and again in the 80's with hydro-cracking. The refinery was working at about 90 percent of its design capacity and can be considered a modern and efficient plant. The earthquake caused significant structural damages to the refinery itself and associated tank-farm with crude oil and product jetties. The consequent fire in the refinery and tank-farm caused extensive additional damage.

142. Several large diameter crude oil and product storage tanks have substantial structural damage, seven nafta tanks have burned down completely and surrounding tanks have been damaged by excessive radiated heat. The 150 meter high chimney collapsed during the quake and fell partly on the heaters and also on to the new refinery unit, causing a fire which destroyed most of the process unit for the most recently constructed part of the refinery.

143. It is difficult to give a good estimate of total damage, but it appears that the cost of complete re-construction will exceed US$350 million. The refinery will be completely out of operation for about 3 months. After that the refinery could operate at about 50 percent of its capacity, using hydro-skimming only. The repairs repaired to bring the refinery back to 100 percent of its previous capacity will take at least 12 to 15 months.

144. The refinery is insured to cover the cost of the damage. However, the existing safety system, especially fire fighting systems were substandard and will require substantial upgrading. The required investments for the needed safety upgrades are estimated to about US$20 to 25 million. In addition it can be expected that the cost of insurance to cover future natural disasters for this plant will most likely double if not triple.

145. *Environmental Pollution.* Due to the fire in the refinery and tank-farm it is estimated that about 1000 tons of oily liquids were discharged into the Sea of Marmara. A specialized oil spill response team from Great Britain recovered approximately 700 tons of oily liquids from the surface of the Sea of Marmara. The

rest of the pollutants have sunk to the sea bed or been washed onto the shore. The contamination of the shoreline is light to moderate; about 30 to 40 km of shoreline are affected. The cost of the cleanup for the shoreline is estimated to cost about 3 to 5 million US$ and will take 6 to 9 months, depending on the number of teams which can be deployed in parallel for clean-up operation.

146. *Botas Petroleum Pipeline Corporation,* a State Owned Enterprise (SOE), covering all oil and gas imports, *transit and regional distribution* in Turkey, reported no damage on any of their installations. The main high pressure gas transmission pipeline from Russia via Ukraine, Bulgaria and Romania, which crosses the major North Anatolian Fault south of Izmit, was apparently not affected by the earthquake. However, it should be noted that the gas line has an off-shore crossing through the Sea of Marmara about 30 km west of Izmit. A smaller fault is running though the Sea of Marmara and has caused significant changes to the original sea-bed topography. Reports from a Turkish research vessel indicate that on some areas the sea-bed has been lowered over 25 meters. Changes in the sea-bed level, where the off-shore pipe is laid, could lead to excessive mechanical stress in the pipeline and compromise the integrity of the line. Botas will launch an investigation to check the condition of the off-shore pipeline in the next couple of weeks. An investigation will most likely be an external visual inspection using divers with cameras followed by an internal inspection using intelligent tools. The cost for a thorough inspection is estimated to be between 0.5 and 1.0 million US$. *Botas* has insurance to cover the cost of damages if any are found.

147. Pipeline connections to large consumers of *natural gas* in the affected area, such as power plants, were not affected by the earthquake. However, most of Botas installations are in earthquake zones. The extensive damage in Tüpras refinery due to the earthquake and subsequent fire, indicated that the existing safety measures and emergency response planning may be inadequate to cover the potential worst case scenarios.

148. Botas installations are of key importance for the energy sector and a review of the existing safety measures and emergency response planning to incorporate the lessons learnt from disaster in the Tüpras refinery is considered necessary. The estimated cost for risk assessment studies and subsequent revised emergency response plans, for the individual installations, will be about US$500,000 to and take about 6 to 9 months.

149. Of all affected cities, only Izmit had a *municipal gas distribution system* which is operated by Izgaz. The gas distribution system is fairly new, constructed between 1995 to 1997. Izgaz serves about 26,000 customers (households and SME's) and two large industries (Mannesmann pipe manufacturer and a fertilizer plant). Shortly after the earthquake, Botas shut down the two city gate valves for safety reasons. Izgaz closed all isolation valves in their gas distribution system, vented most of the house connections, but kept the main distribution system under pressure to determine if and where damage to pipe network occurred. After preliminary inspection no damage of the main distribution network was found. Izgaz has about 21,000 service boxes (pressure regulator, metering unit and other instrumentation). The services boxes are mostly installed on the outside of the houses and about 15 percent of all boxes were damaged due to collapsing houses. On August 27th Botas re-opened the city gate

valve for Izgaz to allow re-pressuring of the vented areas and partial supply of gas where the system has been completely checked. The cost of one service box is roughly US$1,000, the total cost for replacement of all the damaged service boxes is about US$3 MM, the repair to the damaged house connections is estimated to be about US$2 MM. The repair schedule of the damaged parts is dependent on the re-construction of the damaged housing which were connected to the gas distribution system. Izgaz has insurance to cover the cost of the damages. Below are estimated costs of damage to the oil and gas sector resulting from the earthquake:

Table 18: Cost estimates for the Damage to the Oil and Gas Sector

	Insured Damage *	**Uninsured Damage ****	**Follow-on Cost *****	**Total**
1. Tüpras Refinery	> $350m		$20m to $25m	**> $375m**
2. Pollution		$5m		**$5m**
3. Oil & Gas Pipelines/Terminals			$2m	**$2m**
4. Municipal Distribution	$5m			**$5m**
Total	**> $355m**	**up to $5m**	**up to $27m**	**> $387m**

* Assuming the insurance will cover the cost of all damage to the respective industrial plant or system.

** Clean-up cost for environmental damage will most likely not be covered by the insurance.

*** Follow-on cost is meant for studies to improve safety standards and carry out risk assessment studies. These costs are investments that the individual operators have to finance on their own.

Annex

Table 1: Assumptions Used in Estimates of GNP, 1999-2000

	Kocaeli	Sakarya	Bolu	Yalova	Total Affected Region
Share of GDP (%	4.8	1.1	0.9	0.4	7.2
Assumption on disruptions to industry and services component of GDP in most severely affected regions					
1999 Q3	50%	50%	50%	50%	4%
1999 Q4	30%	30%	30%	30%	2%
2000 Q1	15%	15%	15%	15%	1%
2000 Q2	8%	8%	8%	8%	1%
The above disruptions are, however, expected to be partially (1/3) offset by increased economic activity in other areas. Expected distruption after adjustment thus are:					
1999 Q3	33%	33%	33%	33%	2%
1999 Q4	20%	20%	20%	20%	1%
2000 Q1	15%	15%	15%	15%	1%
2000 Q2	8%	8%	8%	8%	1%

Source: SIS, Staff Estimate

Table 2: Seasonally Adjusted Growth Rates (Baseline)

	Agriculture	Industry	Services	GDP	Factor Income	GNP	GNP Index 1999=100
1992Q1	2.7	2.4	3.8	3.2	(26.4)	3.0	104.6
Q2	6.7	(2.2)	(0.6)	0.1	62.3	0.4	105.1
Q4	4.8	3.8	3.0	3.5	(213.2)	2.4	109.5
1995Q1	2.7	5.3	0.9	2.3	(306.3)	4.1	113.9
Q2	(4.0)	5.1	2.6	2.2	1.0	2.2	116.5
Q3	0.0	2.4	2.1	1.9	10.8	2.0	118.8
Q4	(1.2)	(0.5)	0.5	(0.1)	(0.4)	(0.1)	118.7
1996Q1	4.2	1.7	3.9	3.3	50.2	3.8	123.3
Q2	1.6	3.1	1.8	2.1	(30.3)	1.6	125.2
Q3	(2.1)	0.9	0.8	0.4	(10.1)	0.3	125.5
Q4	8.3	2.0	(0.2)	1.6	(0.8)	1.6	127.5
1997Q1	(12.4)	3.2	3.9	1.3	44.9	1.7	129.7
Q2	6.2	3.9	4.0	4.3	24.4	4.6	135.6
Q3	0.4	1.6	0.3	0.7	28.8	1.2	137.2
Q4	(4.6)	1.2	2.2	1.0	9.5	1.2	138.9
1998Q1	0.1	2.1	2.1	1.8	(20.1)	1.3	140.7
Q2	8.4	(2.1)	(2.0)	(0.8)	67.8	0.5	141.4
Q3	3.0	0.7	(1.5)	(0.2)	(28.6)	(1.1)	139.9
Q4	3.9	(5.8)	(0.8)	(1.6)	148.0	1.8	142.4
1999Q1	(13.0)	(2.3)	(4.8)	(5.3)	(66.6)	(8.7)	129.9
Q2	(1.1)	9.0	4.5	5.1	(17.2)	5.0	136.4
Q3	14.3	4.0	4.0	5.3	12.0	5.0	143.3
Q4	1.1	1.5	1.5	1.4	12.0	1.6	145.6
2000Q1	0.2	0.1	0.1	0.1	0.5	0.1	145.8
Q2	0.2	0.1	0.1	0.1	0.5	0.1	146.0
Q3	0.2	0.1	0.1	0.1	0.5	0.1	146.2
Q4	0.2	0.1	0.1	0.1	0.5	0.1	146.4
Implied non-seasonally adjusted growth rates							
1997	(2.3)	10.4	8.6	7.5	68.1	8.3	
1998	7.6	1.8	2.1	2.8	53.4	3.8	
1999	(0.1)	2.3	(0.6)	0.3	(38.7)	(0.8)	
2000	4.4	5.3	4.2	4.6	11.8	4.7	

Source: SIS, Staff Estimates

Table 3: Seasonally Adjusted Growth Rates (After Earthquake)

	Agriculture	Industry	Services	GDP	Factor Income	GNP	GNP Index 1999=100
1992Q1	2.7	2.4	3.8	3.2	(26.4)	3.0	104.6
Q2	6.7	(2.2)	(0.6)	0.1	62.3	0.4	105.1
Q4	4.8	3.8	3.0	3.5	(213.2)	2.4	109.5
1995Q1	2.7	5.3	0.9	2.3	(306.3)	4.1	113.9
Q2	(4.0)	5.1	2.6	2.2	1.0	2.2	116.5
Q3	0.0	2.4	2.1	1.9	10.8	2.0	118.8
Q4	(1.2)	(0.5)	0.5	(0.1)	(0.4)	(0.1)	118.7
1996Q1	4.2	1.7	3.9	3.3	50.2	3.8	123.3
Q2	1.6	3.1	1.8	2.1	(30.3)	1.6	125.2
Q3	(2.1)	0.9	0.8	0.4	(10.1)	0.3	125.5
Q4	8.3	2.0	(0.2)	1.6	(0.8)	1.6	127.5
1997Q1	(12.4)	3.2	3.9	1.3	44.9	1.7	129.7
Q2	6.2	3.9	4.0	4.3	24.4	4.6	135.6
Q3	0.4	1.6	0.3	0.7	28.8	1.2	137.2
Q4	(4.6)	1.2	2.2	1.0	9.5	1.2	138.9
1998Q1	0.1	2.1	2.1	1.8	(20.1)	1.3	140.7
Q2	8.4	(2.1)	(2.0)	(0.8)	67.8	0.5	141.4
Q3	3.0	0.7	(1.5)	(0.2)	(28.6)	(1.1)	139.9
Q4	3.9	(5.8)	(0.8)	(1.6)	148.0	1.8	142.4
1999Q1	(13.0)	(2.3)	(4.8)	(5.3)	(66.6)	(8.7)	129.9
Q2	(1.1)	9.0	4.5	5.1	(17.2)	4.6	135.9
Q3	14.3	4.0	4.0	5.3	12.0	5.4	143.3
Q4	1.2	1.5	1.5	1.7	12.0	1.9	146.0
2000Q1	0.2	0.1	0.1	0.4	0.5	0.4	146.6
Q2	0.2	0.1	0.1	0.4	0.5	0.4	147.2
Q3	0.2	0.1	0.1	0.2	0.5	0.2	147.5
Q4	0.2	0.1	0.1	(0.4)	0.5	(0.4)	146.9
Implied Non-Seasonally Adjusted Growth Rates, After Quake							
1997	(2.3)	10.4	8.6	7.5	68.1	8.3	
1998	7.6	1.8	2.1	2.8	53.4	3.8	
1999	(0.1)	1.3	(1.6)	(0.5)	(38.7)	(1.6)	
2000	4.5	5.9	4.8	5.7	11.8	5.8	
Implied Non-Seasonally Adjusted Growth Rates, Baseline							
1997	(2.3)	10.4	8.6	7.5	68.1	8.3	
1998	7.6	1.8	2.1	2.8	53.4	3.8	
1999	(0.1)	2.3	(0.6)	0.3	(38.7)	(0.8)	
2000	4.4	5.3	4.2	4.6	11.8	4.7	

Source: SIS, Staff Estimate

Table 4: Emergency Revenue Bill in Parliament

	1999	2000	1999	2000
	(TL trillion)		(US$ million)	
Personal Income Tax (Withholding) 1/	75.0	37.5	158.6	66.8
Corporate Income Tax 1/	100.0	50.0	211.4	89.1
Supplementary Motor Vehicle Tax	90.0	0.0	190.3	0.0
Stamp Tax on Check Transactions	1.4	2.7	3.0	4.8
Cellular Telephone Use Surcharge	63.4	172.6	134.0	307.5
Property Tax	7.5	7.5	15.9	13.4
"Article 13" 2/	--	--	--	--
TOTAL	337.3	270.3	713.1	481.7

1/ 50% of 1998 tax base will be paid in three equal installments, two in 1999 and third in Jan. 2000.
2/ Article 13 pertains to stock exchange activities, 'Competition Board' activities. Uncertain at this stage whether this will be assessed and what impact it will have.

Source: SPO, MoF, Staff Estimate

Table 5 : Losses from Reduced Tourism Revenues

	1999
	(US$ million)
Forecast Tourism Revenues in 1999 1/	5,000.0
Share from Istanbul and Marmara Region 2/	20%
Estimated Regional Revenues for Aug-Dec, 1999	580.0
Assumed Decline due to Earthquake	35%
Loss in Value Added Due to Earthquake	203.0
Share of VA loss from Istanbul	162.4
Tax Loss (marginal rate = 20%)	32.5

1/ Forecast from the IMF, major drop from 1998 levels due primarily to elevated civil disturbances unrelated to the Earthquake.
2/ Share of tourism in Istanbul and Marmara region based on tourist arrivals into Istanbul Airport, 1998

Source: Staff Estimate

Table 6: Estimated Tax Losses from 1999 Government Tax Deferral

(TL Billion)	Central Government Tax Share	Municipal Tax Share	Total	Total loss in 1999 Tax Collections	Tax Losses Due Slower Growth	Imputed Cost of Deferral	Loss due Irretrievable Damage	Total Imputed Tax Loss
Projected tax yield Aug-Dec. (w/o quake)								
Personal income tax (withholding)	58,687.0	10,356.5	69,043.5	69,043.5	22,093.9	5,720.6	23,474.8	27,814.6
Personal income tax (declaration)	5,870.0	1,035.9	6,905.9	6,905.9	2,209.9	572.2	2,348.0	4,557.9
Corporate income tax	6,267.0	1,105.9	7,372.9	7,372.9	2,359.3	610.9	2,506.8	2,970.2
Advance CIT tax	20,117.0	3,550.1	23,667.1	23,667.1	7,573.5	1,960.9	8,046.8	9,534.4
VAT (dom)	47,686.0	8,415.2	56,101.2	56,101.2	17,952.4	4,648.3	19,074.4	22,600.7
Customs	15,187.0	2,680.1	17,867.1	5,717.5	2,858.7	348.3	1,429.4	3,207.1
VAT on imports (KDV)	82,854.0	14,621.3	97,475.3	31,192.1	15,596.0	1,900.3	7,798.0	17,496.4
Other (excludes BOLU 2-5 ilçe)	48,995.0	8,646.2	57,641.2	57,641.2	18,445.2	4,775.9	19,598.0	23,221.1
Indirect Tax Loss from Tourism industry 1/	12,649.9	2,710.7	15,360.6	15,360.6	15,360.6	0.0	0.0	15,360.6
TOTAL	298,313	53,122	351,435	273,002	104,450	20,537	126,414.3	124,987.0

1/ Tourism industry losses are unrelated to the tax deferral program.

Assumptions:

1- Tax deferral assumed for 9 months, with no amnesty granted.
2- Loss on collections assumed to correspond to output loss, seasonally adjusted.
i.e. loss of Sept output (1/9 annual output) and 20% Q4 output (24% of annual total).
3- Loss in 1999 corresponds to full tax deferral, and collections are all accounted for in 2000.
4- Advanced CIT tax and declared income tax excludes August due to collection prior to quake.
5- Petroleum consumption tax excluded; collection through others assumed to fully offset losses.
6- VAT on imports and customs duty is assumed proportional to GDP loss.
7- Lost municipal taxes assumed fully compensated by government transfers.
8- One-quarter of deferred taxes assumed irretrievable due provisions (eg. capital losses over 1/3 qualifies for total write-off).
9- Tourism industry losses due to cancellations through Istanbul gateway, unrelated to regional tax deferral program.

Source: MoF, Staff Estimate

Table 7: Energy Infrastructure and Distribution Rehabilitation Costs (Fiscal Impact)

	Total	1999	2000
	(US$ million)		
Risk Assessment Studies for Existing Installations	0.7	0.1	0.6
Tupras Refinery Uninsured Damage	--	--	--
Tupras Refinery Follow up Safety Upgrade 1/	25.0	2.5	22.5
Pollution Abatement in Marmara Sea 2/	5.0	1.3	3.8
Oil and Gas Pipeline Repair (Follow on Cost)	2.0		2.0
Municipal Distribution Costs 3/	5.0	1.3	3.8
Total	37.0	5.0	32.0
Total w/o 'Safety Upgrade'	12.7	2.6	10.1

Assumption: 20% of risk assessment completed in 1999

1/ Tupras follow up safety measures excluded from fiscal costs (Table 5, Part I)
2/ Pollution measures uses high assessment, 25% falls in 1999 based on 6 to 9 month time frame.
3/ Municipal distribution costs, 25% occurs in 1999.

Source: MEER Mission

Table 8: Electric Power Supply System Rehabilitation Cost (Fiscal Impact)

	Total	1999	2000
	(US$ million)		
Power Generation	--	--	–
Power Transmission	12.0	1.5	10.5
Power Distribution	36.0	21.0	15.0
Total	48.0	22.5	25.5

Assumption: The emergency program costs for rehabilitation of transmission and distribution is all undertaken in 1999

Source: MEER Mission

Table 9: School Rehabilitation and Related Supplemental Education Expenditures

	Number of Recipients	Unit Cost (US$)	Total Cost	1999 (US$ million)	2000
School Reassignment Costs (busing, etc.)	37,000	150.0	5.6	2.2	3.3
School Cost Support to Affected Families (uniforms, textbooks, meals, etc.)	101,500	487.7	49.5	37.1	12.4
School Rehabilitation Costs			39.4	9.9	29.6
Psycho-social Counseling Services			3.0	1.2	1.8
Monitoring, Evaluation and Contingencies			2.6	1.3	1.3
Total			100.0	51.7	48.4

Source: MEER Mission and Staff Estimate

Table 10: Health Sector Rehabilitation Fiscal Cost Estimates

	Number	Unit costs (US$ 000)	Total	1999 (US$ million)	2000
Rehabilitation of Health Centers					
Urban	18.0	226.4	4.1		
Rural	10.0	153.0	1.5		
Site Preparation, Renovation					
Urban	18.0	22.6	0.4		
Rural	10.0	15.3	0.2		
Renovation	20.0	22.6	0.5		
Prefab	28.0	18.0	0.5		
Sub-Total			7.1	3.6	3.6
Rehabilitation of Hospitals					
Reconstruction/Renovation	10.0	750.0	7.5		
Site Preparation	10.0	75.0	0.8		
Prefab Units	3.0	150.0	0.5		
Sub-Total			8.7		
Total Civil Works			15.8	7.9	7.9
Medical Equipment - Health Centers			0.8		
- Hospitals			2.0		
Sub-Total			2.8	1.4	1.4
Total			18.6	9.3	9.3

Source: MEER Mission Estimate

Table 11: Temporary Housing Costs

	Number of Units	Population Affected	Unit price 1/ (US$)	Total Cost	1999 (US$ million)	2000
Estimated Prefabricated Housing Demand	30,000	120,000	8,000.0	240.0	240.0	0.0
Relocation to Alternative Housing	20,000	280,000	2,160.0	151.2	49.9	101.3
Total	50,000	400,000		391.2	289.9	101.3

1/ Unit cost of prefabricated housing and alternative housing (occupied hotels etc.) from the MEER mission.

Source: MEER Mission, Staff Estimate

Table 12: Region's Contribution to Turkish Economy

	% Share in GDP (1997)	% Share in Manufacturing Sector Value Added
Kocaeli	4.8	15.3
Sakarya	1.1	0.8
Yalova	0.4	0.8
Bolu	0.9	0.3 1/
Avcilar and Bagcilar		2.5
Total	7.2	19.7

1/ Only Gölyaka and Düzce Districs

Source: SIS

Table 13: The Breakdown of Members of KCI

	Number of Enterprises	% Share
Gebze	587	52.1
Izmit	421	37.4
Korfez	71	6.3
Gölcük	39	3.5
Kandira	7	0.6
Karamürsel	2	0.2
Total	1,127	100.0

Source: Kocaeli Chamber of Industry

Table 14: Earthquake Insurance Policies in Turkey (As of Dec. 31, 1998)

Zone	Number of Policies	Total Insured (US $ million)
1	239,893	35,432
2	17,577	6,007
3	26,157	7,014
4	45,031	9,197
5	102,440	10,288
6	23,181	3,817
7	28,994	5,579
8	54,912	8,551
9	15,722	2,260
10	64,228	7,467
11	12,734	1,909
12	20,148	2,149
13	3,156	431
14	9,218	1,202
15	2,479	1,223
Total	665,870	102,524

Source: Treasury Undersecretariat

Table 15: Exposure of Halk Bank to Region

(TL million)	Industrial	Commercial	Fund Based	Cooperative	Total
Bolu	391,080	16,164	178,688	1,385,000	1,970,932
Istanbul (Avcilar)	245,090	1,394,087	196,221	175,000	2,010,399
Kocaeli	661,334	1,598,381	1,093,327	3,745,000	7,098,042
Adapazari	963,052	348,995	468,202	3,860,600	5,640,850
Yalova	153,258	57,806	7,360	1,639,000	1,857,424
Total	2,413,814	3,415,433	1,943,798	10,804,600	18,577,647

Source: Halk Bank

Table 16: Exposure of Ziraat Bank to Region

(TL million)	Industrial	Commercial	Fund Based	Cooperative	Total
Bolu	3,661,366	5,589,495	888,611	116,794	10,256,266
Istanbul (Avcilar)					
Kocaeli	948,751	2,153,576	1,446,333	148,795	4,697,455
Adapazari	1,931,327	6,055,077	950,165	26,434	8,963,003
Yalova	2,439,292	311,760	103,474	37,616	2,892,142
Total	8,980,736	14,109,908	3,388,583	329,639	26,808,866

Source: Ziraat Bank

Table 17: Emlak Bank - Deferred Loans Due to Earthquake

	(US $)
Deferred Commercial Loans	24,360,587
Doubtful Commercial Loans	30,432,115
Deferred Individual Loans	32,793,408
Doubtful Individual Loans	3,000,000
Maritime Industry	60,000,000
Total	150,586,110

Source: Emlak Bank

Table 18: Age Distribution of Population (mid-year 1998)

Age	(000)	
0-4	6,550	
5-9	6,390	
10-14	6,554	
15-19	6,654	
20-24	6,295	
25-29	5,473	
30-34	4,986	
35-39	4,536	
40-44	3,767	
45-49	3,052	
50-54	2,355	
55-59	1,887	
60-64	1,719	
65-69	1,513	
70-74	925	
75 & up	793	
Total	63,451	
	(000)	(%)
Children 0-17	23,487	37
Adults 18-54	33,127	52
Elderly 55 +	6,837	11
Total	63,451	100

Source: SIS

Table 19: Social Assistance: Fiscal Cost Estimates

	Total	1999	2000	Total	1999	2000
	(TL trillion)			(US$ million)		
One-Time Lump Sum Loss of life and disabilities compensation	14.4	14.4	0.0	30.5	30.5	0.0
Emergency social assistance						
Food assistance 1/	50.0	20.0	30.0	96.4	42.3	54.1
Emergency drugs and health services 2/	5.8	3.3	2.6	11.5	6.9	4.6
Other emergency health costs 2/	3.5	2.0	1.5	6.9	4.1	2.8
SHÇEK field costs	1.3	0.3	1.0	2.4	0.7	1.7
Cost of earthquake child victims care	1.6	0.4	1.2	3.0	0.8	2.2
Subtotal	62.2	25.9	36.3	120.2	54.9	65.3
Total	76.7	40.4	36.3	150.7	85.4	65.3

1/ Estimates from the SPO.
2/ Numbers from MEER mission, includes sanitation, drugs, vaccines, prosthetics, and mobile health services. Share assumed to be 60% in 1999 and 40% in 2000.

Table 20: Estimated Social Protection Institution Reconstruction Needs

	Construction Needed				Construction		Total Unit	Rounding	Total
Type of institution	Number	Size (m2)	Unit cost (TL million)	Subtotal (TL billion)	Subtotal ($)	Installation ($)	Cost ($)	Total UC ($)	Cost ($)
Nursery	3	2000	100	200	449,438	425,000	874,438	900,000	2,700,000
Elderly home	1	2000	100	200	449,438	425,000	874,438	900,000	900,000
Community center	10	1500	60	90	202,247	425,000	627,247	650,000	6,500,000
Training centers	2	1500	60	90	202,247	425,000	627,247	650,000	1,300,000
								Total	11,400,000

Source: SHÇEK, Staff Estimate

Table 21: SHÇEK Field Costs

Staff in Field	100	
Monthly Salary (TL million)	300	
Staff Costs, 1999 (TL million)	120,000	
Staff Costs, 2000 (TL million)	360,000	
Other Field Costs (TL billion)	50	1/
Estimated Other Field Costs 1999	200	
Estimated Other Field Costs 2000	600	

	1999	2000
Estimated Field Costs, total (TL billion)	320	960
o/w staff	120	360
o/w other field costs	200	600

1/ Aug. 17-Sept 7 1999 has been taken as representative of one month

Source: SHÇEK, Staff Estimate

Table 22: Estimated Cost of Earthquake Child Victims

Estimated Number of Children Who Will Become Wards of SHÇEK	1,000
Cost per Child per Month (TL million)	100
Total Cost for 4 months of 1999 (TL million)	400,000
Total Cost for 12 months of 2000 (TL million)	1,200,000

	1999	2000
Child Ward Costs (TL billion)	400	1,200

Source: SHÇEK, Staff Estimate