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Economic Effects of the 1999 Turkish Earthquakes: An Interim Report

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ECONOMIC EFFECTS OF THE 1999 TURKISH EARTHQUAKES: AN INTERIM REPORT

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by
Alexandra Bibbee, Rauf Gonenc, Scott Jacobs, Josef Konvitz and Robert Price

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ABSTRACT/RESUMÉ

This Working Paper presents a cross-Directorate Report on the economic, budgetary, regulatory and urban-policy implications of the earthquakes which struck the Marmara and Bolu areas of Turkey on 17 August and 12 November 1999. The earthquakes caused high casualties and significant material damage to property, with severe effects on economic activity. The Report traces the factors underlying Turkey's vulnerability to earthquake damage, along a known active fault line, to deficiencies in risk identification procedures and risk-reduction methods, as well as to the absence of risk transfer and financing techniques. It suggests that these deficiencies may stem from the nature of recent Turkish economic development, which has been driven by the need to assimilate a mass migration from the countryside to the cities and has been associated with extremely high and variable inflation. Ensuring a more orderly future development requires both an overhaul of governance structures in Turkey, including better central-local co-ordination and urban planning procedures and more balanced macroeconomic policies, so as to introduce more effective public oversight and more appropriate private incentive structures. The earthquakes have given an extra impetus to the reform process needed to achieve both. While the defects in the housing stock cannot be quickly or easily corrected, the structural reforms set in train by the disaster, allied to the disinflation process underway in Turkey, should make for an economic environment that allows both for better future preparedness and a more orderly, earthquake-resistant pattern of urban development than has been apparent in the past two decades.

JEL classification: H8
Keywords: earthquakes; housing; governance; risk

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Ce document de travail présente un Rapport, établi en commun par plusieurs directions, sur les implications économiques, budgétaires, réglementaires et celles touchant à l'urbanisation, des tremblements de terre qui ont secoué les régions de Marmara et Bolu en Turquie les 17 août et 12 novembre 1999. Ceux-ci ont été la cause de pertes humaines considérables et d'importants dégâts matériels, avec de sérieuses conséquences sur l'activité économique. Le Rapport retrace les facteurs fondamentaux de la vulnérabilité de la Turquie face aux conséquences des séismes, le long d'une ligne de faille connue, face aux déficiences dans les procédures d'identification des risques et dans les méthodes visant à les réduire, ainsi que face à l'absence de transfert de risque et de techniques financières. Le Rapport suggère que ces déficiences peuvent provenir de la nature de la récente politique économique de la Turquie, qui a été conduite par la nécessité d'assimiler une importante migration de la campagne vers les villes et s'est combinée à une inflation extrêmement élevée et inconstante. Des structures incitatives privées plus appropriées, associées à une révision des structures de la gestion des affaires publiques, comprenant une meilleure coordination des administrations locales et centrale, de meilleures procédures de planification urbaine, ainsi que des politiques macro-économiques plus équilibrées, visant à rendre plus efficace la surveillance des pouvoirs publics, sont de nature à assurer une évolution plus méthodique dans le futur. Leur réalisation nécessite un processus de réformes auquel les séismes ont donné un élan supplémentaire. Bien que l'on ne puisse aisément et rapidement pallier aux manques de stocks en matière de résidences, les reformes structurelles initiées par la catastrophe, associées au processus de désinflation en cours en Turquie, pourraient créer un climat économique tel, qu'il autoriserait à l'avenir une meilleure prévention, ainsi qu'un développement urbain mieux organisé bénéficiant de mesures parasismiques, que ce ne fut le cas pendant les vingt dernières années.

Classification JEL : H8
Mots-clés : tremblements de terre ; logement ; gestion des affaires publiques ; risques

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ECONOMIC EFFECTS OF THE 1999 TURKISH EARTHQUAKES: AN INTERIM REPORT

by

Alexandra Bibbee, Rauf Gonenc, Scott Jacobs, Josef Konvitz and Robert Price[1]

I. Background to the Report

Motivation and scope

1. On 17 August and 12 November, earthquakes struck the Marmara and Bolu areas of Turkey, causing significant material damage and severe casualties. The area affected was the country's industrial heartland, the immediate and adjacent provinces (including Istanbul) accounting for around one-third of Turkey's overall output. The initial assessment was that the effect would be severely negative on GDP during the short term, but that recovery and reconstruction would probably result in stronger growth in 2000. An important economic policy concern was that the earthquakes struck an economy facing severe macro-economic and structural policy challenges, with potential repercussions on both, and policy responses have had to be shaped accordingly. For Turkey to fulfil its growth potential, a programme of fiscal consolidation and disinflation needs to be carried through, which the financial and economic costs of the earthquake have made more difficult, but also more urgent. Just as critically, the economy is undergoing a process of structural reform, based on the need to liberalise and stabilise the financial system and improve the governance of the economy, and the sectoral, regional and urban planning dimensions of the disaster have important implications for this. Maintaining international investor confidence has been an essential ingredient in all this. While the human toll of the disaster has been immense, it has thus been important that the response is forward-looking, ensuring that the impact has been to reinforce rather than retard current ongoing efforts for reform.

2. In light of the above, the aim of this Report is to present an appraisal of the economic, budgetary, regulatory and urban-policy implications of the present phase of earthquake activity in western Turkey. The Secretariat is due to present a draft *Survey* to the *Economic and Development Review Committee* in November, as part of the normal EDRC cycle, and this Report should be regarded as a precursor of that. The themes taken up here will be taken up again, and elaborated upon where needed, in the *Survey*. The current report has been a collaborative project with the Public Management Service and Territorial Development Service and has the following structure. Section II investigates the economic and budgetary costs of the earthquakes and their implications for economic growth and the budget. Understanding such costs is necessary for near-term budget planning and the longer-term re-allocation of national resources. Section III describes the regulatory and governance factors behind the country's vulnerability to heavy

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1. This report was prepared by a cross-Directorate team headed by Robert Price and comprising Alexandra Bibbee and Rauf Gonenc (all from the Economics Department), Scott Jacobs (Public Management Service) and Josef Konvitz (Territorial Development Service). The team visited Ankara, Istanbul and the affected regions in December 1999 on a mission led by Val Koromzay (ECO). The team is grateful to the Turkish authorities for logistic and other support during the mission and the preparation of the report and to Andrew Dean for comments. Thanks go to Jean-Marie Strub and Janice Gabela for statistical and secretarial assistance respectively.

earthquake damage, including factors related to building codes and zoning requirements. Co-ordinating central and local government roles here is obviously essential. But achieving the ultimate goal of damage minimisation also implies changing private-sector behaviour and culture though a combination of education, regulatory reform and private incentives. In this context section IV looks at the policy issues surrounding better private sector risk management, through the development of the insurance and mortgage markets. The analysis here builds on the general recommendations for natural disaster management put forward by the World Bank. The final section contains an assessment of the catastrophe, given that it is simultaneously offering both immense pain and economic reform opportunities, but that the fault line running through northern Turkey requires enhanced disaster preparedness.

Geological background to the earthquakes

3. The earthquakes struck western Turkey on one of the world's longest and best-recorded strike-slip (horizontal motion) faults: the east-west trending North Anatolian fault. This fault is very similar to the San Andreas fault (*see map 1*), which has led to active scientific collaborations between scientists in Turkey and the US aimed at understanding the hazards both countries face.

(Map 1. Comparison of North Anatolian and San Andreas faults)

4. Turkey has a long history of large earthquakes, which have occurred in progressive adjacent historical phases (*Map 2*). The August 1999 event was the eleventh with a magnitude greater than or equal to 6.7 of a sequence of major earthquakes which started in 1939. By 1944 the earthquake locations had moved westward, rupturing 600 km of contiguous fault. An additional adjacent 100 km of fault then ruptured in the events of 1957 and 1967. The August and November 1999 events filled in a 100 to 150 km long gap between the 1967 event and two smaller disturbances which took place further west during 1963-64. The severity of the first, Mw 7.4, earthquake is underlined by the fact that there was as much as five metres of horizontal fault slip and two metres of vertical slip. Geologists now expect that Southern Istanbul will, with high probability, experience an event with significantly larger intensity of ground shaking than in the Marmara, within at most 30 years and probably within the next decade.

(Map 2. Time profile of earthquake activity along the North Anatolian fault)

5. Despite the fact that the epicentre of successive earthquakes seems to be moving westward with a high degree of regularity along the North Anatolian fault, a national study of disaster risk is currently unavailable. The scientific study of the geological fault lines in Turkey has only been undertaken in recent decades and geological surveys conducted by professionals who follow established international practice apparently exist for certain localities only. Geological mapping has suffered from a lack of coherent direction, unreliable compilation, inadequate financing, and a shortage of trained personnel. A national assessment of areas of risk has been undertaken using proxy data, including the recorded levels of earthquake frequency and intensity in recent decades. This generated a 1996 map by the Ministry of Public Works, which divides the country into five zones. This division is not detailed enough to distribute insurable risks (except over entire regions) or determine land use plans, although more than half the population, numerous dams and three-quarters of the nation's industry are found in the two most hazardous zones. At the local level, risk assessment is compromised by a gap in coverage at a scale large enough (minimum 1:1000) to take property lines and the outline of buildings into account.

A high mortality and injury rate

6. The two earthquakes caused considerable damage to housing, public facilities and infrastructures, but the numbers of dead and injured dominate the tragedy (*Tables 1* and *2*). Over 18 000 people are estimated to have died, and around 50 000 were injured, of which perhaps two-fifths will be left

permanently disabled. Large portions of the area were devastated, with around 109 000 housing units and business premises completely destroyed, and another 249 000 damaged to varying degrees. Numerous schools, health facilities, roads, bridges, water pipes, power lines, phone lines, and gas pipelines were severely damaged. Up to 600 000 people were forced to leave their homes, of which perhaps half became homeless and had to stay in tents, and many of the survivors, especially children, were left deeply traumatised. The characteristics of this population and of the survivors are not known: how many parents lost children, how many children are orphaned, or lost one parent or a sibling, etc. Information of this kind is needed to understand better the relation between the constructions and vulnerability, as well as long-term health and social welfare costs.

(Table 1. Major disasters in OECD countries with implications for regional development)
(Table 2. The extent of the damage)

7. As in any natural disaster, the level of the earthquake's destructiveness reflected not only the intensity of the shock, but also the vulnerability of structures subjected to this shock. The maximum intensities of ground shaking in Turkey were only a fraction of what was recorded in the earthquakes in Northridge, California in 1994, and Kobe, Japan in 1995, yet the loss of human life was at least an order of magnitude higher[2]. Since population density was similar, this reveals the far higher vulnerability of structures in Turkey. Surface fault opening, ground shaking, and soil-liquefaction caused structural damage that was dramatically exacerbated by poor construction quality. Expert evaluations of the post-earthquake devastation confirm that much of it could have been avoided with proper siting and construction practices (*Box 1*).[3]

Box 1. **Engineering, construction and siting errors in the earthquake zone**

In the past, builders in Turkey used traditional, time-proven construction methods which minimised destruction in earthquakes. However, the earthquakes revealed several defects in urban planning and construction techniques which may have amplified the material and human toll of the disaster:

*Siting on liquefiable soil*s: large-scale urbanisation has been permitted on liquefiable soil. The loss of life due to inadequate foundation systems (a primary cause of the destruction in Adapazari) is especially tragic, because the majority of the affected buildings were less than twenty years old.

Siting on the fault line: many other structures were also destroyed by virtue of their having been built directly over, or immediately adjacent to, the ruptured segment of the North Anatolian Fault. Entire villages and developments (including the Gölcük naval base) straddling the fault were destroyed.

Construction engineering problems were another major contributing factor to the disaster. These included weak ground level stories of multi-story buildings, related to their usage for commercial purposes, with fewer retaining walls and higher ceilings, causing ground floor collapses. Widespread use of unreinforced hollow clay tiles to construct interior and exterior walls had deleterious effects on the performance of the structural frame during the earthquake.

Poor construction materials: visual inspections of collapsed buildings suggest that the concrete in the typical building was often of a very poor quality and unacceptably weak. The presence of seashells in the concrete suggests that contaminated beach sand was used in the mix. Also, smooth (undeformed) steel reinforcing was used; causing degradation of the bond between the concrete and the steel reinforcing, which is not permitted in much of the world especially in construction expected to withstand the shock of an earthquake. Poor or incomplete use of reinforcing details could also be observed.

2. See WSJ Earthquake Engineering Update, September 1999.

8. In OECD economies, good construction techniques, enforcement, land use planning and emergency planning usually mean that injuries and deaths are low, while property losses can be very significant. Property losses have been rising throughout the 1990s, at least in part because natural disasters in highly urbanised regions have been more frequent and more intense. In both developed and developing countries, some social groups, and especially the poor, are most at risk, their exposure often being a function of the location and quality of housing. However, most of the people affected in the Turkish earthquakes were not the poor but the middle class. The earthquakes occurred in a region with high per capita incomes, and where population growth had been managed through the construction of multi-story housing which had replaced traditional buildings. The ratio of numbers of deaths to numbers of houses destroyed in August (over 18 000 deaths and over 90 000 houses destroyed) is exceptional when compared to other earthquakes in OECD Member countries.

… and an initially difficult relief effort

9. A contributory factor in the heavy loss of human life may have been the difficulties in mounting a timely and effective official emergency response to the first earthquake. To a large extent, this was due to the fact that it struck at 3 a.m. in a heavily populated and large area. Many people were trapped inside collapsed buildings, including the officials responsible for implementing emergency response efforts. Emergency response resources were largely destroyed or damaged[4]. In the critical first hours, rescue efforts were provided by on-site survivors mobilising themselves in an ad hoc way. Telecommunications, transport, and electricity infrastructures were severely damaged by the earthquake and initially overwhelmed by outsiders trying to phone or drive to the region[5]. This in turn prevented the arrival of civil defence rescue units and medical teams (dispatched by Ankara) until early evening. Even after arrival, the lack of non-telephone communications (radios) hampered the effectiveness of the rescuers. Full telecommunications and electric power was restored only two to three days after the earthquake.

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3. *ibid.*

4. A Parliamentary Earthquake Investigation Commission report commented that the 110 people of the Civil Defence Institution had "virtually become lost amongst the 13 600 damaged buildings" after the Marmara quake and that insufficiency of personnel had resulted in a low success rate for rescuing persons from collapsed buildings.

5. There were critical failures in the national infrastructure: i) the main fibre optic cable governing telephone connections into the earthquake region was cut where it crossed the fault line just east of Ismit; ii) two main substations on the electric power grid were damaged, causing a widespread power blackout across Turkey; and iii) an overpass on the motorway between Ismit and Ankara collapsed. Compounding these failures was widespread cellular phone use by outsiders trying to get information from the region, which caused the telephone system to break down completely, and by people driving to the region, which clogged the roads. See World Bank, *Maramara Earthquake Assessment Report*, September 1999.

II. Economic impact of the disaster

Economic significance of the earthquake zone

10. The region affected by the earthquake is both geographically extensive and economically dynamic. It forms the industrial heartland of Turkey. The major industries are autos, petrochemicals, manufacturing and repair of motor (and railway) vehicles, basic metals, production and weaving of synthetic fibres and yarns, paint and lacquer production, and tourism[6]. The four districts most severely affected (Kocaeli, Sakarya, Bolu and Yalova) contribute over 7 per cent of the country's GDP and 14 per cent of industrial value added (*Table 3*). Per capita income is almost double the national average. Though containing only 4 per cent of the nation's population, the region contributes over 16 per cent of budget revenues. The immediately surrounding districts (of Bursa, Eskisehir, and Istanbul) have been mainly affected indirectly by their close economic linkages with the former area, e.g., industries and small businesses supplying services or material inputs to each other's production processes. They also are subject to a shared seismic risk and so face magnified uncertainty for the future as a fall-out of the recent events. Taking all seven cities together, the wider earthquake region accounts for 35 per cent of national GDP and almost half of the nation's industrial output.

(Table 3. Selected indicators for the earthquake region)

Damage to economic infrastructure

11. Heavy damage was sustained in the energy, transport, and communications sectors. In electricity, an estimated 3 400 distribution towers and 490 km of overhead lines were damaged or destroyed, and there was extensive damage to underground cable lines. Oil and gas production facilities suffered extensive damage, though the fiscal cost has been held down by insurance coverage of fire damage to the Tüpras oil refinery. Modest oil and gas pipeline damage was sustained to municipal distribution systems, and there will be clean-up costs due to oil and chemicals discharged into the Sea of Marmara[7]. Telecommunications damage included ruptured transmission lines, station damages, buildings and network facilities. Office buildings, water pipes and supplies, wastewater treatment, sewerage systems and other structures accounted for additional damage to municipal infrastructure.

12. Damage to the transport infrastructure included 60 km. of the Ankara-Istanbul highway, the Gebze-Izmit-Arifiye railroad, the railcar factory in Adapazari and rolling stock, Derince Harbour, local streets and provincial highways. Traffic on the railway and motorway connections between Istanbul and Ankara was restored quite quickly. Damage to the industrial facilities and port or jetty structures located along the northern shores of the Gulf of Izmit was concentrated and varied from small displacements to settlement and total collapse. With immediate intervention, a large part of infrastructure facilities were

6. Many foreign companies have affiliates nearby in the region, including Goodyear, Pirelli, Honda, Hyundai, Toyota, Renault, FIAT, Ford, Bridgestone, Mannesmann, Lafarge and Bayer.

7. Environmental damage could also result from the practice of dumping debris and rubble from the earthquake directly into available surface waters. The disposal from damaged small and medium enterprises could be a concern insofar as they used significant amounts of chemicals in their production processes and in inventories.

soon serviceable again. However, SPO estimates that at least $600 million will be needed both to repair damage and to meet the infrastructure requirements of new construction[8].

Effects on the enterprise sector

13. Private and public sector estimates of the damage to the sector as a whole range from $1.1 to $4.5 billion (*Table 4*). The value-added loss in manufacturing is estimated by SPO at $600 to 700 million. The agricultural sector suffered little damage (SPO estimates $25 million in financing needs in the sector). Damage to large enterprises is believed to have been lighter than in smaller enterprises, though by no means trivial: SPO estimates an $880 million total loss just for the 19 affected state-owned enterprises in the region. Human capital losses sustained by industry have been more serious, but harder to estimate. Besides temporary disruptions to labour supply due to deaths, injuries, and demotivation, SMEs and large enterprises in the region are concerned about possible out-migration of qualified employees. Consequently, many of the larger enterprises are participating in the provision of shelter, care, and housing for their employees, which appears to have persuaded many to stay in the area. The tourism industry (based in Yalova) has been virtually destroyed and tourists may not return for many years, so that a fundamental restructuring will be needed.

(Table 4. Macroeconomic costs of the earthquake)

14. Microenterprises (retail shops, artisan workshops, and services employing up to ten people) suffered the most, losing most of their working capital and premises (often situated on the ground floors of collapsed buildings, see *Box 1*), and key family workers. They accounted for the major part of the more than 15 000 destroyed and nearly 31 000 damaged business premises (*Table 2*). World Bank on-site observations in the early aftermath of the Marmara earthquake suggest that about 600 small shops and 1 500 services were severely damaged. Smaller firms were also hurt by close economic linkages with larger firms.

15. Insurance coverage among the small enterprises is very limited and insurance penetration in Turkey is quite low. Payments of claims are estimated to have amounted to $750 million. As most earthquake risk is reinsured internationally, the bulk (95 per cent) of these losses have been covered by international reinsurers, entailing a significant subsequent upward adjustment in reinsurance premia. Given the dependence on foreign reinsurers, claims processing has been subject to some months of delay, resulting in liquidity constraints for insured businesses facing major repair and replacement costs. (It does not appear that banks were willing to provide bridge financing.)

16. The government has attempted to help businesses in a number of ways. First, it has announced the deferral of all tax payments for individuals and businesses living in the earthquake area[9]. Second, a debt rescheduling and new subsidised credit programme via the state banks has been introduced to support particularly hard-hit businesses and individuals (see below). Nevertheless, the World Bank estimates that 50 per cent of self- and SME employment in the region will be lost permanently.

8. This does not include the cost of relocating cities, however.

9. A substantial part of these deferred payments may never be recovered, due to the large-scale loss of tax records.

Burden on the financial sector

17. In the banking sector, the emergence of bad loans due to uninsured earthquake losses constitutes a concern. The direct exposure (cash loans outstanding) of banks in the region is estimated to be about $733 million [10] -- of which $119 million is held by public banks and the remainder by private banks. The World Bank estimates that roughly one-third of such outstanding loans could be directly affected by the earthquake, which could in turn lead to defaults and affect capital adequacy of the system, [11] itself coming under closer scrutiny in the context of banking sector reform (below). The exposure of the public banks goes beyond the bad loan problem, moreover. According to a government decree of 28 August, the outstanding debts to Ziraat, Halk and Emlak banks[12] owed by individuals or firms (in the seven cities of the broader region) who have sustained serious damage from the earthquake would be deferred for three years -- with grace period of one year for both principal and interest, the latter being set at half of the current interest rate. New subsidised loans would also be made available to the same applicants, including working capital loans for up to one year, and investment loans up to five years with a grace period of one year for both principal and interest -- with interest rates set at half of the corresponding commercial interest rates (Ziraat) or 20 per cent (Halk). *Table 6* shows that the total amount of outstanding loans expected to be restructured is about $56 million, and the amount of new subsidised credits over $42 million. The implied duty loss (fiscal cost) is estimated at around $70 million in 1999-2000 (although more than $500 million had been estimated in the fiscal accounts for 2000; see Table 8). These costs will continue beyond the year 2000, moreover.

(Table 6. Volume and cost of earthquake credit subsidy schemes)

18. There could be some problems with design of the subsidised credit scheme. Only applicants who filed for the scheme within three months after the earthquake will be considered. (It seems that few people have come forward thus far relative to the amount of known damage, and there is a possibility that the time period for applications will be extended.) Also, it is not clear that the system of independent verification of damage by provincial commissions is rigorous and transparent enough. There is the risk that scarce public resources might not be directed to those most in need, particularly small and micro businesses who have fewer personal connections and access to public banks. Indeed, small businesses in the region complain that they are not able to obtain credit to proceed with restructuring.

Aggregate economic costs of the disaster

19. Several assessments of the earthquake's aggregate macroeconomic impact have been made, notably by the World Bank, the State Planning Organisation, and the Turkish Businessmen's Association (TÜSIAD). They are based on different methodologies, which makes comparisons difficult but nonetheless allows for a range of plausible quantification. Also, for the most part the estimates were made in the month following the earthquake, when information was still sparse while the effects of the devastating second shock to the Bolu region on 12 November were not factored in. *Table 2* suggests that additional costs of perhaps 50 per cent might be implied by the Bolu shock. Subject to these caveats, the results of these studies suggest the following possible magnitudes of macroeconomic impact:

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10. In addition, there are some large-scale enterprises which are established in Istanbul and use loans from Istanbul branches to make investments both in and out of the earthquake region. Including such indirect exposures, the World Bank initially estimated total banking exposure at about double the above estimate.

11. The World Bank has estimated that among private banks, on average 1.5 per cent of the total loans will be expected to be written off.

12. Ziraat provides subsidised lending to mainly the agricultural sector, Halk to small businessmen and artisans, and Emlak for housing.

- Wealth and income losses range from $5 to $14 billion (*Table 4*). Destruction of physical capital accounts for the greater part, $3 to over $10 billion, of which housing and enterprise sectors each account for roughly 40 to 50 per cent, and infrastructure the remainder. The greatest uncertainty in these estimates (i.e., the widest ranges) appears to lie in the extent of damage to the enterprise sector (particularly to small and micro businesses). The associated income losses range from ½ to 3 per cent of GDP, affecting mainly 1999 and including not only the loss of output due to supply and demand disruptions, but also the cost of emergency relief -- a "dead-weight cost" which does not replace damaged structures but diverts resources from other uses all the same.

- Job losses could range from 20 to as much as 50 per cent of the pre-earthquake labour force in the affected region, due to both damage to business premises (demand side) and loss of life and health and out-migration (supply side). Most of these job losses are concentrated in self-employed and small business jobs, of which in turn a large proportion is expected to be semi-permanent.

- Growth in 1999 may have been ½ to 1 percentage points lower than the EPO baseline (see *Figure* below), reflecting disruptions to both supply (loss of physical capital and labour force) and demand (loss of inventories, temporarily depressed consumption and investment activity, interrupted input-output linkages across firms) -- albeit offset to some extent by the mobilisation of spare capacity in the rest of the country. Initially, these impacts were expected to result in a 2 to 2½ per cent point drop in final GDP. However, the official first estimates for 1999 indicate a drop of 5 per cent, suggesting that either the estimates of the earthquake impacts were too optimistic, or that the recession deepened by more than had been initially anticipated (i.e., worsening the baseline). As the latter may itself have partly reflected increased uncertainty resulting from the earthquake, it is in the end difficult to distinguish between baseline and earthquake factors. In 2000, by contrast, growth may be up to 1½ points above baseline due to the demand effects of the reconstruction effort which gets underway in that year.

- Inflationary effects have not been estimated and are generally assumed to be small or negligible, as substantial excess capacity in the wider economy, together with imports, should diffuse any excess demand pressure arising from the reconstruction. Thus, the government does not consider that the reconstruction poses any risks to the disinflation programme. Even so, price pressure in housing and pockets of the construction materials industry cannot be excluded, as existing spare capacity may not well match the areas of excess demand, and such prices may bear close watching in 2000.

(Figure. Earthquake impacts on major macroeconomic variables)

Social costs of the disaster: shelter, social infrastructure and rebuilding needs

20. The earthquake implies major impacts on the government budget, both from the above-described costs of interest subsidies, debt rescheduling and subsidised credit programmes, and from the direct budgetary costs arising from rehousing needs, family support and social infrastructure damage, namely:

1. new investment spending for the construction of interim prefabricated homes and the progressive reconstruction and repair of permanent housing and infrastructure;
2. extra consumption/transfer spending for the relief effort and extra social security spending due to extraordinary death and disability benefits; and

3. repairs to schools and hospitals.

Official foreign funding will meet much of the costs, but a financing gap remains, which the government has had to take action to bridge.

Mitigating the displacement of the population by temporary shelter

21. With more than 300 000 housing units destroyed or damaged by the earthquake, about 600 000 people were forced to find emergency shelter. They had three options: *i)* shelter with friends or relatives, *ii)* move to an undamaged second home or rent accommodation, and *iii)* tent shelter in organised camps (more likely for people whose homes were demolished), or in the neighbourhood of the damaged but usually still-standing house[13]. The latter option could also involve the use of vacant public buildings. Only people in category *iii)* were considered to be "homeless": of these, by 1 December, about 200 000 people were registered in 121 tent communities, while another 80 000 to perhaps 200 000 were estimated (by various sources) to be living in individual tents or in public buildings. By implication, at least 200 000 people opted for shelter with friends or alternative second-home or rented accommodation; many of these moved out of the region. Those who chose not to live in a tent town received a "rent allowance" of about $175 per month (for one year), on condition that their house was mid- to heavily damaged. However, the cash value of assistance received in camps was far higher -- including free health care, food, cooking, clothing, counselling, skills training, schooling, and pocket money -- which provided a strong incentive to go there rather than accept the rent allowance, especially for those from the lower economic strata[14]. The large gap between the value of the benefit-in-kind option and the alternative cash benefit, in essence, restricted peoples' choices, including the decision to out-migrate, while making them dependent on the state.

22. With the cold and damp winter weather approaching, the government decided early on that tents had to be substituted by sturdier temporary accommodations. The search for a solution generated much internal debate. In the end, it was decided to build 30 772 prefabricated homes by public means, while another 10 696 were to be funded and built by the private sector. With an average household size of four, these prefabs were able to house around 165 000 people, i.e. well below the lower limit of the homeless population estimate, so that the units had to be rationed. The cost of a 2-unit prefab (each 30 m^2 unit fully equipped) was $3 300[15], rising to around $5 000 inclusive of infrastructure costs. This implies a total fiscal cost of $77 million (though $120 million appears in the 1999 fiscal accounts; see *Table 8*). Construction of the units was completed by end-November, and by end-year the shift of people to the prefabs was complete. Tent dwellers were given the choice of moving into such a house or accepting the rent allowance in order to find their own arrangements, either in the same or in another city. As of April 2000, around

13. In many cases the houses were habitable, but the residents were afraid to enter them for fear they would collapse. This reflected the very low level of credibility among the population of MPW damage assessments (see World Bank, "Temporary Shelter Report").

14. Surveys indicate that the tent camp population was relatively poor and poorly educated. Nearly half owned their houses and 61 per cent lived in an apartment building; 38 per cent were under treatment for illness, and 64 per cent had experienced psychosocial problems since the earthquake, rising to 79 per cent for children. They tended to develop focused strategies for assuring that they were eligible for as many benefit options as possible, but felt great uncertainty. They exhibited classical symptoms of dependency and victimisation. A significant number were unwilling to move to prefabs because they did not want to lose the fringe benefits associated with camp living. By contrast, those living next to friends and relatives were more likely to have financial resources and emotional support, and more likely to have a plan that the cash from the rental subsidy would support (World Bank, *op. cit.*).

15. This was below market value of $4 200, as the MPW was in a position to set prices and standards for these units.

65 000 people were still living in 54 tent communities, while a total of 300 000 to 400 000 people (100 000 families) were receiving the rent allowance..

(Table 8. Fiscal impact of earthquake)

23. Besides assistance associated with shelter, government sought to help people in other ways, notably by extending special social insurance benefits for earthquake victims, insured and uninsured alike. An "earthquake amendment" to the new pension law has reduced the period of mandatory contributions in order for insured members and their dependants to be eligible for death and disability benefit, to just one year (with Treasury covering the shortfall in minimum contributions from the normal four years). This affects mainly monthly payments to dependants of deceased breadwinners as well as disability payments to insured members[16]. The law also provided for the following lump sum payments to be paid regardless of length of service or wage earned: $1 500 for each lost direct relative, and $1 000 for each second degree relative. Financial help was further given in the form of a deferral of all taxes until 2000. Finally, the government has provided extra community services, such as orphanages, child-care facilities, elderly accommodations, and training centres. The combined budgetary cost of all forms of emergency assistance incurred in 1999 is estimated at $700 million (*Table 8*).

Longer-term housing replacement obligations

24. The latest estimates of the Ministry of Public Works (MPW) indicate that nearly 94 thousand houses were completely destroyed and 218 thousand damaged, of which 105 thousand moderately and 113 thousand lightly (*Table 5*). According to the provisions of the (former) Disaster Law, the government is responsible for replacement of destroyed stock and rehabilitation of lightly to moderately damaged stock, though only the primary residences of owner-occupied houses are eligible for this guarantee. The World Bank estimates that 55 to 75 per cent of the affected units might satisfy the government criteria[17]. The public cost of replacing a destroyed house is approximately $20 000 (not including land acquisition costs), covering a very modest (80 m^2) apartment construction of standard design and location. The average cost of repairing a moderately damaged house is estimated to be $8 000, and a lightly damaged one, $3 000. The MPW is planning to build some 20 thousand new units this year, with construction due to have started in March. The preparatory work has involved the rapid mobilisation of engineers from all around the country to complete the work of damage assessment, determination of the holders of property rights, geological surveys to ensure the proper siting of permanent housing settlements, and infrastructure construction and repair. But despite the fast pace of reconstruction, there will remain a further 30 to 50 thousand units potentially eligible for full restitution and many still in need of repair. Ultimately, the government may face $1.7 to $2.2 billion in housing reconstruction costs (*Table 5*)[18], while estimates of damage to the housing sector go as high as $5 billion (*Table 4*).

(Table 5. Housing reconstruction cost)

16. Reflecting the pattern for Turkey as a whole, about three-quarters of the population is either a member of a social security fund or the dependant of one.

17. According to the MPW, 70 per cent of the population having lost their shelters are homeowners, Of these, around 75 per cent will have a legal beneficiary. This would tend to support the lower band estimate of the World Bank.

18. These estimates do not include the cost of relocating entire cities, which could substantially raise the upper bound. For example, the town of Adapazari (capital of Sakarya province) is planning to relocate all housing 20 km outside the city, due to poor soil quality there (i.e., which liquifies easily in earthquakes).

25. In lieu of direct provision, the government is also offering a system of cash benefits towards building or repairing one's own home, which could help to hold down fiscal costs and further speed up the work of reconstruction and rehabilitation. Those who lost their house and are willing to leave the region or to build their own home in the region, within the municipality area, are given a 20-year no-interest loan of about $10 500, while those willing to build their own home within the region but outside the municipality area receive a loan of about $6 000 (2 900 people are estimated to have taken this set of options); owners of damaged homes receive a loan of around $1 000 toward repair of a lightly damaged house and $3 500 for a mid-damaged house, with eligibility subject to certification by an engineering company (66 500 households have reportedly received this benefit). While allowing for more freedom of choice and flexibility -- hence more rational redevelopment patterns -- the cash benefits are (once again) only at best around half as generous as the corresponding direct government provision. The absolute gap is high in the case of a new home, where the take-up rate may remain low. The 2000 budget assumes that the combined value of direct housing investments and alternative cash benefits will total $1.2 billion (*Table 8*).

Repairing damage to social infrastructure

26. As regards social infrastructure, damage to schools was extensive: 43 school buildings were demolished and 377 endured severe damage. Until these are rehabilitated, around 25 000 schoolchildren will need to be transported to different school facilities, which requires extra payments for transport, uniforms, books, schoolteachers, and food. Total costs amount to an estimated $100 million for the 1999-2000 school year. The quality of education is also likely to suffer (an unaccounted for cost), as classroom size in the schools receiving the overflow will double during the interim period[19]. On the other hand, quick mobilisation of extra resources meant that little school time was lost after the earthquake. In the health area, 28 health centres and 10 hospitals were severely damaged, depriving the area of health infrastructure just when it was needed the most. Including the cost of deploying temporary prefab health care units and replacing damaged medical equipment, the cost of rehabilitating damaged capacity in the health sector is estimated at around $40 million.

Impact on the Budget

Overall financial burden

27. *Tables 7* and *8* provide the provisional government estimates of these various fiscal costs, which are seen to total about 1 per cent of GNP in 1999 and 2 per cent in 2000, $5.9 billion in all. Most of the 1999 losses result from immediate reconstruction and repair costs, plus extra consumption/transfer and social security spending.

(Table 7. Consolidated (central government) budget)
(Table 8. Fiscal impact of earthquake)

28. Indirect impacts could potentially have arisen as a result of a higher risk premium on government debt due to the worsened budgetary position and hence a higher debt service burden. Around $1 billion of private capital flowed out of the country in the week after the earthquake. However, confidence was quickly restored and capital flows stabilised with the passage of a social security reform bill on 25 August,

19. The government is simultaneously implementing a new law which raises the number of years of compulsory schooling, creating supply bottlenecks even before the earthquake.

accompanied by the government's announcement that it would pursue other structural reforms without delay and that it would not finance earthquake costs by new domestic borrowing.

Foreign contribution to the reconstruction effort

29. Further re-establishing confidence was the large commitment of official capital flows to the reconstruction and relief effort. Total commitments to date stand at $3.8 billion (*Table 9*): $2.6 billion is in the form of project finance, to be disbursed mainly in 2000 and beyond as the reconstruction proceeds, while $1.1 billion is in the form of budget support, $107 million being already disbursed in 1999. The loans have been provided on a highly concessional basis. A large part of the project money ($1.0 billion) is being administered through the World Bank-financed Project Implementation Unit (PIU). The PIU was set up in the Prime Minister's office in the context of an earlier loan project and has now been strengthened to co-ordinate all paperwork, tenders, and disbursements of aid in a transparent way. Appointments of the staff of the PIU must be approved by the Bank, and Bank procurement rules must be followed[20]. (A draft Tender Law under preparation would internalise these procurement practices in the future). World Bank money accounts for more than half of these funds, and is geared to financing not only housing and infrastructure reconstruction, but also to institution building for future disaster preparedness, including the setting up of : *i)* a national co-ordinating disaster management agency while enhancing the capabilities of the local authorities in coping with a future disaster, and *ii)* a national mandatory earthquake insurance plan.

(Table 9. External financing for Marmara earthquake)

30. After official foreign funding, there remains a financing gap of $2.1 billion. In order to close this gap, on 26 November the government announced an "earthquake package" of tax measures. It included a one-off tax on personal and corporate tax; real estate tax and motor vehicle tax paid in 1999; a special transactions tax; a special tax on each paper cheque; an increase in the remittances of surpluses generated by regulatory boards; a 25 per cent increase in the tax on mobile telephone usage for 2000, and an increase in petroleum products consumption tax. A one-off "windfall profits" tax on government securities was announced at the same time but aimed at fiscal adjustment in 2000 rather than coverage of earthquake costs.[21] The total expected revenues from the earthquake package (excluding the windfall profits tax) are $189 million in 1999 and $1.5 billion in 2000,[22] sufficient to offset a large part of the gap.

20. For example, large sums are being made available under this project for the funding of various studies by consultants or for construction and engineering projects. A fair set of procurement rules would not discriminate in favour of domestic suppliers of such services as such discrimination would perhaps not only raise costs, but also impede the importation of foreign know-how which Turkey so desperately needs (see above).

21. This tax was to be levied on 1 January 2000 on t-bills and bonds issued before 1 December 1999, the rate of taxation varying inversely with residual maturity of the asset in order to capture back some of the real interest rate gains of disinflation. The tax was at first controversial because it was totally unexpected, was levied on interest accruing before introduction of the tax, and applied only to government paper. However, markets adjusted quickly.

22 . If the windfall profits tax is included, the latter figure comes up to $4.5 billion.

Safeguarding the stabilisation programme

The IMF Programme

31. By nature the above costs are temporary, so that they do not really impinge on questions of fiscal sustainability; but they come at a critical time for the public accounts. They must be seen against the background of a severe underlying deterioration in 1999, when the overall government debt surged from 44 to 58 per cent of GDP within the space of a year, and the adoption of a very tight stabilisation programme designed to create and preserve a sustainable longer-term fiscal position and non-inflationary growth.

32. To prevent the earthquake costs[23] from leading to generalised fiscal relaxation, the IMF programme (*Box 2*) will introduce a special monitoring and reporting format for earthquake-related expenditure. The 2000 budget will also be exceptionally burdened by growth of interest payments from 13¾ per cent of GNP last year to an expected 17 per cent this year. This reflects the real interest burden of the large amount of securities issued in 1998-99 at fixed nominal interest rates (albeit partly clawed back by the windfall profits tax). However, both burdens are seen as being temporary, as the reconstruction is assumed to be essentially completed in 2000 and sharp interest rate declines of early 2000 will feed through into declining interest payments by next year.

33. In 2001 and 2002, the programme will strive to maintain the primary surplus of the public sector at the level reached in 2000 exclusive of earthquake costs, i.e. at 3¾ per cent of GDP (*Table 10*). Nevertheless, the government will face the task of replacing the large number of temporary taxes introduced this year by more permanent measures in 2001. The risk that housing reconstruction costs could continue beyond the year 2000, the certainty of earthquake-related state bank duty losses for another three years or more, *inter alia*, suggest the need for further adjustment.

(Table 10. Public sector primary balances)

Impact on the structural reform process

34. The stabilisation strategy is buttressed by an impressive number of structural reform actions in the field of public finance and government involvement in the economy, and the disaster has made these even more urgent, in part because of the need for re-evaluating the priorities in the use of national resources. As noted, a pension reform bill was passed only days after the earthquake, substantially raising retirement ages and reducing expected future pension fund deficits[24]. The government has decided to eliminate support to industrial crops, while support prices for cereals will now be linked to world prices, and future plans involve a shift away from price support altogether, toward direct income support. To promote budget reform, the 2000 budget will newly include the cost of credit subsidies provided by state banks. To spur privatisations, in August a constitutional amendment was approved granting foreign investors the right to international arbitration, and laws are moving forward to deregulate and de-monopolise the telecommunications and energy sectors, two key sectors of future privatisation activity. Fiscal reform and privatisation are being underpinned by reforms to the financial system (see Section IV), which will include a hard budget constraint for the state banks.

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23. The IMF estimates earthquake costs at around 1 per cent in 1999 and 1½ per cent of GDP in 2000 -- the latter roughly ½ percentage point lower than that estimated by the government.

24. However, a generous early retirement package that Parliament recently voted for itself seems to go in the opposite direction.

Box 2. **The IMF programme**

The costs of the disaster have to be assimilated at a time when Turkey is undergoing a process of budget consolidation as part of a 3-year disinflation programme agreed with the IMF. This rests on three pillars:

- an up-front fiscal adjustment that is sufficient to stabilise the debt in the first year,
- structural reforms to make the fiscal adjustment sustainable over the medium term; these are substantially front-loaded as well as comprehensive, covering pensions, agricultural support policies, budget reform, privatisation, and banking, and (in the future) tax administration and policy;
- an exchange rate anchor to inflation expectations, while a pre-announced exit strategy allows for a smooth transition to a more flexible system by the end of the programme period.

The latter two features, in particular, distinguish this from the previous seventeen IMF programmes that failed.

The fiscal adjustment is critical, as weakness in the public accounts is the ultimate factor behind high inflation. The key fiscal goal is to break the debt accumulation process that got out of control in 1999. This is to be achieved by an increase in the primary balance of the public sector (a performance target) from a deficit of 2 per cent of GDP in 1999 to a surplus of 2¼ per cent in 2000. Together with privatisation receipts of $7½ billion in 2000 (an indicative target), this should be sufficient to stabilise the public debt at its 1999 level (58 per cent of GDP). Revenue and expenditure measures amounting to over 7 per cent of GDP underpin the adjustment of the primary balance, given that it would have deteriorated by around 3 per cent of GDP in 2000 (of which 1½ per cent due to earthquake costs) in the absence of new measures.

More than two-thirds of the adjustment (5 per cent of GDP) is in revenue measures (*Table 7*). Besides the above earthquake tax package, this includes increases in the VAT and other tax rates and fees; re-instatement of quarterly advance payments of corporate and personal income tax, and reintroduction of the reform in the method (marked-to-market) for computing taxable interest receipts for holders of government securities. Expenditure measures include: cuts in civil service real wages by around 10 per cent (reflecting a 15 and 10 per cent nominal increase in first and second halves, respectively, consistent with the inflation target); cuts in current spending and the ending of support to industrial crops.

35. Overall, the economic and financial repercussions of the disaster have been managed in such a way as to preserve confidence -- especially foreign confidence -- in the stabilisation and structural reform programmes. The opportunity has even been used to consolidate the progress made. Financial markets have exhibited strong confidence, as interest rates fell sharply at the start of the year. This is important, because achieving the targeted 25 per cent CPI (20 per cent WPI) inflation in the first year of the programme requires a radical shift in inflation expectations, based on a belief by domestic and foreign actors that policies are credible. Besides the above fiscal adjustment, strong signals are being sent to the private sector about the seriousness of the government's commitment to disinflation. The "currency board" rules by which the Central Bank now operates ties its hands insofar as it cannot sterilise capital inflows or outflows while following a pre-announced crawling peg for the exchange rate, in turn tied to the inflation target. Incomes policy provides support and has limited this year's increase in civil servants' wages and in the minimum wage to the inflation target[25]. Also, a law has been passed by Parliament to limit rent increases in 2000 to the targeted rate of inflation (rents accounting for 16.2 per cent of the CPI)[26]. This scheduled transition to a low inflation regime has important implications for future growth prospects and for the management of the hitherto uncontrolled urban housing market, which has been one of the factors behind the material and human toll of the earthquakes. These factors are discussed in the next section.

25. Minimum wages are set by a tri-partite commission, of which the government is member.

26. This law may not pass a constitutional challenge however.

III. Regulatory and governance issues: towards more effective urban planning

36. The problems of poor construction and siting described at the beginning of the Report need to be understood in the context of the extremely rapid process of urbanisation which Turkey has been undergoing, in which the population has been moving *en masse* from the countryside to the cities. The process of urbanisation itself has been part of a momentum to industrialisation which has relied heavily on the informal economy for its underlying dynamic and in doing so may have encouraged a trade-off between economic expansion and orderly development. The process has been so rapid as to put pressure on the regulatory, supervisory and governance structures meant to ensure sustainable development. The earthquakes, in turn, have focused attention on the need to overhaul this framework and from a forward-looking perspective, structural reform is a key ingredient in terms of reconstruction and post-reconstruction normalisation. Indeed, the earthquakes have come at a time when Turkey is already entering a period of transition and modernisation where institutions are being reshaped to provide more effective support to innovation and entrepreneurship. In this sense, the response to the governance issues highlighted by earthquakes offers an opportunity to accelerate and reinforce this process, as already evidenced by the fiscal and financial reforms noted above.

37. This section begins with a discussion of the regulatory and legislative framework behind the apparent vulnerability of the Turkish housing stock to earthquakes, in the context of existing legislation and its enforcement, which involves accountability and performance at all levels of government. The succeeding subsection then presents a discussion of the policies and institutions needed to govern the development of a property market in which individuals gradually assume responsibility for finance and insurance. The intention is to provide a strategic overview of the issues involved and the policies being adopted to deal with them, rather than to make comprehensive recommendations. These issues will be returned to in more detail in the draft *Survey*. Turkey is also the likely object of an OECD *Regulatory Review*, undertaken by PUMA. These reviews provide targeted assistance in institution building which could be of particular benefit to Turkey. The OECD's *Regulatory Reform Programme* is aimed at reforming or eliminating regulations which raise unnecessary obstacles to competition, innovation and growth, while ensuring that regulations serve important policy objectives in an efficient manner. Drawing on the analysis and recommendations of good regulatory practices contained in the 1997 *OECD Report to Ministers on Regulatory Reform*, the Regulatory Reform Programme is a multi-disciplinary process of in-depth country reviews undertaken by several OECD committees and members of the International Energy Agency (IEA). Using peer review, comparative analysis, and a multi-disciplinary framework, these country reviews examine public sector quality, competition and trade policies, selected sectors, and the macroeconomic context for reform. Thus, they assess complementarities between policy areas, and present a coherent set of policy options to maximise the benefits of reform. Turkey is a possible candidate for an in-depth review in 2000 or 2001.

Regulatory background to disaster

38. The measures and procedures pertaining to natural disasters in Turkey are set out in law (see *Box 3*) and include the stipulation of building standards. Moreover, although there is no special legislation regarding the incorporation of earthquake risks in building standards, the rules for urban planning as set out in the *Reconstruction Act* specify the need to evaluate risk factors determining potential disaster areas and to take the necessary precautions for minimising the loss of life and property. These include the development of a seismological and strong ground motion network for the country; the establishment of a national information centre for processing of all kinds of earthquake data, such as the preparation of earthquake catalogues and earthquake hazard maps of Turkey; the determination of measures, construction

techniques and design principles for the structures to be built in the earthquake zones, and the development of methods of repair and structural strengthening of buildings damaged by earthquakes or prone to be affected by disasters including training and monitoring activities.

Box 3. **Legislation and regulation regarding natural disaster readiness in Turkey**

Activities related to disaster relief had been carried out under particular acts of remedy, until 1958, when the Ministry of Reconstruction and Settlement was established. In 1964, a General Directorate to deal specifically with these issues was set up within this Ministry.

The *General Directorate of Disaster Affairs* is composed of: the Departments of Earthquake Research, Communication of Emergency Aid, Planning and Loan Management, Disaster Survey and Damage Assessment, Temporary Housing, Prefabricated Housing Production and Construction, Disaster Fund Management and Supplies. There are also machinery service and maintenance workshops and prefabricated housing construction plants. Moreover, the General Directorate has regional storage and equipment centres located in disaster-prone areas.

The major legislation pertaining to the functioning of the General Directorate is the *Act on Measures and Assistance Regarding Natural Disasters Affecting General Public Life*, enacted in 1959, which underwent some amendments in 1968. The law specifies the protective and preventive measures as well as regulating the activities to be undertaken before, during and after natural disasters, and defines guidelines for terms and conditions of assistance to be provided to affected people. In practice all expenditures for emergency aid, rescue and relief, temporary and permanent housing and the necessary services are met from the "Disasters Fund" established by law in 1959.

The General Directorate of Disaster Affairs is entrusted with the following responsibilities:

- Providing emergency aid and securing co-ordination among the relevant institutions during and after a disaster.
- Implementing the measures to provide temporary shelter immediately after the disaster and undertaking the reconstruction and rehabilitation activities of damaged housing, work places and infrastructural facilities.
- Taking measures to realise and co-ordinate planning, project preparation, implementation, management and control activities in disaster areas as well as in disaster-prone areas.
- Establishment of regional centres for the production and storage of prefabricated structural elements aiming at the accommodation of people and co-ordination of emergency assistance in cases of disasters.

39. In practice, despite the legislation, the bulk of land development in Turkey seems to have occurred through two informal mechanisms:

- Occupation and expropriation of "government land" by new city-dwellers, and
- *de facto* development of agricultural lands (outside official settlement plan) around cities.

In effect, Turkey has coped with urban growth through migration by tolerating the illegal construction of housing, often on publicly-owned land, thereby encouraging the large construction sector to supply housing at lower cost by eliminating the need to purchase and improve land. The illegal settlements were not exclusively for the poor, as is often the case in some developing countries; even middle class people have had to compromise on the quality of construction, infrastructure and public services. The regularisation of illegal settlements was initiated by their residents, who used the process to secure investment in infrastructure and public services as municipalities incorporated their district, and who acquired certification of conformity for their buildings through amnesty even if these still did not meet the

standards of the codes. All involved, local and national officials, builders, and property owners, found it convenient to ignore legal measures for town planning and construction. The benefits of this process have been the gradual extension of municipal jurisdiction over illegal settlements, and the avoidance of major social tensions during a sustained period of rapid urban growth through migration. This "gradual legalisation" has helped avoid the totally informal, illegal, unequipped and unserviced settlements around Turkish cities. It has been a major factor minimising housing and living costs in the country, and consequently fostering industry's competitiveness. In the process, there has been implicit agreement among all concerned that economic development was the highest priority. Licences have been granted for plots that carry a high risk, with tacit collusion between government, builders and homeowners to bypass the (weak) zoning/construction ordinances.

40. Achieving better safety standards would seem to entail an overhaul of the *Construction Law* and *Law on Municipal Administration*, to ensure that the principles of orderly urban development are more closely followed. At the same time, the regulatory and supervisory codes covering the construction industry have come under scrutiny:

- *Technical and professional standards in the construction industry.* There has been little or no criminal and tort liability, and no supervisory agency responsible for professional standards and liability. Professional training for those in the construction sector, building contractors, sub-contractors, foremen and apprentices, has been left unsupervised;

- *Building codes* have been periodically updated, but not at a pace that has kept up with earthquake technology. As noted, most of the building stock destroyed in the earthquake was built in the last twenty years;

- The *Tender law* and building contracting system have not succeeded in preventing abuses in public procurement (public buildings such as schools and hospitals suffering from many of the building defects of private houses).

It would be beyond the remit of this report to offer policy solutions to the complex issues thrown up by the above planning and development problems. As noted, they are to some extent strategically related to the economic development process, and solutions will need to be part of a global approach to bringing the informal economy within the ambit of state regulation. It will also require a reappraisal of the respective responsibilities of the central and local authorities and of the role to be played by the private sector. The problems associated with high-risk land development have called into question the effectiveness of co-ordination across levels of government and the absence of supportive private sector incentives for risk avoidance and preparedness (such as would be provided through a competitive insurance or mortgage market).

Central-local co-ordination

41. Disaster management is in the hands of the central government in Turkey, and since disasters, by definition, are of a magnitude as to overwhelm local and even regional resources, there is a strong argument in favour of such national responsibility. In the event of a major natural disaster, fifteen central government ministries (each having its own disaster management unit) establish a crisis centre in the Prime Minister's office, which mobilises resources to the affected area[27]. The General Directorate of Civil Defence in the Ministry of Interior and the military play a central role in rescue and relief operations.

27. For smaller size crises with more localised effects, the Ministry of Public Works is in charge of the crisis management effort.

However, while such a centralised approach has obvious advantages, it may not have achieved an optimal outcome in terms of preparedness or response. There have been no awareness campaigns to inform citizens of risks and appropriate actions to take in an emergency. Moreover, international best practice indicates the importance of municipalities and provinces being able to develop their own capabilities in disaster management, the lessons of recent global disasters highlighting the contribution of civil society in an emergency, the value of local knowledge, and the benefits of international co-operation. Including many different ministries in emergency planning can, in principle, make it difficult to match resources with responsibilities in sectoral ministries: for example, the ministries of education and health may be unable to reinforce schools and hospitals on their own, but would have to depend on the ministry of public works.

42. The earthquakes thus necessarily raise questions about co-ordination of emergency planning and response between local and national levels. Insofar as the regulatory and planning functions of national, regional, and local governments have been fragmented up to now, questions also arise as to the efficient allocation of regulatory responsibilities to reduce risks and the need to adopt an approach to reconstruction which balances central and local government interests. With respect to the reconstruction of cities suffering large-scale destruction, including Izmit, Adapazari and Duzce, the responsibility of the government to replace housing gives the central state the initiative, but the decision-making about what is built, where and when will need to involve local and regional levels if a strong a component of informed consumer choice is to be built into the reconstruction programme. Engaging local and regional levels of government in land use planning and facilitating measures to reduce risk and improve preparedness at those levels is, however, a complex challenge, especially since regulations emitting from the national government do not at present permit much flexibility at local levels.

Strategic urban and regional planning issues

43. The immediate challenges are to ensure coherent development/reconstruction of the affected areas and towns, some of which have had their economic viability put in question, while trying to ensure that the defects which magnified the losses in the recent earthquakes are not so catastrophic when the next earthquake hits. Starting from the assumption that it is not a question of replacing what was destroyed building-for-building, there are six major considerations which are difficult to reconcile each with the other in a coherent strategy: *i)* the expectation of people that the new housing and other facilities will be safer; *ii)* the desire to move people into new, permanent houses as quickly as possible, thereby reducing the emotional as well as financial cost of interim solutions with temporary housing; *iii)* the reduction of government support for homeless people and for temporary housing as quickly as possible; *iv*) the opportunity to introduce improvements in infrastructure, civic facilities, etc. provided by the reconstruction process; *v)* the chance to introduce new measures of code enforcement, insurance, etc. for rebuilt property and districts; and *vi)* the need to generate private investment and spur economic activity, so that employment and incomes can recover.

44. In the final months of 1999, the first, second and third considerations (i.e. moving people into new, permanent houses and reducing government support for temporary housing as quickly as possible) appeared dominant. The World Bank report appraising the proposed reconstruction loan to Turkey criticised expenditure on temporary housing as wasteful and costly[28]. There are reasonable concerns about

28. The World Bank states that: First, better use could have been made of existing capacity (vacant housing, warehouses, public buildings), supported by better transportation to get people to their places of work. Second, international experience shows that there is a danger that such "interim" housing may become quasi-permanent. For example, after the Kobe earthquake Japan spent $2.5 billion on 48 000 temporary pre-fab homes; five years later, approximately 12 000 are still in use, with adverse effects on the health of the occupants. Third, the haste to build prefabs may have pre-empted land needed for permanent construction,

fostering a dependency mentality, and about people trying to claim benefits on dubious grounds. But in the absence of better maps of the affected sites, of intensive consultations with local populations, and of an assessment of economic and environmental deficiencies in the cities that had been destroyed, it is very difficult to know what should be rebuilt, and what should be changed. This implies that some weeks, perhaps months, would be needed to prepare plans, and that people would therefore remain in temporary housing for perhaps longer than otherwise. People living in temporary housing would be critical of delay when plans are ready but postponed for financial, political or other considerations which are outside their control, but might be more accepting of the situation if it facilitates strategic planning, which should include broad measures of public participation, and should enlarge rather than restrict the options available. The objective of reconstruction on sustainable lines can be compromised if decisions are made prematurely, on the basis of inadequate information.

45. As things stand, government policy appears to call for residential districts in Adapazari and Duzce to be relocated to geologically secure sites, at some distance from present town centres. The World Bank project appraisal points out that reconstruction "in situ", replacing a damaged or destroyed building by a new one, would be more costly than construction of an equivalent number of houses on a green-field site. This strategy of new town development poses major problems of development of sustainable transport systems and poses the risk of introducing a rupture in the social and cultural condition of the town (thereby actually exacerbating the shock of the catastrophe and making it more difficult for people to recover a sense of normalcy in their lives). A resettlement strategy could also generate legal challenges by people with claims for land adjustment and compensation. Because the government's plan to replace houses is also limited to owner-occupied housing, landlords will get only one building rebuilt. In the immediate future, therefore, there will be a shortage of rental housing, and the rebuilding strategy does not appear to indicate where rental housing might be built. Not only might a shortage of rental housing compromise mobility at a time when population movement must be expected (with consequences for employers who need to attract workers with certain skills); a failure to plan for rental housing may lead over time to the *de facto* separation of owner-occupied housing from rental properties on a scale far greater than what already exists.

Contingency planning: preparing for the next earthquake

46. Given the earthquake movement along the North-Anatolian fault, Istanbul is perhaps the city-region now most at risk. As noted above, seismologists expect a severe earthquake in the southern Istanbul region, bordering the sea of Marmara at some time in the next quarter-century, with the strong possibility of such an occurrence within a decade. In Istanbul, there are known areas of high risk (where liquefaction of soil would occur). Should the people living in these areas be resettled? Should their housing be 'retrofitted' (i.e. improved to be more earthquake resistant)? Low-cost improvements may yield significant benefits in terms of resistance to destruction, and could be phased in while preserving existing districts. In the meantime, emergency planning needs to take account of the possibility that some parts of the city will suffer far greater destruction than others. Finally, because the city continues to grow (at a rate estimated at 300 000 newcomers per year), and in the absence of a coherent, enforceable strategy to plan for this growth, illegal settlements and sub-standard construction will continue to be the norm, thus increasing the magnitude of the problem facing those with the responsibility of emergency preparedness.

47. It is beyond the scope of this report to elaborate on the elements required to meet any future earthquake emergency. However, good communications will be a priority, while the experience of Kobe should encourage the creation of more areas of open space within the city, where people can assemble, as

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which reinforces the risk that the schedule for building permanent structures may slip and that the prefab cities may become new slums.

well as redundant networks and pathways for public services, infrastructure, and massive campaigns of public information and training. Since centralised public services can be easily crippled in time of a disaster, priority will need to be given to retrofitting schools and hospitals, the build-quality of which is generally poor. These could be used as focal points during emergencies.

48. Perhaps most importantly, at present, while options for the future can still be explored in the reconstruction process, there is an urgent need for guidance about metropolitan regional development and appropriate policy instruments. A metropolitan regional review conducted by TDS in 2000-2001, could be the means of accelerating the analytical phase. An OECD review bringing in expert knowledge from Member countries could complement efforts in Turkey by the SPO and other actors to analyse regional conditions. Such a seminar could an be an opportunity to present an overview of OECD policy trends and the lessons of success and failure in recovery from disaster.

IV. Enlarging the scope for market-driven economic development

Involving the private sector: the mortgage market

49. The administrative deficiencies noted above have operated against the background of a perverse set of incentives for the private sector, which have acted to make both the population and the business sector short-sighted with respect to risks. A government guarantee to replace housing after an earthquake has been behind the lack of pressure for better mapping and risk analysis. A system of private incentives to risk minimisation has thus failed to develop. At the same time, chronic inflation and associated high real interest rates have prevented the development of a mortgage market. Standard urban planning, micro-zoning according to geophysical information, building code development and enforcement will increase the cost of housing, creating a demand for both a mortgage and insurance market. Indeed, a longer-term consequence of the earthquakes will need to be the development of the two, so far minimally-developed markets for earthquake-resilient and infrastructure-equipped suburban habitable land and that for pricing the natural risk vulnerabilities of individual assets.

50. The creation of housing-credit and insurance markets should be assisted by a low inflationary environment, which would allow for a longer-term financial planning horizon and help Turkey to attract long-term foreign capital. Moreover, the need to create the conditions for more sustainable urban development comes at a time when the opportunity to make profits from buying government paper are diminishing, promoting a need for alternative domestic savings instruments. However, for mortgage and insurance markets to emerge, legal/institutional impediments to their development will have to be reviewed, giving an impetus to financial market reform. A new action plan, including the securitising of mortgage credits, would need to be developed in order to help form a sound system. Important reforms to the financial system are already taking place that should facilitate financial market diversification. Perhaps most far-reaching have been the measures to improve the regulatory and supervisory framework for the banking sector, in particular passage of legislation to create a new independent supervision authority and to strengthen its autonomy by giving it full authority to license/delicense banks. It should be operational by end-August 2000 and replaces the former split responsibility between treasury and the central bank. Together with enhanced prudential regulations, this will allow the authority to intervene and restructure banks for quick resale to new owners[29].

51. Reform of the banking sector as it adapts to a low-inflation regime could unleash the development of a mortgage market, which may be instrumental in providing financing for high quality new housing construction[30]. Such a market is already developing, albeit only in the upper segment of the property market. High inflation has thus far prevented the creation of TL-denominated instruments beyond one year, effectively ensuring that the housing industry operates on a pay-as-you-build principle. However, there are some USD denominated transactions in the middle-upper market, the main market vehicle for property investment being Real Estate Investment Companies. These are regulated by the Capital markets Board since 1995 and are tax-favoured (to allow them to compete with the informal economy which dominates the building industry). These companies seem set to expand, not least because earthquake risks

29. Strains are already apparent in the banking sector: five troubled banks have recently been transferred to the Deposit Insurance Corporation.

30. The sector was distorted by high inflation, with a focus on making easy speculative profits which hindered the development of traditional banking activities. The quasi-fiscal operations of state banks further distorted financial markets and led to a large hidden public debt build-up (which surged to an estimated 8 per cent of GDP in 1999).

have directed market interest quite clearly towards property compliant with building and zoning codes, which such companies can guarantee. Indeed, the role played by mortgage companies in insisting on building standards and insurance will be a growing stimulus to more orderly development of the housing market as far as new building is concerned.

Managing risks: developing the private sector insurance market

52. While a natural corollary of a growing mortgage market would be the development of a private insurance market, this would be slow to impact on the current housing stock in Turkey, which is currently severely underinsured. Property owners are usually reluctant to incur the up-front costs of risk mitigation measures because they either misperceive risks, are myopic and/or face severe budget constraints. And judged by its past record and present financial capacity (capital adequacy), the technical abilities of the local insurance industry are limited for handling the earthquake risks.

53. The government thus has a role to play, as indeed is the case in other OECD economies where the concurrent provision of public and private insurance is considered a necessity. On 27 December, a decree promulgating a new mandatory national insurance scheme along with abolition of the former government guarantees in the housing area was announced, which will form the core of a future revised Disaster Law. As a result, a government-sponsored "Turkish Catastrophic Insurance Pool (TCIP)" is now being put in place, which will be subject to a coverage limit of US$25 000 per house, and will permit additional private insurance coverage *(Box 4)*. The new scheme is to be operational by 28 September 2000.

Box 4. **Compulsory earthquake insurance**

The prospects of the local insurance industry expanding its coverage, if earthquake insurance were made compulsory, are limited, due to its low capital base and the reluctance of leading international reinsurers to provide more capacity to the industry in its present state. In addition, a pure private sector approach is unlikely to succeed, as some insurers will attempt to underwrite only those risks that are overpriced, leading to instability and bankruptcy for those who get the wrong part of the portfolio. Well-founded concerns over Turkish building standards are an aggravating factor.

Under these circumstances, it was perceived that a joint public/private sector solution was necessary to reduce the risk borne by the Government and the property owners. On 27 December 1999, the Turkish Government approved a Decree-Law on the introduction of compulsory earthquake insurance for residential buildings and offices. This measure represents an important and clear break with the past, when under the *Disaster Law* the Government was liable for rebuilding housing destroyed by natural disasters almost free of charge. When the Decree goes into effect those who fail to get insurance will no longer be able to benefit from government aid in the event of a natural disaster[1].

The Decree paves the way for the creation of the Turkish Catastrophic Insurance Pool (TCIP) that will be the stand-alone provider of earthquake property insurance in the country for up to $25 000. Coverage in excess of that amount will be provided by private insurers. While initially, in the first several years of its operations, the TCIP will be supported by a contingent line of credit from the World Bank, its major sources of capital support will come from the collected premiums, reinsurance and excess of loss treaties and, possibly, issuance of catastrophe bonds. It is envisaged that in five years, the TCIP will have enough capital to effectively protect Turkish homeowners against catastrophic events larger than that occurred on 17 August 1999, which would effectively relieve the Turkish Government from its large contingent liability due to frequent natural disasters.

In addition to its core earthquake insurance functions, it is expected that the TCIP would also greatly contribute to the better enforcement of building codes through a commercial arrangement with independent engineering firms that would be retained to certify the construction quality of new residential dwellings to be insured under the plan. However, since there will be a single undifferentiated premium, this will need to come via pressure from the reinsurers rather than a built-in incentive structure. Indeed, care will need to be exercised to ensure that the insurance premium is not treated as a tax and ultimately assimilated into the central government budget.

1. State-owned buildings and buildings belonging to state organisations, as well as houses built within the borders of villages in rural areas, are exempt from the requirement.

54. The new scheme will require the services of insurance companies as information and collection agents, and could help stimulate development of the sector in the longer run. However, for this to be really effective, the challenge is to reconcile low-cost insurance with the need to generate economic signals which allow individuals to respond to risks. Public provision alters incentives and creates a moral hazard. To enhance the role of insurance in encouraging property owners to take steps to reduce losses from natural hazards such as earthquakes, private incentives are needed that internalise risks. This may be the only real solution to enforcement failures noted above, since incentives to favour development over safety will change only slowly and uncoordinated regulatory responsibilities between local and national levels are not yet rationalised. Uncontrolled building on dangerous land may well continue, since it will take great political courage to call out the bulldozers against squatters who have erected buildings. The effectiveness of the proposed new supervision authority, with professional standards and liability, is uncertain. The greatest boost to home safety in Turkey might thus well lie in private risk-based enforcement to standards in land use and construction. For this to be the case, private insurance should ideally assign risk-related premia to the risk exposures of different types and locations of buildings. The lack of premium differentiation is a drawback here, which should be corrected as cartographic deficiencies are remedied.

55. An active insurance industry would be instrumental in ensuring the enforcement of building codes, relieving the burden on government in this respect. Indeed, it is because reinsurers do not utilise information on risk to price their products to invest in cost-effective mitigation measures there is a need for building codes. There is also limited interest by engineers and builders in designing safer structures if it means incurring costs that will hurt them competitively. Interviews with structural engineers concerned with the performance of earthquake-resistant structures indicate that they have no incentive to build structures that exceed existing codes because they have to justify these expenses to their clients and would lose out to other engineers who did not include these features in the design. This would change with the development of insurance and mortgage markets.

V. Summing up: implications for the economy and future disaster readiness

56. The human and material toll of the two earthquakes have been severe. The costs have been heavy in terms of material damage to the residential and small-business infrastructure in the affected regions and the financial strain on the budget is potentially great. However, for the business sector in general, the effects on output should be relatively short term, and following a negative effect on output in 1999, there could be a positive impulse to GDP growth in 2000. Moreover, international assistance has reduced the financial burden to manageable proportions (for re-housing and reconstruction if not for retrofitting existing sub-standard property). The disaster has not diverted policy attention from the need for sound macroeconomic policies and the structural reform process has been strengthened by it. The fact that resources have needed to be shifted to the affected areas has made it even more crucial that public spending and tax-raising should become more efficient, and that the government's agenda for reform has been backed by an IMF programme. International investor confidence has grown and interest rates have fallen. Hence, despite the disaster, the economic prospects for the economy remain relatively bright.

57. Nevertheless, the heavy human and material damage inflicted by the earthquakes prompt important questions with respect to Turkey's disaster preparedness, particularly since the earthquakes occurred along a known active fault line. Forty-three per cent of Turkey's population is living in the "first-degree" earthquake risk zone and the number is growing faster than in any of the other four risk zones. The components of a comprehensive disaster management strategy appear to have been missing, making for a combination of relative slowness of response and a human and material vulnerability to shocks greatly in excess of that observed in other OECD member countries subject to earthquakes. The factors underlying this vulnerability can be traced to deficiencies in r*isk identification* procedures and *risk-reduction* methods, as well as to the absence of *risk transfer and financing* techniques. The report suggests that these deficiencies may stem from the nature of recent Turkish economic development, based as it has been on the need to assimilate a mass migration from the countryside to the cities. As the process of economic growth becomes more orderly, some of these pressures will subside. However, strategic errors have been exacerbated by administrative problems at various levels of government.

58. The inability of the national emergency relief system to cope with natural disasters of recent magnitude points to inadequate disaster readiness The process of *risk identification* -- assessing potential losses due to earthquakes and preparing a response -- is impeded by inadequate mapping capacity. The delineation of hazard zones indicating both soil quality and exposure to risk (earthquake zone maps) is fairly rudimentary and the cadastre has not been brought up to date. The World Bank is applying $24.21 million to the renovation of the cadastre and of land management systems but funding has not yet been found to undertake intensive mapping of the floor of the Marmara Sea and of the Istanbul shore, to provide a training programme for geologists, to undertake surveys across the country; and to establish a geological survey. Adequate information on earthquake risk is, of course, a necessary precursor to aggressive education and awareness campaigns to inform citizens of risks and appropriate actions to take in an emergency. These have been absent. They are also needed to ensure an optimal balance of responsibility between central and local authorities when a disaster occurs. Currently, the response to emergencies is highly centralised, whereas international experience suggests that local knowledge can be very valuable in disaster mitigation and relief.

59. While response strategies are critical to mitigating the effects of disasters, *prevention measures* are key to reducing the toll of earthquake disasters and Turkish urban planning has proved deficient in this respect. The combination of high property and human losses is evidence of a systemic failure to enforce building codes and implement appropriate land use and planning policies, even in relation to known risks. The governance failures behind poor siting and construction practices are complex. The laws governing

such development may contain loopholes; implementation and monitoring may be inadequate, and co-ordination between central and local government may have been a factor. Land use and development planning strategies require both the establishment of construction standards that correspond to hazard exposure, and the enforcement of these standards through adequate regulation (such as land use and building certification)[31].

60. Even after all possible steps are taken to minimise risk, residual catastrophic risk remains and covering this requires a market for *risk pricing and transfer* which has not yet developed in Turkey. Instead, the obligation of the government to rebuild damaged residences operates as a disincentive to individual insurance. Insurance penetration is very low and the insurance industry has been unprepared to take on an active role in this respect. A mortgage market, which would serve to encourage such an insurance market, has been prevented from developing *inter alia* by endemic high inflation. The transition to a low inflation regime, now set in train, should allow such a market to develop; but it could only impact on the current housing stock with a very long lag. The government has thus introduced a new mandatory national insurance scheme, while abolishing its former guarantees in the housing area. A government-sponsored insurance pool is now being put in place, which will transfer the national risk into world-wide risk-sharing pools, managed by international reinsurance companies and backed by substantial capital resources. However, for the moment, the differentiation of risks will remain rather rudimentary and individual incentives to take precautions against earthquake will be inadequate.

61. Whatever measures are taken to ensure enforcement of urban planning and building codes for future constructions, and to promote private insurance provision, disaster preparedness, especially in the threatened region of Istanbul, needs to rely both on improving the earthquake resistance of the existing housing stock ("retrofitting"), while planning for the next emergency response. Retrofitting will be enormously expensive, and could only be achieved very gradually, but it would seem inevitable that the government will have to undertake more spending beyond the reconstruction phase in order to avoid yet greater budgetary and human costs in the future. This might involve tax breaks to complement the new national insurance scheme, but the full cost for rehabilitation of low-income housing may have to be borne by the state, especially those in illegal settlements that are not covered by insurance. And in the event of a major earthquake before the new insurance fund has matured, the state will also have to bear a large portion of the insured claims. At the same time, schools, hospitals, and other public buildings in the zones at risk urgently need to be reinforced and earthquake-proofed, so as to become useable as shelters for the most vulnerable members of society. The demands on the Budget will thus remain heavy, requiring careful costing and prioritising of expenditures and continuing efforts to strengthen tax administration. The international community could play an ongoing financing and advisory role with regard to these longer run burdens. Nevertheless, the dilemma of how much earthquake preparedness Turkey can afford, against the need for budgetary stringency, can best be eased by policies to maximise the private sector's contribution.

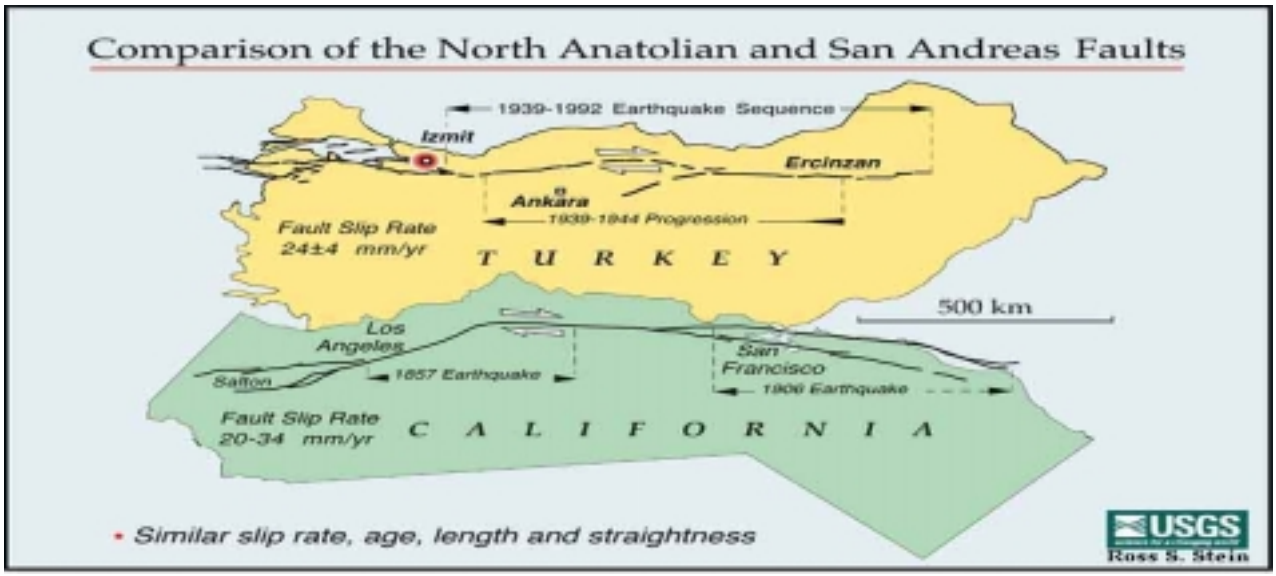
62. An important message which emerges from this report is that the human and material effects of the earthquakes are not independent of the governance and incentive structures that are in operation, and that policy responses to future threats need to take this into account. In this sense, the structural reform and modernisation process already underway in Turkey should make for an economic environment which allows a more orderly, earthquake-resistant pattern of urban development than has been apparent in the past two decades. Privatisation and prioritisation within the public sector will necessarily mean a closer attention to the allocation and efficient use of scarce resources, bringing in train a rebalancing between the regulatory and planning functions of the national and lower levels of government. Similarly, reform and liberalisation of the state banks and financial sector in general will allow greater room for private sector

31. Construction standards were established in 1975, then revised and enlarged in 1996. While the majority of the structures subjected to the earthquake were built under the old codes, the main problem with those built since 1996 has remained the implementation, monitoring, and control of these codes at the local level.

initiative in countering future risks. More generally, natural disaster risk-identification and reduction methods are evolving across the world, and the ability of Turkey to learn from international experience (as well as from its own mistakes) will be enhanced to the extent that the ongoing processes of structural reform and macroeconomic rebalancing are successful.

Maps, tables and figures

Map 1. **Comparison of the North Anatolian and San Andreas Faults**



Map 2. **Time profile of earthquake activity along the North Anatolian fault**

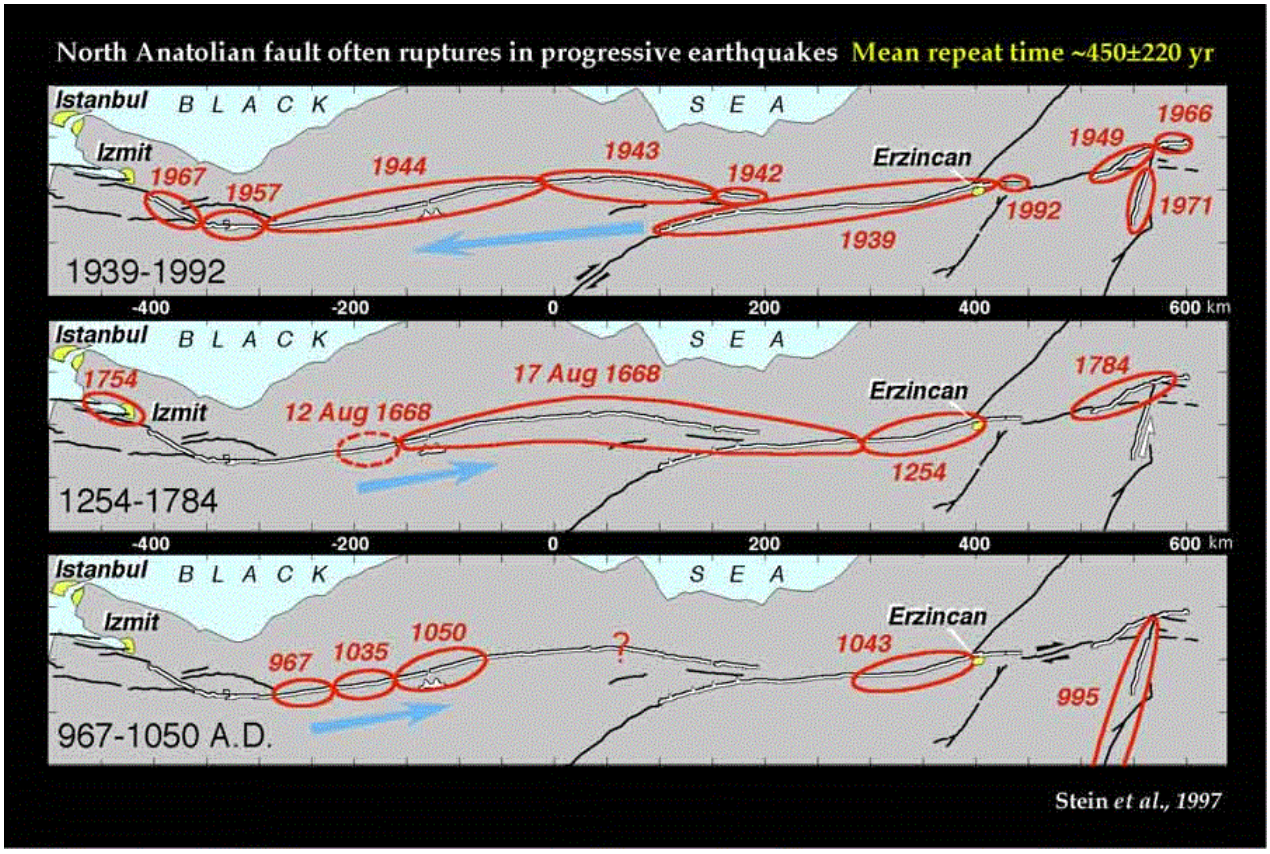


Table 1. **Major disasters in OECD countries with implications for regional development**

Date	Place	Agent	Deaths	Damage cost	Additional comments
1906	San Francisco	Earthquake	2 000	US$6 billion dollars in 1987; 500 million in 1906	
1908	Messina, Italy	Earthquake	150 000		
1923	Kanto Plain, Japan (Tokyo)	Earthquake	140 000 +		
1939	Erzincan, Turkey	Earthquake	32 000		230 000 homeless
19-20 September 1985	Mexico City, Mexico	Earthquake	7 000 +	US$ 4 billion	40 000 injured 30 000+ homeless. General hospital collapsed, burying 600 staff, patients, widespread *ad-hoc*, collective solidarity efforts. Reconstruction fostered outer-edge development at expense of city centre.
10-17 September 1988	Gulf of Mexico	Hurricane Gilbert		In US, US$ 10 billion In Mexico, US$ 880 million	400 000 homeless in Mexico
15 September 1989	Texas	Hurricane Hugo		US$5 billion	
7 October 1989	California (Loma Prieta)	Earthquake	61	US$7 billion	Collapse of cypress freeway in Oakland
28 December 1989	Newcastle NSW, Australia	Earthquake	12	Australian $1 billion	Reconstruction to take 5 to 10 years; 10 000 houses damaged in city of 300 000 people
1990	Sicily	Earthquake	20 +	US$10 to 15 billion	
25 January-26 February 1990	NW Europe	Storms, Gales, Daria, Vivian	120	US$10.5 billion	
13 March 1992	Erzinkan, Turkey	Earthquake	540	US$1.5 billion	180 000 homeless, 3 850 injured
23-26 Aug. 1992	Florida	Hurricane Andrew	34	US$16 to 30 billion	Reconstruction changed socio-economic structure of many s. Florida communities; greater segregation and popularisation by income, race, ethnicity
July-August 1993	Midwest, US: Mississippi Valley	Flooding	50	US$ 12 billion	100 000 evacuated; 150 000 homeless, 40 000 business or homes damaged or lost; changes afterward in settlement pattern.
17 January 1994	Northridge, CA	Earthquake	56	US$ 30 billion	25 000 homeless; 8 500 injured thousands without water or power; Major disruption to highway system (detours cost $1 million/day in congestion, accidents).

../…

Table 1. **Major disasters in OECD countries since 1985 with implications for regional development** (continued)

Date	Place	Agent	Deaths	Damage cost	Additional comments
17 January 1995	Kobe, Japan	Earthquake	6000 +	US$100 billion (+)	Massive devastation to port city, trade disrupted. 50 000 injured, 300 000 homeless. City rebuilt with new infrastructure for economic activities, social integration, disaster preparedness.
February 1995	NW Europe	Flooding	40 +	US$3 billion	250 000 evacuated. Flooding raised questions about land-use changes and planning practices, which increased vulnerability and intensity. Worst storms in the Netherlands since 1953, after which the Dutch initiated a major civil engineering project of protection. (in 1953, 2 000 drowned, 300 000 displaced people
7-10 October 1997	Mexico	Hurricane Pauline	230 +	US$100 million insured value	50 000 Homeless; Worst affected were Acapulco, Guerrero, Oaxaca
17 August 1999	Izmit, Turkey	Earthquake	18 000 +	US$ 5 to 14 billion	50 000 injured; 600 000 homeless; Death and damage include impact of second shock on 12 November 1999 in Bolu province
26 December 1999	France	Wind storm	80-90	US$8 to 10 billion	Major damage to electricity distribution network, railroads and forestry industry

Note:

Major emerging risks:

- Urbanisation in coastal zones
- Increasing gap between value of losses and insurance cover
- Lack of capacity to plan for reconstruction within a strategic vision for regional development

Source: OECD.

Table 2. **The extent of the damage**

	Marmara earthquake (17 August 1999	Bolu-Düzce earthquake (12 November 1999)	Total
Life losses	**17479**	**894**	**18373**
Injuries	**43953**	**4948**	**18373** **48901**
Number of housing units	66441	27177	
Destroyed	67242	37451	93618
Moderately damaged	80160	33222	104693
Lightly damaged			113382
Total	**213843**	**97850**	**311693**
Number of business premises	10901	4281	
Destroyed	9927	6772	15182
Moderately damaged	9712	4945	16699
Lightly damaged			14657
Total	**30540**	**15998**	**46538**

Source: Turkish authorities.

Table 3. **Selected indicators for the earthquake region**[1]

	Population	Share in GDP	Share in industrial value added	Per capita income	Share in budget tax revenues	Share in bank deposits	Share in banking credits
	Thousands	Per cent		$	Per cent		
Kocaeli	1177	4.8	11.3	7845	15.8	1.4	0.9
Sakarya	732	1.1	1.1	2734	0.4	0.5	0.2
Yalova	164	0.4	0.7	4966	0.1	0.2	0.1
Bolu	553	0.9	0.7	3104	0.3	0.3	0.2
Bursa	1959	3.5	5.0	3434	3.0	2.4	3.2
Eskisehir	661	1.2	1.1	3335	0.8	0.7	0.7
Istanbul	9199	22.8	26.8	4728	37.5	44.1	41.0
Kocaeli+Sakarya+Yalova + Bolu	2626	7.2	13.8	5243	16.6	2.4	1.4
Total of 7 Cities	14444	34.7	46.7	4581	58.0	49.6	46.3
Turkey	62866	100.0	100.0	3031	100.0	100.0	100.0

1. 1997 or 1998.
Source: Turkish authorities.

Table 4. **Macroeconomic costs of the earthquake**

US$ billion

	TÜSIAD[1]	SPO[2]	World Bank[3]
Direct costs	**10**	**6.6 to 10.6**	**3.1 to 6.5**
Housing	4	3.5 to 5	1.1 to 3
Enterprises	4.5	2.5 to 4.5	1.1 to 2.6
Infrastructure	1.5	0.5 to 1	0.9
Indirect costs	**2.8**	**2 to 2.5**	**1.8 to 2.6**
Value-added loss	2	2 to 2.5	1.2 to 2
Emergency relief expenditures	0.8	...	0.6
Total damage costs (rounded)	**13**	**9 to 13**	**5 to 9**
Secondary effects			
Current account losses	2	...	3
Fiscal costs	2	5.9	3.6 to 4.6
Job losses (per cent of labour force in the region)	...	...	20 to 50%

1. TÜSIAD first estimated the value of the loss of national wealth by surveys of its members and in co-operation with SPO. It then estimated the associated loss of national income by assuming that economic activity in the region came to a halt for two to three months (with about $50 million lost each day), due not only to loss of physical capacity, but also employee absenteeism, lack of water and energy, supply shortages and transportation difficulties, which depressed overall output regionally as well as nationally.
2. SPO estimated wealth losses on the basis of information given to the government from various sources (including a physical count of destroyed properties) and preliminary estimations based on certain assumptions.
3. The World Bank used an enumerative technique to estimate physical damages (on-site inspections by Bank staff). The GNP impacts are estimated by: a) assuming that the percentage of value added lost due to disruptions to industry and services in the four most severely affected regions is 50, 30, 15, and 8 per cent in 1999Q3 to 2000Q2, respectively, b) further assuming that one-third of the disruptions in the first two quarters are offset by increased economic activity in other areas; c) multiplying the net disruption by the weight of the region (7.2 per cent) in national value added.

Source: TÜSIAD (Turkish Industrialisation and Businessmen's Association), "Economic Impact of the Turkish Earthquake", 1 September 1999; SPO (State Planning Organisation), "The Impact of the Turkish Earthquake on the Turkish Economy (A Brief Assessment)", 23 September 1999; and World Bank, "Turkey: Marmara Earthquake Assessment", 14 September 1999; OECD staff estimates.

Table 5. **Housing reconstruction cost**[1]

As of 12 December 1999

	Number of units	Cost per unit (US$)	Total damage (US$ million)	Fiscal cost			
				Units eligible		Total cost (US$ million)	
				Lower bound	Upper bound	Lower bound	Upper bound
Collapsed	93618	20000	1872	51490	70214	1030	1404
Medium	104693	8000	838	57581	78520	461	628
Light	113382	3000	340	62360	85037	187	255
Total	311693	9785	3050	171431	233770	1678	2287

1. This table replicates the method utilised by the World Bank with the most recent damage assessment reports, which assumes that 55 per cent of the damaged housing is eligible for restitution under government criteria in the lower bound estimate, while 75 per cent is eligible in the upper bound estimate. The latter represents the actual proportion of primary homeowners and assumes that none of them takes the cash benefit in lieu of direct housing benefits.

Source: World Bank, *Marmara Earthquake Assessment Report,* 1999; Turkish authorities; OECD staff estimates.

Table 6. **Volume and cost of earthquake credit subsidy schemes**

$ million[1]

	Restructuring of current stock	Interest subsidy (AR)	Incremental duty losses[2]	New loans	Interest subsidy (AR)	Incremental duty losses[2]
	(as of February 2000)			(as of December 2000)		
Halk Bank	24	100%	24[3]	15	35%[4]	5
Ziraat Bank	15[5]	61.5%[6]	9[5]	15[7]	35%[4]	5
Emlak Bank	18[7]	125%[8]	8	12	65%[9]	15
Total	**56**		**41**	**42**		**24**

1. As of February 2000, $1 = TL 573 036; as of December 2000, $1 = TL 662 457 (estimated by using the declared value of the currency basket and the parity 1 Euro = $0.9556 prevalent on April 10, 2000).
2. Does not include the effects of compounding, which would substantially raise the estimated duty losses. Also does not include duty losses in 2001-02.
3. Incremental duty losses for 2000. The amount of total duty losses for the period 2000-02 is estimated at $40 million.
4. Equals half of commercial interest rate of 70 per cent.
5. The amount of agricultural credit rolled over was $12 million in 1999, and the amount of corresponding duty losses $8 million (interest subsidy: 85 per cent - 20.2 per cent). The amount of other rolled over credits in 1999 was $3 million and corresponding duty losses $1 million) (interest subsidy: 80 per cent - 42.5 per cent).
6. Includes half of agricultural interest rate (20.2 per cent), plus commercial interest rate (42.5 per cent).
7. Ziraat Bank requested TL 10 trillion ($15 million) from the Support and Development Fund for 2000, according to Decree no. 99/13887.
8. Equals compounded commercial interest rate (185 per cent), minus half the commercial simple interest rate (60 per cent) for 1999.
9. Equals compounded commercial interest rate (100 per cent), minus half the commercial simple interest rate (35 per cent) for 2000.

Source: Data provided by the Turkish authorities.

Table 7. **Consolidated (central government) budget**

In per cent of GNP

	1999			2000			
	Earthquake impact	Earthquake tax	Provisional 1999	Baseline	Earthquake impact	Measures	Programme
Total revenue	**-0.4**	**-0.1**	**23.9**	**20.3**	**-0.1**	**5.1**	**25.2**
Tax revenue	-0.4	-0.1	18.9	16.0	-0.1	4.6	20.4
Direct	-0.1		8.6	5.8		3.2	9.0
Personal			6.3	4.7		0.4	5.1
Corporate	-0.1		2.0	1.0		1.5	2.5
Other			0.2	0.2		1.3	1.5
Indirect			10.3	10.0	-0.1	1.4	11.3
VAT			5.3	5.1	-0.1	0.5	5.5
Petroleum excise			2.9	2.8		0.4	3.2
Other			2.1	2.1		0.5	2.6
Non-tax revenue			5.0	4.5		0.4	4.9
Primary expenditure[1]	**0.4**		**21.8**	**21.3**	**0.6**	**-1.5**	**20.3**
Personnel			8.8	8.4		-0.5	7.9
Other current			2.8	3.1	0.2	-0.2	3.0
Transfers	0.2		8.4	8.2	0.2	-0.8	7.5
Social security	0.1		3.5	3.2	0.1	-0.5	2.8
Extra budgetary funds	0.1		1.3	1.2	0.1	-0.2	1.1
Agricultural subsidies			0.3	0.3			0.3
Capital transfers			0.2	0.2			0.2
Transfers to SEEs			0.5	0.5			0.5
Banks' duty losses			0.0	0.6			0.6
Other			2.5	2.3			2.3
Investment	0.1		1.8	1.6	0.2		1.8
Interest payments			**13.7**				**16.9**
Primary balance	**-0.8**	**0.1**	**2.1**	**-1.0**	**-0.7**	**6.6**	**4.9**
Primary balance (IMF definition)[3]	**-0.9**	**0.1**	**1.7**	**-1.4**	**-1.3**	**6.6**	**3.9**
of which:							
Unallocated earthquake expenditures[2]	0.1		0.1		0.6		0.6
Monitorable earthquake costs[4]							-1.1
Overall balance			**-11.6**				**-12.0**

1. Current budget allocations.
2. Appears as "housing" in Table 8, not included in authorities' definition of primary and overall balances.
3. Excludes interest receipts and central bank profits, includes unallocated earthquake expenditure).
4. Excludes 0.1 per cent of GDP revenue loss due to earthquake and 0.1 per cent of GDP transfers to social security funds (representing their premium losses due to the earthquake).

Source: IMF; Turkish authorities.

Table 8. **Fiscal impact of earthquake**

	1999		2000	
	US$ million	Per cent of GNP	US$ million	Per cent of GNP
I. Consolidated budget[1]	1402	0.8	1571	0.7
Revenue loss	739	0.4	314	0.1
Expenditure	663	0.4	1257	0.6
II. Housing[2]	122	0.1	1242	0.6
Prefabricated houses	122	0.1		
Permanent houses			509	0.2
Payment in cash			283	0.1
Aid for medium-damaged houses			450	0.2
III. Duty losses of public banks[3]			531	0.2
Ziraat			328	0.2
Halk			94	0.0
Emlak			109	0.1
IV. Local governments[4]	81	0.0	65	0.0
V. Funds	169	0.1	371	0.2
Social aid and solidarity fund[5]	169	0.1	261	0.1
Mass housing fund			110	0.0
VI. SOEs[6]			452	0.2
Total public sector	**1774**	**1.0**	**4248**	**1.9**

1. Excludes "unallocated earthquake expenditures" shown in Table 7.
2. Equal to "unallocated earthquake expenditures" shown in Table 7.
3. Does not equal the most recent estimates of fiscal costs of the earthquake credit subsidy scheme shown in Table 6, which are more recent and considerably lower than the initial estimates shown in the present table.
4. Includes expenditure for sewerage, water, mapwork and development plan, water and sewerage for temporary settlements, and equipment (latter three categories in 1999 only).
5. Includes outlays for death aid, aid for disabled people, emergency aid, shelter aid, restore and shelter aid, and business aid.
6. Refers to the damage recovery costs and includes all SOEs in the region. Moreover, production and sales losses at SOEs are estimated at $632 million.

Source: Turkish authorities.

Table 9. **External financing for Marmara earthquake**

$ million

Donor	Type of assistance				
	Programme loans	Project loans		Grants	**Total**
		Managed by PIU (World Bank)	Managed by the implementing agency		
IMF	500				**500**
World Bank					**993.8**
Import and budget finance	252.5				252.5
MEER project finance		505			505
Reallocation		62.5	173.8		236.3
International Finance Corporation			50		**50**
European Investment Bank[1]		455	152		**607**
Council of Europe Development Bank[1]			303		**303**
Italy[2]			18		**18**
Spain[2]			60		**60**
Belgium[2]			4		**4**
Islamic Development Bank					**300**
Import trade finance	150				150
Project finance			150		150
Gulf Co-operation Council			400		**400**
Black Sea Trade and Development Bank			10		**10**
Japan					**450**
Commodity loan	200				200
Project finance (SMEs)			250		250
South Korea[2]			30		**30**
EU[1]				35	**35**
Germany				12	**12**
Total	**1102.5**	**1022.5**	**1600.8**	**47**	**3772.8**

1. Assumes $1 = 1.01 Euro (as of February 24, 2000).
2. Tied.

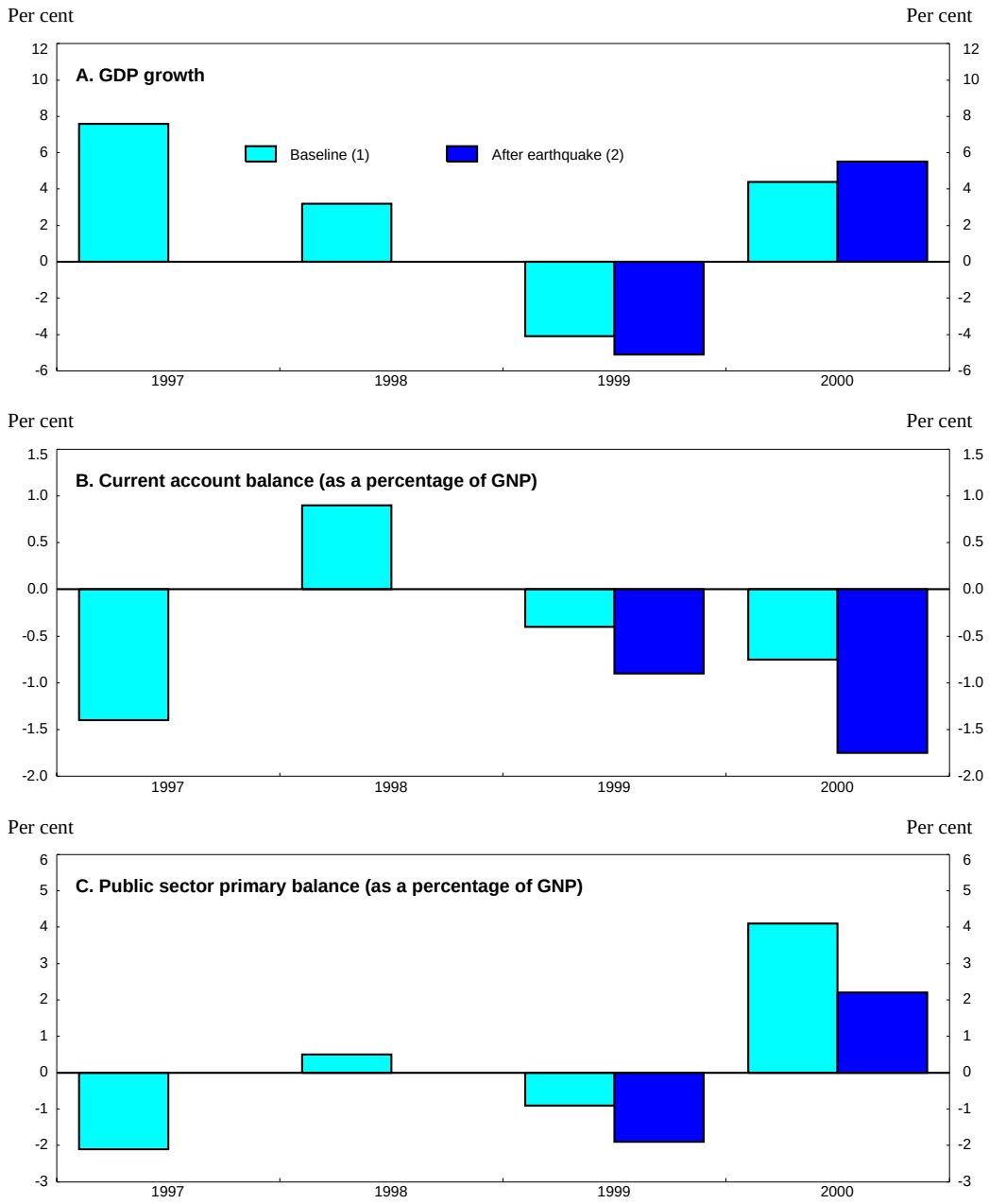
Source: Turkish authorities.

Table 10. **Public sector primary balances under IMF programme**

	SMP programme		Standby programme (targets)		
	1998	1999	2000	2001	2002
Primary balance of public sector	0.5	-1.9	2.2	3.7	3.7
Central government	3.6	1.7	3.9	5.3	5.6
Extra budgetary funds	0.0	-0.5	-0.6	-0.6	-0.6
Unemployment insurance fund	0.0	0.0	0.4	0.5	0.2
Local authorities	-0.4	-0.8	-0.6	-0.6	-0.6
SEEs	-1.1	-1.2	-0.9	-0.8	-0.8
Social security institutions	-0.4	0.0	0.0	0.0	0.0
Unpaid duty losses	-1.2	-1.2	0.0	0.0	0.0
of which:					
Earthquake-related costs	0.0	1.0	1.5	0.0	0.0
Central government		1.0	1.3		
Extra budgetary funds			0.2		

Source: IMF; Turkish authorities.

Figure. Earthquake impacts on major macro variables



1. 'Baseline' calculated as 'After earthquake' less estimated earthquake impacts. GDP growth and current account impacts taken from World Bank Marmara earthquake assesment report, while public sector primary balance impact is taken from SPO official estimates.
2. 'After earthquake' denotes realisations and official targets for the years 1999 and 2000 respectively.

Source: World Bank, IMF and SPO.

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