IV. MACROECONOMIC EFFECTS OF DAMAGE

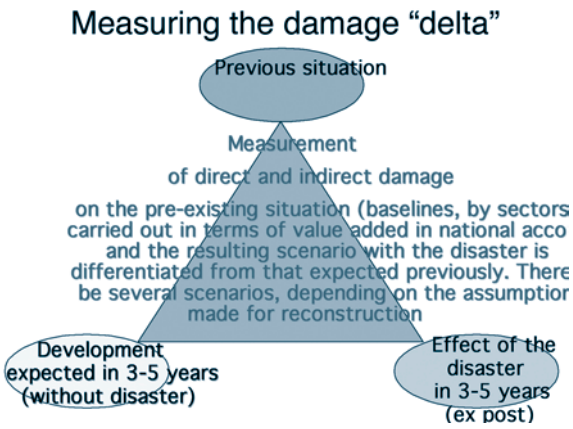
This chapter deals with the estimation of the quantifiable effects of the disaster on the main macroeconomic variables and aggregates (GDP, national income, investment and gross capital formation) and on the fundamental economic gaps (balance of payments, balance of public finances and inflation). The impacts will be measured in the short term (in the year or cycle in which the disaster occurs) and in the medium term (a period to be determined case by case according to the magnitude of the damage and the estimated time needed for a return to "normal" conditions). The macroeconomist will elaborate this chapter on the basis of the reports prepared by the sectoral experts. An accompanying task is to verify the consistency of different estimates by comparing the evolution of macroeconomic variables with that obtained by piecing together sectoral, regional or partial information. The macroeconomist should also form a view of the economic performance and the behavior of the main aggregates expected prior to the disaster. Finally, and most important, the macroeconomic assessment provides a basis on which to estimate the financial and technical cooperation that the international community is expected to contribute during the rehabilitation and reconstruction processes. This chapter contains five sections. The first provides a basic understanding of the steps involved in the macroeconomic assessment of the disaster damage. The second describes the functions of the macroeconomist. Section three refers to the establishment of the baseline, that is the pre-disaster situation and the performance expected during the year of the disaster in the absence of it. Section four deals with the assessment of the situation following the disaster. The last section details the general economic effects, the effects on economic growth and income and those on the fiscal and external accounts. For the situation following the disaster, the use of future reconstruction scenarios is introduced based on the capacity of the economy to absorb external resources and its project delivery capacity.

1. Macroeconomic assessment

The macroeconomic assessment should provide a summary of the damage that offers an overview of the full magnitude of the disaster's socio-economic impact, both for the country's economic development as a whole and for each of its main variables.[1] It should determine and specify the sectors or areas in which the effects were most severe and the period of time for which they will continue to be felt. Consequently, it should include, not only the disaster's effects on the economic growth rate, income, the external sector, public finances, employment, price levels and inflation, but also possible damage to natural resource endowments.

1 This summary must be presented in a uniform and comparable manner (in the same currency units). It must will take into account the possibility that a disaster's impacts might produce net benefits to society, rather than harm or loss. If such benefits are considered significant, their value should be calculated and subtracted from total estimated damage.

The overall assessment essentially measures a "delta" value, that is, the difference between the situation expected in the period before the disaster happened and the situation that the affected country or region is expected to experience as a result of the direct and indirect damage (see the following chart).



There may be more than one ex - post disaster effects scenario, and several post-disaster alternatives may be identified according to the local capacity for recovery; the amounts of external assistance received; the overall macroeconomic, fiscal and commercial goals set in pre-disaster programmes; the developing country's capacity to carry the debt required by the process; and any commitments that it might have with international financial institutions.

2. The functions of the macroeconomist and the preparation of the assessment

The chapter written by the macroeconomist will normally be based on the reports prepared by the sectoral specialists. Nevertheless, she or he must also work in the disaster area to gather data (sectoral, regional data) and assessments related to the disaster's macroeconomic effects. To this end, he or she should contact the macroeconomists at the ministries or government bureaus with economic functions and the financial, tax and national planning authorities. He or she should also request relevant information from academics and specialized independent analysts. When the data is vague and unreliable, the macroeconomist must rely on his or her judgment to arrive at an estimate and choose the sources for his on her figures and estimations.

Discrepancies and consistency problems are likely to arise because the data gathered comes from different sources and may be expressed in different economic units. For example, discrepancies may arise between public sector figures for national accounts data and the balance of payments. To overcome these difficulties, the macroeconomist must establish an audit trail.

An audit trail provides detailed information on the nature of the damage, its incidence and the estimated value of the damage. It is part of a meticulous approach to deriving estimates that allows for the simplification of tasks and the verification of the estimates should a figure be challenged. It includes the adoption of alternative methods for estimating the value of the damage, and it uses objective and precise criteria as a basis for the definition and adoption of decisions and priorities that will guide the rehabilitation and reconstruction programs. The audit trail should also ensure that there is no double acounting in the sectoral assessments, i.e. that effects in one sector that also have an effect on another should not be counted in both. For example, damage to rural roads will have to be clearly distinguished in the farming sector to ensure that it is not duplicated in the assessment made by the transportation and communications sector.

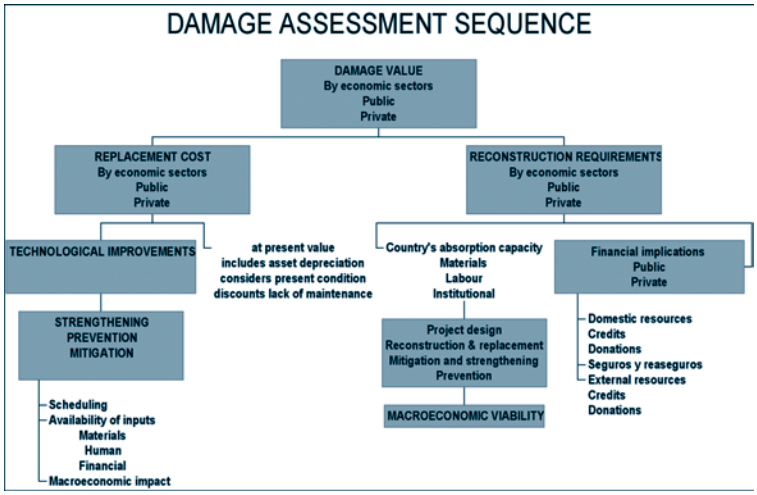
Quick rules of thumb that allow one to check the consistency of macroeconomic data are to use fiscal statistics to estimate government consumption in the national accounts; to review data on exports and imports from the national accounts to make it compatible with the balance of payments; to check the quality of the investment data; to compare the growth of nominal GDP with the growth rate of financial assets; to compare consumption and receipts from domestic taxes; and to compare GDP growth and imports.

The assessment report normally includes an introduction with a brief description of the phenomenon's characteristics and the magnitude of its impact. The macroeconomist also plays an important role in the preparation of the introduction.

A general recommendation is that direct damage be consolidated after it has been quantified in terms of physical magnitudes and that the macroeconomist analyze the criteria and prices used for setting the monetary value. This will make it possible, where necessary (especially in countries with high inflation), to make assessments at replacement values (or to adjust those that have already been made at purchase cost so that they are shown at replacement value). This is essential for determining the financial requirements of restoring the destroyed or damaged assets.[2]

The following chart illustrates the assessment sequence.

2 The introductory chapter to this manual contains the criteria for assessing direct damage, as well as a discussion of the advantages and disadvantages of using purchase versus replacement costs. Some flexibility is called for. It is sometimes useful to show both, since one indicates the cost of the loss and the other the replacement value, which takes into account any technological improvement thought desirable when replacing the destroyed assets. Furthermore, since the reconstruction process should not recreate the prior vulnerability, which was often the cause of the seriousness or magnitude of the damage, the reconstruction value will include elements of reinforcement and improvement above and beyond the replacement value.



The overall assessment should show the net results, that, is the difference between the negative and positive effects. A recovery in the construction sector, for example, is a phenomenon that is noticed relatively soon and can, to some extent, counteract the fall in the levels of activity forecast for most production sectors.

Another of the basic aims that should guide the work of the macroeconomist in the field is to form his or her own view on the economic performance forecast before the disaster occurred and on the way in which that performance would have been reflected in the major aggregates, both for the year in which the disaster occurred and for the following year or years.

The macroeconomist is therefore responsible for compiling and consolidating data on the impacts in the different sectors. In addition to the summary of direct damage (to capital) and indirect damage (the flows which will cease to exist) mentioned in the preceding paragraph, the macroeconomist should included an estimate of the economy's financial requirements and the financial and technical aid expected from the international community during the restoration and reconstruction process. That process normally runs for two years, but if the impact is great, it may be extended to as many as five.

The macroeconomic analysis may be called by different names, such as "effects on economic development" or "the phenomenon's repercussions on the economy". Where appropriate, the expression "in the short term" or "in the medium and short term" may be included, depending on how far into the future the effects of the disaster are projected. Such projections are generally limited to a maximum of five years, although destroyed urban service infrastructure, farmland, woodlands and the environment can take longer to replace. Similarly, the investments needed to replace production capacity and certain plantations can take more than five years to mature. These factors should be reflected in the report.

3. The situation before the disaster

As already mentioned, one of the macroeconomist's tasks will be to obtain a comprehensive understanding of pre-disaster economic trends, including its main problems, and the salient features of the economic policy that was being implemented. This background information is necessary for understanding the phenomenon's effects on the country's economy and the key areas of its economic policy, as well as the new challenges being set for the economy. Central banks, the country's economic, tax or finance ministries and its departments or ministries of planning, together with international financial bodies and ECLAC itself, prepare annual reports or have the information needed to provide an understanding of the topic.

Familiarity with the pre-existing situation can only be obtained by identifying the baselines on which the country's economy functions: those elements which are central to the economy's development -its engines of growth and the constraints imposed by the present development model (without assessing or making value judgments on it). It is also necessary to identify the most significant features of the situation prior to the disaster: the part of the cycle in which the event occurred; the seasonal nature of the activities in the country and its main sectors; and its capacity for risk exposure and for responding to external conflicts, including its ability to carry debt, the amount and importance of domestic savings and the strength and importance of flows of foreign direct investment.

This involves obtaining macroeconomic databases from the national authorities, academics and the country's economic advisors (establishing whether there are any econometric models for the economy and any input-output tables or tables of weights for intersectoral linkages). These sources can help the macroeconomist understand the estimates or projections for the situation expected before the disaster, whether scenarios or short- or medium-term projections. On the basis of frequently sketchy information and interviews, a projection should be prepared of economic growth expected before the disaster occurred and how this would have been reflected in the main aggregates: economic growth, inflation, exports, imports, balance of payments, external debt and so on. This preliminary projection will be of great assistance not only for the macroeconomist's own work, but also for that of the other members of the assessment team.

The following are usually among the most important information sources for assessing these tendencies: projections of economic growth for the year (sometimes half-yearly or even quarterly projections are prepared by planning offices or ministries or by central banks); the fiscal budget adopted and budget estimates for the following months made prior to the occurrence of the natural disaster (Ministry of Finance); and other macroeconomic statistics that are generally compiled by Institutes of Statistics; including crop growth index, trends in the manufacturing industry, monthly inflation trends and urban unemployment surveys. By extrapolating on the trends shown by these statistics during the months for which they are available, the macroeconomist will be able to estimate what annual performance would have been had the disaster not occurred.

It is more difficult for the macroeconomist to obtain global assessments of how the economy is developing in the affected area or region, since planning ministries, regional development corporations and state or provincial governments have only very recently begun to implement statistical programmes at the regional level. Naturally, if this type of information were available, it would greatly help the macroeconomist to describe the situation and the disaster area's economic outlook.

It is necessary to analyze trends in the external sector's main aggregates, namely, exports, imports, external financing, levels of international reserves and external debts. Trends in the prices and supply of the chief export products must also be taken into account when projecting the level of exports prior to the disaster. The estimated cost of servicing the debt is another important element, since the feasibility of making payments must be considered in the light of new post-disaster financial conditions and requirements.

This is also the case with other major macroeconomic aggregates: public finances (including the foreseeable deficit before the disaster occurred) and trends in the consumer price index and employment are among the most important.

The projections for the disaster period and for one or two years (there may be more than one pre-disaster scenario) for the main macroeconomic variables should be used to prepare a GDP series at current prices, forecasting development for at least five years from the disaster period. A constant price series (with the base year used by the country and expressed in the local currency and in dollars) is also required for the same variables. In both cases, macroeconomic data from the assessments made by international bodies and especially by ECLAC itself should be compiled before the mission in order to identify the intertemporal comparisons needed.

Finally, the exchange rate to be used for the assessment should be set. In the case of sudden events, the exchange rate for the appropriate period (whether a quarter, month, week or day) should be established; for longer-lasting events (droughts or disasters that last for several months, such as El Niño), an average for the event's duration should be determined.

4. The performance observed after the disaster

The disaster will affect the different sectors in varying degrees and will thus be reflected in the macroeconomic performance of the economy as a whole. The following table illustrates the potential impact –and possible timeframe– of an event's consequences.

Table 1

ECONOMIC IMPACTS FOLLOWING A NATURAL DISASTER ON A SMALLER ECONOMY

Economic impacts following a natural disaster on a smaller economy			
Variable	Year of event	Year after	Subsequent years
GDP	Immediate drop in GDP growth	Rise in GDP growth from reconstruction	Slow down in second and third year
Exports of goods	Reduction in the rate of growth	Return to previous levels	Continuation of year after
Imports of goods	Considerable increase in rate of growth	Return to pre-disaster level	Further drop, possibly caused by reduced incomes
Tourist arrivals	Considerable drop	Some recovery	Recovery continued
Cruise ship arrival	Considerable drop		
External debt	Increase in rate of growth	Drop of the rate of increase to below pre-disaster levels	

The role of the macroeconomist and of the sectoral specialists is preeminent here. The purpose is to identify actions and events occurring during the emergency that have an impact on the economy's aggregates: emergency imports of food, medicines and other essential goods; the magnitude of the aid donated in solidarity by the international, local and national communities; state expenditure (at the national and local levels) to combat the disaster,[3] and expenditure incurred by the private sector, either in support of the victims or to provide post-disaster goods and services until essential services are restored. This is particularly important with regard to public services (drinking water, electricity, telecommunications and telephone services), especially when, as is increasingly the case.

Similarly, with support from the sectoral specialists, the macroeconomist an should attempt to quantify the effects of the disaster on the education, health and other public infrastructures, many of which, if they have not been catastrophically damaged, are used as shelters and centers for storing and distributing aid. These expenditures must be specifically accounted for, in addition to any damage suffered by the health and education sectors themselves.

3 Including military expenditure, such as, transportation, personnel mobilization and space at army premises; use of installations, vehicles and personnel belonging to the different agencies mobilized by the official emergency response bodies (committees, national and local emergency offices, etc.); and resources from national disaster funds, when these form part of the state's budget.

During the event, resources are received not only in the form of altruistic aid (whether requested or not), but also from other sources. Registers exist of aid agencies, such as the Red Cross and other international bodies. The United Nations also publishes regular bulletins with information about the progress of the disaster, emergency needs and very short-term consequences. At the request of the affected country, a consolidated request for support is prepared. All such international information can be found at www.reliefweb.org, a Web site that should be consulted before the assessment is begun. As well as making it possible to complete the data needed to identify the expenditure incurred during the emergency (which has to be shown in the consolidated summary of damage), the systemization of this information will also facilitate its inclusion when measuring the disaster's impact on external variables, public finances and the currency.

a) General economic effects

The idea under this heading is, above all, to present a summarized appreciation of the disaster's economic repercussions throughout the economy. The specialist should gather data on the repercussions for capital assets (direct damage) and for the flows that will cease to exist (indirect damage), as well as on the secondary effects on the main macroeconomic variables mentioned. This mainly consists of a summary and analysis of the table data, which shows damage to physical infrastructure and natural resources, as well as to the production of goods and services that will cease to exist. It also includes increased import requirements resulting from the disaster. It usually covers a period of two years, but can be extended to five if the disaster's magnitude so merits. If relevant, it includes alternative scenarios of later developments and specifies the assumptions underlying each one.

This analysis is essential for designing restoration and reconstruction programmes and for orientating any international aid that might be needed. To this end, it is often necessary to show amounts in domestic currency (at the prices in the period when the assessment was made) and in dollars. The text should also include a summary of the effects (with a breakdown) on economic growth, population income level, employment, inflation, exports and imports and public finances.

A summary table showing the main economic indicators and the way in which the disaster affected them supports the relevant analysis. The sectoral specialists provide the macroeconomist with their estimates of indirect damage to production and services for the present and the following year and of the implications for the external sector. This damage is assessed at current prices in the year when the disaster occurred. This information is entered in the first two columns of Table 2. The last two columns indicate the ratio of value - added to the gross value of production. In Appendix XVI, as in the previous chapters dealing with specific sectors, an example is included to illustrate the contents of the macroeconomic overall impact assessment.

Table 2

SECTOR	EXTERNAL IMPACT	MACROECONOMIC IMPLICATIONS WEIGHTED BY ECONOMETRIC MODELS AND INPUT-OUTPUT TABLES WHEN AVAILABLE	
		GROSS VALUE OF PRODUCTION	VALUE ADDED
PRODUCTION SECTORS			
Farming (including livestock, fishing, forest resources)			
Industry			
Commerce			
Services			
- Finances and banking			
- Tourism			
- Personal and other non-industrial			
INFRASTRUCTURE			
Water (drinking, irrigation, drainage, sanitation, and waste disposal)			
Energy (generation, transmission, distribution)			
- Electricity			
- Others (oil, gas, etc.)			
Transportation and communications			
SOCIAL ASPECTS			
Education			
Health			
Housing and human settlements			
Cultural heritage			
Social conditions (social fabric: employment, etc.)			
ENVIRONMENTAL ASPECTS			
TOTAL			
FISCAL IMPLICATIONS (for the public sector)			
- Income			
- Expenditure			

The cost of the impact in terms of direct and indirect damage will be assessed sector by sector by means of the assessment methods described or suggested for each sector. Available sectoral weighting methods will be applied to these values to identify delta (D), or "damage" expressed as the difference between the expected value without the disaster (Va) and the value produced by the weighted sectoral assessment (Vb).

DAMAGE "DELTA"

The difference between the expected results with and without the disaster are expressed as follows:

D = Va - Vb, where Va is the variable's initially expected condition (sectoral, weighted) and Vb is the value discounting the disaster's effect.

Direct damage shows the losses of capital assets and is calculated as follows:
K = Ka - Kb, which measures the loss of capital, where this is assessed from the identified direct damage, sector by sector.

The indirect effects, in terms of output/income affected by the event, is expressed as:

DY = Ya - Yb, which measures the lost output/income.

Generally speaking, it is assumed that the capital/income-output relationship is not substantially altered by the disaster. Nevertheless, if sufficient information is available, it could be assumed that there have been changes in this relationship as a result of the disaster and the reconstruction processes. This is one of the elements that might motivate the suggestion of alternative scenarios.

b) The effects on economic growth and income

The aggregate that best reflects variations in the general level of economic activity is gross domestic product (GDP). Accordingly, the macroeconomist should estimate the disaster's effects on this variable's growth rate and the extent to which they modify the GDP forecasts made before the disaster. As stated, these estimates are generally relevant for a period of one or two years beyond the disaster year.

A clear distinction should be made between nominal and real magnitudes. GDP is generally obtained in nominal values and is transformed into a real magnitude. Thus the impact "delta" should be made in real terms (real magnitudes expressed in the prices of the base year normally used in the country) in order to obtain an appreciation of the disaster's real effects on the economic growth rate . One common problem of a statistical nature is explicitly distinguishing between the nominal and real value of the major aggregates that make up internal supply (gross domestic output by branches of activity) and demand (expenditure on public and private consumption and capital formation) at the time of the disaster occurred.

The macroeconomist must therefore consult national experts in order to select the most appropriate and reliable price index (whether the implicit price deflator of GDP, the wholesale price index or the cost of living index), so that the figures are expressed at constant values. This conversion is essential for the correct appreciation of the magnitude of the losses in GDP or income resulting from the disaster and their effect on the forecast growth rate. It is important to make clear that once this adjustment has been made, the data for the year, or for the two or more subsequent years, should be expressed, as far as possible, in constant disaster-year prices. In other words, the effect of inflation should be removed. This is important because the purpose at this point is to estimate the disaster's effects on the real growth rate.

The forecast aggregate demand and supply information obtained is to be modified according to the damage calculations supplied by the sectoral specialists, by applying these the deflators recommended by the Central Bank or corresponding economic authority.

The preceding calculation is used to make a preliminary estimate of the disaster's impact on the sector's GDP makeup. When the impact of reconstruction programmes is taken into account, the assessment might show that the disaster has a positive effect on GDP. Once the macroeconomist is in possession of the gross values of the damage obtained by the sectoral specialists, he or she must convert them to value - added so that they can be incorporated into GDP. This can be done by identifying the ratio of value-added to gross production value for all economic sectors and branches of activity. The above information is generally obtained from an input-output matrix that is recent enough for the ratios to be valid, or considering appropriate ratios.

The projections and forecasts about post-disaster development are made first for the disaster year and then for the following year(s). The number of years to be considered will vary in accordance with the relative impact of the event given the size and level of development of the economy and the economic cycle. These projections may be made for several alternative scenarios. The assumptions applicable to each case must be specified. There is not much literature on the subject, and, to obtain an approximate estimate of the impact, it would be prudent to consider the models used by the country's analysts or by analysts at international institutions. All these models must be subject to a set of endogenous and exogenous variables and, for the purpose of simplification, certain assumptions must be made for each case. The methodological and taxonomic development of each model is not shown here. This task has to be carried out on a case-by-case basis in order to decide which type of model or models are to be employed.

i) The measurement of GDP. Generally, GDP data is obtained on the basis of real sectoral data. In some cases, the distinction should be made between GDP at market prices and at factor costs. GDP data is sometimes obtained at factor costs, while the macroeconomists needs GDP at market prices. The relationship between value - added and final demand is shown in the following table.

Gross domestic product as net contribution to income	Gross domestic product as net final demand
- Gross value - added to basic prices o Remuneration paid to wage earners o Other taxes less production subsidies o Fixed capital consumed o Surplus of exploitation/mixed income - Taxes less production subsidies	- Household final consumption expenditure - Final consumption expenditure by non-profit institutions serving households (individual) - Government's final consumption expenditure o Collective o Individual - Gross fixed capital formation o Gross fixed capital formation o Variations in stock levels o Purchases minus disposal of valuable objects - FOB exports - Minus FOB imports

Alternative ways to calculate GDP

- As the sum of value - added (the production approach) - GDP estimated at consumer purchaser's prices (GDPbp). This is the sum of gross production in each sector at producer prices (GPpp) minus each industry's intermediate consumption at purchaser's prices (ICbp), plus customs duties and other import taxes (Im):

  GDP = total industrial production at basic prices
  GDP = PBpp - ICbp + Im

This approach makes it possible to calculate the value - added to each industry's basic price by subtracting each industry's intermediate consumption at purchaser's price from its production at basic price.

- As the sum of primary incomes (the income approach). With this approach, GDPbp is equal to the sum of employees' remunerations (Er), indirect taxes net of subsidies (Tin), fixed capital consumed (CKF), net exploitation surplus (NES) and customs duties and other import taxes (Im):

  GDPbp = Er + Tin+ CKF + NES + Im

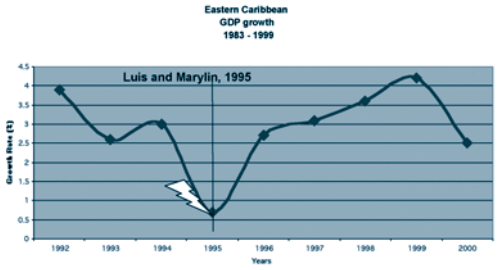
- As net final demand (the expenditure approach). In this process GDPbp is equal to the sum of final consumption (FC), gross fixed capital formation (GFKF), variation in stock levels (E) and exports (X), minus imports:

  GDPbp = FC + GFKF + E + X - M

- The commodity flow approach. The national accounts system combines three approaches (production, income and expenditure) to calculate national accounts statistics. Since it balances the supply and use of each output by means of supply and use tables, it is possible to make a uniform crosscheck at a very detailed level to ensure that the figures are consistent.

Therefore, the input-output matrix preparation methodology can be used for calculating GDP at purchaser's prices (GDPbp) and measuring it either as the sum of value - added or of primary incomes, or as net final demand. With the assistance of the input-output tables or the sectoral weightings, it is possible to identify the way in which damage in one sector is reflected in others. Losses are accounted for at replacement cost and the damage scenario is defined. Changes in basic balances -external sector, fiscal deficit, internal balance (prices, exchange rate, etc.- should be highlighted.

The past performance of economies following a major disaster are exemplified by the situation experienced in the Caribbean after two major hurricanes, Luis and Marilyn, as is illustrated by the following graph.



Source: Eastern Caribbean Central Bank

ii) The use of several future scenarios. The first scenario (quantification and impact of the event without taking later reconstruction activities into account) serves as a basis for alternative reconstruction scenarios. These scenarios are based not on replacement values, but on reconstruction costs, the emergency reconstruction priorities sector by sector and the reconstruction strategies that begin to emerge in the weeks following the disaster.

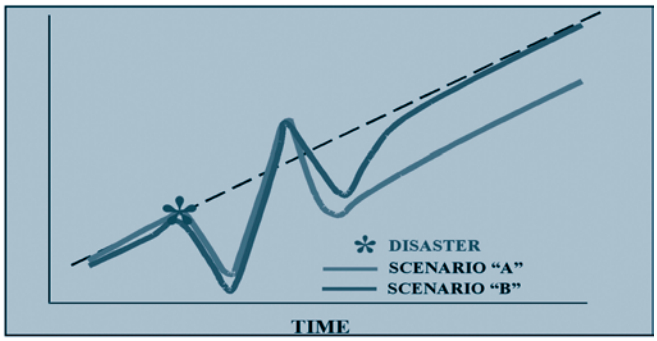
The various scenarios should specify the assumptions made about two core elements: the economy's capacity to absorb external resources and its project delivery capacity. These scenarios should also include assessments of the way that key economic variables will behave in the event of a significant increase or diversion of resources for reconstruction taking into account interest rates, debt capacity and the availability of production inputs and means (raw materials, capital goods, internal savings, labor, etc.).

The effect on income refers to connections that might be established with the impact on employment. This is extremely important for calculating the impact of a disaster that slows or closes down income - generating activities. The estimate of the impact on income also includes an assessment of the disaster's effect on inflation and the available sources of supply. The calculation of the effects on the population's income is another way of analyzing the problem of the disaster's consequences on the level of activity (and for that reason it should not, of course, be added to them). It is sometimes useful to singularize effects when they encompass a defined stratum of the population (especially the lowest deciles), in order to facilitate the design of reconstruction-related occupational absorption programmes, whether in rural or urban areas. Clearly, these assessments will be closely related to those made about the disaster's effects on employment. These phenomena sometimes affect the population's real income if inflexible supply, caused by temporary interruption to the supply channels, exacerbates inflation. The example that accompanies this chapter (taken from the assessment of the macroeconomic impact of the El Salvador earthquakes in 2001) shows the type of analysis and macroeconomic assessment results expected. The following table and figures illustrate the way in which the results should be presented at the end of the exercise.

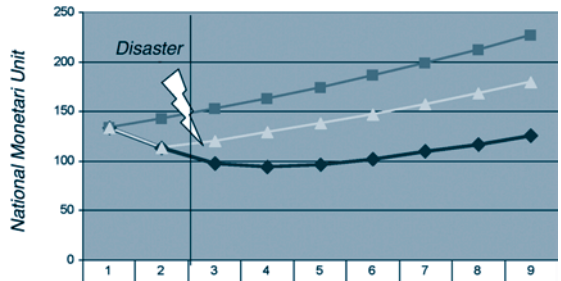
MACRO / GLOBAL IMPACT (CURRENT VALUE AND CONSTANT VALUE)	EX ANTE SITUATION (CURRENT PERIOD)	EX POST SITUATION (CURRENT PERIOD)	SHORT-AND MEDIUM - TERM PROJECTIONS (INCLUDING ALTERNATE SCENARIOS)
1. GDP			
EXTERNAL BALANCE			
- Exports			
- Imports			
A - BALANCE OF TRADE			
B - CURRENT BALANCE AND CAPITAL ACCOUNT			
- Net credits (including service and repayment)			
- Net donations			
- Net private transfers			
- Other income (payments fominsures and reinsurers)			
2. FISCAL BALANCE			
- Income			
- Expenditure			
3. CAPITAL ACCOUNT			
- Gross capital formation			
- Domestic investment			
- Foreign direct investment			

Based on a consistency model, different reconstruction scenarios may be estimated. The model that produced the second figure is based on particular features of a smaller economy and on the empirical evidence available for smaller economies before and after a disaster.

THE EFFECT OF DISTASTERS ON THE GROWTH OF A NATIONAL ECONOMY



NATIONAL INCOME BEFORE AND AFTER A DISASTER: SLOW OR FASTERCOVERY ADJUSTMENT AS COMPARED TO TREND



	1	2	3	4	5	6	7	8	9
Slow reconstruction efforts	133.687	112.722	98.0169	94.3167	96.7038	102.345	109.345	117.128	125.279
Trend	133.687	142.83	152.599	163.035	174.186	186.098	198.826	212.424	226.952
Fast reconstruction	133.687	112.722	120.431	128.668	137.467	146.869	156.914	167.645	179.111

Periods (Years)

c) Effects on the external sector and the balance of payments

When making their assessments, the sectoral specialists will have included among the disaster's secondary effects those that affect the current account of the balance of payments and, where relevant, the external financial requirements for the reconstruction process.

The macroeconomist will need to have estimates of the balance of payments for the economy as a whole, as well as a projection for the disaster year (and, if possible, for the following year, too). This information must be supplemented with information on other external-sector basic magnitudes (e.g., the total amount of external debt, the effect of debt servicing and the level of international monetary reserves).

The data required for estimating the effects of the disaster on the balance of payments are as follows: a pre-disaster estimate of the balance of payments for the year in which the disaster occurs; and the balance - of - payment accounts for the preceding five years, using the most detailed data possible (i.e., IMF, Fifth Manual). The balance of payments comprises three components: flows of goods and services in and out of the country; unilateral transfers that are the counterpart of real resources or financial claims that are provided or received; and changes in resident's claims on, and liabilities to, non-residents that arise from economic transactions.

Possible effects on the balance of payments

a) Flows of goods and services

Decrease in export merchandise (a result of the destruction of output and capacity or of diversion to the internal market).

Decrease in service earnings, which arises out of losses to the merchant fleet, tourism and other infrastructure.

Increase in imports that are indispensable during the restoration phase (fuel; foodstuffs to replace lost harvests and production of staple food; additional inputs).

Decrease in import value due to tariff reduction.

Disaster related insurance and re-insurance.

b) Unilateral transfers

Unilateral transfers received from the rest of the world will increase (donations and grants; remittances).

Unilateral transfers provided to the rest of the world will decrease (profit and interest repatriation).

c) Changes in resident's claims

Changes in resident's claims should be estimated on the basis of the need for medium - and long - term external financing of restoration and reconstruction during the two years following the event.

The expert should also consider in the calculation additional external financing needed to confront a possible worsening of the current account deficit. The performance of the balance of payments for Dominica (in US dollars) following hurricanes Luis and Marilyn (1995) illustrates such an assessment.

Dominica: Balance of payments (US dollars. Millions) 1993-1997					
	1993	1994	**1995**	1996	1997
Goods	-118	-129	**-143**	-129	137
Services	48.9	36.4	**34.5**	64.9	84.0
Income	-17.3	-29.9	**36.0**	-53.2	-46.5
Transfers	23.5	19.1	**21.2**	27.5	28.3
Capital transfers	26.3	23.2	**52.3**	57.4	60.8
Financial account	53.9	80.5	**78.9**	26.6	14.2
Foreign direct investment	35.7	61.1	**146.1**	48.1	57.0

Source: Eastern Caribbean Central Bank

d) The effect on public finances

A natural disaster affects the budget. The budget is a financial programming exercise projecting how the government plans to spend revenue. It presents certain expected levels of receipts and certain expected levels of expenditures. Public sector operations may be reported on a cash flow or accrual basis. Central government revenues should be shown on a cash basis. Revenues on an accrual basis may include commitments by their parties that cannot be honored.

The presentation of fiscal accounts on an accrual basis depends on the need to reconcile fiscal with other financial and economic variables, the importance of the floating debt as a source of finance and the availability of data. Public sector operations are carried out in the context of a fiscal year. The fiscal year does not necessarily coincide with the calendar year. Adjustments are needed to make fiscal figures compatible with other figures such as the national accounts.

Possible budgetary effects due to the disaster include the following:

Reduction in current revenues due to decreases in tax revenues: the tax base, tax rates, tax holidays (reductions in import duties) and non-tax revenues;

Reduction in capital revenues due to destruction and damage;

Variations (probable increase) in current (operating) expenditures: increases in operating outlays, increases in transfers and decreases of interest on public debt; and

Increase in capital expenditures: increase in direct investment, capital transfers and financial operations.

The financial impact of the disaster can be analyzed by rearranging the fiscal components in a presentation that shows the gap between central government operations and their financing. It is important to take into account the influence of the rest of the general government accounts and in particular that of state enterprises on the budget. The relations between state enterprises and the central budget are captured in current expenditures under transfers. Enterprises can be classified into those engaged in production; in providing certain services; in marketing commodities; and in producing, importing, and refining petroleum products.

As an example of such a budget impact on a very small economy, Antigua and Barbuda reported increased import tax revenues following hurricanes Luis and Marilyn in 1995 despite a reduction in import tariffs.

Antigua and Barbuda: Central Government Budget Balances
(EC Dollars) Millions, 1993 - 1997

	1993	1994	1995	1996	1997
Tax revenue	255.0	281.0	**283.0**	323.0	327.0
Domestic taxes	44.8	52.0	**53.3**	59.9	63.4
International trade taxes	140.5	166.2	**160.5**	181.6	187.5
Import duties	44.0	47.1	**46.0**	54.6	56.8
Current expenditure	274.4	275.4	**290.5**	314.6	324.3
Capital expenditure	2.4	2.8	**4.2**	5.0	3.7

e) Employment

The reports on the social and economic sectors should include estimates that make it possible to appreciate the overall effects on the level of employment derived from: the effects of the destruction of production capacity or social infrastructure, and from the occupational requirements created during the emergency and the rehabilitation process. These effects on employment not only have implications for household incomes and national output, but they increasingly affect people's mobility and migratory flows, both within the country (between the most and least affected regions) and to neighboring and more distant nations. Such shifts often have significant social and political implications.

f) Prices and inflation

Inflation data should be readily available from the Central Bank on a monthly or at least quarterly basis. It is a key variable for the IMF and for countries that have programmes with the IMF. However, price surveys leading to the construction of a price index are generally carried out in urban areas. Therefore, the analyst may be confronted with a paucity of pricing data for the countryside when assessing a natural disaster that has affected a sector such as agriculture.

Although the macroeconomist cannot be expected to measure the general levels of inflation before and after the disaster, he or she should at least express an opinion (based on the sectoral analyses) about the effect that supply constraints (due to destruction of crops, manufactured goods, trading channels, transportation routes, etc.) could have on the price of particular goods and services that will be supplied by alternative means. An assessment of the influence of these variations on general price levels and on relative prices must be made and included in the description of the general effects of the disaster.

g) The use of models

As already mentioned, the models to be used will preferably be those generally employed by analysts in the country in question. Examples will now be given of two generic models and the tools that are needed when adapting these models to specific cases. The behavior of investment deserves a separate discussion. The effects on investment are not clear from the damage assessment; they will vary according to the availability and quality (amount, terms and conditions, internal/external mix and public/private participation) of resources for the reconstruction process. The use of models allows for the introduction of different scenarios and constraints. In Appendix XVII, two models are briefly described as an illustration of how they can be useful for measuring short- and medium-term impact and designing reconstruction strategies.

Models are alternative methods that macroeconomists can use to process and analyze the information received from the sectoral specialists and the country's economic authorities. Past experience of disaster assessments suggests that estimates of impact on GDP and on the GDP growth rate are made by positing different scenarios, not just one unvarying course of action. It should be remembered that estimates of impact on the GDP growth rate made using the input-output matrix and the GOV and VA ratios are only approximations of reality and that in practice, many countries in the region lack an up-to-date or relatively recent input-output matrix. Therefore, estimates made using this instrument can be unreliable or fail to reflect the magnitude of sectoral impacts.

From the point of view of macroeconomic policy, the key question is this: How much money does the government need to finance the reconstruction costs, and how quickly can it obtain it while remaining within the framework of sustainable fiscal policy? At this point in the assessment it is important to identify the underlying public sector deficit, that is the deficit excluding reconstruction costs. The next step is to determine how the underlying deficit was expected to be financed: for example, by loans from multilateral institutions, by issuing bonds, or both. If loans are obtained, information on the maturity, grace periods and interest rate (generally expressed in terms of LIBOR rates plus x basis points) should be obtained from the country's authorities, and a medium- and long-term debt plan should be drawn up. Once this information has been obtained, two scenario modes can be proposed:

a. Probable financing structure and

b. An occurrence probability associated with each financing structure. With the first mode, there can be as many scenarios as there are financing structures defined. To simplify matters, no more than three scenarios should be used, each one set out in roughly the following way:

Scenario A (pessimistic): this assumes that the government contracts loans for the amount needed to repair the damage and pay the estimated replacement costs over a period of several years (e.g., five) without overheating the economy or throwing the system out of balance. The related expenditure is also distributed over the same period because of the limits on the economy's absorptive capacity. It is assumed that the loans will have a long-term maturity period (e.g., 20 years), a grace period of several years (e.g., five) an interest rate equivalent to the LIBOR plus a moderate number of basis points (e.g., 150).[4]

Scenario B (probable): this assumes that the government contracts loans for the amount needed to repair the damage and pay the estimated replacement costs over the same period suggested in the previous example (five years). The disbursements of the loans contracted at the end of the disaster year are paid on the same terms as in Scenario A, but it is assumed that the financing is raised by issuing special disaster bonds with a longer maturity period (e.g., seven years) and an interest rate of LIBOR plus a sufficient number of basis points (e.g., 280) to make it an attractive investment.

Scenario C (optimistic): This assumes that the government borrows more money in order to improve and strengthen the infrastructure of the affected area by incorporating vulnerability reduction programmes in the reconstruction process. The loans are contracted on the same terms as in Scenario A.

With the second mode, each scenario is associated with a probability distribution that, as in the preceding mode, can be distinguished by the occurrence probability allocated to the three scenarios. An occurrence probability of 50 percent is assumed for the probable scenario and 25 percent each for the pessimistic and optimistic scenarios.

In every case, it is important to check whether the reconstruction expenditure is expected to create faster economic growth, especially if it is assumed that a good part of the additional expenditure will be reflected in the volume of imports. In short, projections should be made for the planned reconstruction period based on the total underlying deficit:

Total underlying deficit = net financing need plus debt amortization = gross financing need minus disbursements of existing debt = fiscal financing gap

The above information can be used to make a “sensitivity analysis” by distinguishing between the overall fiscal deficit in each of the proposed scenarios and the underlying position. The analysis can be extended to include public debt and debt servicing, the financial gap and the balance of payments.

4 The periods and the points added to the interest rate will be adapted in each case to the affected country’s financial conditions and risk rating, to the magnitude of the debt and to the economy’s capacity to absorb the required reconstruction.

APPENDIX XVI
MACROECONOMIC EFFECTS OF THE EARTHQUAKES IN EL SALVADOR IN 2001

1. Summary of damage

Total damage is the equivalent of 12.1 percent of 2000's GDP. It is also the equivalent of 43.5 percent of exports, 29.3 percent of imports, and 42.3 percent of gross fixed capital formation. These figures highlight the challenges facing public finances and the external sector.

2. The situation before the earthquake

General features

El Salvador's GDP grew by 2 percent in 2000, marking the third consecutive year of falling growth rates.[5] To a large extent, this performance was associated with a slack export sector, where a fall in international coffee and sugar prices combined with a rise in fuel prices to worsen the terms of trade. A slowdown was also experienced in the construction and trade sectors, as well as in agriculture for domestic consumption.

Public finances weakened in 1999; together with the external sector, this constituted the most vulnerable area of the economy. The deterioration occurred in spite of efforts to apply a conservative fiscal policy in spending, as well as measures aimed at broadening the taxpayer base and reducing tax avoidance and evasion. Some of the government's basic assumptions about the economic situation before the earthquake are shown in Table 1.

At the close of 2000, a central government fiscal deficit of 2.3 percent of GDP was reported; this was slightly higher than in 1999. For 2001, without the effect of the earthquake, the fiscal deficit had been estimated at 2.8 percent. Had the trend in revenue collection continued, the fiscal deficit was expected to come under more pressure, largely because of the government's obligation to pay more than a billion dollars in pensions over the next five years. Income from customs duties was also expected to fall as a result of free trade agreements entered into by the country.

5 According to official estimates in December 2000.

Table 1

SELECTED ECONOMIC INDICATORS

	1999	2000	2001 (before the earthquake)
Targets			
Real GDP (%)	3.4	2.0	3.5 - 4.5
Inflation (%)	-1.0	4.3	2.0 - 4.0
Assumptions			
Coffee crop 1999/2000 (hundreds of millions of pounds)	3.2	-.-	-.-
Coffee crop 2000/01 (hundreds of millions of pounds)		2.9	3.2
Coffee exports (hundreds of millions of pounds)	2.5	3.1	2.6
Average price of exported coffee (dollars per 100 pounds)	99.0	96.5	75.0
Exports of goods FOB (millions of dollars)	2,500.4	2,981.9	3,603.1
Imports of goods CIF (millions of dollars)	4,119.9	4,908.1	5,782.0
External inflation (%)	2.6	3.7	2.0- 3.0

Source: El Salvador Central Reserve Bank.

In the private sector in 2000, the highest growth was to be found in the transport and communications (6.2%), banking and insurance (5.1%) and manufacturing (4.5%) sectors. In the external sector, exports of goods and services increased by 17.3 percent and imports by 18.1 percent, taking the deficit on the trade balance of goods and services to 26 percent. The current account deficit was the equivalent of 3 percent of GDP, compared with 2 percent in 1999. Before the earthquake, it was estimated that the deficit in 2001 would be reduced to 2.5 percent, because of expected improvements in exports of maquila products (especially textiles) following the broadening of the Caribbean Basin Initiative.

Trade deficits continued to be offset by family remittances, which totaled 1.751 billion dollars in 2000. In addition, the Central Reserve Bank had amassed net international reserves of almost 1.9 billion dollars, the equivalent of four and a half months of that year's imports.

December-to-December inflation in 2000, measured by the national consumer price index (CPI), was close to 4.3 percent, reversing the previous year's -1 percent. Before the earthquake, a December-to-December inflation rate of 3 percent had been projected for 2001.

In late November 2000, the Monetary Integration Project was announced. When it came into effect on January 1, 2001, the prevailing exchange rate, which had been in effect since 1994, was set at 8.75 colóns to the dollar. Other currencies were allowed to circulate freely alongside the colón, and the dollar was made the unit of account for the financial system. Prior to the earthquake, the government had hoped that this process would promote the flow of capital and increase foreign direct investment.

It is important to emphasize that the macroeconomic mechanisms used to adjust to external shocks (e.g., the January 13 earthquake) in a dollarized scenario are totally different from those used in a national currency scenario. In the former scenario, adjustments can be made through fiscal measures and through the labor market; in the latter, it can be made by modifying the nominal exchange rate. A dollarized scenario calls for strict control of public finances, together with greater external resources and considerable flexibility in the labor market.

3. The accumulated effects of the two earthquakes: post-earthquake projections for 2001 and the following years

The assessment of the macroeconomic effects of the second earthquake for 2001 and the following years uses the estimates contained in the document on the 13 January disaster to focus on the impact on growth, inflation and the deficit, both in the current account of the balance of payments and in public finances.

Some post-earthquake projections of the most probable 2001 macroeconomic scenario measure the role of economic policy and, as a result, the future reconstruction challenge.

The earthquake's main impact on the GDP growth rate, in terms of the GDP percentile structure, was on the social (40 percent), infrastructure (32 percent) and production (20 percent) sectors . The most badly affected part of the social sector was housing. In infrastructure, roads suffered the most damage, and their restoration and reconstruction may raise the country's low level of public and private investment. In the production sectors, the greatest damage was caused to small and micro - businesses, many of which have begun to recover on their own initiative, although many others will disappear permanently or will only be revived with the assistance of directed credit programmes to provide them with working capital and inventory capital.

Table 2 shows overall supply and demand at current prices. The post-earthquake projection column includes the increase in imports that might occur because of reconstruction work.

Table 3 shows overall supply and demand at constant 1990 prices. The projection for 2001 was estimated by the Central Reserve Bank for a pre-earthquake scenario with 4.5 percent growth in GDP. All post-earthquake estimates were made by ECLAC and show a GDP growth rate of 4 percent in the first year (2001), with stronger growth in 2002 and 2003.

In short, the conclusion is that an earthquake in a small open economy like that of El Salvador puts increased pressures on public finances, since the additional expenditure, added to import requirements (especially for construction and housing) can culminate in simultaneous internal and external deficits. These will turn the adjustment process into a cause of higher unemployment rates, unless the international community provides additional financing. Such new funding must be provided on concessionary terms to ensure that the increase in the country's foreign debt does not increase its external weakness.

When added to those contracted after the previous earthquake, the new loans provided by multilateral institutions to lessen the fiscal gap caused by the magnitude of the reconstruction expenditure (an estimated 336 million dollars for this event) a total of 1.94 billion dollars.[6] It is considered that reconstruction will call for average annual investments of 390 million dollars over the next five years (a total of 1.9 billion dollars)

Table 2

OVERALL SUPPLY AND DEMAND AT CURRENT PRICES
(Millions of dollars)

	1999 Preliminary	2000 Projection rev. Dec.	2001 Projection pre-quake	2001 Projection post-quake	Percentage of GDP		
					2000	2001 before	2001 after
Overall demand	149,779.1	163,730.2	180,767.7	182,163.7	141.6	145.0	146.8
Consumption	104,605.4	111,988.5	121,514.9	121,503.2	96.8	97.5	97.9
Private	93,624.4	100,411.5	108,649.9	108,569.6	86.8	87.2	87.5
Public	10,981.0	11,577.0	12,865.0	12,933.6	10.0	10.3	10.4
Gross domestic investment	17,741.6	19,574.9	21,310.2	22,588.3	16.9	17.1	18.2
Fixed capital formation	17,618.9	19,436.2	21,083.3	22,406.1	16.8	16.9	18.1
Private	14,376.1	16,011.2	17,148.1	18,216.4	13.8	13.8	14.7
Public	3,242.8	3,425.0	3,935.2	4,189.8	3.0	3.2	3.4
Inventory variations	122.7	138.7	226.9	182.2	0.1	0.2	0.1
Export of goods and services	27,432.1	32,166.8	37,942.6	38,072.2	27.8	30.4	30.7
Overall supply	149,779.1	163,730.0	180,767.6	182,163.7	141.6	145.0	146.8
Imports of goods and services	40,693.6	48,062.9	56,108.5	58,108.5	41.6	45.0	46.8
Gross Domestic Product	109,085.5	115,667.1	124,659.1	124,055.2	100.0	100.0	100.0
Farming	11,725.9	11,806.7	12,414.4	12,086.2	10.2	10.0	9.7
Mining and quarrying	435.2	461.7	499.3	499.3	0.4	0.4	0.4
Manufacturing industries	24,545.9	27,092.3	29,476.9	29,412.6	23.4	23.6	23.7
Water and electricity	2,020.4	2,350.9	2,551.8	2,444.5	2.0	2.0	2.0
Construction	4,773.6	5,037.0	5,484.0	5,799.8	4.4	4.4	4.7
Commerce, hotels, and restaurants	20,740.6	21,462.6	22,857.8	22,632.3	18.6	18.3	18.2
Transportation, storage, and communications	9,209.3	9,955.6	10,858.2	10,858.2	8.6	8.7	8.8
Banking, insurance, and other financial institutions	4,606.9	4,952.7	5,417.8	5,417.8	4.3	4.3	4.4
Real estate and business services a/	4,544.3	4,704.7	5,000.9	5,050.9	4.1	4.0	4.1
Housing rentals	8,634.9	9,027.4	9,649.4	9,699.4	7.8	7.7	7.8
Community, social, personal, and domestic services b/	7,191.5	7,751.1	8,143.1	8,034.7	6.7	6.5	6.5
Government services	8,071.2	8,491.7	9,084.5	8,898.5	7.3	7.3	7.2
Minus							
Attributed banking services	4,506.6	4,845.4	5,225.4	5,225.4	4.2	4.2	4.2
Plus							
Customs duties and VAT	7,092.4	7,418.1	8,446.4	8,446.4	6.4	6.8	6.8

Source: ECLAC, preliminary estimates based on figures provided by the Central Reserve Bank.
a/ Includes leasing and use of non-residential properties; professional legal, accounting, and audit services; preparation of data, computer services, architectural services, and advertising.
b/ Includes private education and health services, entertainment services (cinema and television) and other services such as veterinary services; trade, professional, labor, and religious associations; electrical and motor vehicle repair shops.

6 Plus the sum of 112 million dollars needed for the reconstruction of housing whose loss was reported after 31 January, but before the second earthquake.

Table 3

OVERALL SUPPLY AND DEMANDS AT CONSTANT PRICES

	1999 Preliminary	2000 rev. Dec.	2001 Projection pre-quake	2001 Projection post-quake	Relative changes 2000/99	2001/00 pre-quake	2001/00 post-quake
Overall demand	84,898.5	89,439.8	96,081.2	97,100.6	5.3	7.4	8.6
Consumption	55,411.1	56,273.4	58,777.6	58,776.9	1.6	4.5	4.4
Private	50,710.6	51,557.7	53,749.1	53,720.7	1.7	4.3	4.2
Public	4,700.5	4,715.7	5,028.5	5,056.1	0.3	6.6	7.2
Gross domestic investment	10,594.8	11,149.5	11,957.8	12,630.6	5.2	7.2	13.3
Fixed capital formation	10,488.3	11,054.0	11,670.8	12,400.2	5.4	5.6	12.2
Private	8,829.3	9,421.4	9,851.4	10,463.2	6.7	4.6	11.1
Public	1,659.0	1,632.6	1,819.4	1,937.0	-1.6	11.4	18.6
Inventory variations	106.5	95.5	287.0	230.3	-10.3	200.5	141.2
Exports of goods and services	18,892.6	22,016.9	25,345.8	25,693.2	16.5	15.1	16.7
Overall supply	84,898.5	89,439.8	96,081.2	97,100.6	5.3	7.4	8.6
Imports of goods and services	29,015.1	32,455.2	36,550.4	37,855.7	11.9	12.6	16.6
Gross Domestic Product	55,883.4	56,984.6	59,530.8	59,244.9	2.0	4.5	4.0
Farming	7,205.1	7,145.9	7,403.0	7,207.0	-0.8	3.6	0.9
Mining and quarrying	242.6	249.9	262.3	262.4	3.0	5.0	5.0
Manufacturing industries	12,655.3	13,225.8	14,109.9	14,079.8	4.5	6.7	6.5
Water and electricity	350.2	354.3	374.4	358.6	1.2	5.7	1.2
Construction	2,176.6	2,126.5	2,243.4	2,373.1	-2.3	5.5	11.6
Commerce, hotels, and restaurants	10,940.9	11,030.8	11,370.7	11,259.9	0.8	3.1	2.1
Transportation, storage, and communications	4,554.8	4,836.6	5,124.8	5,124.2	6.2	6.0	5.9
Banking, insurance, and other financial institutions	2,098.4	2,205.2	2,337.5	2,337.3	5.1	6.0	6.0
Real estate and business services a/	1,811.4	1,838.6	1,893.7	1,912.5	1.5	3.0	4.0
Housing rentals	4,719.4	4,790.2	4,876.4	4,901.2	1.5	1.8	2.3
Community, social, personal, and domestic services b/	2,889.7	2,928.3	2,982.1	2,942.0	1.3	1.8	0.5
Government services	3,093.1	3,099.3	3,145.8	3,081.2	0.2	1.5	-0.6
Minus							
Attributed banking services	1,825.6	1,918.7	2,005.0	2,005.1	5.1	4.5	4.5
Plus							
Customs duties and VAT	4,971.5	5,071.9	5,411.7	5,410.9	2.0	6.7	6.7

Source: ECLAC, based on official figures

a/ Includes leasing and use of non-residential properties; professional legal, accounting, and audit services; preparation of data, computer services, architectural services, and advertising.

b/ Includes private education and health services, entertainment services (cinema and television) and other services such as veterinary services; trade, professional, labor, and religious associations; electrical repair shops and workshops for motor vehicles, watches, jewelry, etc.

In other words, the effect of the second earthquake was to further strain not only public finances, but also domestic savings and investment capacity. Such a significant increase in reconstruction expenditure will only come about if external resources can be obtained on preferential terms through loans made mainly by the Central American Bank for Economic Integration (CABEI), the Inter-American Development Bank (IDB) and the World Bank.[7]

7 According to the Central Reserve Bank and the IMF, the preferential terms for these loans are a 20-year period, a 5-year grace period and an annual interest rate of 7.5 percent (LIBOR). This suggests that there will be no significant rise in short-term debt during the three years following 2001.

We considered it useful to present three scenarios based on the estimated damage caused by both earthquakes. They are based on the following increases to the economy's historical investment rates: Scenario 1) 150 million dollars in the first year and an average of more than 400 million dollars a year for the following four years until reconstruction is completed; Scenario 2) an average of 380 million dollars for five years; and Scenario 3) 400 million dollars in the first year and an average of 375 million dollars a year for four years.[8] This will determine the level of public expenditure and investment. It will depend on the terms of the country's debt in the next few years and its feasibility will be associated with the national productive structure's ability to expand. The length of time that the reconstruction phase lasts is another factor that might change, and with the cumulative effect of the second earthquake, it could easily continue for more than five years

Table 4

SUMMARY OF MAIN ECONOMIC INDICATORS IN THREE RECONSTRUCTION SCENARIOS FOR 2001 AFTER THE EARTHQUAKES OF 13 FEBRUARY

	Scenario 1 (pessimistic)	Scenario 2 (probable)	Scenario 3 (optimistic)
Real GDP growth	3.0%	3.5-4.0%	4.0-5.0%
Inflation	4.3%	3.0%	3.0%
Fiscal deficit	5.0-5.5%	4.8-5.0%	2.7-3.0%
Current account deficit/GDP	4.0%	3.5%	2.5%
Public debt/GDP	35%	33%	32.3%

Source: prepared by ECLAC All the scenarios assume that loans will be made on preferential terms, especially with regard to interest rates and grace periods: 7½ percent annual interest over 20 years with a five-year grace period.

Pessimistic Scenario: prepared on the basis of 150 million dollars for reconstruction in 2001, with a further 1.750 billion dollars in 2002-2005. Although real GDP growth is greater than in 2000, the reduced flow of resources for reconstruction in 2001 would not be enough to give a boost to the production sector and would cause a marked deterioration in the main economic indicators.

Probable Scenario: prepared on the basis of 380 million dollars for reconstruction in 2001 and 1.520 billion dollars in 2002-2005. This scenario would double 2000's GDP growth rate and reduce annual inflation. New reconstruction work and higher imports would increase the fiscal and current account deficits, respectively. It is estimated that the underlying deficit would be 2.7 percent of GDP, while reconstruction expenditure would be 2.1 percent of GDP, for an overall deficit in 2001 of 4.8 percent of GDP.

Optimistic Scenario: prepared on the basis of 400 million dollars for reconstruction in 2001 and 1.5 billion dollars in 2002-2005. Under this scenario, GDP growth would increase, inflation would be lower than in 2000 and the fiscal and external sector accounts would be kept at prudent levels.

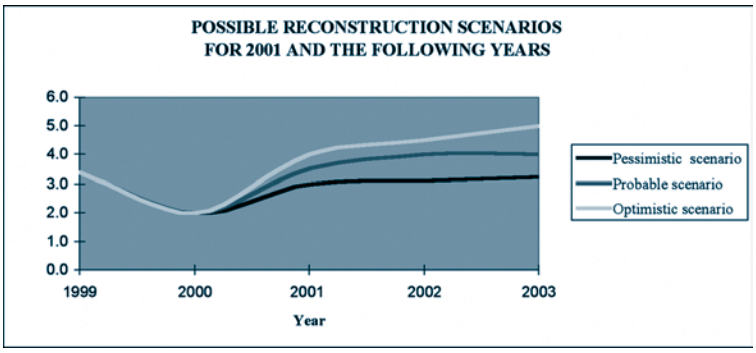
8 Changes in interest rates and reconstruction loan conditions could cause changes in the cost of servicing the fresh debt. The concessions obtained may not only favour a swifter reconstruction process, but also create fewer pressures on the basic macroeconomic balances.

These scenarios are of assistance in measuring possible impacts on the main economic indicators. However at the time of preparing the second assessment, it was still not possible to specify the amount of aid that might be received, the financing that would be available for 2001, when disbursement and implementation will take place or whether these loans would be made on the preferential terms mentioned previously.

This assessment does not include the effect of the possible use of alternative means of partially financing reconstruction, such as the sale of concessions or shareholdings in privatized businesses. Another possible source of financing should be increased domestic savings and tax revenues. This would lessen the strain produced by increased public expenditure –both current spending (in the emergency and for immediate rehabilitation) and investment spending (during the five or more years that reconstruction is expected to last).

Figure 1 shows GDP growth rates for each of these three scenarios.

Figure 1



As noted, the costs of reconstruction are over 1.9 billion dollars. This adds to the challenge already posed to economic policy by the first earthquake. Additional resources and appropriate management of public finances are needed to finance the national reconstruction plan and, at the same time, keep international reserves at an adequate level, control debt servicing costs and avoid further risks of macroeconomic instability.[9] All this has to be done without producing any negative effects on production capacity and employment, which have already been harmed by the earthquakes.

9 These funds could be generated by a basket that could be made up of concessionary loans from multilateral bodies, bond issues, own resources and fiscal measures designed to broaden the taxpayer base and improve tax collection and the efficiency of the revenue authorities. The recent amendment to the tax code, which tackles the country's traditional problems of tax avoidance and evasion, might make tax collection more efficient.

Surveys of business activity carried out after the two earthquakes, together with the expectations of different business sectors, do not conclusively support the view that an increase in tax revenues can be obtained in 2001.[10] Their stated perception was that internal demand could fall unless there were a recovery in income and employment. In addition, a potential increase in demand for resources for reconstruction could reduce demand in other areas. Reconstruction would bring a relative increase in current expenditure that could have a negative effect on the forecast rates of growth in social and capital expenditure, precisely because of the costs incurred during the emergency stage of the earthquakes and the financing of the 2001 "winter plan" (emergency measures to provide temporary housing and stabilize hillsides before the start of the rainy season).

In any of these possible reconstruction scenarios, the public sector deficit would be financed by the new loans, even in a scenario in which the Central Bank continued amassing international currency because of the potential increase in family remittances. The previous situation will be aggravated the more that reconstruction is financed by increasing the level of medium- and long-term debt. In the probable scenario, the overall cost of debt servicing could reach 33 percent of annual GDP, which is a reasonable level.

4. The impact on employment

Since the impact of the second earthquake was more localized than the first one, the effects on employment are more directly related to damage caused to the productive sectors of San Vicente, Cuscatlán and La Paz (especially small and micro - commerce). It is believed that the second earthquake had a much lower impact on the agricultural and maquila sectors, and damage was concentrated on rural and semi-urban sectors that used their homes as production centers. Consequently, the figures contained in the first assessment can be used as a basic reference, since they do not forecast changes in the major relationships and magnitudes caused by the second earthquake.

According to figures provided by the Coffee Council of El Salvador, more than 8 900 jobs have been lost as a result of the second earthquake, 43 percent of them in the San Vicente department; 13 percent in La Paz; 9 percent in Cuscatlán and other departments, such as San Salvador. Also, according to figures provided by the Chamber of Agriculture (CAMAGRO), more than 400 Lake Ilopango fishermen were affected.

Because a large number of the people engaged in these family, small, and micro - businesses are women, this population group will be particularly affected.

10 The surveys were undertaken by the El Salvador Foundation for Economic and Social Development (FUSADES), the National Private Enterprise Association (ANEP) and the El Salvador Chamber of Commerce and Industry.

The impact on employment was once again concentrated on small and medium-sized enterprises. The second earthquake increased the unemployment rates in San Vicente (7.3%), Cuscatlán (6.9%) and La Paz (6.3%). It also put more jobs at risk in these departments and destroyed production enterprises.

The first earthquake was responsible for the loss of 484 jobs in coffee plantations and 630 in coffee processing plants. Both figures were increased by the second earthquake (see above).

APPENDIX XVII

TWO EXAMPLES OF MODELS APPLICABLE FOR ESTIMATING THE IMPACT OF DISASTERS AND FORECASTING THEIR SHORT- AND MEDIUM-TERM CONSEQUENCES

Model A

Basic theoretical assumptions:

This is a simplified and improved version of the model used mainly by the International Monetary Fund (IMF) to estimate the impact of a natural disaster on GDP and the main macroeconomic variables.[11] The underlying assumption of Model A is based on empirical observation. This shows that although natural disasters usually have a very severe negative impact on the rate of economic growth in the immediate aftermath (a year, say), the growth rate tends to recover relatively quickly in the succeeding period. It is assumed that, other things being equal, the swiftness and size of the recovery in growth rate is a direct function of the capacity to replace the assets destroyed by the disaster and, more generally, of the reconstruction process itself.

In this model, it is assumed that the higher growth rate in the years following a natural disaster does not necessarily replace or return the well - being lost in the disaster within the medium (three to five years) or long (eight to ten years) terms. This is related to the conditional convergence hypothesis of growth theory, which postulates that the poorest countries (with less capital stock) tend to grow more quickly than developed countries (with greater capital stock).[12]

The first assumption in this model is a function of added production for the entire economy at a general level; a different function may be adopted, depending on the type of disaster and the type of economy. For the sake of simplicity, a Cobb-Douglas function with constant scale returns is assumed:

$$Y = AK^{\alpha}L^{\beta}$$

where:

$$y = \frac{Y}{L} \quad 0 \prec \alpha \prec 1 = \frac{K}{L}$$

Y is the product of GDP, K is the capital stock, L is the labor stock and A is a technological parameter that includes a trend variable as well as variables of external competitiveness and of human capital accumulation levels (total productivity of the factors).

The estimate is made using an error correction model that identifies the growth determinants with panel regression results from the Cobb-Douglas production function described above. The structural factors affect the technological variable and the macroeconomy, while prospects explain deviations from the long-term trend.

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11 Some of the improvements to the model were proposed in the course of ECLAC's damage assessment of the earthquakes in El Salvador at the beginning of 2001. The IMF's original model has no error correction mechanism and the GDP growth rate is plotted from estimates of expenditure and the magnitude of the fiscal gap.

12 Robert Barro and Xavier Sala-i-Martin (1995), Economic Growth.

The model makes it possible to include information about long-term balance factors and also allows the information to be given an important role in specifying the dynamic structure. It also identifies the long-term determinants of total factor productivity in a context of balanced relationships provided by a technological production function. Short-term deviations are the result of factors that have been triggered when the long-term balanced relationship has not been fulfilled. Their magnitude is explained by stationary variables.

In general, the model sets certain requirements about the way in which the variables and the parameters are grouped. At the same time, this functions as a test of the reliability of the results and provides information about the growth trend and the nature of the economic cycle.

The following is a brief explanation of the error-correction model:

- A fundamental characteristic of co-integrated variables is that their short-term deviations tend to diminish in the long term. Therefore, it seems reasonable to suppose that there must be a co integration relationship between, for example, two variables Y_t and X_t:

$$Y_t = \beta X_t + \varepsilon_t \qquad (1)$$

- There will probably be short-term imbalances between the variables, which the following VAR model of autoregressive vectors could explain (unless they are white noise, short-term changes can be estimated using an ARMA model):

$$\Delta X_t = \Sigma^n_{i=1}\alpha_{11}(i)\,\Delta X_{t-1} + \Sigma^n_{i=1}\alpha_{12}(i)\,\Delta Y_{t-i} + \varepsilon x_t \quad (2)$$

$$\Delta Y_t = \Sigma^n_{i=1}\alpha_{21}(i)\,\Delta Y_{t-1} + \Sigma^n_{i=1}\alpha_{22}(i)\,\Delta X_{t-i} + \varepsilon Y_t \quad (3)$$

However, since the variables function over a long term, the previous VAR does not include this knowledge and might not correctly identify the way that they should behave in the short term. Therefore an error correction model should be included:

$$\Delta X_t = \alpha_S(Y_{t-1} - \beta X_{t-1}) + \Sigma^n_{i=1}\alpha_{11}(i)\,\Delta X_{t-1} + \Sigma^n_{i=1}\alpha_{12}(i)\,\Delta Y_{t-i} + \varepsilon X_t \quad (4)$$

$$\Delta Y_t = \alpha_L(Y_{t-1} - \beta X_{t-1}) + \Sigma^n_{i=1}\alpha_{21}(i)\,\Delta Y_{t-1} + \Sigma^n_{i=1}\alpha_{22}(i)\,\Delta X_{t-i} + \varepsilon Y_t \quad (5)$$

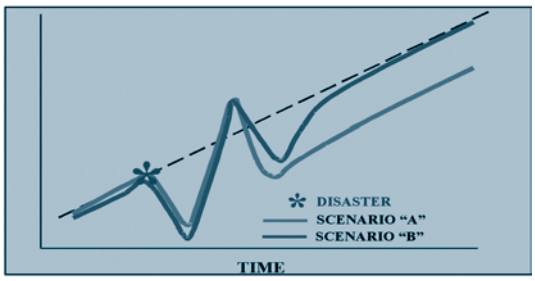
With this correction, a differential between the short and long-term variables should be corrected when the value of the variables t-1 to t is changed, provided there is equilibrium between the variables. For example, if Y_t rose in relationship to X_t in t-1, then in equation (4), X_t in t would be expected to rise ($\alpha_x>0$). In equation (5) Y_t would be expected to fall ($\alpha_y<0$) in t.

Both α_x and α_y are known as the equilibrium adjustment speed. Either of the two may have a value of zero, but not both at the same time. Therefore if $\alpha_Y = 0$, we can conclude that the imbalance adjustments could only be corrected through X_t and also that if all the $\alpha_{21}(i)=0$, then there would only be Granger causality from Y_t to X_t and not vice versa.

This model is based on the work of J.M. Albala-Bertrand (1993), which proposes a macroeconomic model to measure the impact of a natural disaster.[13]

Under this model it is assumed that the effects of a natural disaster are geographically localized, and that only rarely do they have a negative impact on added output. In fact, at least in the short term, their effects on GDP seem to be positive. Basically, the model postulates that the effects of a natural disaster "are a problem of development, not a problem for development". The central argument is that even when the amount of total damage is large in relationship to GDP, this is not an obstacle to an economy's growth. The model distinguishes between disasters whose impact is immediate (earthquakes, floods) and those with a slow impact (droughts). It is not applicable to man-made disasters (wars, technological failures, etc.). Despite such arguments, ECLAC's experience over more than thirty years of disaster assessment in the developing countries of Latin America and the Caribbean shows that disasters are a problem both for and of development, in the sense that the response capacity and resilience to these events entail changes to existing structures and institutions. Otherwise, the positive effects of disasters on growth and output are constrained by the availability of resources budgeted for these events (disaster or prevention/mitigation funds). Where developing economies were suffering from shortages before the disaster, the resources allocated for attention and reconstruction not only compete with pre-existing development projects, but also add an extra burden that states cannot carry by themselves or that they are incapable of absorbing. The result is that after every disaster the gap between the level of growth expected and that achieved grows wider (see the following figure).

THE EFFECT OF DISTASTERS ON THE GROWTH OF A NATIONAL ECONOMY



Both in the model and analytically, a natural disaster consists of three elements: The impact of the disaster, the response to the disaster and the disaster's incidental interference. The analysis is centered on the disaster's impact on both growth and the loss of capital and output. A disaster is considered to be of great magnitude when the ratio of total damage to GDP is comparable to an economy's growth rate (for example, five percent). However, this parameter should be used with caution, since a smaller damage ratio can also imply severe economic effects if the damage is localized in a key area of economic activity.

13 For further information, see World Development, Vol. 21, Nº 9, pp.1417-1434, 1993.

This model assumes several rules for the behavior of disasters and their assessment, the last three of which are rendered questionable or invalid in the light of ECLAC's empirical observation.[14] If recent experience shows anything, it is that damage is not necessarily overstated for political reasons. On the contrary, there are many recent examples of countries which have attempted to minimize the damage in order to maintain strict macroeconomic or fiscal discipline or which, for electoral reasons, have denied the existence of negative impacts, especially on vulnerable social sectors. In cases like that of Hurricane Mitch, the stability of macroeconomic variables was severely strained. It also seems that disasters are happening more often and that their consequences are increasing with every one. This is especially so with hydro-meteorological disasters, which could be linked to climatic change.

Because of the above, in methodological terms, a model enabling the identification of the upper limit of the disaster's impact on output is considered useful. This is a five-part process. The following is assumed that at the time of assessment:

I. The emergency stage is either very advanced or has finished
II. Materials are available;
III. The capital stock lost cannot be replaced in the short term;
IV. All the losses are of capital stock. and
V. Capital stock is homogeneous

Given (IV) and (V):

$$\Delta K = D \Rightarrow \Delta K = Ka - Kb \qquad (1)$$

Where K is the capital, D is the damage or total loss caused by the disaster, b is the impact before the disaster and a is the impact after the disaster. Assuming that the overall capital-output ratio is the same as for the total damage ratio, then:

$$c = K / Y = \Delta K / \Delta Y \qquad (2)$$

where c is the capital-output ratio
$\Delta Y = Ya - Yb$ (daño esperado en el producto)
Y = producto (ingreso)

Solving (2) by ΔY y sustituyendo ΔK por D:

14 The model is based on six "rules" or assumptions:

Rule I: Specific localization. Disasters only affect a "geographically" or "economically" localized area of activity.

Rule II: Internal effect differentiation. Neither the disaster's magnitude nor the social vulnerability at a particular disaster magnitude are the same throughout the disaster area.

14 Corollary II(a): Local sectoral coexistence. In the disaster area, affected economic units will coexist internally, with unaffected units belonging to the same economic sector.

Corollary II(b): Disasters have a greater effect on the poorer sectors (or on the poorest units within the sectors) of society.

Rule III: Differentiated damage to capital stock. The different types of capital stock are not equally affected by disasters. In fact, the distribution pattern for capital loss depends on the type of disaster

$$\Delta Y = D/c \qquad (3)$$

Transforming (3) in growth rate and dividing both sides by Y:

$$y = d / c \qquad (4)$$

Where $y = \Delta Y/Y$: output growth rate (fall) and $d = D/Y$ is the total damage/output ratio.

Consequently, the expected fall in the output growth rate (y) is in direct proportion to the total damage/total output ratio (d) and in inverse proportion to capital/output ratio (c). If assumption (iv) is removed, then $\Delta K < D$, since part of the damage corresponds to loss of output and not only to capital stock. This means that ΔK is heterogeneous, and c must be revalued in accordance with the productivities of the different types of capital stock. Therefore, other factors must be included in (4) to set a realistic value for the bottom level and consequently for an interval of the expected fall in the output growth rate:

i. Not all disaster damage is to capital stock;
ii. As a rule, disaster damage is overestimated;
iii. Losses to capital stock are normally estimated at replacement cost;
iv. All types of capital stock are heterogeneous in terms of production;
v. Output growth does not depend exclusively on physical stock.

The first three factors affect the numerator in (4); the others affect the denominator. The resulting equation gives the bottom level of the expected reduction in the GDP growth rate. Removing assumption (iv) and incorporating factor (i):

$$D = D_1 + D_0 \qquad (5)$$

where D_1 is total damage to capital and D_0 is total damage to production. Restating (1):

$$\Delta K = D - D_0 = D_1 \qquad (6)$$

Since the cost of capital is calculated at replacement cost (factor iii), depreciation is subtracted to assess the present damage or loss of productive potential resulting from the capital loss. If this were not done, the effect on capital loss would be overestimated. Therefore:

$$D_3 = \pi D_2 = \pi D_1 \qquad (7)$$

14 Rule IV: Overestimation of damage. It is assumed that the total amount of damage is overestimated for political and technical reasons.

Rule V: GDP stability and inflation. It is assumed that disasters do not have a strong negative effect on GDP and inflation.

Rule VI: Probability of disasters. Disasters are scarce and occur only occasionally.

Where D_3 is the present cost of capital loss, **B** is the reciprocal of the rate of depreciation, and **T** is depreciation. For example, $\pi = 1 - \lambda$ and $\lambda = T/D_2$ Correcting D_2 in (8):

$$\Delta K = D_3 = \pi D_2 = \pi D_1 \qquad (8)$$

Since capital is heterogeneous in all types of stock (factor iv) and (in accordance with rule III) the least productive types of stock are generally the ones most affected by disasters, the average capital/output ratio where there is capital loss would be greater (i.e., less productive) than the overall average. This differential impact is incorporated by multiplying **c** by a ratio that, if rule II applies, will be greater than 1. However, if empirical evidence makes this rule inapplicable, its value could be equal to or less than 1:

$$c_1 = \alpha c \qquad (9)$$

where c_1 is the capital/output ratio corrected by factor (iv).

Since capital is heterogeneous in all types of stock (factor v) and, according to the composition of the capital losses, more or less productive than any type (rule II and corollaries IIa and IIb), the average capital/output ratio for capital loss will be different from the overall average. This is incorporated by multiplying c_1 by a coefficient that will be determined for each case (greater than 1 if damage is caused to the least productive capital; otherwise, less than 1):

$$c_2 = \beta c_1 = \alpha\beta c \qquad (10)$$

Where c_2 is the capital/output ratio corrected in accordance with factor (v).

Finally, since output does not depend exclusively on the contribution of capital, the contribution of the non-capital factors (factor v) is corrected by multiplying c_2 by a actor greater than 1, such that:

$$c_3 = \gamma c_2 = \gamma\beta c_1 = \gamma\alpha\beta c \qquad (11)$$

Where c_3 is the capital/output ratio multiplied by the contribution of the non-capital factor. When all the corrections are incorporated in to (4):

$$y = d_3/c_3 \qquad (12)$$

To state it in another way:

$$y = (\pi\varepsilon/\alpha\beta\gamma)\ (d - d_0)/c \qquad (13)$$

Since this is the lower limit of the expected fall in the output growth rate due to a natural disaster, the interval is expressed as:

$$d_3/c_3 \leq y < d/c \text{ (expected loss interval)} \qquad (14)$$

This model enables the estimation of how much investment (or expenditure) should increase to compensate exactly for the expected loss or damage to output. The model includes three additional assumptions:

vi. Since the main purpose of any post-disaster response is to replace capital (reconstruction investment), the contributions made to replace indirect losses (in flows) are limited;

vii. Although reconstruction investment represents autonomous capital expenditure, it nevertheless competes with alternative uses for the resources; and

viii. There has to be sufficient idle capacity in the economy, especially in the construction sector.

Therefore:

$$\Delta Y = m\,\Delta KIr \qquad (15)$$

where **m** is the multiplier, **Ir** is reconstruction investment, **Y** is income (output), **Δ** is the variation and $m \geq 1$. Dividing equation (5) on both sides by **Y**:

$$y = m\Delta v \qquad (16)$$

where $v = Ir/Y$ is the investment ratio. This means that when $m \geq 1$, for each unit of variation in the investment ratio (v) the output growth rate (y) can be expected to increase by **m**.

If reconstruction work is expected to last for several years, then equation (14) can be made to equal (13) such that:

$$\Delta v = d_3/mc_3 \text{ (compensatory investment ratio)}$$

The above represents the minimum increase in the investment ratio needed to fully compensate for the expected fall in output growth rate (capital lost or damaged) in the first year following the disaster. It is known as the compensatory investment ratio.

To calculate the minimum compensatory investment required, the following assumption is added to the model:

ix. The new capital is at least of the same quality as the lost capital. In fact, if mitigation and vulnerability criteria are included, it will necessarily be of greater quality.

At the end of the first year, the reconstruction investment ratio for that year Δv_1 should be deducted from the damage or total capital loss ratio. The compensatory investment ratio for the second year will now be:

$$\Delta v_2 = \frac{d_3 - \Delta v_1}{mc_3} \qquad (17)$$

In this way, it can be generalized for the following year or derived as a geometrical series.

The series decreases and converges to zero as it tends toward infinity. The significant thing about this approach is that reconstruction can take place over several years without negative consequences for output or sacrificing funds for other development projects. Of course this will depend on the values of the multiplier **(m)**, the corrected capital/output ratio **(c_3)** and the corrected capital damage ratio **(d_3)**. With this, it is easy to demonstrate that the greater the value of the multiplier and the capital/output ratio, the smaller the value of $\mathbf{1/mc_3}$ and the nearer to unity the ratio r. The closer this ratio gets to **1**, the smaller the reconstruction investment required for any particular year.

In the first year, in addition to the investment expenditure, there is a part of total damage which corresponds to current GDP and which must be compensated for once only and at the same time. If the income multipliers are symmetrical and the disaster's impact tends to lead to contraction while the response to the disaster promotes expansion, then the same amount of additional expenditure will be needed to compensate for the loss of current income. Nevertheless, as the impact multipliers are expected to be lower than the response multipliers, compensatory expenditure is only a part of the loss of current income. Therefore, the amount of compensatory expenditure required in the first year would be:

$$\Delta e_1 = (\mathbf{m_1} / \mathbf{m_2}) \, \mathbf{d_0} + \Delta \mathbf{v1} \qquad (18)$$

where e_1 is the total first year expenditure ratio, v_1 is the minimum compensatory investment ratio in the first year, d_0 is the current output loss ratio, $\mathbf{m_1}$ is the impact multiplier and $\mathbf{m_2}$ is the response multiplier.