II. INDUSTRY AND TRADE

A. INTRODUCTION

This chapter has been organized in three sections. The first refers to common aspects to be taken into account in the evaluation of the damage caused by natural disasters to industry and trade The other two sections refer to those two sectors, separately, although according to the same methodology of presentation, namely, general appraisal of the magnitude and characteristics of the disaster within the sector; methodology and sources of information for quantifying direct damage; nature and method of estimating indirect effects; modalities for appraising the impact of both categories of damage on the behaviour of the main macroeconomic variables (secondary effects); and, finally, ways of determining public sector priorities to respond to the demands of both sectors in response to the disaster

In each section, reference is made to the statistical sources usually available in the countries of the region, to the methodology considered to be the most reasonable in each case, and the type of information to be obtained from official sources during field work and through contacts with industrial and trade associations

B. ASPECTS COMMON TO BOTH SECTORS

From the perspective of this manual, the two sectors have certain traits in common. Value added is generated in both sectors in large, mid-sized and small establishments. The differences among these three strata mean that the effects of a natural disaster on them will also be different. Large establishments –both in industry and trade– generate a large part of overall production and, generally, are more modernized than the others. Therefore, in both sectors, they possess a proportionately greater part of the supply of capital. They generally have more solid installations and are often insured against natural disasters.

Although in structural terms, small establishments in Latin America and the Caribbean have been loosing relative weight, a phenomenon clearly observable in census information about their number and the value added they generate, they still maintain an important percentage of employment, both in industry and trade, a rising trend during the 1980s due to the slow growth of productive employment which gave rise to a significant increase of informal activity, specially in trade, and most specially in the large cities The precarious conditions in which this broad segment operates increase their vulnerability to natural disasters

Both industry and trade are concentrated in large cities, although trade, specially small establishments, are somewhat less polarized For this reason, damage to industrial and processing sectors occurs in strict correlation with whether the effects of the disaster under analysis are urban in character or not. That is, when the disaster affects mainly the

countryside (droughts, floods), its effects are generally felt less in these two sectors than in others, given their concentration in cities and, among these, in the larger cities. In those cases, however, agro-industry suffers the most In fact, hurricane force winds in coastal areas have had powerful impact on trade and manufacturing in many capital cities of the region, specially in the countries of the Isthmus and Caribbean, where the principal cities are near or on the coast

These structural traits of industry and trade clearly affect not only the type and magnitude of the damage caused by a natural disaster but also the needs and support required for rehabilitation. Large establishments which, given the size of their investments in machinery and equipment, buildings and stockpiles, suffer proportionally greater damage, are more likely than smaller establishments to have insurance against this type of damage, as mentioned above, so that their property losses are somewhat mitigated

Micro-businesses, on the other hand, given that they usually function in the homes of their owners and use basically domestic inputs, react –generally– with greater flexibility and speed to save stocks of inputs and finished products which constitute most of their assets. Moreover, the urgent need to recover their only source of income means that small tradesmen and artisans rapidly restore their production processes, effecting repairs themselves. For these reasons, experience has shown that mid-sized manufacturing and trade businesses need proportionally more assistance to recover.

C. MANUFACTURING SECTOR

1. General observations

In order to generate a general overview of the effects of the disaster on the industrial sector rapidly, thus delimiting the problem and making it possible to refine successive evaluations and formulate an accurate diagnosis of the sector which will enable the authorities to define priorities for sector recovery, the evaluation should begin as follows:

a. Collecting information on industry

Obviously, this is one of the first tasks for the sector evaluator, although the speed with which he/she must act means that action must be selective. In the case of industry, the most relevant information is:

i. the most recent industrial censuses (National Statistical Office) and continued production series (Central Banks and Planning Offices):

ii. periodic surveys (Ministries of Industry and Central Banks),

iii. industrial associations (Bulletins and statistical information),

iv. institutions which group industrial areas (for example, textiles, appliances, construction supplies, etc),

v. other sector associations such as, chambers of small businesses, industrialized workers' unions, social security institutions, etc., and

vi. information occasionally available from municipalities (license and permit offices) about the location of businesses in the affected zone.

This background information, complemented by subsequent field work, will be used in both the following two points and in the evaluation of direct, indirect and secondary damage.

b. Delimiting the affected zone

The national authorities responsible for the emergency generally act with great speed, elaborating diagrammes of the affected area and nature of the damage, and occasionally making field surveys which provide a first approximation to the number of industrial establishments destroyed or damaged.

On the basis of familiarity with the affected geographical area and other data provided by the authorities, the attempt should be made, on the basis of the latest available industrial census (complementing that data with the information usually available in industry ministries and municipalities), to estimate the number of affected establishments, their relative size; the employment they generate; and the branch of industry to which they belong.

On the basis of this information, complemented by the periodic evaluations performed by ministries and planning offices, the sector evaluator should form an idea of the industrial process at the time (or period) of the disaster That appraisal (both quantitative and qualitative) is very important for understanding the circumstances in which the disaster occurred and its possible macroeconomic impact.

The evaluator should conduct an informal survey among the owners or managers of the principal industrial companies affected and, on the basis of that sample, of mid-sized and small industries as well, in order to form an idea of the magnitude and characteristics of the damage done and the most urgent sector needs, both during the rehabilitation stage and for full recovery.

Each of the components of the evaluation· direct damage, indirect damage and secondary effects, are dealt with in greater detail below

2. Direct damage

Once he/she has formed a general idea of the effects of the disaster on the manufacturing sector, of their geographic extent and the probable type of damage, the evaluator should move on to a more precise estimate.

The most probable direct damage to the manufacturing sector can be grouped as follows: buildings and installations, machinery and equipment; furnishings and transportation equipment; inventories of finished products, spare parts and raw materials; and irrecoverable documents

These estimates should be made in direct consultation with the governmental instances linked to the sector and relevant associations, groupings, etc. The available official appraisals should be verified in the field. Current replacement prices for lost capital assets can be obtained, from lists of internationally valid unit costs, among other sources; from imports unit prices; or those which appear in the projects which the national development bank may have on hand, and which should, as far as possible, be from industrial areas similar to and of the same size as those which have been affected.

For the propose of calculating damage, it is very useful to address large, mid-sized and small industry separately [5] Large industries usually have more precise accounting records. In that case, the estimates should be made to a large extent on the basis of interviews with company executives. In the case of small businesses, the weight of immobilized assets, within total assets, is very much less, a fact which, together with the precarious nature of their accounting records, makes it necessary to make rougher and less discriminatory estimates.

The estimate of direct damage usually begins with the total number of manufacturing establishments in the country, with respect to which the number of those affected by the natural phenomenon is projected

To illustrate the type of methodology which could be applied in the calculation of direct, indirect and secondary damage to the manufacturing sector, a hypothetical example of a natural disaster is presented, as follows

Suppose that a hurricane has affected the Golf of Mexico, hitting the State of Veracruz, specially the coastal area, with an impact zone of approximately 2 500 km2

The last available industrial census was used to generate a first approximation to the number of establishments possibly affected, and their characteristics in terms of size, branch of industry, assets value, general production and employment This information is summarized in charts 9 and 10

The general characteristics of industry, State-wide, are as follows:

[5] A conventional definition is: large, those which emply more than 200 workers; mid-sized, those which emply between 200 and 40· and small, those with less than 40 workers.

Concept	State of Veracruz	National total	Percentage participation
Number of establishments	6081	119212	5.0
Employees (thousand of persons)	53	1747	3 0
Total fixed assets (millions of pesos)	9.2	171.3	5 4
Value added	5.2	182 8	2.9

This information makes it possible to conclude that, if destruction were total in the State of Veracruz, losses to total national industry would be between 3% and 5.5%, measured either in terms of number of establishments, number of employees, fixed assets or value added. Thus, a "ceiling" is created for the subsequent detailed evaluation.

Another significant fact deduced from census data is that, in the State of Veracruz, 89% of the industrial establishments employed less than 5 persons, but that the large establishments (with more than 250 employees), of which there were around 40, possessed 85% of the physical industrial infrastructure and generated around 80% of the value added. For the sector as a whole, the capital/product ratio was 1.6% In the example, the industries of greatest weight in the State (from the point of view of capital, employment and added value) were those related to processing cereals, sugar, knitting, fertilizer, petrochemicals, steel, and boat building and repair.

Census data such as these serve, among other purposes, to help verify the data obtained from official surveys and estimates, and direct visits, on the basis of the following adjustment parametres:

i. the growth of the number and type of industrial establishments between the census year and the year of the disaster, and

ii. the impact of the inflationary process on the values of domestic currency which appear in the census.[6] Continuing with the example, suppose that a first approximation made by the Emergency Committee indicated that the hurricane had affected around 1 100 industrial establishments, destroying 14 large companies, among which the sugar, boat building and chemical industries were prevalent; it affected some 300 mid-sized and 400 small industries fairly severely; and caused minor damage to another 350, of which 250 were small and 100, mid-sized. To proceed with the evaluation on the basis of this initial information, the four main categories for damage were employed·

[6] For example, the gross product of the State of Veracruz, which in 1975 was some 5 200 million pesos (grosso modo some 20 million dollars), as has been seen, would correspond to some 957 billion pesos in mid 1988

a. Buildings and installations

To estimate losses in this area, in terms of replacement prices, it is necessary to know both the physical area destroyed or damaged and the current value of a square meter of industrial space. The latter factor varies according to the size of the company (large companies, with the machinery and technology they employ, require constructions and installations better and more complex than mid-sized businesses and even more so than small industries). Suppose that the information about the 14 large companies was provided by the Ministry of Industry and rectified during field visits and conversations with company executives. The value of a square meter constructed (including installations), at replacement cost, was fixed at around 450 000 pesos (200 dollars).[7] (See chart 1).

The average size of the mid-sized and small establishments, including storage, work shops and sales space, was defined in consultation with business associations at 1 400 and 500 m2, respectively. The price for a square meter of space was defined at 400 000 (some 180 dollars) for the mid-sized businesses and 250 000 pesos (110 dollars) for small industries. For severely damaged establishments (both mid-sized and small), total replacement costs were calculated on the supposition that the cost of demolishing the damaged section would be practically equal to the value of the recoverable section (which would not need to be rebuilt)

Field visits made it possible to conclude that, on the one hand, repair of buildings in mid-sized industries, which had sustained minor damage, amounted to 25% of the total replacement cost of their buildings, and in small industries, 35%.

Thus, total building and installation losses were estimated at around 257 billion pesos (equivalent to some 114 million dollars). (See chart 1 again)

b. Machinery and equipment

As in the previous category, the main problem is to find adequate replacement prices. The values which appear in censuses refer to the accounting records of the companies; therefore, they exclude accumulated depreciation (in function of the number of years of useful life since acquisition). They also reflect acquisition prices (except in some countries with inflation where periodic revaluation of physical assets is encouraged) These limitations are specially severe in the case of machinery and equipment, for which technical change is more rapid, so that the replacement price must take that factor into account.

It is supposed that, as in the case of buildings, the large industrial companies affected have calculated their losses of machinery and equipment directly, in consultation with national authorities The evaluator then checked those figures with the current value of

[7] The exchnge rate used at the time of this anlysis was 2 250 pesos to the dollar.

the destroyed equipment, on the basis of the unit value of recent imports These data, adjusted in this way, reveal that investments in machinery and equipment (per worker) are currently three times higher in the petrochemical industry than in the sugar industry and seven times higher than in the boat building industry.[8] The respective results are presented in chart 4

With respect to direct damage in this area in mid-sized and small industries, the example supposes that, given the multiplicity of areas affected and the lack of coherence in the data gathered by direct surveys, the evaluation should base its estimates to a large extent on census parametres, duly evaluated and up-dated. Among the mid-sized companies either destroyed or partially damaged, those related to food processing, clothing, cement and metal working predominate; in contrast among the small industries, basically food processing, clothing and different forms of repair services were most prevalent

The starting point for this estimate was the ratio between machinery and equipment, and workers, by area, obtained from the census, which yielded a figure of 60 000 (1975 pesos) for the mid-sized industries, and 20 000 for small businesses. It was then supposed that those assets had been used for half their useful life,[9] so the values were doubled. In this way, the respective coefficient was 9 600 dollars per worker in the first, and 3 200 in the latter category. Then, on the basis of the current exchange rate (2 250 pesos to the dollar), those values were expressed in current pesos. The average number of workers for mid-sized industries was fixed at 30 and, for small industries, 5 workers.[10] As was the case for buildings, it was supposed that mid-sized industries with minor damage lost 25% of their machinery and equipment, while small businesses lost 35%.

c. Furnishings and vehicles

Larger industries usually have a proportionately larger supply of these items, both given the superior working conditions of their employees and because they often have lifts and a fleet of vehicles for transporting raw materials and finished products. (Smaller industries usually hire these services). In order to appraise these elements (depending on the time available and the significance of the damage sustained), current market values for furnishings and vehicles similar to those destroyed should be obtained, hopefully with relative ease.

However, if the weight of this factor is expected to be relatively slight, indirect estimates will suffice. For example, there is a certain proportionality between investments in furnishings and equipment and that in buildings and installations (for all industry in the

[8] Calculated in current dollars, this amount to 27 000, 9 000, and 4 500, per worker, respectively.

[9] That is, the census value represents 50% of their value when new.

[10] Given the type of industrial areas affected, these averages are different from those for the State of Veracruz, as a whole.

State of Veracruz, furnishings and vehicles amounted to 60% of the value of buildings and installations). However, it has been observed that that ratio declines in direct relation to the size of the establishment. In the example used here, it is supposed, as in the two previous areas, that the estimates of damage in the 14 large industries affected were obtained directly from them or official sources, with samples being taken only to certify their reliability

As for mid-sized and small industries, a basically indirect method was used, based on census reports, by area, because in some areas, such as refrigeration and cement works, the relative weight of the fleet of vehicles within total assets is greater. On average, the furnishings and vehicles/building and installation ratio was 50% for mid-sized industries and 20% for small establishments. In the case of companies with more severe damage, the total destruction of these elements was supposed, while for those which sustained minor damage the same percentages of 25% and 35% as for the other two areas discussed above were maintained. The respective estimates are presented in chart 2.

d. Inventories

This category ends the evaluation of damage to the physical assets of the industrial sector As is known, it consists in: finished products (by the company itself); products in process; raw materials; and other goods (such as spare parts and others not related directly to production).

This is the category most severely affected by natural disasters because, generally due to problems of space, the installations in which inventories are stored are less protected than those which house machinery and equipment.

The 1975 census generated several basic sets of data for estimates of the damage caused by the hurricane to the inventories of the affected industries in the State of Veracruz. It is understood that 30% of total inventories consists in imported products (mainly inputs and machinery spare parts) Then, it was decided that the value of all inventories was equal to 15% of the gross value of manufacturing production and 30% of the fixed assets of industry in that State. On the basis of this information and field work, the estimates presented in chart 2 were made, always assuming that the figures for large companies were obtained from official sources For mid-sized companies, estimates for those with substantial damage were based on the application of a ratio of 30% damage to fixed assets; while, for small establishments, given their relative scarcity, circulating capital, inventories were estimated at only 15% of fixed assets.

In establishments with minor damage, both mid-sized and small, loss of inventories was somewhat more severe than that of fixed assets, according to the field surveys taken and for the reasons given above, that is, instead of 25% and 35% of their total value

(see chart 1), they were estimated at 40% for both strata [11] Thus, relative losses in this category amounted to 207 billion pesos, three fourths of which were sustained by mid-sized establishments (see chart 2).

Adding this figure to the three previous amounts produces a total of 972 billion pesos in fixed asset losses in the industrial sector, or some 430 million current dollars As can be observed, within this total, the greatest weight is that of machinery and equipment (35%), followed by buildings and installations (26%), inventories (22%), and furnishings and vehicles (17%).

In order to complete the estimate of the direct damage to the manufacturing sector, the destruction of financial documents in the hands of the affected companies was estimated. Those deemed irrecoverable, according to the estimates of the local Chamber of Industry, amounted to only 5 billion pesos, so that direct losses rose to a grand total of 977 billion pesos.

The imported component of direct losses or, rather, the cash needed to replace fixed assets and inventories destroyed or damaged, should be estimated on the basis of diverse sources (such as, the structure of domestic and imported prices in investment projects available in the Development Bank and macroeconomic statistics relating imports to gross investment) The pertinent research, within the context of the example, yielded the following figures:

	Loss of fixed assets (millions of dollars)	%	Imported component (millions of dollars)
Buildings and installations	114	10	11
Machinery and equipment	151	38	57
Furnishings and vehicles	74	10	7
Inventories	92	30	30
Total	431		105

In brief, industry in the State of Veracruz would require some 100 million dollars for rehabilitation, mainly to import machinery, equipment, spare parts and certain raw materials

[11] Assuming, as for the previous case, that inventories represent 30% of fixed assets for mid-sized companies and 15%, for small businesses

3. Indirect damage

Damage to industrial establishments will obviously affect production, both by suspending operations and as a result of the relative scarcity of inputs caused by the temporary interruption of communications and trade channels. The higher costs incurred by use of longer alternative shipping routes should be added as indirect damage and will be specially significant for the sugar and cement industries affected by the disaster. Losses arising from the suspension of exports for these reasons –which occurred with greatest impact on the mid-sized petrochemical and canning companies in the example– should be taken into account, as well as the tax revenue which the government does not perceive from suspended production and sales. In order to complete the estimate of the indirect effects of the hurricane, the emergency costs incurred by companies to face the situation should be added.

In this example, it is supposed that the estimate of production losses, stemming from damage to the plant itself and supply problems, etc , was made on the basis of data generated by surveys performed by the Veracruz Industrial Association, and verified and corrected on the basis of the calculations presented in chart 12, which presents values of production per worker in the different sizes of establishment and industrial areas.[12] In order to convert those values into current pesos, their equivalent in dollars during the census year was calculated and they were converted once again into pesos, at the current exchange rate (2 250 pesos to the dollar)

The figures of chart 12, relative to production per worker, were multiplied by the number of workers employed by the affected companies, thus producing an estimate of their gross annual product. In function of the anticipated interruption of operations as a result of the disaster and until those establishments would be rehabilitated, fractions of annual production were calculated, in terms of two months, one month or 15 days. Chart 12 presents the methodology utilized in detail and includes the calculation of value added, on the basis of the losses in gross production values. As indicated in the chart, the census VA/VBP ratios calculated according to establishment size and type were used, in the understanding that, by reflecting technological productions relations, they are still valid, given that they change little over time.

The final results of these estimates yield total losses to the gross value of production of 84 200 million pesos (some 37 million dollars), which were generated, by type of company, as follows:

[12] The annual figure was divided by six, in the case of large and mid-sized companies, and by 12 for small industries. in order to account for the time during which operations were suspended (two months and one month, respectively).

	Millions of pesos
Large companies	14 500
Mid-sized companies	66 800
Small companies	2900
Total	84 200

Contact with the local Chamber of Industry made it possible to form a general notion of which companies were important exporters (petrochemical, cement, tobacco) The conclusion was that, of the 37 million dollars of production lost, 15 million correspond to products which were not exported.

According to the methodology described above, losses of value added were 31 600 million pesos. (See chart 12)

The impact of production losses on public finances was moderate, given that the State would not perceive 4 700 million pesos of value added tax revenue and export tax revenues.

Finally, the impact on employment was negligible, because most companies chose to retain their staffs during the rehabilitation process, using them for debris removal and reconstruction.

Chart 3 presents a summary of the direct and indirect damage to the industrial sector

4 Secondary effects

In this part of the evaluation, the background data and quantification which –when integrated with the other sectors– make it possible to appreciate the global effects of the disaster on the main macroeconomic variables should be presented. Given the nature of damage sustained by industry in the example, its effects are only significant at the level of the gross product, the balance of payments and public finance. It is important that the evaluator form an idea of the conditions in which the sector was developing and of sector prospects prior to the disaster Those elements are basic reference points for weighting the effects of the disaster

Thus, in the example, it is supposed that, within the global critical period which affected the country beginning in 1982, total GDP growth had been projected at 1.5% and for industry at 2%, for 1983; with a surplus of 8 4 billion dollars in the merchandise account (remainder from 20.6 billion in exports and 12.2 in imports); a situation of relative balance in current accounts; and a financial deficit in the public sector equivalent to 10% GDP.

Within a trend of somewhat more rapid growth in the State of Veracruz than in the rest of the economy during the 1980s given the surge in the petrochemical sector, growth of 3% was foreseen for industry in that State for 1988 The value added by that industry was, in turn, 5 5% of that of all industry in 1987. Chart 4 presents the effects of the disaster on those projections As can be observed, the losses caused by the storm in Veracruz produced a decline in GDP of around 32 billion pesos (see chart 12), with the result that the industrial growth rate foreseen for that year dropped to practically half of its original value (from 3% to 1 6%), although its impact on national industrial growth, a reduction form 2% to 1 9%, was nil

The impact of the disaster on the balance of payments did not, in itself, affect national totals nor those of public finance, although their impact will be observable when added to the impact of other sectors on those macroeconomic variables. Finally, the adverse impact on the current accounts balance of payments were 120 million dollars, to which the greater demand for capital from multilateral sources for the reconstruction of petrochemical plants, estimated at 50 million dollars, should be added

At the same time, the demand on the Government of Veracruz to rebuild the industrial sector, which consisted in a set of small factories, valued at 500 million pesos, should be added to the loss of tax revenue due to lost production. The impact on the balance of payments and public finance is summarized as follows:

Impact on the balance of payments (millions of dollars)	
Fewer exports (sugar, petrochemical, cement)	15
More imports (inputs and capital goods)	105
Negative impact on surplus in current accounts	120
Demand for capital from international financial institutions	50

Impact on public finances (millions of pesos)	
Reduced value added tax revenues	4 700
Increased local government expense to rehabilitate the industrial base	5 000

5. Priorities for recovery and rehabilitation

The chapter on industrial sector evaluation ends with an account of the action the government should undertake to facilitate recovery, from the perspective of the businessmen affected. In this regard, the affected industrialists and sector associations and chambers should be surveyed, to reveal what support is needed for sector rehabilitation, both from the public sector and abroad

D. THE TRADE SECTOR

1. General observations

The methodological description of the evaluation of the impact of a natural disaster on trade activities will be much briefer than that of the industrial base because it is very similar to that sector and many points need not be repeated. Moreover, in the example used to illustrate that methodology, detailed reference to sources and calculation procedures will be much briefer, except when sector specificity advise otherwise. In fact, certain characteristics of the trade sector are different from those of the industrial sector and should be kept in mind during the evaluation These are: the average size of establishments, in terms of employees, is less, the relative weight of machinery and employees is less; the relative weight of machinery and equipment among total physical assets is also less; the opposite obtains with regard to inventories.

The trend noted above in the industrial sector, of the growth of mid-sized establishments as opposed to small businesses, is even more pronounced in the trade sector, where the proliferation of department stores is noteworthy, although their growth has affected mid-sized companies more than small businesses, which endure because they most often serve very peripheral or rural areas. Moreover, information about trade is usually less plentiful and less reliable than for industry, so that the evaluator should rely comparatively much more on the opinions and judgments of sector and professional associations of the country and region under study. For example, there are hardly any continued series of the level of trade activity in any country of the Latin American region, except GDP estimates which are very global and indirect.

Finally, along these same lines, detailed reference will not be made to the methodology and sources used, when they were totally analogous to what was described in detail for the industrial sector.

2. Delimiting the affected area

Continuing with the example introduced above, it is supposed that the natural disaster affected a large number of trade establishments of different sizes in the State of Veracruz, with considerable damage inflicted mainly by the rains which followed the storm which destroyed an important segment of inventories and many buildings and their furnishings. The natural phenomenon, which occurred in the coastal area around the port of Veracruz, and destroyed (according to the example followed throughout this chapter) a large number of establishments and small shops, both in the port itself and in three other population centres on the coast.

Chart 5 presents some data from the 1975 census which makes it possible to gauge the relative weight of trade activity in the State of Veracruz within the national total. This is between 4% and 6%, according to the indicator used. Charts 12 and 13 also present

statistical data which provide a more detailed characterization of trade activity in that State, according to type and size of establishment. It is known that the Emergency Committee (or the Veracruz Chamber of Commerce) reported, shortly after the disaster, that 2 100 of the 30 000 commercial establishments in the State of Veracruz had been affected or destroyed That information can be broken down as follows

	Number of establishments	Destroyed	Partially damaged
Department stores	5		5
Fruit stalls	500	500	
Miscellaneous	1 200	400	800
Shoe and clothing stores	300	200	100
Gas stations and repair garages	50		50
Total	2 055	1 100	955

3. Direct damage

Generally, the information available does not allow for detailed estimates of the areas which constitute the fixed assets of the companies affected. Therefore, the evaluation of direct damage should be broken down into only four categories:

- Buildings and installations
- Furnishings and office machinery
- Inventories
- Debtor documents

a. Buildings and installations

In order to calculate this component, the floor space affected was multiplied by the replacement value of a square meter constructed (the latter element was adjusted to include demolition costs and the value of the commercial installations).

Research in Mexico City to evaluate damage to the trade sector after the earthquake of 1985,[13] concluded that the floor space usually occupied by small shops (which are the

[13] See ECLAC, Daños causados por el terremoto de México y sus repercusiones sobre la economía nacional, (LC/G.1367), 1985.

majority[14]) varied between 50 and 500 m2, with an average of around 100 m2. That average was used in the exercise presented in this chapter for all establishments affected, except for fruit stalls (or market stalls), for which average floor space was taken from the same source (12 m2) and gas stations and repair garages (500 m2), and department stores (1 500 m2) The replacement value of a square meter of commercial construction (defined in broad terms, as explained above) currently fluctuates around 350 000 pesos per square meter (some 155 dollars).[15] In contrast, for fruit and market stalls, the most acceptable price for a square meter was 100 000 pesos (some 45 dollars). Moreover, the more solid buildings of gas stations and repair garages were appraised at 700 000 pesos per square meter, a price which was also used for department stores Finally, repairs of partially damaged buildings were estimated, on average, at 30% of their replacement value, in accord with earlier experiences in this regard.

The results of this exercise are presented in chart 6, where it can be observed that three fourths of the value of the damage sustained corresponds to small businesses. Of that value (40 billion pesos), approximately half corresponds to the total reconstruction of buildings and installations, and the other half to repairs.

b. Furnishings and equipment

Generally, these elements have less relative weight among total fixed assets here than in the industrial sector and detailed research to appraise them is not justified. In earlier evaluations, estimates have been used which relate the value of furnishings and equipment to that of buildings and installations. The most adequate figure for that ratio seems to be 20% for small commercial operations and 40% for the rest. The figures in chart 6 were generated according to that criterion, assuming that its weight is similar in both destroyed and partially damaged establishments The replacement value of furnishings and equipment, calculated in this way, amounts to some 10 billion pesos for the entire trade sector

c. Inventories

As stated above, this item has great relative weight within the value of the assets of this sector, given its nature as intermediary between producer and consumer. In this case, surveys revealed that, generally, inventories correspond to the value of, at most, two months' sales, on average, throughout the sector.[16] Moreover, it has been observed that there is also a more or less stable relationship between the value of buildings and

[14] According to the 1975 census, 96% of the commercal establishments in the country employed less than five persons (See Annex IV).

[15] A figure around 150 dollars was used in some earlier ECLAC evaluations.

[16] This estimate was ratified by census data of trade in the State of Veracruz in 1975, when annual sales were 14 200 million pesos and accumulated inventories were 2 100 million.

installations and that of inventories, perhaps due to the buildings' storage capacities (see chart 14), although this varies according to type of trade Those ratios were used in the following calculation related to the replacement value of lost inventories in Veracruz a result of a natural phenomenon. (See chart 6)

d. Debtor documents

Finally, losses arising from the destruction of documents or those considered unrecoverable amounted to 5 billion pesos, according to the Chamber of Commerce, and corresponded to 10% of the document portfolio of the destroyed businesses.

Direct total losses to trade thus amounted to 158 billion pesos, that is, some 69 million dollars.

4. Indirect damage

Surveys led to the conclusion that small trade businesses, with official aid, could reopen in one month, and the rest of the trade sector in two months.

In the case of trade, the main function of which is to provide a service, production losses during the period when operations are suspended should be estimated, not on the basis of sales not made (it is not a case, as in the industrial sector, of goods which could not be produced), but rather on the basis of idle cash. This, in turn, for the purposes of this evaluation, can be identified with value added.

To this end, the income (or product) which each worker (sales person or owner) generates, on average, was estimated, for small, mid-sized and large trade establishments. On the basis of annual figures, those for one or two month interruptions were calculated. Chart 7, which presents the respective figures, shows that accumulated GDP losses for the trade sector amounted to 5 600 million pesos (2 5 million dollars). As indicated in that chart, some 10 000 workers were affected, but, given that 90% of them work in small shops (their only source of income), they were employed immediately in rehabilitation tasks; therefore, there was very little unemployment.

No export companies were affected, so that foreign sales were not lost. In contrast, the loss of inventories and equipment requires a certain increase in imports, because, according to Chamber of Commerce estimates, of the 100 billion pesos in lost inventories and the 10 billion in furnishings and equipment, 30% and 20%, respectively, were imported and must be replaced In dollars, those additional imports, together, amount to some 15 million dollars.

5. Secondary effects

Finally, the loss of 5 600 million pesos of value added in trade meant a 3% decrease in anticipated GDP growth in that sector, to 2.4% The impact at the national level was insignificant (from 2.0 to 1.9%). (See chart 9).

The impact on the trade balance was only an additional 15 million dollars in imports; on the public sector, lower value added tax revenues, amounting to 3 100 million pesos (calculated as 15% of the value of gross sales not made, estimated, in turn, at 20 700 million pesos) [17]

[17] These were calculated on the basis of the census ratio between the value added tax and the gross value of trade sales in the State of Veracruz, which was 0 27.

Chart 1
INDUSTRIAL BUILDINGS AND INSTALLATIONS BY TYPE OF COMPANY: CALCULATION OF DAMAGE (AT REPLACEMENT PRICES)

Company	Area affected in m^2	Cost per m^2 constructed	Total value (millions of pesos)
Totals			257 075
Large			
10 sugar companies 1/	20 000	450	9 000
2 boat building companies	6 000	450	2 700
2 resin and synthetic fabric companies	5 000	500	2 500
Mid-sized			
300 severely damaged 2/	420 000	400	168 000
100 with minor damage	140 000	100	14 000
Small			
400 severely damaged	200 000	250	50 000
250 with minor damage	125 000	87 000	10 875

1/ In this example it is supposed that these companies, which are among the most important in the State of Veracruz, gave direct information about affected floor space.

2/ Average floor space per establishment. 1 400 m^2 for mid-sized, and 500 m^2 for small businesses.

Chart 2
SUMMARY OF DIRECT DAMAGE TO THE INDUSTRIAL SECTOR IN TERMS OF FIXED ASSETS AND INVENTORIES

Companies	Number of companies	Employment (number of persons)	Buildings and installations	Machinery and equipment	Furnishings and vehicles	Inventories	Total
			(in billions of pesos)				
Total	1 064	6 250	257.1	340.4	167.5	207.0	922.0
Large companies	14	1 800	14 2	90 2	14.5	35 0	153
Sugar mills	10	600	9.0	24.6	7.0	8.0	48.6
Boat builders	2	800	2.7	16.0	5 0	12 0	35.7
Petrochemical plants	2	400	2.5	49.6	2.5	15.0	69.6
Mid-sized	400	1 200	182 0	232.2	141.0	160.0	715.2
Severe damage	300	9 000	168 0	216 0	134.0	155.0	673.0
Minor damage	100	3 000	14 0	16.2	7.0	5.0	42.2
Small	650	3 250	60.9	18.0	12 0	12 0	102.9
Severe damage	400	2 000	5.0	14.4	10.0	11 0	85.4
Minor damage	250	1 250	10.9	3.6	2 0	1.0	17 5

Source and methodology: See accompanying text.

Chart 3
INDUSTRIAL SECTOR

		Damage		
		Total	Direct	Indirect
A)	Summary of direct and indirect damage (billions of pesos)			
	Fixed assets	765.0	765.0	-
	Inventories	207 0	207 8	-
	Documents	5.0	5 0	-
	Production losses	84.2	-	84.2
	Total	1 061.2	977.0	84 2
B)	Foreign component (millions of dollars)			
	Increased imports			105
	Fewer exports			15
	Total negative impact on trade balance		180	

Chart 4
IMPACT OF THE DISASTER ON INDUSTRIAL GROWTH IN THE STATE OF VERACRUZ WITHIN THE NATIONAL TOTAL

Industrial sector GDP (billions of pesos)					
	1987	1988			
		Anticipated prior to the disaster		After the disaster	
		Growth rate	Absolute value	Growth rate	Absolute value
National	43 700	2%	44 700	1 9	44 238 1/
State of Veracruz	2 400	3%	2 470	1 6	2 438 1/

1/ Obtained by subtracting losses of 31,600 million pesos of GDP, calculated in the chart, from the value anticipated prior to the disaster.

Chart 5
STATE OF VERACRUZ: TRADE OF 1975

		Participation on the national total, %
Number of establishments	29 500	6 2
Persons employed	62 500	5.7
Fixed assets (millions of pesos)	1 193	4.3
Sales (millions of pesos)	14 217	4.3
Value added (millions of pesos)	3 853	4.3

Chart 6
LOSSES IN FIXED ASSETS AND INVENTORIES

	Losses in fixed assets	Losses in inventories	Total fixed assets and inventories
		(in billions of pesos)	
Small shops	38 9	70.0	108.9
Department stores and others	11 4	32.5	43 9
Total	50 3	102.5	152.8

Chart 7
TRADE: CALCULATION OF LOST VALUE ADDED

	Number of establishments	Employment		Annual value added per worker(in thousands)		Accumulated losses2/ (in millions of 1988 pesos)
		By establishment1/	Total	Dollars1/	1988 pesos	
Small shops	1 500	5	7 500	2.5	5 600	3 500
Fruit and market stalls	500	3	1 500	1.5	3 400	425
Gas stations and repair garages	50	15	750	5.0	11 200	1 400
Department stores	5	15	75	10 5	23 600	300
Total	2 055		9 825			5 625

1/ Calculated on the basis of the 1975 census for similar types and sizes of establishment The valid exchange rate was 12.50 pesos to the dollar

2/ Annual values (calculated by multiplying the value added per worker by the total employment in affected establishments) were divided by 12, for small shops, and by 6, for the rest, to account for GDP not produced, during the interruption of one or two months.

Chart 8
TRADE: IMPACT OF NATURAL DISASTERS ON GDP GROWTH

		1987	Previsions for 1988	
			Prior to the disaster	After the disaster
			(1987 prices)	
GDP generated by trade				
a)	In billions of pesos			
	Veracruz	1 770	1 820	1 814
	National total	41 100	41 900	41 894
b)	Trade rates of growth			
	Veracruz	2.0	3.0	2.4
	National total	0.6	2 0	1.9

Chart 9

CHARACTERISTICS OF MANUFACTURING INDUSTRY IN THE STATE OF VERACRUZ BY BRANCH

		Number of establishment	Persons employed	Fixed assets				Added value (millions)
				Total	Machinery and equipment	Buildings and other constructions	Furnishings and transportation equipment	
						(millions of pesos)		
201	Fruit and vegetable processing and canning	12	1445	30	18	9	3	40
202	Cereals and other grain processing and mill products	1973	4675	258	128	98	32	251
203	Sugar mill and alcohol distillation	215	15873	2411	1773	357	281	1047
204	Slaughter house and meat processing, preservation and packing	12	78	8	1	7	-	4
205	Processing and treatment of milk products	45	350	65	40	13	12	18
207	Wheat products	794	3215	136	61	32	43	182
208	Chocolate, candy, sweets, syrups, concentrates and colouring agents for food	11	328	118	84	30	4	37
209	Diverse food products	875	2976	126	85	21	20	178
211	Elaboration of alcoholic beverages, except malts	17	110	3	1	1	1	6
213	Elaboration of sodas and non-alcoholic beverages	60	2076	154	78	17	59	198
220	Processing and production of tobacco products	14	844	19	11	4	4	38
231	Preparation, spinning, knitting and finishing of white fibres, except crochet	13	4405	523	404	110	9	460
239	Crochet and other textile products	4	117	2	1	1	-	1
241	Outer wear garment factory	446	781	6	3	1	2	16
243	Other articles made from textiles and other materials, except clothing	85	135	2	1	1	-	3
251	Footwear factory, except those made of rubber or plastic	34	87	1	1	-	-	2
252	Leather and skin and artificial materials factory	52	151	2	2	-	-	5
261	Lumber, plywood and similar products	3	17	2	2	-	-	1
263	Other wood and cork products, except furniture	87	225	2	2	-	-	6
271	Building and repair of furniture and accessories, except those of metal and molded plastic	273	242	7	4	2	1	11
281	Wood cellulose, paper and cardboard	4	1243	516	430	72	14	327
291	Editorial industry	17	232	20	15	3	2	15
292	Printing, binding and similar activities	135	507	17	13	2	2	18
301	Basic industrial chemical production	6	540	373	323	32	18	165

Chart 9 (continuation)

302	Fertilizers and plaguicides production	5	2436	1534	1231	257	46	555
303, 304	Resins and synthetic or artificial fibres, paints, varnishes, lacquers and the like, soaps, detergents, perfumes, cosmeeics production	5	1009	374	346	14	14	94
305	Pharmaceutical and medicinal production	5	423	85	53	24	8	56
309	Other chemical products	6	22	1	1	-	-	1
321	Rubber goods	12	115	9	8	-	1	8
322	Plastic materials and products	5	14	1	1	-	-	1
331, 332	Earth, china and porcelain articles and those of glass and glass products	4	546	302	289	-	13	201
333	Clay products for construction	198	506	4	1	2	1	6
334	Cement, lime and plaster production	10	854	504	382	104	18	105
335	No metals minerals industries	113	736	23	13	3	7	27
341	Basic iron and steel industries	5	4	1222	1100	9	13	682
351	Farm implements and hand tools, hard ware and iron work	281	693	10	6	2	1	18
353	Metal structure products, tanks, boilers and the like	10	1098	83	78	2	3	79
359	Other metal products, except machinery and equipment	22	156	9	7	1	1	15
361	Building, assembly and repair of farm machinery, implements and tractors	10	41	1	1	-	-	2
363	Building, assembly and repair of machinery, and equipment for specific industries	13	484	20	13	3	4	48
364	Building, assembly and repair of office machinery	41	84	1	1	-	-	2
369	Building, assembly and repair of machinery, and equipment for common use in several industries	90	1136	97	86	2	9	142
371	Building, assembly and repair of transformers, motors and other machinery and equipment for the generation and use of electrical energy	7	68	1	1	-	-	4
379	Building of other apparatus, accessories and electrical supplies	6	36	-	-	-	-	1
381	Building and assembly of automobiles, busses, trucks and sub-parts	19	250	12	7	4	1	14
383	Building and repair of ships, aircraft and their parts	5	1981	312	111	67	134	128
393	Jewelry, silver work and paste jewelry production	17	45	1	1	-	-	1
399	Other manufacturing industries	17	45	1	1	-	-	2
Total		6 081	53499	9307	7219	1307	781	5222

Source: 1975 industrial census, Secretary of Programming and Budget of Mexico.

Chart 10
INDUSTRY IN THE STATE OF VERACRUZ
BY ESTABLISHMENT SIZE1/

	Number of establishments	Persons employed	Fixed assets	Value added
			(millions of pesos)	
	1 Absolute values			
Total	6106	66146	11550	7434
Up to 5 persons	5556	10431	192	224
From 6 to 50 persons	539	6955	402	397
From 51 to 250 persons	69	7704	1082	8063
251 or more persons	42	41	9874	5950
	2. Percentage structure			
Total	100.0	100.0	100 0	100 0
Up to 5 persons	89.4	15 8	1.7	3.0
From 6 to 50 persons	8.8	10 5	3.5	5.3
From 51 to 250 persons	1 1	11.6	9.4	11.6
251 or more persons	0 7	62.1	85.5	80 0

	Persons per establishment	Fixed assets per person (thousands of pesos)	Capital/product ratio
	3 Significant ratios		
Total	11	175	1.55
Up to 5 persons	2	18	0.85
From 6 to 50 persons	13	58	0.01
From 51 to 250 persons	112	140	125
251 or more persons	978	241	1 66

Source Annex 1

1/ The figures in the chart include mining activity, therefore they differ from those of Annex 1 which refer only to manufacturing.

Chart 11
MACHINERY AND EQUIPMENT LOSSES
IN SMALL AND MID-SIZED INDUSTRIAL COMPANIES

	Number of companies (1)	Total Employment (2)	Machinery and equipment per worker (thousands of 1975 pesos) Census 1975 (3)	Value new a/ (4)	Millions of current pesos (5)	Total (billions) (5 x 2)
Mid-sized						
with major damage	300	9000	60	120	24 0	216 0
with minor damage b/	100	3000	15	30	5 4	6.2
Small						
with major damage	400	2000	20	40	7.2	14.4
with minor damage c/	250	1250	8	16	2.9	3 6

a/ It was supposed that census values reflected the value of the equipment half way through its useful life.
b/ 25% of assets destroyed.
c/ 35% of assets destroyed

Chart 12
ESTIMATE OF LOSSES IN TERMS OF THE GROSS VALUE OF INDUSTRIAL SECTOR PRODUCTION

	Number of companies	Number of workers	Gross value of production per worker (thousands of 1975 pesos)	Gross value of production per worker (thousands of dollars)	Gross value of production per worker (thousands of 1988 pesos)	Gross value of total annual production	Gross value of lost production	Value added of lost production a/	VA/VBP ratio
						(millions of current pesos)			
Total	1064	16050	-	-	-	-	84200	31600	0.37
Large companies	14	1800	-	-	-	-	14500	6500	
Sugar mills	10	600	164	13	29200	17500	2900 b/	1200	0.4
Boat builders	2	800	90	7	15700	12600	2100 b/	1500	0.70
Petrochemical	2	400	180	14	31500	56700	9500 b/	3800	0.40
Mid-sized	400	12000	220	17	38200	-	66800	23400	0.35
With major damage	300	9000	220	17	38200	343800	57300 b/	-	
With minor damage	100	3000	220	17	38200	114600	9500 c/	-	
Small	650	3250	80	6	13500	-	2900	1700	0.60
With major damage	400	2000	80	6	13500	27000	2200 c/	-	
With minor damage	250	1250	80	6	13500	16900	700 d/	-	

a/ Calculated on the basis of the census ratio between the aggregate value and the gross value of production, by company size and type.
b/ Calculated on the basis of a production interruption of two months.
c/ Calculated on the basis of a production interruption of one month
d/ Calculated on the basis of a production interruption of fifteen days.

Chart 13
CHARACTERISTICS OF THE TOTAL NATIONAL TRADE SECTOR 1975

By number of persons employed	Number of establishments	Persons employed (thousands)	Persons per establishment	Value added (millions)	Value added per person (thousands)
Total	473202	1102	2.3	89059	81
Up to 5	455479	682	1.5	23745	35
From 6 to 25	14002	161	11.5	23627	147
From 26 to 100	3181	144	45.0	23470	163
More than 100	540	115	213.0	18217	158

Chart 14
CHARACTERISTICS OF TRADE IN THE STATE OF VERACRUZ BY ACTIVITY, 1975

Purchases and sales by activity		Number of establishments	Persons employed	Fixed assets	Inventories	Amount of sales	Value added
				(millions of pesos)			
Total		29494	62472	1193	2129	14217	3853
611	Unprocessed food	2529	3507	29	38	320	88
612	Livestock and food of animal origin	2914	4239	44	14	358	138
613	Processed food, beverages and tobacco	15474	26187	3090	313	3278	313
621	Clothing, accessories and textiles	3255	6476	85	320	1071	305
622	Personal items (except clothing)	620	1777	27	76	351	114
623	Other personal items	1059	2729	54	153	721	178
631	Appliances	520	2026	42	163	616	220
632	Other household items	822	1262	11	30	121	38
640	Department stores	200	3514	87	248	1798	468
650	Gas, fuels and lubricants	410	2096	110	22	1110	233
661	Farm and forestry raw materials	4	159	2	4	57	12
622	Construction materials	715	3036	122	270	1163	340
669	Other raw materials	137	315	6	12	74	22
671	Machinery, implements and spare parts	68	567	20	93	446	139
672	Office equipment and furniture	41	209	9	17	88	29
673	Technical and scientific equipment	13	49	1	2	11	4
680	Transportation equipment and accessories	479	3744	145	326	2241	666
691	Real estate	5	7	1	6	3	1
699	Diverse articles	229	573	6	22	248	37

Source: 1975 trade census, Dirección Nacional de Estadística y Censos de México