CROSS-CUTTING SECTOR

# MACROECONOMIC IMPACT OF DISASTERS

## PDNA GUIDELINES VOLUME B

GFDRR Global Facility for Disaster Reduction and Recovery

WORLD BANK GROUP

# CONTENTS

# GENERAL COMMENTS

One of the main objectives of a post-disaster assessment is to estimate the impact of the event on overall socio-economic development in the affected country or area. To estimate total disaster impact, two components are normally estimated: first, the economic impact that represents the consequences of the destruction of physical assets and of the changes in production flows arising from the event that triggered the disaster, on overall economic conditions and performance; second, the impact on human development that represents the consequences of the disruption of the population´s normal livelihoods, employment and income as well as access to basic services of health and education. A subsequent estimation of post-disaster financial requirements to achieve recovery and reconstruction is possible only after disaster impact has been determined.

One of the main features of disaster impact assessment involves the estimation of the disruptions caused by the disaster on the macroeconomic performance of the affected country or area. This is usually made in comparison to the expected or foreseen performance of the main macroeconomic variables of the country or area in the absence of a disaster, by superimposing into it the estimated isolated effects of the disaster on the destruction of physical assets and on the resulting changes in the flows of production of goods and services. Based on such projections of post-disaster macroeconomic performance, a set of activities aimed at restoring pre-disaster economic performance and including disaster-resilient reconstruction standards may be designed, constituting a strategy for recovery and reconstruction.

In addition to the above, and following recent universal trends, efforts aimed at measuring negative disaster impact on human development have been started. Making use of the conceptual notions of human development and its components, introduced by the United Nations Development Programme (UNDP) in the latter part of the 20th century, it is also possible to estimate the possible negative impact of disasters on selected human-related development indicators that measure personal income, living conditions, and health and education access. In addition, potential setbacks to the achievement of Millennium Development Goals (MDGs) caused by disasters provide another possible measure of the human development impact of disasters. Once disaster impact on human development is quantified, it is possible to estimate the financial requirements to achieve human development recovery after disasters.

The following section of the PDNA Handbook describes the manner in which macroeconomic disaster impact may be estimated on the basis of a quantification of the destruction of assets and disruption of socio-economic activities caused by disasters of any kind and origin. A separate section describing the methodology to estimate disaster impact on human development will be added later. In turn, the estimation of disaster impact leads to the subsequent estimation of the financial requirements or needs to achieve post-disaster economic recovery and disaster-resilient reconstruction.

It may not be necessarily evident to the reader that in order to estimate overall disaster impact at both macroeconomic and human development levels, it is essential that post-disaster assessments be conducted on a sectoral fashion, covering all institutional social and economic sectors of activity that are regularly measured in each country of the world, and using a standard assessment methodology to enable a valid aggregation of sectoral results to obtain the overall view of disaster impact for the entire affected country or area. Furthermore, it is essential for the reader and user of the PDNA Guidelines to understand that the quantitative estimation of disaster impact must be evidence-based in order to satisfy the normal reliability requirements of the agency or agencies that are to provide the required financial resources to achieve recovery and reconstruction after a disaster, be they of national or international scope.

At the national level, this task will likely fall within the purview of the Ministry of Finance and of Economic Development Planning, while any of numerous international organisations and friendly donor government organisations may decide on the type and quantity of post-disaster assistance and financing to be provided.

# MACROECONOMIC IMPACT ESTIMATION

## INTRODUCTION

Macroeconomic impact is defined as the consequences of the estimated destruction of assets and of the changes in economic flows caused by a disaster on overall economic performance. Thus, in order to analyse macroeconomic disaster impact it is essential to first estimate the total value of destroyed assets and of the changes in the flows of production of goods and services caused by the disaster in the entire affected area of the disaster; i.e. in all sectors of economic activity. After that estimation is done, it is possible to estimate the impact of the disaster at all levels of economic activity, the possible positive impact of proposed activities aimed at achieving economic recovery, and the possible positive impact of reconstruction investments following disaster-resilient standards.

It must be recognised from the outset that there is no unique parameter to define macroeconomic disaster impact. In fact, some effects of a disaster, such as the cost of treating persons who are injured in a disaster, are considered positive to economic growth, as the number of medical treatments is used to define health sector production growth. Different analyses must be made to obtain a comprehensive estimation of disaster impact. The estimation of disaster effects on destroyed assets and on production of goods and services flows is the basis on which the impact of the disaster on the performance of the main macroeconomic variables may be estimated, including – *inter alia* – gross domestic production and growth, the external sector, and the fiscal position of the affected country.

It must be stressed, however, that not all disasters cause a measurable impact at the macroeconomic level that warrant the introduction of interventions to stabilise the overall economy, since a disaster may only cover and affect limited geographical areas of a country, or have no effect on strategic sectors of economic activity. In fact, many events are likely to have only a localised impact on the geographical areas covered by the natural phenomenon causing the disaster without negatively impacting, in significant terms, the macroeconomic position of the country. On the other hand, all disasters – whether large or small – may cause significant impact and suffering at the personal or household levels, which would require the undertaking of interventions to lessen such negative conditions. In addition, disasters may have a negative impact on specific sectors of economic and social activity,

and may – directly or indirectly – produce positive effects on other sectors, and thereby affect different population groups in both negative and positive manners, as discussed later.

A distinction must also be made of the impact caused by the disaster itself and the subsequent impact of post-disaster activities or interventions aimed at recovery, reconstruction and risk reduction. Isolated disaster impact is that which may be noticed and measured immediately after the disastrous event, and which would remain in place if no recovery and reconstruction activities were undertaken. Measuring this type of impact – assuming no recovery and reconstruction activities are carried out – is precisely how a strategy and goals for recovery and reconstruction are defined right after a disaster occurs.

Many persons tend to combine the negative impact of the disaster itself with the possible positive impact of post-disaster activities of recovery and reconstruction, and as a result may state that disasters bring about (net) positive results on the macroeconomic performance of a disaster-affected economy. The reader of this handbook must be warned, however, that such a positive outcome is not likely to occur in all cases of disaster, but only in countries that have a significant capacity to develop and to face economic crises; and that there are many cases – usually in smaller and poorer States – where the capacity to undertake and finance recovery and reconstruction is normally very limited and where the negative impact of a disaster is never totally overcome. Thus, the need to analyse isolated disaster impact separately from recovery and reconstruction impact becomes very evident.

In addition to the above, it must be recognised that to analyse historical economic performance data to assess the macroeconomic impact of a disaster may not yield valid results because historical data already includes the effects of post-disaster interventions for recovery and reconstruction that were implemented by both public and private sector agents of society after disasters, unless of course details on the value and efficiency of each recovery and reconstruction activities are also available for the analysis. Therefore, historical macroeconomic data may not provide a sound basis for estimating the isolated impact of the disastrous event itself; it may only be used to estimate the combined impact of disasters and of post-disaster interventions.

Thus, it becomes evident that the time to conduct an assessment of isolated disaster impact is immediately after a disaster has occurred, since that is the time when disaster effects are still visible to an Assessment Team, to base the definition of a strategy for recovery and reconstruction derived from the actual isolated impact of the disaster on the affected population and on the socio-economic development conditions that prevailed prior to the disaster. And, as has been mentioned previously – since in many cases of disaster there may not be a significant and measurable impact at the macroeconomic level – impact analyses must be carried out in all cases of disaster at the sectoral and personal levels as well, and covering the geo-political divisions of the affected country (provinces, districts, communities).

From the above considerations, it is evident that the following sequence of activities must be followed in order to estimate macroeconomic disaster impact:

- Estimation of total value of disaster effects (i.e. aggregation of sectoral assessments);
- Estimation of isolated disaster impact at the macroeconomic level; and
- Estimation of the possible impact of recovery and reconstruction activities.

The following sections describe the methodology to be used in carrying out the aforementioned activities to estimate macroeconomic impact of the disaster and of the recovery and reconstruction programs and activities that are to be developed afterwards.

## SUMMARY OF DISASTER EFFECTS

As has been defined in the preceding chapters of the PDNA handbook, disasters have two main economic effects: first, the destruction of physical assets existing in the affected area, which is defined as "damage" and, second, the changes of production flows which may include decline in production and/or increase in production costs, which are defined as "production flow changes". In order to have an overarching framework for analysis to estimate damage and flow changes in a post-disaster assessment, use is made of the world-wide *System of National Accounts* that all countries have in place to measure overall production and growth, and for which a standard set of institutional sectors of economic activity is considered.

The values of destroyed assets and of changes in production flows are therefore estimated by sectoral Assessment Teams during field visits to the disaster-affected areas, in comparison to the baseline information collected prior to the assessment. Once all sectoral Assessment Teams have completed their separate estimations following a standard methodology, aggregation is made to ascertain the total value of disaster effects (i.e. damage and production flow changes) caused by the disaster. In that process, special care must be exercised to ensure that no double or multiple accounting is incurred, since very often the boundaries between sectors may not be well known by the sectoral Assessment Teams. In addition, care must be exercised to ensure that only those items that are normally measured in the national accounts are included, for which the readers of the PDNA handbook are referred to the *National Accounts Handbook* developed by the United Nations Statistics Division of the Department of Economic and Social Affairs (UNSTATS): *National Accounts: A Practical Introduction*, in *Handbook of National Accounting*, Series F, Number 85. In regard to the latter point it is to be noted that personal or household income decline and expenditures are not to be included in the estimation of sectoral damage and production flow changes; rather, physical assets and production flow changes at the sector level are the inputs to be used for the estimation of disaster effects in this part of the analysis. Changes in personal or household income and expenditures are to be used separately for the estimation of disaster impact on human development conditions, but should not be added to estimated damage and production losses of the sectors of economic activity.

To obtain the total value of disaster effects, an arithmetic aggregation of sectoral damage and production flow changes is made. In strict economic concepts, such aggregation of stocks and flows may be debatable; however, it is done only to illustrate the value of the global or total effects caused by any disaster. Furthermore, when conducting the assessment of disaster impact at the macroeconomic level, only the value of changes in production flows is used to estimate production decline due to the disaster; and the value of destroyed assets is used separately to estimate financial requirements for reconstruction. This has been recognised since the very early assessments made in the 1970s (as indicated, for instance, in *Informe sobre los daños y repercusiones del huracán Fifí en la economía hondureña*, pages 31 and 32, CEPAL, Mexico City, 1974).

The aggregation of disaster effects is made not only to obtain the value of the global effects of the disaster, but to provide a basis for estimating the impact of the disaster on overall socio-economic development, for the design or modification of public policies to lessen or shorten the impact of the disaster in the short to long term, to provide a first idea of priorities for recovery and reconstruction among sectors, and to provide a quantitative basis for the estimation of financial requirements for economic recovery and disaster-resilient reconstruction.

Persons concerned about the validity of adding assets and flows should also be assured that the values of damage and production flow changes will be used separately in subsequent steps of the assessment, as will be discussed later on in the PDNA Guidelines. Indeed, for the analysis of macroeconomic impact, only the values of

changes in the production of goods and services flows are to be used; and the values of destruction of assets are to be used separately to ascertain disaster impact on stocks or capital.

There are many possible cases of duplications to be avoided during the aggregation of sectoral results. For example, production losses in agriculture, livestock and fishery are to be measured using unit prices paid to producers, and not wholesale or retail market prices. Doing otherwise would result in including parts of the losses of manufacture and trade sectors into the losses of the primary sectors of agriculture, livestock and fishery. The value of damages to housing should include the damage to the water supply, sanitation and electricity components that are located within the housing units only, while the damage to assets in the systems of water supply, sanitation and electricity distribution – which reach to the street adjacent to the housing units – are to be accounted for under the sectors of Water, Sanitation and Electricity, respectively. Any damage to primary, secondary and tertiary roads is to be included under the Road Transport Sector, while damage to roads within farms is to be included under the Agriculture Sector. Damage and production flow changes to built-environmental assets and services are normally accounted for in the sectors of economic activity that utilize them; damage and production flow changes to natural environment assets and services should be accounted for under the environment. Thus, the value of agricultural soils that have sustained damage through erosion or siltation is included as damage in the Agriculture Sector; the value of urban soils that may have sustained destruction is included as damage in the housing or urban sector; damage or production flow changes to natural forests are included under Environment. In the Tourism Sector, any damage to water and sanitation, electricity, transport and communications systems is only included when they are owned and operated by the hotel or restaurant owners; otherwise, such damage should be accounted for under the sectors of Water and Sanitation, Electricity, Transport and Communications, respectively. Production flow changes in productive sectors that are caused by the interruption of basic services such as water supply or electricity are accounted under those production sectors; losses in revenues of water and sanitation and electricity enterprises that interrupt the provision of those services to consumers due to the disaster are accounted as production flow losses in the sectors of Water and Electricity, respectively. In some countries where tourism activities and income are significant to the national economy, a satellite account on tourism may be included in the national accounts, and any assessed damage and production flow losses are included in this Tourism Sector; otherwise, any damage and production losses sustained by the hotels and restaurants are to be included in the Trade Sector.

These are examples of possible duplications. In actual practice, the sectoral Assessment Teams must refer to the system of national accounts of the affected country to define in which sector to locate damage and production flow changes, and the Macroeconomic Assessment Team members should provide guidance to them on the matter. To assist in this matter, Annex A presents a summarised version of the United Nations *Handbook of National Accounts*, where the reader may find guidance to define the boundaries of sectors.

Since disasters may sometimes bring positive effects, once the sectoral values of damage and production flow changes have been aggregated, any such positive effects of the disaster must be factored in to obtain the net value of damage and losses. An example of such a positive effect is the case of some coastal areas of Ecuador, which are normally uncultivated due to lack of sufficient rainfall; after the El Niño in 1982-1983 which brought about heavy rains, a full seasonal crop was obtained and its production was deducted from the value of production losses. Another example of positive effects is when torrential rains have generated flooding and have concurrently increased the volume of water stored in hydropower

dams. In subsequent months, thanks to the additional storage of water, the affected country may be able to derive a positive benefit from the disaster through a higher amount or volume of hydropower generation, instead of using fuel-fired thermal power units, as was the case during the 2009 floods in El Salvador following a tropical storm.

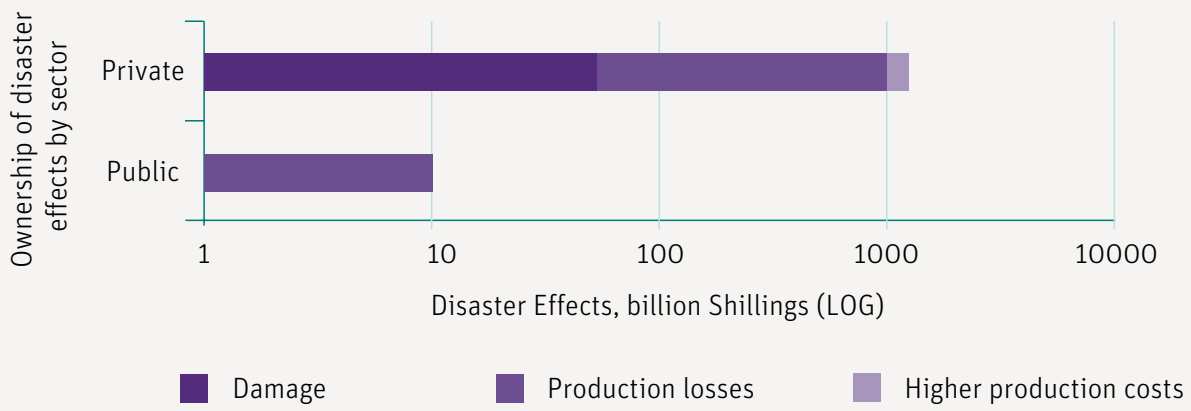
An example of a summary of total damage and production flow changes is shown in Table 1.

After completing its estimation, the value of damage and production flow changes must be broken down into its different components. On one hand, it is very useful to define the **public *versus* private ownership breakdown.** This will provide an indication of how much, in relative terms, public and private sectors have been affected, which in turn will provide an early indication of the relative efforts that public and private sectors must make in the financing and conduction of recovery and reconstruction programs. It is to be borne in mind that the private sector involves ownership by private enterprises and individuals, and that the public sector may include ownership by national and sub-national (or local) governments (see figure 1 below).

**Table 1:** Estimated drought effects in Uganda, 2010-2011 (billion Shillings). Office of the Prime Minister, The 2010-2011 Integrated Rainfall Variability Impacts, Needs Assessment and Drought Risk Management Strategy, Government of Uganda, Kampala, 2012.

| Sector | Sub-sector | Disaster Effects | | | | Ownership | |
|---|---|---|---|---|---|---|---|
| | | Damage | Production losses | Higher production costs | Total | Public | Private |
| Agriculture | | 106.2 | 1,969.6 | 85.4 | 2,161.2 | -- | 2,161.2 |
| | Food crops | -- | 911.8 | -- | 911.8 | -- | 911.8 |
| | Cash crops | -- | 123.0 | -- | 123.0 | -- | 123.0 |
| | Livestock | 106.2 | 934.9 | 85.4 | 1,126.5 | -- | 1,126.5 |
| Industry | | -- | 278.0 | -- | 278.0 | -- | 123.0 |
| Commerce | | -- | 39.2 | 130.7 | 169.0 | -- | 169.9 |
| Electricity | | -- | -- | 106.3 | 106.3 | 29.0 | 77.3 |
| Water supply/ sanitation | | -- | 0.6 | 1.3 | 1.9 | -- | 1.9 |
| Health | | -- | -- | 14.9 | 14.9 | 10.5 | 4.4 |
| Food assistance costs | | -- | -- | 16.9 | 16.9 | 16.9 | -- |
| **Total** | | **106.2** | **2,287.3** | **355.4** | **2,749.0** | **56.4** | **2,692.6** |

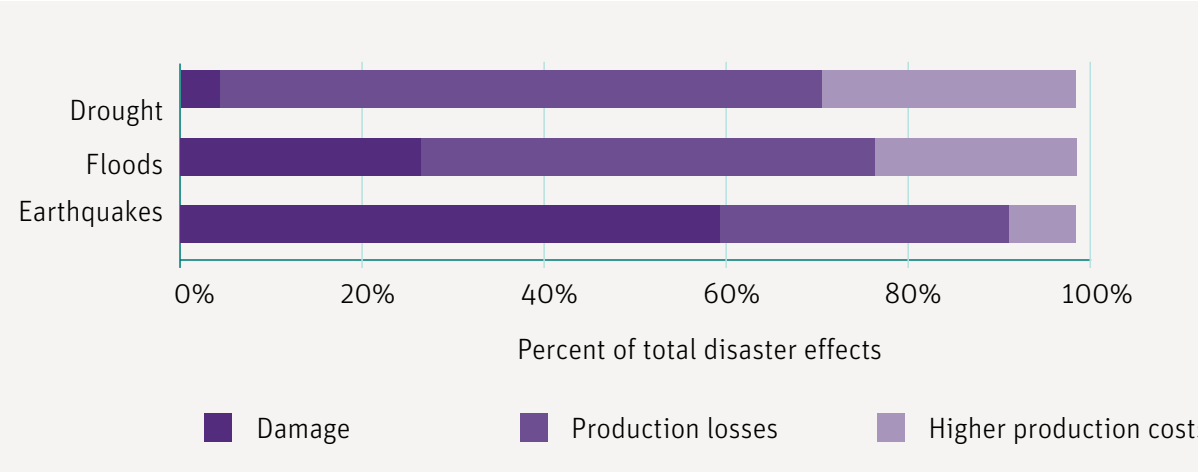
**Figure 1:** Breakdown of Public vs Private Ownership of Disaster Effects, 2010-2011 Uganda Drought




Since national governments very often assist private individuals, especially those who belong to the lowest income strata, through the provision of cash grants, credit, and/or other incentives for recovery of production and for reconstruction of their assets after a disaster, the final breakdown of efforts between public and private sectors for reconstruction may differ from what is indicated in the previous chart.

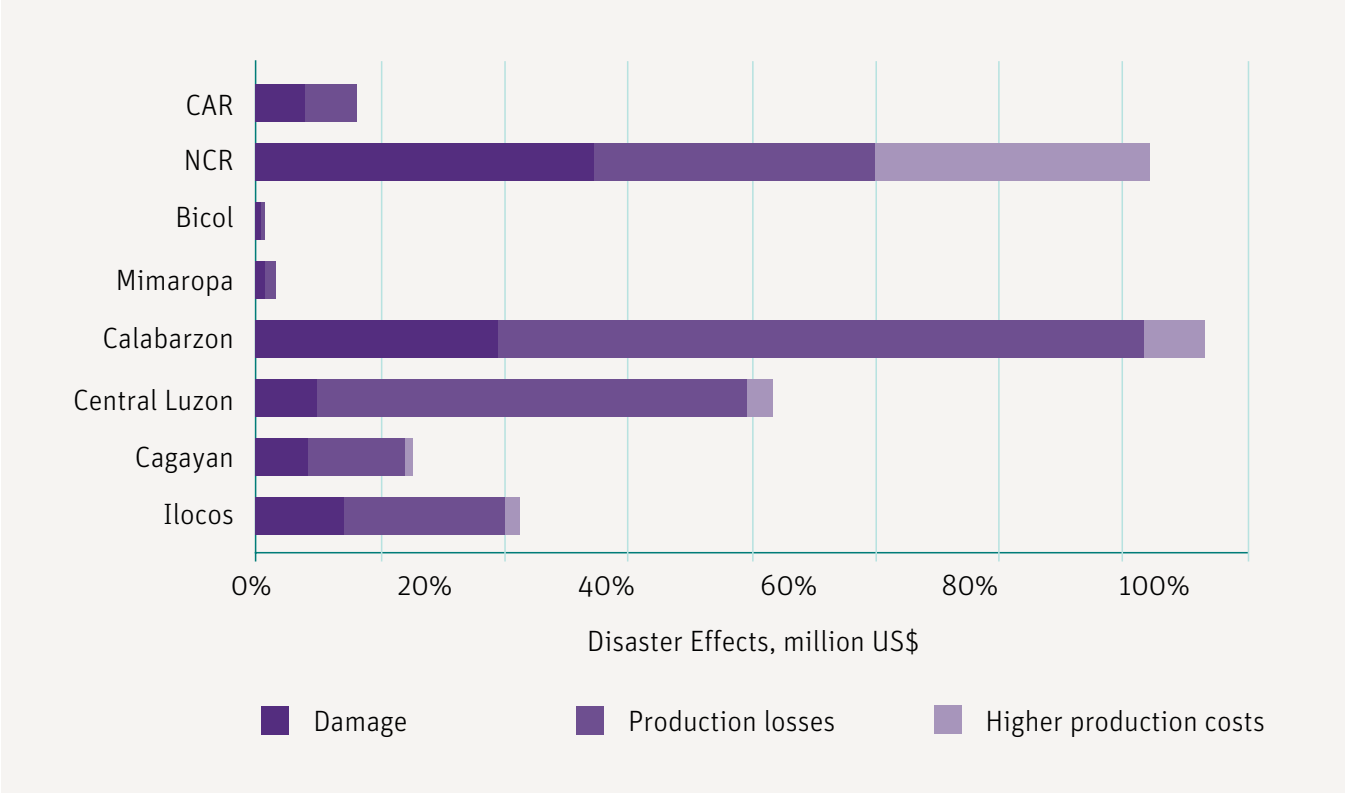
Other useful information for the analysis of the total value of disaster effects is the **breakdown between damages and production flow changes;** or the breakdown between the value of destroyed physical assets and the value of changes or losses in the production of goods and services. After conducting many assessments of the effects of disasters, it has been found that the relationship between damage and losses varies roughly in accordance to the origin of the natural event that causes the disaster. The up-to-date DaLA database available at the Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank, which includes disasters assessed during the 40-year period between 1972 and the present time (www.gfdrr.org), shows evidence that events of geological origin (such as earthquakes and landslides) normally cause more damage than production flow changes. Disasters of hydro-meteorological origin – such as floods and drought – normally cause more production flow changes than damage (see Figure 2 below).

**Figure 2:** Typical Distribution of Damage and Production Flow Changes for Different Types of Disasters



The spatial or **geographical breakdown of disaster effects** by sub-national, geo-political divisions affected by the disaster enables identifying the most affected provinces, districts or municipalities. This information can later on be used to define the assignation of financial resources for recovery and reconstruction (see Figure 3). A map may also be developed showing the spatial distribution of disaster effects.

**Figure 3:** Spatial Distribution of Disaster effects, Typhoons Ondoy and Pepeng, Philippines 2009




The value of disaster effects may also be **broken down by the main sectors of economic activity,** to understand better the nature of the affected activities, as well as the type of activities that will need priority attention in the recovery and reconstruction programs. An example of such a breakdown is shown in Figure 4, which refers to the flood disaster in Yemen in 2008, where it may be observed that disaster effects were concentrated in productive and social sectors, rather than in infrastructure .

A further refinement is the **breakdown of disaster effects by individual sectors** of economic and social activity that enables a detailed visualisation of the effects of the disaster in the specific sectors affected by the disaster, information that may be useful to later define sectoral priorities of intervention in recovery and reconstruction. This breakdown also provides a basis for the estimation of possible disaster impact on the overall economy, and for the subsequent estimation of financial requirements for recovery and reconstruction. Figure 5 shows such a sectoral breakdown for the Uganda drought in 2010-11.

**Figure 4:** Breakdown of Damage and Losses (in million US$) by Main Sectors of Activity After the 2008 Floods in Yemen. From Damage, Loss and Needs Assessment, October 2008 Tropical Storm and Floods, Hadramout and Al-Mahara, Republic of Yemen, The World Bank, GFDRR, Washington, D.C., 2009.

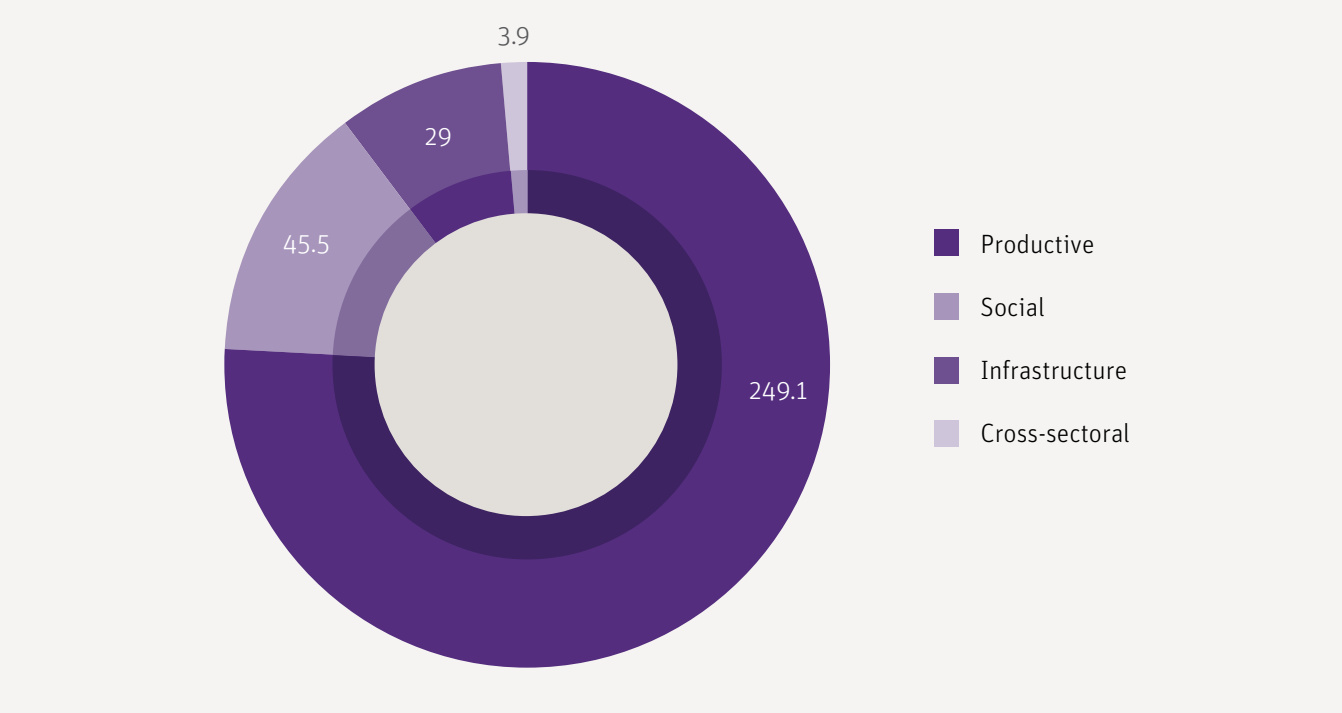
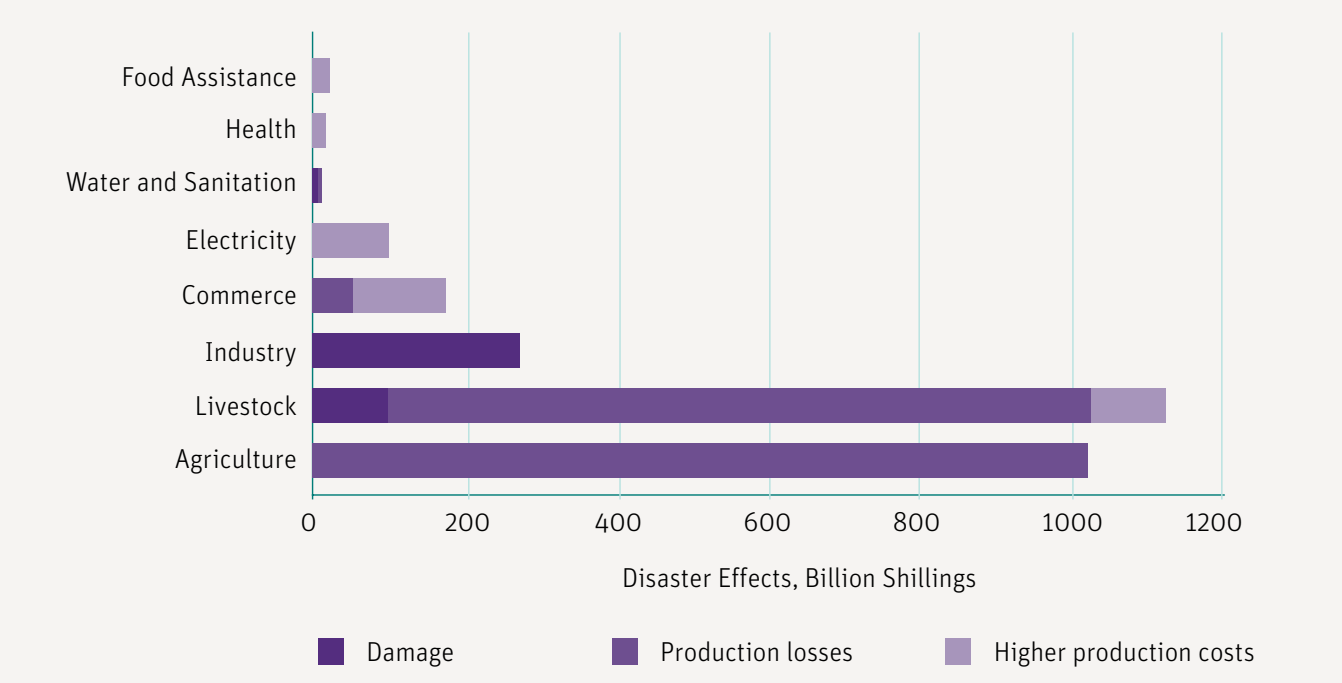



**Figure 5:** Breakdown of Disaster Effects by Individual Sectors of Economic Activity after Uganda Drought 2010-2011

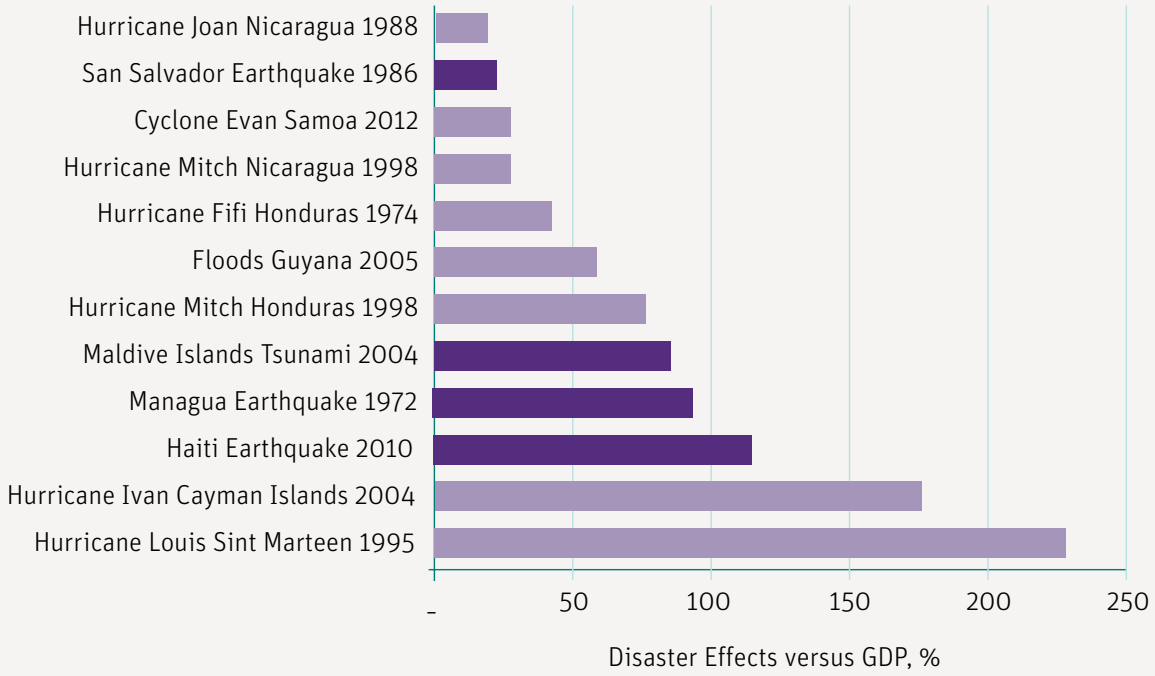



A comparison of the values of disaster effects versus the gross domestic product (GDP) in the affected country in the year prior to the disaster may provide an idea of the relative size of the disaster vis à vis the size of the affected economy. Note that the comparison is made to the previous year´s GDP to avoid comparing to the disaster-affected GDP in the current year.

While the addition of stock and flows values is debatable in purely economic terms as has been previously indicated, the ratio thus developed does provide an empirical measure of the magnitude or significance of a disaster, which may be used to compare the effects of different disasters in the same country and to other disasters in different countries.

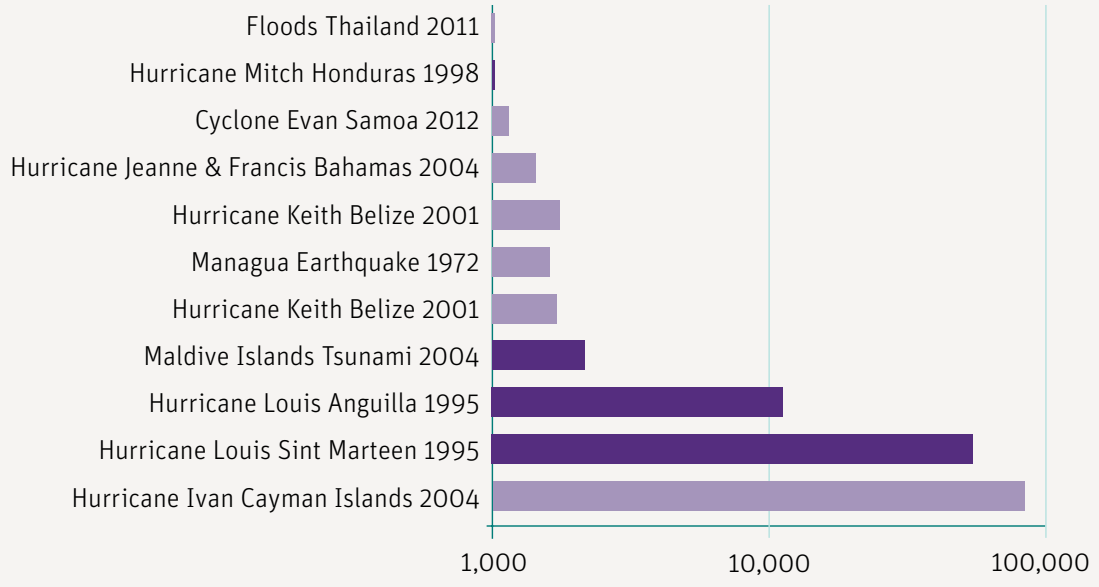
Using such a comparator, Figure 6 shows the most significant disasters that have been assessed using the DaLA methodology from 1972 to the present time. It seems evident that the highest magnitude values correspond to disasters of hydro-meteorological origin that have occurred in small-country economies, especially those of Small Island Development States (SIDS).

**Figure 6:** Estimated DaLA Magnitude of Most Significant Disasters, 1972 to 2012. From DaLA Database, in http://www.gfdrr.org, and Supplemented with Data from More Recent Disasters.




Similarly, the comparison of **disaster effects per person** (using the affected country's total population) is a very useful empirical comparator to develop, so that the significance of each disaster for each country may be realised and also to compare disasters of different types and origins that have affected different countries in the past. Figure 7 shows the most significant disasters in terms of damage and production flow changes per person, duly adjusted for inflation, in the period 1972 to 2012, which are included in GFDRR's DaLA Database. From the graph it becomes evident that small-size economies and island countries, affected by disasters of hydro-meteorological origin, have higher values of disaster effects per capita.

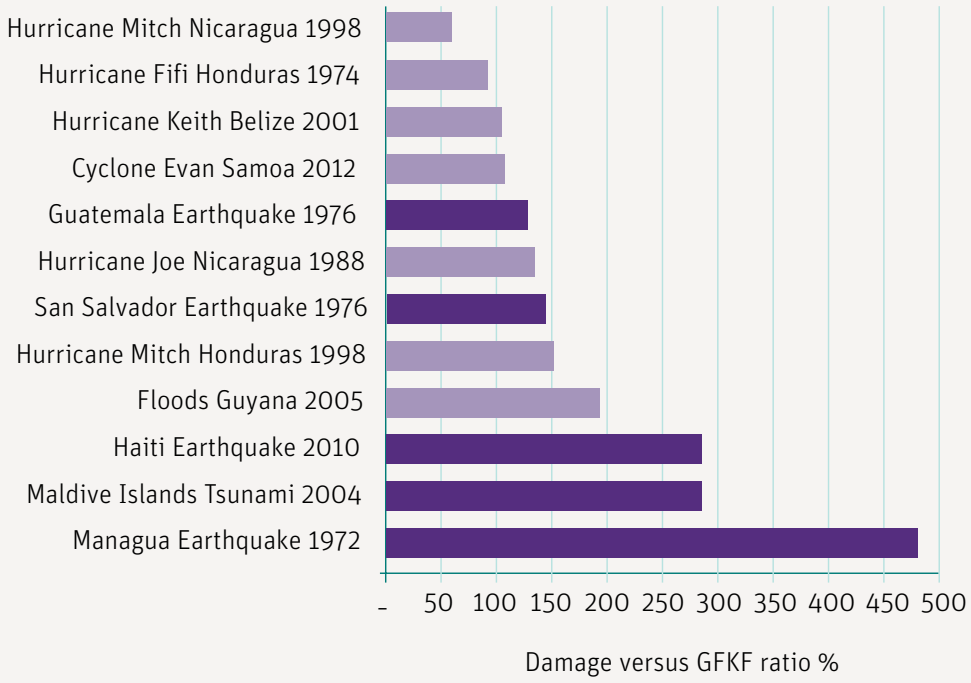
**Figure 7:** Most Relevant Disasters in Terms of Per Capita Disaster Effects, 1972 to 2012. From DaLA Database, http://www.gfdrr.org.




The ratio of **damage versus gross fixed capital formation (GFKF)** of the affected country is another useful comparator that provides a first indication of the capacity of the country to rebuild the assets destroyed by the disaster, as well as a first idea of the possible time required to achieve full reconstruction. Figure 8 also draws from GFDRR's DaLA Database to show disasters that occurred from 1972 to 2012, where the ratio of damage versus GFKF is highest. It may be observed that smaller economies, affected by disasters of geological origin, tend to result in higher values of the ratio between damage to gross fixed capital formation.

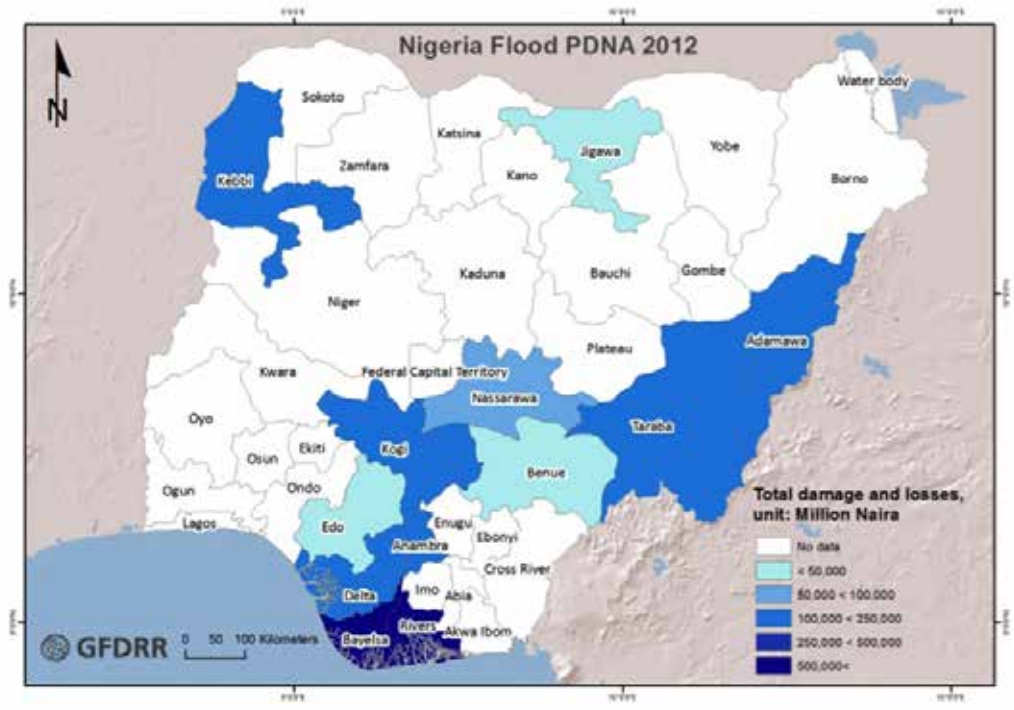
A comparison of the value of **production flow changes *versus* the value of the previous year´s gross domestic product** may provide a first indication of the possible degree of affectation of economic growth, as well as useful comparisons to other past disasters in the same country or in others. The comparison of disaster effects is made with the previous year's GDP in order to avoid a comparison that already involves the impact of the disaster. A full assessment of the impact of losses on the growth of GDP, however, is to be obtained through the impact analysis described later.

**Figure 8:** Most Relevant Disasters in the Ratio of Damage Versus Gross Fixed Capital Formation, 1972 to 2012, from DaLA Database, http://www.gfdrr.org.




Estimation of the **spatial or geographical distribution of disaster effects** may enable the identification of the disaster's most affected geo-political or geographical areas. Depending on the specific nomenclature used in each specific country, such sub-divisions may include provinces, districts, municipalities and villages. Thus, any field surveys conducted during the assessment should take into consideration such spatial breakdowns.

**Figure 9:** Map Showing Most Affected States After 2012 Flood Disaster in Nigeria, Indicating Value of Disaster Effects in Million Naira

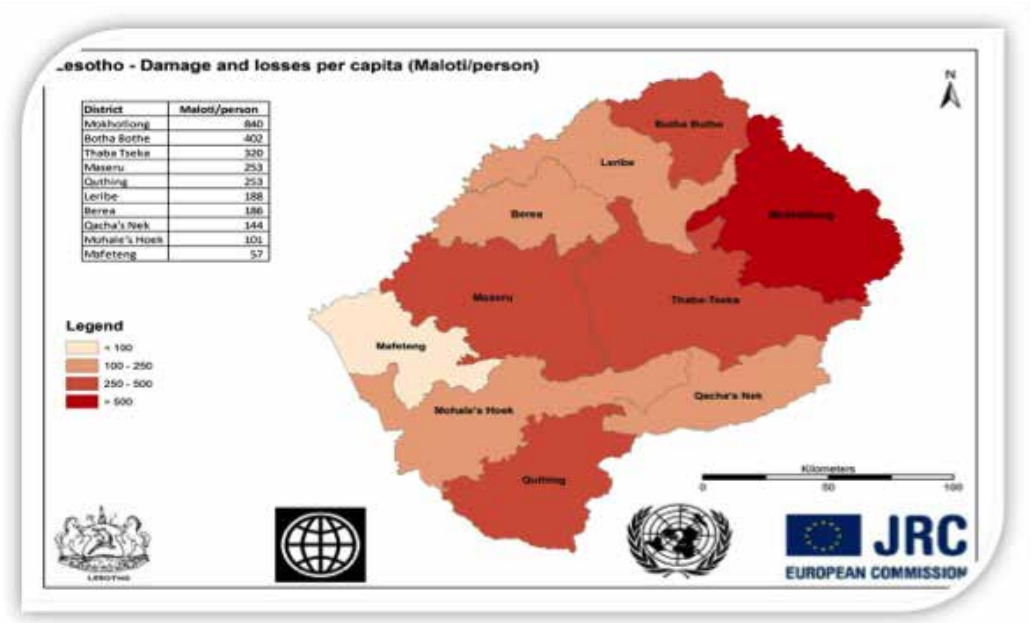


After the spatial distribution of total disaster effects has been determined, maps showing the most affected geographical subdivisions may be prepared to clearly illustrate those that have been more affected than others. Figure 9, taken from the *Nigeria Flood Post-Disaster Needs Assessment (PDNA)*, 2013, shows such a map for the extraordinary floods that affected Nigeria in 2012.

Another useful comparison of the effects of disasters is the **spatial distribution of per capita disaster effects.** This entails the comparison of disaster effects *vis à vis* the population of each affected sub-national division being analysed, whether they are provinces, districts or any other lower level geographical unit, and provides a more meaningful index of the destruction and production decline sustained by the affected population which can be useful for defining priorities for post-disaster interventions and investments.

In this respect, a table must be developed showing values of disaster effects in each geopolitical or geographical subdivision, the corresponding population in each for the current year of the disaster in question, and a third column providing the average value of disaster effects per capita. These values may later on be used to derive a map, similar to the previous one, showing the most affected subdivisions, as shown in figure 10.

**Figure 10:** Spatial Distribution of Per Capita Disaster Effects After 2010-2011 floods in Lesotho. From the Government of the Kingdom of Lesotho, Post-Disaster Needs Assessment Heavy Rains 2010/11, Maseru, 2012.



## ESTIMATION OF MACROECONOMIC IMPACT OF A DISASTER

### OVERVIEW

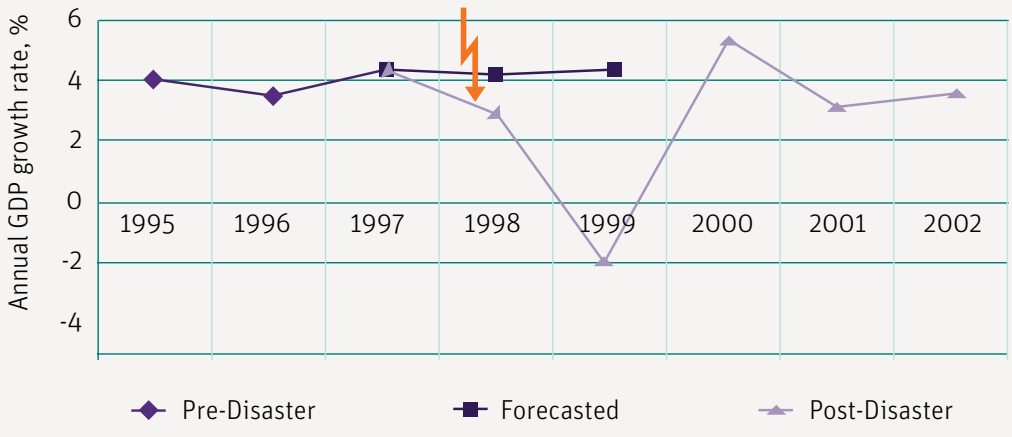
The destruction of physical assets (defined as damage) and the changes in production flows caused by any disaster may have an impact or consequences on the value and growth of the economy of the affected country, whenever the affected area is large and whenever strategic sectors of economic activity have been affected. In spatially concentrated cases of disaster, such impact may not be significant at the macroeconomic level; however, individual sectors of activity may show high levels of impact, and the affected individual persons or households may suffer a considerable negative impact on their living conditions, including employment and income decline and increased costs of living after a disaster.

Consideration needs also to be given to possible disaster cases where a region of a country is heavily and negatively impacted so that its future economic growth is pushed below its pre- or non-disaster potential, while the overall impact on the national economy is negligible. Such disaster-affected regions may not be able to recover and reconstruct without receiving targeted assistance from the central government.

The impact of the disaster is to be measured with respect to a baseline given by the expected or forecasted performance of the national or regional economy if the disaster had not occurred. To clarify, the value of sectoral production flow changes is to be superimposed on the performance of the economy that had been forecasted (before the disaster occurred) for the current and several subsequent years, for the entire country or for the affected areas. This superposition would enable measuring the "delta" on economic growth caused by the economic shock imposed by the disaster.

As mentioned before, the aforementioned analysis of macroeconomic impact is to be made in a staged fashion; i.e. first isolating the effects of the disaster and later superimposing the positive effects of recovery and reconstruction activities. The isolated impact of the disaster is obtained by the subtraction of the changes in production flows caused by the disaster from the originally forecasted performance of the economy, assuming that no post-disaster interventions for recovery and reconstruction are to be made. In subsequent steps of the analysis, the future impacts of recovery intervention activities and of investments required for reconstruction are to be superimposed on the post-disaster economic performance, to estimate the combined isolated impact of the disaster and of post-disaster activities and their effectiveness (See Figure 11 below).

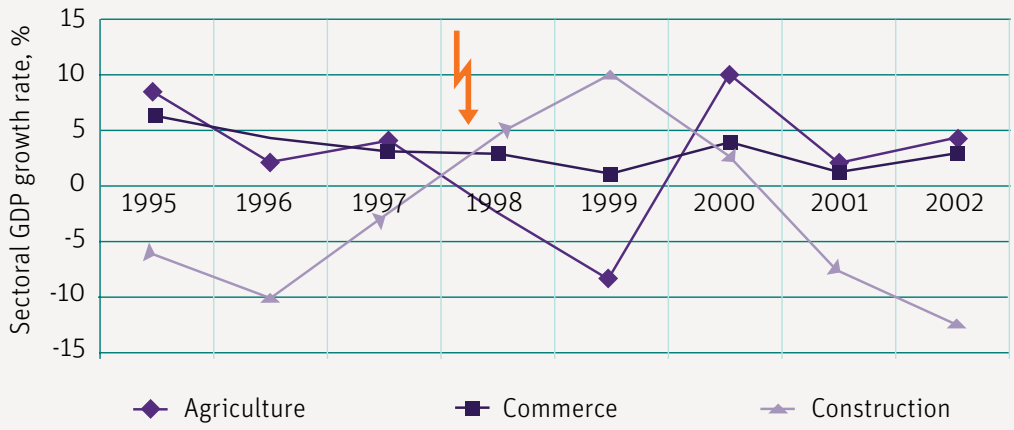
**Figure 11:** Combined Impact of Hurricane Mitch and of Post-disaster Recovery and Reconstruction in Honduras



It must be mentioned that disaster impact is not expected to be the same at different levels of aggregation in the analysis. As stated before, the estimated isolated disaster impact at the macroeconomic level may not be significant, but it may be substantial in specific, individual affected sectors depending on which activities have sustained more disruption of productive activities. Moreover, sector-level impact may vary from one sector to the other, as a function of the degree of affectation of their respective activities; in many cases, the negative impact may be very high, while it is quite possible that other sectors may actually derive positive benefits.

As an example, consider the combined impact on economic growth in Honduras after Hurricane Mitch in 1998 and the subsequent recovery and reconstruction interventions. Using annual information from the System of National Accounts of that country, obtained from the United Nations Statistical Database (http://www.unstats.org) as shown in Figure 12, the combined impact of the disaster and of post-disaster activities on the growth of the gross domestic product is very clearly observed as a decline for years 1998 and 1999 in the agriculture sector, and a clear recovery trend after 2000. The impact on the trade sector, though, as shown in same graph, is less pronounced since that sector was less intensively affected by the hurricane. On the other hand, the impact on the construction sector follows an opposite trend, showing significant growth after the hurricane occurred, in direct response to reconstruction activities.

**Figure 12:** Annual Growth of Gross Domestic Product for Selected Sectors of Economic Activity in Honduras After Hurricane Mitch and After Post-disaster Recovery and Reconstruction Activities.




The impact of disasters at household or individual person levels would normally be much higher than at sectoral or macroeconomic levels, and employment, livelihood and personal income losses are to be estimated as well to provide the basis for that separate analysis. However, from the above considerations on sectoral impact, it may be foreseen that employment and income would change – either decline or increase – in response to the post-disaster performance of the affected sectors. As indicated in the previous example, individual persons working in the agricultural sector may lose more employment and income than those working in trade; conversely, the construction sector is likely to increase its demand for labor as a result of reconstruction activities.

## USE OF THE SYSTEM OF NATIONAL ACCOUNTS

As has been indicated before, systematic use is made of the worldwide System of National Accounts (SNA) for the analysis of disaster impact. The System of National Accounts is a tool that enables economists to measure

the level of economic development and the annual rate of economic growth, changes in consumption, savings, investments, debt and wealth for the total economy of a country and for each of the sectors of economic activity. Using information available in this system, economists are able to:

- Forecast the future growth of an economy;
- Analyse the impacts of alternative policies adopted by the government on the economy and sectors; and
- Estimate the impact of a disaster or any other shock on the economy and its sectors.

The National Accounts essentially integrate, in a consistent manner, economic and statistical concepts and methods, and thus provide a means to conduct domestic and international comparative analyses.

Moreover, the National Accounts consist of a coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables that have been defined based on internationally agreed concepts, definitions, classifications and accounting rules. These accounts provide a comprehensive record of most of the complex set of economic activities occurring at all times in an economy, and of the inter-action between economic agents and groups of agents that goes with it.

In brief, the National Accounts System is a quantitative macroeconomic representation of the national income cycle that uses the principle of double-entry bookkeeping of business accounting as well as several accounts, in order to show existing relationships between the various economic variables.

While it is not required for all Assessment Team members to have a thorough knowledge of the National Accounting System in order to conduct the sectoral assessment entrusted to each of them, it is essential for the team members that produce the Macroeconomic Impact Assessment to be fully acquainted with this tool. For full particulars on the subject, readers are referred to the handbook developed by the United Nations Statistics Division of the Department of Economic and Social Affairs: *National Accounts: A Practical Introduction,* in *Handbook of National Accounting*, of which a summarised version is included in Annex A to provide a basic knowledge of the subject for use and application during assessments.

The System of National Accounts falls within the institutional domain of the National Bureau of Statistics in all countries. It is therefore advisable that representatives of this government agency in any disaster-affected country be part of the Macroeconomic Assessment Team.

## BASELINE INFORMATION REQUIREMENTS

Before undertaking the analysis of impact assessment, it is essential that an adequate baseline of pre-disaster conditions for comparison be collected and duly organised. This refers to two types of information: on one hand, historical data on the performance of the main macroeconomic aggregates for the disaster-affected country, including gross domestic product (GDP), balance of payments (BoP), fiscal sector position and consumer price information for the past five years. On the other hand, the most recent forecasts available on the same variables for the current and subsequent years of the disaster, as developed by the relevant country authorities for conditions expected in the future.

The use of such information enables the elaboration of the scenario of macroeconomic performance that would have prevailed in the country if the disaster had not occurred. The non-disaster scenario thus developed is then

used as a base to superimpose the resulting economic flow changes as estimated during the sectoral assessments, so that the "economic growth delta" caused by the disaster in question can be estimated, assuming that – as a first stage in the analysis – no post-disaster interventions are to be made. Afterwards, as subsequent steps in the analysis, the estimated positive values of recovery interventions and reconstruction investments are to be superimposed, with the anticipated appropriate time delays, to forecast their positive impact on the performance of the economy.

In regard to **baseline on gross domestic product**, annual historical information is to be obtained – usually from authorities of the Central Bank, the Ministry of Finance and/or the Bureau of Statistics – expressed in current and constant values, and broken down by sectors of economic activity, at national and sub-national levels, for the past five years. The same type and disaggregation of information on GDP forecasts for the current year of the disaster and for two or three subsequent years should also be obtained. Normally, the calendar year is to be used for such forecasts, although it is also possible to use the fiscal year in those countries where it is used in the national accounting.

In many countries, the Ministry of Agriculture, in cooperation with FAO and WFP, conduct annual forecasts of agriculture production in the first quarter of each calendar year, based on the expected acreage or surface area that farmers intend to plant for each type of crop and on the anticipated average unit yield of different crops based on the type of seed varieties to be used by the farmers. When that information is available, care must be exercised by the Macroeconomic Assessment Team to determine whether the forecasted GDP figure prepared by the Central Bank or Finance Ministry takes into consideration such more recent, more substantive and specialised projections of Agriculture Sector output.

Another item required as part of the baseline for the assessment of disaster impact is the full list of technical coefficients or ratios that relate value added over output for each sector of economic activity included in the GDP figures. The most recent set of these coefficients or ratios is to be obtained from supply-and-use tables in the National Accounts that are normally developed by the Bureau of Statistics. These *value added/output ratios* are developed on the basis of detailed census on output and costs which are conducted by Statistical Offices in benchmark years; the same office estimates the value of these ratios for non-benchmark years.

In connection with the baseline on the balance of payments, annual historical data on the current account balance is required together with forecasted annual information about it for the current and two or three subsequent years after the disaster. This information may be obtained from the Central Bank, Bureau of Statistics or the Ministries of Trade and of Finance in the affected country.

In connection with **baseline for the fiscal sector,** annual values on both historical and forecasted series of revenues and expenditures, showing the current, fiscal and primary accounts, will be required. A table showing the current types of taxes is another essential element of baseline required for this analysis of fiscal sector impact. This information may be obtained from the Ministry of Finance and/or from the IMF Representative in the affected country.

Baseline data on the historical annual variation of **consumer price indexes** (CPI), together with forecasted quarterly variation for the current year of the disaster, and annual forecasted values of the same variable for the years after the disaster, are to be obtained from the Central Bank and/or the Bureau of Statistics in the affected country, to enable the conversion between nominal and constant values for the analyses.

A set of historical data on **official exchange rates** between the national currency and that of the United States Dollar is also required for the assessment, and should be obtained from the Central Bank.

## STEP-WISE PROCEDURE TO ESTIMATE MACROECONOMIC DISASTER IMPACT

The following sections describe the procedure to be followed by the Macroeconomic Assessment Team for the estimation of the possible impact of disasters at the macroeconomic level, following a step-wise approach that first analyses the impact of the disaster in isolation, and later examines the possible positive impact of the different activities designed to achieve economic recovery and reconstruction of destroyed assets under a "building-back-better" strategy that involves reduction of disaster risk. While the UN-ECLAC Handbook (*Handbook for estimating the socio-economic and environmental effects of disasters*, United Nations Economic Commission for Latin America and the Caribbean, Santiago and Mexico, 2003) provides the required theoretical background for such analysis, the procedure described here is oriented towards the practical aspects of the analysis that members of the Macroeconomic Assessment Team should follow.

Three stages are required to determine whether there is any resulting negative or positive impact on the macroeconomic performance of a country affected by a disaster. In the **first stage**, only the isolated effects of the disaster in terms of changes in economic flows, assuming no recovery and reconstruction interventions, are considered; in the **second stage**, the positive impact of economic recovery activities is estimated, after the needs for economic recovery have been estimated separately; and, in the **third stage**, the positive impact of disaster-resilient reconstruction activities is estimated, after the needs for reconstruction with risk reduction features have been estimated. The same procedure is to be followed for each of the above-mentioned stages.

### i) Possible disaster impact on GDP performance

The following steps are to be followed to estimate the possible impact of a disaster on the performance of gross domestic production after a disaster. The first stage of the analysis is that of isolated disaster impact that assumes no activities or interventions to achieve recovery and reconstruction are ever conducted, which in fact is a worst-case, post-disaster scenario.

1. Determine the value of gross domestic product that is to be used as baseline for comparison in the analysis of GDP impact after the disaster, for the current and for several (1 to 3) subsequent years, depending on the possible duration of disaster effects as indicated by sectoral Assessment Teams:

    - Obtain from pertinent government authorities the most recent – but as yet not affected by any disaster effects – value of gross domestic product for the affected country and/or next lower geo-political units available, using constant values, in the year of the disaster. These annual values should normally refer to calendar years; any fiscal-year values should be converted into calendar-year figures;

    - Adjust – upwards or downwards – the above value, using the annual agriculture production forecast prepared by the Ministry of Agriculture in cooperation with FAO and WFP in the first quarter of the year, that estimates expected crop production on the basis of farmers' intention on planted surface area for each crop and of the expected crop unit yield on the basis of seeds being used, normally available at the end of the second quarter each year. This adjustment is required only if the overall GDP forecast does not already include the agriculture sector's most recent estimations.

In most countries, GDP forecasts are prepared by the Central Bank and/or Ministries of Finance and/or Economic Planning, at the start of each calendar year; and updated on a quarterly basis thereafter. Since the agriculture production forecast only becomes available at the start of the second quarter, it is possible that the first forecast made at the macro level may not include the agriculture sector projection;

- Prepare a table showing gross domestic product for the year of the disaster and for several subsequent years, for use as the basis for comparison of isolated disaster impact, expressed in constant terms.

2. Using data from the sectoral assessments, already converted into constant values by using deflation coefficients obtained from Central Bank or Bureau of Statistics, develop sectoral tables to estimate disaster impact using the model spreadsheet presented in the next page. These sectoral tables should have three main columns for the estimation of disaster impact per calendar year of the analysis, beginning in the current year of the disaster and continuing on with subsequent years during which disaster impact is expected. Referring to the spreadsheet shown below, fill in the required information and make the following estimations:

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| 1 | | | Non Disaster | Post Disaster | Disaster Impact |
| 2 | Gross production, LCUs | | D2=D3*D4 | E2= E3*E4 | |
| 3 | | Quantity produced, tons | D3 | E3 | |
| 4 | | Producer price, LCU/Ton | D4 | E4 | |
| 5 | Intermediate consumption, LCUs | | D5=(1-D6)*D2 | E5=(1-D6)*E2 | |
| 6 | | Value-added coefficient | D6 | D6 | |
| 7 | Post-disaster higher cost of production, LCUs | | | E7= E8 | |
| 8 | | (From sectoral assessment) | | E8 | |
| 9 | Value Added, LCUs | | D9=D2-D5 | E9=E2-E5-E7 | F9=E9-D9 |

In the column for **non-disaster conditions**, again using data already converted into constant values, enter the data obtained from the forecasted performance of each sector for the current year of the disaster:

- Fill in the quantity of production expected (D3) and fill in the forecasted price paid to the producer (D4) to obtain the non-disaster forecasted value of gross sectoral production (fill in cell D2);
- Fill in the value of sectoral value-added coefficient obtained from the Bureau of Statistics (D6), and obtain the forecasted value of intermediate consumption under non-disaster conditions (filling in cell D5 using the formula provided);
- Obtain the non-disaster forecasted value added of production for the sector (D9) by subtracting intermediate consumption (D5) from the value of gross sectoral production (D2) and fill in cell D9 using the formula provided.

In the column for **post-disaster conditions** enter the data (again using constant values) obtained by the sectoral Assessment Team for each sector for the current year of the disaster, and conduct the necessary estimations as follows:

- Fill in the sector-estimated quantity of post-disaster production (E3) and fill in the estimated price paid to the producer (E4) to obtain the estimated post-disaster value of gross production (fill in cell E2);

- Fill in the normal value of intermediate consumption, using the same value of the technical value-added coefficient as used for non-disaster conditions, filling in cell E5;
- Fill in cell E7 with the sector-estimated higher production costs taken from the assessment;
- Estimate the post-disaster value added of production for the sector (E9) by subtracting the normal intermediate consumption (E5) and the post-disaster higher cost of production (E7) from the estimated post-disaster value of gross production (E2) and fill in cell E9.

In the last column of the spreadsheet to obtain **disaster impact**, fill in cell F9 by subtracting the post-disaster value added of production for the sector (cell E9) minus the non-disaster forecasted value added of production (D9), which will yield the impact of the disaster on production for the sector analysed. Repeat the procedure for all sectors of economic activity that may have been affected by the disaster and for the subsequent calendar years during which impact may still be significant, and aggregate them to obtain the total impact of the disaster.

In preparing this table, the Macroeconomic Assessment Team (using its knowledge of national accounting) must ensure that the above values of production flow changes refer to the sectors classified as per the definition of sectoral production boundaries specified in the System of National Accounts. In that regard, higher values of personal consumption (for instance in the sectors of Water and Transport) should not be included in this analysis. For this purpose, readers are referred to the section *"Production boundary and principles of valuation,"* included in the United Nations Handbook of National Accounts. This is essential to ensure that only flow changes that are considered relevant in the National Accounts are included in the analysis.

3. In addition to the above, the estimated post-disaster higher production costs (as exemplified under cell E8 in the above spreadsheet, and expressed in constant values) are to be taken as increases in production in the sectors where they will be actually produced, and similar spreadsheets are to be developed in order to estimate their value added for addition to the forecasted GDP, as shown in the following additional spreadsheet:

| A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|
| 1 | Higher production costs | | Post-disaster higher production | | | | |
| 2 | Sector/Item | Gross value, LCUs | Sector | Item | Gross value, LCUs | Value- Added Coeff. | Value Added, LCUs |
| 3 | **Agriculture** | | | | | | |
| 4 | Seeds provision | 350.0 | Trade | Import of seeds | 350.0 | 0.35 | 122.5 |
| 5 | Fertilizer costs | 650.0 | Industry | Fertilizer production | 650.0 | 0.45 | 292.5 |
| 6 | Pesticide costs | 350.0 | Industry | Pesticide production | 350.0 | 0.45 | 157.50 |
| 7 | **Transport** | | | | | | |
| 8 | Fuel consumption | 2,100.0 | Trade | Sales of fuel | 2,100.0 | 0.35 | 735.0 |
| 9 | Maintenance costs | 1,800.0 | Services | Vehicle maintenance | 1,800.0 | 0.35 | 630.0 |
| 10 | **Health** | | | | | | |
| 11 | Vaccination costs | 450.0 | Industry | Vaccine production | 450.0 | 0.45 | 202.5 |
| 12 | Information campaign | 250.0 | Industry | Printing costs | 150.0 | 0.45 | 67.5 |
| 13 | | | Services | Dissemination fees | 100.0 | 0.35 | 35.0 |
| 14 | **Total** | | | | | | **2,242.5** |

In the above spreadsheet use is made of several examples that require clarification and explanations to ensure clear understanding. First, in the Agriculture Sector, higher expenditures are required for the post-disaster acquisition of agriculture inputs (seeds, fertilizers and pesticides for replanting of the seasonal crop) which increase the intermediate consumption in the sector; these translate in sales of seeds in the Commerce Sector and in production of fertilizers and insecticides in the Industry Sector. Second, in the transport sector, the higher costs of transport involved in the utilisation of longer alternative roads that must be used because of destruction of certain road sections that result in higher costs of Transport Sector costs (which again increase intermediate consumption in the Transport Sector), would translate to additional fuel sales in the Commerce Sector and in more vehicle maintenance in the Services Sector. Third, the Health Sector requires conducting a vaccination campaign together with an information campaign to control an increase in morbidity after a disaster, which is taken as an increase in intermediate consumption in health, but this also translates into higher production of vaccines and information material in the Industry Sector as well as a sale of consultancy fees in the Advertisement or Commerce Sector.

The value added for each of the activities under the sectors listed under column D is to be obtained from multiplying the value of each activity listed under column E times the value-added coefficient listed for each sector of economic activity under column F. Once each cell of column F is estimated, the total of column F is obtained and filled in cell F14, which is to be added to the value of pre-disaster GDP forecast.

4. Convert the value of houses destroyed by the disaster into value added losses, using the discount coefficients normally included in the GDP component of "ownership of dwellings." In this case, only the damage value of houses for which formal ownership is defined is to be considered; informal housing damage is not to be included in these calculations.

5. Prepare a summary table showing the annual values of production losses (as described under point 2 in this section) and higher intermediate consumption production (as described under point 3 of this section), expressed in constant values – by deflating nominal loss values using the implicit price deflator in each calendar year— as estimated by the sectoral Assessment Teams, ensuring no duplication among sectors.

    (i) Estimated sectoral output losses should be included as having a negative sign (after adding up all sectoral losses as described under point 2 above).

    (ii) Estimated higher intermediate consumption production should be assigned to the sectors where the additional production are actually going to be made in a proportion defined by the sectoral specialists, and should have a positive sign (as described under point 3 above).

    The table should have as many columns as the number of years that each of the negative or positive production flow changes would cover, on the basis of the sectoral specialists´ findings.

6. Estimate post-disaster gross domestic product (GDP), for the year of the disaster and for several subsequent years (See Table 2 in the following page).

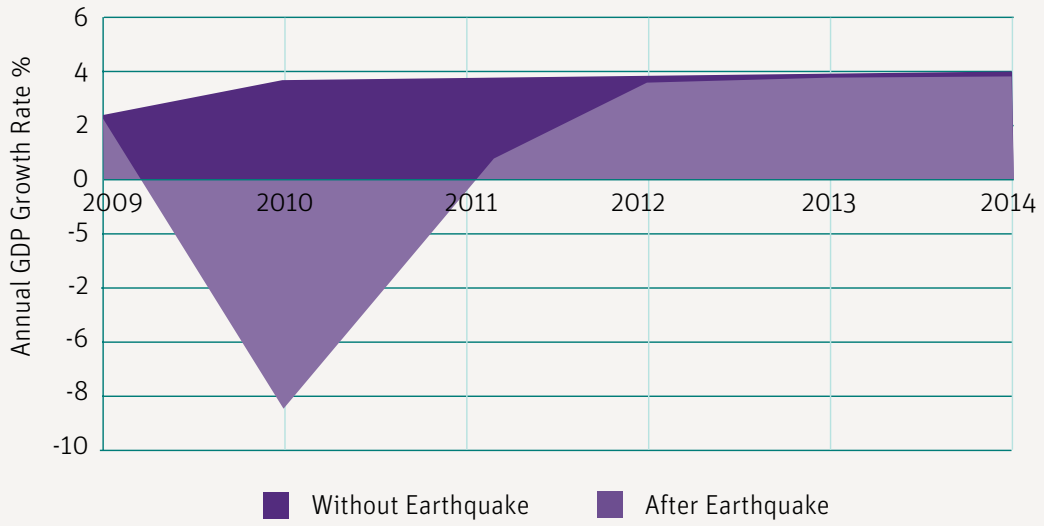
    - Subtract the disaster-induced, value-added production losses as given in 5-i) and 5-ii) from the non-disaster forecasted GDP figures, and subtract the value of dwelling ownership destroyed by the disaster as given in point 4), using constant values.

- Determine resulting annual post-disaster GDP growth rates, for the entire period of analysis, and compare them to the forecasted growth rates if the disaster had not occurred, to ascertain disaster impact (as shown in Table 2) (note that in this case, most of the houses that were destroyed were of the informal type; thus, losses on home ownership in the national accounts are negligible), and prepare a time chart showing GDP change over time, as shown in Figure 13. In order to do that, if a significant modification has arisen in the labor force due to the action of the disaster – i.e. a sizable number of deaths, and/or temporary or permanent disability of workers, or of prolonged illness – the additional sudden decline in GDP for the first subsequent year is to be introduced. This would imply the availability of detailed information on the number of deaths, in terms not only of number, but of age, sector of employment, etc. Should this breakdown of data be unavailable, average values may be utilised and factored in the estimations, as was done in the recent case of the Haiti earthquake in 2010.

**Table 2:** Example of GDP Impact Analysis After Mt. Merapi Volcanic Eruption, Sleman District, Indonesia, 2010 (In Constant Value billion Rp). From World Bank, Damage, Losses and Needs Assessment, Mount Merapi Volcanic Eruption, Jakarta, Indonesia, 2010.

| | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| Non-Disaster GDP Performance | | | | |
| GDP, real billion Rp | 12,504 | 13,285 | 14,133 | 15,031 |
| Forecasted annual growth rate, % | 5.11 | 6.25 | 6.38 | 6.36 |
| Disaster-Induced Losses | | | | |
| Production decline, real billion Rp | | 229 | 585 | -- |
| Intermediate consumption production, real billion Rp | | 22 | 47 | -- |
| Losses in destroyed house ownership | | … | … | … |
| Net production losses, real billion Rp | | 207 | 538 | -- |
| Post-Disaster Impact on GDP Performance | | | | |
| Post-Disaster GDP, real billion Rp | | 13,079 | 13,595 | 15,031 |
| Post-Disaster annual growth rate, % | | 4.60 | 2.33 | 6.36 |
| Post-Disaster GDP Impact, % | | 1.65 | 4.05 | -- |

**Figure 13:** Estimated Impact on GDP Growth Rate After 2010 Haiti Earthquake Without Recovery or Reconstruction Interventions and Investments




The above chart shows the estimated isolated impact of the Haiti earthquake of 2010, considering only economic losses and assuming no interventions for recovery and reconstruction, in comparison to the growth forecasted before the disaster occurred. It may be observed that, in this case, production losses and higher expenditures will be present even after the fifth year following the disaster.

The Macroeconomic Team must also conduct further analysis of disaster impact on GDP, in order to ascertain the **differential impact of the disaster in all affected geo-political or geographical subdivisions of the country.** This is of course depending on the availability of macroeconomic data for such divisions, whether provinces or districts, and that the sector teams have estimated the values of asset destruction and production flow changes related to the same provinces and districts. The latter is standard practice under the DaLA methodology, while the availability of GDP information at the province or district level depends on the country under consideration and its degree of development of its System of National Accounts.

Figures 14 to 16 show this spatial distribution of GDP impact at the national, provincial and district level for the disaster caused by the Mount Merapi Volcanic Eruption in Indonesia in 2010. Both tables come from the World Bank: *Damage, Losses and Needs Assessment, Mount Merapi Volcanic Eruption,* Jakarta, Indonesia, 2010. There it may be clearly observed that, thanks to the availability of GDP information down to the district level in Indonesia and the estimation of disaster-induced production flow changes broken down to the same geographical level of detail, application of the DaLA methodology enables to determine the degree of GDP impact of the disaster in the different geopolitical units, and to identify the unit that was most affected.

**Figure 14:** Impact on GDP at the National Level, After Mount Merapi Volcanic Eruption in Indonesia

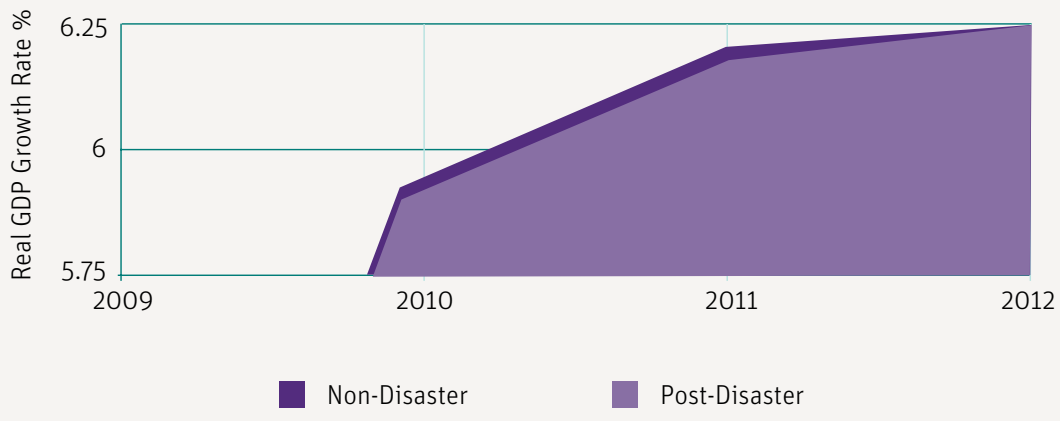



**Figure 15:** Impact on GDP in Central Java Province, After Mount Merapi Volcanic Eruption in Indonesia

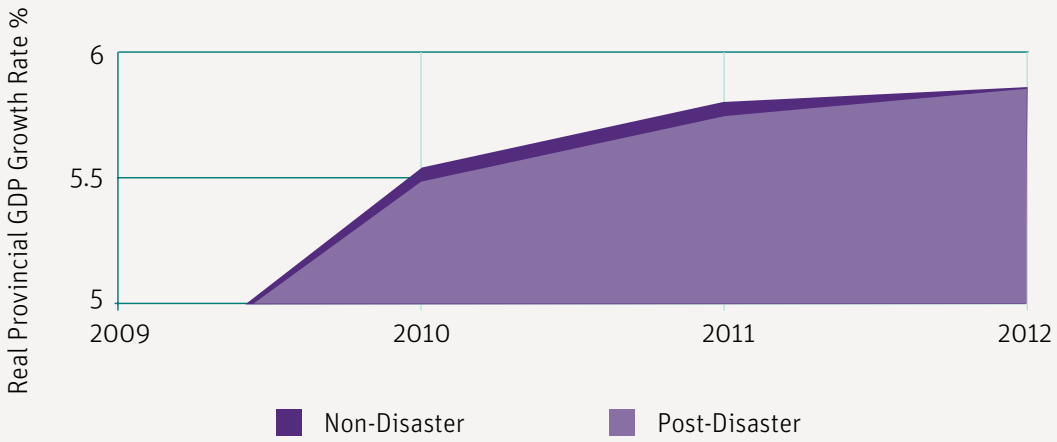
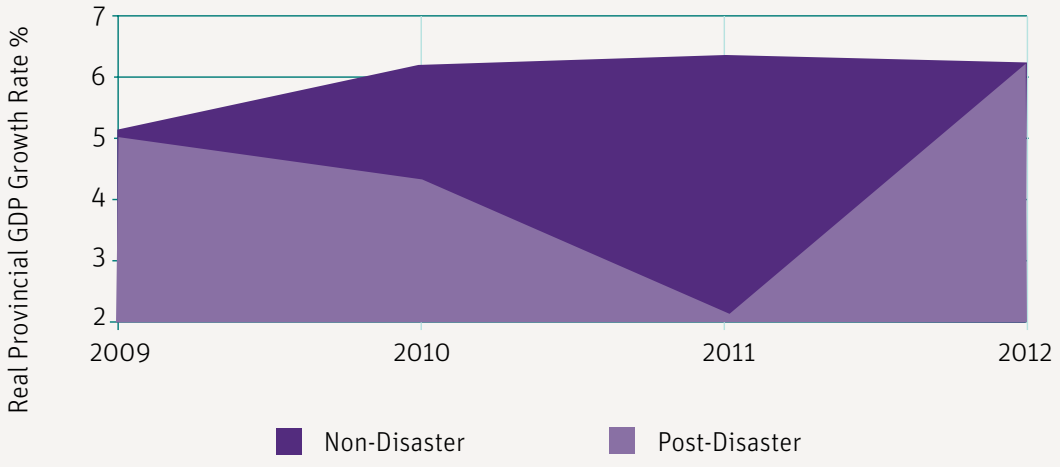



**Figure 16:** Impact on GDP at the Sleman District level, After Mount Merapi Volcanic Eruption in Indonesia




The comparative analysis of the three preceding graphs provides quantitative evidence of the fact that was pointed out initially at the start of this handbook section: i.e. that disaster macroeconomic impact at the national level may be negligible (except for the case of very large disasters), while disaster impact increases at sub-national levels to the point of being substantial at the lowest possible geographical level. In this case, disaster impact is significant

(above 4 percent) at the district level as shown in Figure 16, while it was insignificant at the national level as indicated in Figure 14 (less than 0.1 percent), and has an intermediate value at province level as shown in Figure 15.

Several considerations become evident to the Macroeconomic Assessment Team members. The GDP analysis described in the preceding paragraphs will enable them to determine whether there is any repercussion of the disaster on the macroeconomic performance of the affected country. In most cases, such impact will likely be small or negligible (such as shown in Figure 14 for Indonesia as a whole), while in cases of disasters covering extensive areas and/or affecting strategic sectors of a relatively small economy, impact may be significant (which is the case for Sleman District in Indonesia following the Mount Merapi volcanic eruption shown in Figure 16). Based on that analysis, it will be possible for the macro team to identify and design short- to medium-term strategies to promote and accelerate recovery of production.

The reader of this PDNA handbook should note that the step-wise procedure described above applies to all three stages of the analysis of disaster impact on GDP: i.e. first, to estimate isolated disaster impact, when no recovery and reconstruction activities are included; second, adding the positive impact of recovery activities, once recovery needs have been estimated; and, third, superimposing the positive impact of disaster-resilient reconstruction investments, after reconstruction needs have been estimated.

### ii) Possible disaster impact on the External Sector

This section provides details to guide the Macroeconomic Assessment Team to estimate the possible impact of the disaster on the external sector of the affected country; that is, on the country´s balance of payments (BoP). As in the case of analysis of disaster impact on GDP described in the preceding section, disaster impact on BoP is to be conducted again in three subsequent stages: first, the basic analysis of isolated disaster impact that assumes no activities or interventions to achieve recovery and reconstruction are ever conducted, which in fact is a worst-case post-disaster scenario; second, the possible impact of recovery activities, after a recovery strategy has been defined; and, third, the possible impact of disaster-resilient reconstruction investments.

Before getting into the subject, it hardly seems necessary to say that balance of payment analysis is done only at the national level, and that the same data would not be available for sub-national geographical subdivisions.

The following steps are to be followed to estimate the possible impact of a disaster on the balance of payments in a country after a disaster:

1. Determine the information on the current account of the balance of payments for the affected country that is to be used as baseline for the analysis of post-disaster impact, for the current and subsequent years, depending on the likely duration of disaster effects as indicated by the most affected sectors.
2. Obtain from sectoral estimations of production flow changes, those that would have an impact on increasing imports or decreasing exports of both goods and services (on the Balance of Trade), over the current and subsequent years where disaster-induced production flow changes are to be spread over (As a 1-year example of these, see Table 3 below).
3. Subtract the higher imports and lower exports obtained in step 2 from the value of the different components of the current accounts in the BoP, to obtain the resulting post-disaster value of BoP (See Table 4 below as a single-year impact example).

The example shown in Tables 3 and 4, which refer to the impact of the recent swine flu pandemic in a small Caribbean island country, serves to illustrate the procedure described above for the estimation of the disaster impact on the current account of the balance of payments.

**Table 3:** From Value of Production Flow Changes to Impact on Balance of Trade, after Swine Flu Pandemic in a Small Caribbean Country, in Million J$

| Sector of economic activity | Production flow changes | | Imported or exported component, % | Disaster impact on: (million J$) | |
|---|---|---|---|---|---|
| | Type of flow change | Value (Million J$) | | Exports | Imports |
| Agriculture | Plantation production | 23.1 | 30 | 6.9 | |
| Manufacture | Large industry output | 5,479.8 | 30 | 1,643.9 | |
| Tourism | Tourism sales | 8,465.0 | 100 | 8,465.0 | |
| Mining | Mining production | 144.9 | 100 | 144.9 | |
| Health | Anti-viral medication | 142.9 | 100 | | 142.9 |
| Total | | 14,255.7 | | 10,260.8 | 142.9 |
| **Goods** | | | | **1,795.8** | **142.9** |
| **Services** | | | | **8,465.0** | |

**Table 4:** Estimation of Disaster Impact on Current Account of Balance of Payments, in Million US$

| Component | | Non-Disaster | Value of production loss | Post-Disaster |
|---|---|---|---|---|
| Goods balance | | 545 | | 570.8 |
| | Exports | 378 | 23.9 | 354.1 |
| | Imports | 923 | 1.9 | 924.9 |
| Services balance | | 148 | 112.9 | 35.1 |
| Other income | | 124 | | 124.0 |
| Current transfers | | 313 | | 313.0 |
| Current account balance | | 209 | | 346.7 |

Needless to say, should production flow changes arising from the disaster last for more than one year, the above tables would need to show data for each of the subsequent years.

The Assessment Team should bear in mind that disaster-affected countries that may experience a large negative impact on the balance of payments that lasts over several years may qualify for special loans for balance-of-payment support. Such special support loans are normally available from international financial institutions under very specific conditions.

At the time of the second stage of macroeconomic impact analysis – which is to estimate the possible impact of recovery activities – the Macroeconomic Assessment Team must include the value of imports that may be required during the recovery period, such as food that may be required if domestic production is insufficient to ensure food security after the disaster.

When stage three of the Macroeconomic Impact Analysis is carried out – i.e. to ascertain the impact of disaster-resilient reconstruction – the Macroeconomic Assessment Team should bear in mind that the value of the imported component of reconstruction investments must be factored in when some construction materials are

not produced in-country, as estimated by the sectoral Assessment Teams. Furthermore, that the receipt of any re-insurance proceeds coming from abroad and with their estimated delays would also have a positive impact on the balance of payments, only if and after such amounts are received and invested in the affected country.

Any foreseen increase in the amount of family remittances coming from abroad to assist disaster-affected persons or households in their recovery and reconstruction must also be factored in by the Macroeconomic Assessment Team into the analysis of post-disaster impact on the External Sector.

### iii) Possible disaster impact on public finances

The budget is a financial programming exercise that projects how the government plans to spend its revenue, and defines the levels of expected expenditures and of expected receipts. A disaster may affect the budget on both the revenue and expenditure sides. Possible effects of a disaster on public finances may include:

1. Decline in current revenues caused by decrease in tax revenues: the tax base, tax rates, possible temporary reductions in import duties, and non-tax revenues;
2. Decline in capital revenues due to destruction and damage to property;
3. Possible increase in current expenditures: increases in operations outlays, increases in transfers and decreases of interest on public debt; and
4. Increase in capital expenditures: increase in direct investment, capital transfers and financial operations.

Some of the items described above would result from post-disaster recovery and reconstruction – such as possible temporary tax holidays to enterprises to assist them in recovery, and increases in capital expenditure that occurs during reconstruction – and should be isolated and dealt with after the first stage of impact analysis.

Public sector operations are carried out in the context of a fiscal year, which does not necessarily coincide with the calendar year. Thus, fiscal data adjustments to the calendar year will be required to make fiscal figures compatible with the national accounts.

The financial impact of the disaster should be analysed by estimating the gap between central government operations and their financing. The influence on the budget of the rest of the general government accounts and that of state enterprises should be taken into consideration.

The following is the first analysis of isolated disaster impact on public finances that assumes no activities or interventions to achieve recovery and reconstruction are ever conducted, which in fact is a worst-case post-disaster scenario. Later on, as subsequent stages of the analysis, the possible impact of recovery interventions is to be made, as well as the possible impact of disaster-resilient reconstruction investments is to be taken into consideration.

Follow these steps to estimate the possible isolated impact of a disaster on the fiscal sector after a disaster:

1. Obtain the available information on government revenues and expenditures in the affected country, referred to the situation before the disaster, that is to be used as baseline for the analysis of post-disaster impact, for the current and for several (1 to 4) subsequent years, depending on the likely duration of disaster effects as indicated by the most affected sectors.

2. Obtain the different prevailing rates of taxes applied to production, sales, exports and imports that constitute the total revenues for the government. On that basis and in combination with production, sales and export/import flow changes estimated during the assessment in each sector of economic activity, estimate the reduction or decline in revenues that arise after the disaster, during the current and subsequent years, as needed.

3. Obtain the extraordinary expenditures that the government has had to make to face the post-disaster emergency situation (without including recovery and reconstruction activities), which are over and above the regular budget assigned in each sector of economic activity. Typical government expenditures for the emergency stage after a disaster include: costs of setting up and running temporary shelter schemes, costs of providing medical attention to injured persons and of monitoring and controlling higher morbidity arising from the disaster, costs of providing temporary education facilities and services, costs of re-opening road traffic, cost of emergency food provision, etc.

4. Superimpose the value of losses in revenues and of higher, unforeseen expenditures on the baseline on the government budget, and ascertain how the government budget has been affected due to the disaster.

In some cases, governments have special budget lines to finance such post-disaster expenditures; in other cases, expenditures are done using funds earmarked for other development activities that are left undone due to the urgency to meet emergency demands: in other cases, special, additional budget allocations are made after the disaster.

In some cases, fiscal deficits are incurred or increased due to the situation of lower tax revenues and increased expenditures caused by a disaster. Governments that have faced this kind of situation after reaching an agreement with the International Monetary Fund (IMF) not to exceed a certain percentage of GDP in their fiscal deficits may obtain an exception after the assessment shows the situation to have been caused exclusively due to the disaster.

Table 5 shows an example of estimation of a disaster fiscal impact on a small island economy where a flu pandemic occurred. First of all, the second column shows the "non-disaster" fiscal situation if the disaster had not occurred; the third column shows the lower revenues on sales taxes and export duties that would not be collected due to lower production caused by the disaster, the bauxite extraction levy that would not be collected for the same reason; and the increased expenditures for medical attention and other services that were required. The last column on the right shows the resulting fiscal sector position after the disaster. The impact of the disaster and the fiscal sector may be obtained from the comparison of values from the "non-disaster" and the "post-disaster" columns. In the example, the disaster caused the current balance (current revenues minus current expenditures) to be negative by 2,991 million instead of the near-zero balance; the fiscal balance (revenues and grants minus total expenditures) to reach a deficit of nearly 7 billion from an expected 4 billion; and the primary balance (fiscal balance plus interests) to decrease from 13.3 billion to 10.3 billion (see table 5).

**Table 5:** Estimation of Flu Pandemic Disaster Impact on Fiscal Sector

| | Million J$ | | |
|---|---|---|---|
| | Non-Disaster | Losses due to Pandemic | Post-Disaster |
| **Revenue and grants** | **41,054** | | **39,246** |
| Current revenues | 39,651 | -1,807 | 37,844 |
| Tax revenues | 36,522 | -1,798 | 34,724 |
| Non-tax revenues | 2,399 | | 2,399 |
| Bauxite levy | 731 | -9 | 722 |
| Capital revenues | 711 | | 711 |
| Grants | 691 | | 691 |
| **Total expenditures** | **45,057** | | **46,244** |
| Current expenditures | 39,648 | 1,187 | 40,835 |
| Programs | 8,716 | | 8,716 |
| Wages and salaries | 13,626 | 1,187 | 14,813 |
| Interests | 17,306 | | 17,306 |
| Capital expenditures | 5,409 | | 5,409 |
| **Current balance** | **3** | | **-2,991** |
| **Fiscal balance** | **-4,003** | | **-6,998** |
| **Primary balance** | **13,303** | | **10,308** |

It is to be noted that in the above example, only taxes on production were considered since there was no destruction of assets, as may occur in the case of earthquakes, landslides and floods. Needless to say, when assets are destroyed, property taxes should also decline and be included in the analysis.

The example shown in Table 5 does not include the estimation of the impact of government capital expenditures on the fiscal sector since no reconstruction is required after the case of a health crisis such as the swine flu pandemic.

The Macroeconomic Assessment Team should again conduct this impact analysis in the three post-disaster stages mentioned above: i.e. first, assuming no recovery and reconstruction; second, assuming only recovery activities are conducted; and third, after disaster-resilient reconstruction is undertaken.

It should be borne in mind that when carrying out the second stage of the analysis, any lower tax revenues that may arise due to import-tax exemptions approved by the government and any expenditures to be made by the government (for instance, food imports to ensure food security of the population) to facilitate recovery are to be factored in. When conducting the third stage of the analysis, the impact of capital investments made by the government must be factored in by the Macroeconomic Assessment Team.