

MANUFACTURING



PDNA GUIDELINES VOLUME B



CONTENTS

■ INTRODUCTION	4
■ ASSESSMENT PROCESS	5
■ PRE-DISASTER SITUATION	6
■ FIELD VISITS FOR POST-DISASTER DATA COLLECTION	6
■ ESTIMATING OF DISASTER EFFECTS	7
■ ASSESSMENT OF DISASTER IMPACT	10
■ CROSS-SECTORAL LINKAGES AND ISSUES	11
■ ESTIMATION OF POST-DISASTER ECONOMIC RECOVERY AND RECONSTRUCTION REQUIREMENTS OR NEEDS	12
■ ESTIMATION OF POST-DISASTER HUMAN DEVELOPMENT RECOVERY REQUIREMENTS OR NEEDS	13

INTRODUCTION

The manufacturing or industrial sector is composed of several individual economic activities, according to the United Nations, International Standard Industrial Classification of All Economic Activities, Rev.4, New York, 2008. (<http://unstats.org/unsd/cr/registry/>). These include the manufacture of the following:

- Food products;
- Beverages;
- Tobacco products;
- Textiles;
- Wearing apparel;
- Leather and leather-related products;
- Wood and products of wood and, except furniture;
- Paper and paper products;
- Printing and reproduction of recorded media;
- Coke and refined petroleum products;
- Chemicals and chemical products;
- Basic pharmaceutical products and preparations;
- Rubber and plastic products;
- Other non-metallic mineral products;
- Basic metals;
- Fabricated metal products, except machinery and equipment;
- Computer, electronic and optical products;
- Electrical equipment;
- Machinery and equipment;
- Motor vehicles, trailers and semi-trailers;
- Other transport equipment;
- Furniture;
- Other manufacturing, and
- Repair and installation of machinery and equipment

It is to be noted that some countries – especially some developing countries – may not conduct all the manufacturing activities listed above, and that the list would need to be adjusted to the actual conditions of the country affected by a disaster. Furthermore, the manufacturing sector is usually widespread in geographical terms and involves hundreds or thousands of individual manufacturing units of different sizes and types, which make the assessment of disaster impact more complex and time-consuming, and may require conducting more detailed surveys of affected establishments.



ASSESSMENT PROCESS

This chapter describes the procedure to assess the effects of a disaster on the manufacturing sector, following the traditional methodology originally developed by the United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC) (Handbook for estimating the socio-economic and environmental impact of disasters, 4 volumes, United Nations, 2003), further developed by the World Bank's Global Facility for Disaster Recovery and Reduction (GFDRR) (Guidance Notes for Damage, Loss and Needs Assessment, 3 volumes, The World Bank, Washington, D.C., 2010), and now expanded and adopted by the Post-Disaster Needs Assessment (PDNA). Application of the methodology enables the assessment of disasters' economic and social impacts on the manufacturing sector, and the estimation of post-disaster needs for recovery and reconstruction.

After a disaster, the manufacturing sector may sustain damage that may include buildings, equipment and machinery, stocks of raw materials and of manufactured goods. In addition, after a disaster the sector may face changes in its production flows, including production decline and possible higher costs of production arising from the destruction of assets or other causes associated with the disaster (such as lack of raw materials, strategic inputs of water and electricity, temporary absence of labor, lack of working capital, etc.). Furthermore, some branches of industry – such as the food producers – that rely on the production obtained from other sectors of the economy for raw materials may suffer production declines even if no damage has happened to their facilities.

As in the case of other sectors, the value of damage in the manufacturing industry is measured initially in physical terms and is subsequently converted into monetary terms by using the reconstruction or replacement cost of the destroyed physical assets to the same quality and quantity standards, and using unit replacement costs that prevailed prior to the disaster. The possibility of reconstruction or replacement using improved, disaster-resilient standards, as part of a possible strategy of “building back better”, is to be introduced later when estimating financial requirements for recovery and reconstruction.

Changes in production flows in the manufacturing sector refer to the value of the decline in industrial output and to possible increases in production costs that may arise after, and as a consequence of, the disaster. Increases in production costs represent increases in intermediate consumption for the sector, and are to be treated accordingly when estimating macroeconomic impact. Post-disaster reconstruction activities, on the other hand, may actually produce an increase in the demand and production of certain manufactured goods. This case is analyzed later on in the assessment when estimating the possible positive impact of reconstruction.

The assessment of disaster's effects in the manufacturing sector is more complex than in other sectors of economic activity in view of the usually large number of existing industrial establishments of different types and size that are usually spread over large areas of a country. Therefore, a special sample survey of affected industrial establishments is to be carried out along with the industry sector assessment team's field visits, and its results are to be combined with the existing baseline

information in order to cover the entire universe of the sector. In addition, during the assessment, efforts are to be made to enlist the cooperation of industrial associations of the private sector, which usually have direct access to information from their associated individual members, and which have a shared interest in obtaining post-disaster assistance.

The manufacturing sector assessment team should keep in mind that in some countries, the public sector may actually own and operate selected manufacturing industries that may also have sustained disaster's effects.

For the estimation of damage in this sector, civil or industrial engineers are required to be part of the manufacturing sector assessment team, while industrial engineers and economists are required for the estimation of possible changes in production flows.

PRE-DISASTER SITUATION

The following baseline information on the characteristics and capacity of the manufacturing sector and its different branches of activity must be obtained to provide the quantitative basis required for the assessment:

- Number and size of industrial establishments, by branch of industry, existing in the affected area;
- Typical physical facilities in each of the above, including a description of the number and capacities of industrial buildings, equipment and machinery;
- Information on annual or monthly gross production for each industrial establishment; and
- Quantitative information on the usual destination of manufactured goods, whether they are produced for domestic consumption or for export to other countries.

This type of information is normally available in the country's most recent industrial survey or census, which may have been conducted either by the ministry or ministries of industry or by the affected country's Statistical Office. Further information may be obtained from the national accounts handled by the national Statistical Office. Since this information may already be out of date at the time of the assessment, projections to the current year must be made on the basis of recent growth rates for the sector.

Additional information may be obtained through direct contacts with private sector Chambers or Associations of Industry, which may have or may be able to obtain full particulars about the installed capacities and production of their associates. In fact, such private sector bodies may become partners in conducting the assessment, since they are likely to be very keen to define post-disaster needs for recovery and reconstruction.

On the basis of the previously listed information, a typology of industries, by branch of industrial activity, size, and private and public ownership should be defined for purposes of the assessment. The branches of industrial activities to be analyzed should be defined on the basis of the national accounting system of the country in question.

FIELD VISITS FOR POST-DISASTER DATA COLLECTION

Field visits to determine the effects of the disaster in the affected industries must be carried out by the industry sector assessment team, in combination with a parallel sample survey of typical industrial establishments, in order to assess the value of damage and to estimate possible changes in production flows for the sector.

Any existing reports – however partial in coverage – must be used in conjunction with the field visits and the sample survey mentioned above, to estimate the number of industrial establishments of each pre-defined type that may have sustained total or partial destruction and whose production may be affected directly or indirectly by the disaster.

The field visits by the assessment team, coupled with the sample survey questionnaire responses, should help define the average type and value of damage for each industry establishment type, the time of production stoppage or decline due to different reasons (such as destruction of premises, equipment and machinery; temporary unavailability of raw materials for processing and of essential inputs such as electricity and water; and temporary unavailability of sufficient labor), and the likely requirements for recovery and reconstruction. A copy of the questionnaire developed for this type of sample survey of industrial and trade shops is enclosed as an Annex. It requires only minor adaptations in order to capture information on the different types of industrial branches existing in the affected country, which are to be obtained from the system of national accounts.

During the same field visits, unit reconstruction and replacement costs for repair and rebuilding of physical assets as well as replacement of equipment and machinery are to be obtained, through interviews with industry executives and representatives. Any difficulties and limitations foreseen by the owners of such industries – for instance, in terms of financial and credit requirements, availability of raw materials and inputs, availability of labor, time required for replacement of specialized equipment and machinery, etc. – are also to be identified.

On the basis of the information thus collected and in combination with the baseline data on existing physical capacities and normal or non-disaster production, the industry sector assessment team must develop a scenario of how the sector is likely to function after the disaster until full recovery and reconstruction is achieved. This would include developing separate calendars for the repair and reconstruction of buildings and other facilities, replacement of equipment and machinery, and for the resumption of normal or non-disaster production levels over time.

ESTIMATION OF DISASTER'S EFFECTS

EFFECTS ON INFRASTRUCTURE AND PHYSICAL ASSETS

The value of destroyed assets (damage) in this sector is to be estimated on the basis of the cost to rebuild or repair the buildings and other associated facilities that were totally or partially destroyed, as well as the replacement value of the furniture, equipment, machinery and supplies that were also destroyed, assuming that they are being replaced with the same capacity and quality they had prior to the disaster, and using the unit reconstruction and replacement costs that prevailed at the time of the disaster. The higher costs involved in building back to improved, disaster-resilient standards and in retrofitting existing structures are to be included as part of the subsequent estimation of needs in the assessment. If for some reason, the equipment and machinery that was destroyed can only be substituted by more modern and capable machinery, the additional costs involved should be taken into consideration during the estimation of needs.

In view of the usually very large number, size and type of industrial establishments existing in the disaster-affected area, the damage assessment must rely on information obtained from the above-mentioned, parallel sample survey to define average values of damage for each type or branch of industry, and on counts of the number of each industry type that were either totally or partially destroyed. Then, an extrapolation of the value of damage to cover the entire universe of industrial establishments in the affected area or country must be made based on an assumed ratio of damaged versus total number of industry shops. In some cases, when an actual ratio has not been possible to obtain, use has been made



of the ratio of destroyed to existing housing units (obtained from the housing sector assessment) to be representative of the ratio for the case of micro-sized and small-to-medium sized enterprises. The accuracy of this extrapolation of course is of paramount importance, and the industry sector assessment team should devote sufficient time to discuss and agree on this ratio, so that results are reliable.

In addition to the estimated value of damage, the industry sector assessment team should obtain data on the average age of the destroyed infrastructure, machinery and equipment, and deliver this information to the macroeconomic assessment team. It is to be noted, however, that the value of destroyed assets is that of their replacement costs, and not that of their depreciated or “book value”.

Furthermore, despite the generally low penetration rate of insurance in developing countries, the industrial sector assessment team should obtain information on the possible existence of insurance on destroyed premises, machinery and equipment as well as on industrial production. The questionnaire for the industrial sample survey includes questions pertinent to the issue of insurance, and the industry sector assessment team should inquire about the matter during the field visits. The industry assessment team should also visit local insurance enterprises in order to obtain information on insurance coverage for the sector, the typical percentage of covered assets and production and the likely delay that may occur before delivery of insurance proceeds to the affected industrial establishments.

The industry sector assessment team should realize that the value of damage is not to be reduced by the amount of possible insurance coverage, and that the possible availability of insurance is to be used later on when estimating the value of

recovery and reconstruction requirements. In short, the existence of insurance – total or partial – will not affect the value of destroyed assets and lower production, but will diminish the amount of recovery and reconstruction requirements.

EFFECTS ON PRODUCTION OF MANUFACTURED GOODS

The estimation of industrial production flow changes must be made on the basis of several considerations, and the time frame for their occurrence is of paramount importance. Production flow changes will normally occur over the time period required to achieve full reconstruction of premises, replacement of destroyed machinery, and full availability and flow of raw materials and inputs. Production flow changes are likely to occur due to:

- Damages to the industrial capacity, in terms of destruction of buildings, equipment and machinery;
- Temporary stoppage of production due to lack of electricity or water;
- Temporary disruption of raw material availability and inflow;
- Temporary unavailability or shortages of labor;
- Future unavailability of raw materials in agro-industrial plants due to expected future losses in agriculture, livestock and fishery production that may occur after the disaster itself. This is common in the food-processing industry, but also applicable to other agro-industry enterprises that may face shortages of raw materials after the disaster, caused by future losses in primary agriculture, livestock and fishery production;
- Insufficiency or non-existence of working capital at the enterprise; and
- Possible changes (decline or increase) in demand of the manufactured goods, which may arise from possible generalized income decline of the population and from the expected high demand for construction materials for the reconstruction, respectively.

Therefore, it is essential for the industrial sector assessment team to obtain or derive a comprehensive calendar of how and when the above-mentioned limiting factors would be overcome, giving due consideration to the availability of and difficulties in obtaining adequate financing, and to the time required to import replacement equipment and machinery that is not manufactured in the affected country.

The changes in production flows to be estimated in the industry sector should include both possible production decline and possible operational cost increases. Production decline losses are to be estimated on the basis of the expected time frames required to achieve normal or non-disaster levels of production, after overcoming the possible limitations described above. Increased operational costs may arise from the following possible reasons:

- Payment of overtime to staff to attend and solve urgent problems immediately after the disaster;
- Rental of alternative premises while the destroyed or damaged ones are being rebuilt or repaired;
- Temporary acquisition of electricity and water for the production process from alternative sources, such as renting or acquiring portable power generators or resorting to purchase water from alternative sources other than the pipeline network; and
- Temporary acquisition of raw materials from alternative sources that may be more costly and/or located in faraway locations including other countries

The latter higher costs of production in fact constitute increased intermediate consumption for the industrial process, which would have a negative bearing on the added value of industrial production but which may increase commerce sales.

The estimated values of damage and changes in production flows should be broken down according to ownership by public and private sector. In this regard, it should be recalled that some industrial enterprises might be fully public or private, and some might be jointly owned.

EFFECTS ON GOVERNANCE AND DECISION-MAKING PROCESSES

In many countries, the manufacturing sector is normally in the hands of private sector entities, and the public sector provides regulatory and oversight functions. Other countries have publicly-owned manufacturing enterprises. After a disaster, governance may be negatively affected, and the assessment must include an analysis of such disaster's effects.

In that regard, five possible effects may have occurred, covering different areas:

- 1 Knowledge and skills: the manner and extent of technical expertise and institutional information for the sector;
- 2 Resources: human, material and financial, including availability of skilled labor, raw materials for processing, cost and price structure, etc.;
- 3 Systems, information management, communications and basic inputs; and
- 4 Legal authority, monitoring, oversight and reporting.

The assessment should include analysis of how the capacity of the public sector to oversee the normal functioning of the manufacturing sector may have been compromised (including the availability of registries, etc.), how the disaster may have modified the structure of costs for manufacturing that may result in changes in consumer prices of the manufactured goods, how the disaster may have caused non-performance of existing pre-disaster credit loans, and also the availability of skilled labor.

EFFECTS ON RISKS AND VULNERABILITIES

After a disaster, it is necessary to analyze risk for manufacturing industries. On one hand, pre-existing disaster risk may not have been evident, and some industries may have been located in disaster-prone geographical areas due to the absence or insufficiency of land-zone mapping and other urban planning standards. On the other hand, the disaster may have increased risk and vulnerability through instability of sloping terrain that may cause further landslides, the occurrence of aftershocks following an earthquake, increased fire risk after droughts, etc. In one recent case, extraordinary flooding of coal mines translated into insufficiency of electricity for industrial production and other purposes.

Such higher risks need to be fully analyzed and schemes for reducing or eliminating them must be devised as part of recovery and reconstruction with risk reduction.

ASSESSMENT OF DISASTER IMPACT

The industrial or manufacturing sector assessment team must make additional estimations in this sector that may have an impact at both the macroeconomic and personal or household levels, and deliver them to the separate assessment teams handling impact analysis.

For the macroeconomic impact analysis, the following figures must be estimated and delivered to the macroeconomic assessment team:

- The estimated value and calendar of industrial production flow changes (including production decline and possible higher production costs), expressed in current value, to be used for the analysis of disaster impact on gross domestic product and growth;



- The estimated value of industrial goods that will not be possible to export to other countries due to the estimated decline in production, and/or the estimated values of goods that may need to be imported from abroad due to shortages in their domestic production, since this will have a bearing on the balance of trade and payments;
- The estimated imported component of the industry sector reconstruction costs (including the items that are not produced locally in the affected country and that will have to be imported), expressed in percentage (%) terms of reconstruction needs once they have been assessed, to be used for the analysis of disaster impact on the balance of payments;
- Estimated values of tax revenues that will not be accrued by the government due to the decline in industrial production, to be used for fiscal sector impact analysis; and
- Values of decline in production and higher production costs arising from the disaster in the case of government-owned industrial enterprises, to be used in the analysis of disaster impact on the fiscal sector.

In order to estimate possible disaster impact at personal or household levels and on human development, estimates of industrial production decline and of associated employment losses are to be delivered to the team in charge of the subject. It is to be remembered that the subsequent losses in personal or household income that arise from production losses in the industry sector are not to be added to the estimated value of production flow changes, since that would result in double accounting of disaster's effects. Rather, these losses in personal and household income are disaster's effects measured at a different level of analysis.

CROSS-SECTORAL LINKAGES AND ISSUES

During the assessment, several cross-cutting issues, such as the differential impact of the disaster on gender and the possible impact on the environment, must be given due consideration.

For the manufacturing sector, the gender breakdown of the labor force – whether skilled or not – is an essential part of the baseline information gathered at the start of the assessment, together with information on wages and salaries. Once the estimated values of production losses for the sector have been made, separate estimates should be made for men and women of the number of jobs temporarily or permanently lost due to the disaster, together with how their personal incomes may have declined.

The manufacturing sector usually uses the natural environment either as raw materials or because the industries discharge waste into it. Due to a disaster, those functions may change and the environment may sustain damage to its natural or built assets or may provide lower quantities of environmental services. Such changes must be quantified by the assessment team with assistance from environmental economists, and expressed in monetary terms for inclusion in the assessment.

ESTIMATION OF POST-DISASTER ECONOMIC RECOVERY AND RECONSTRUCTION REQUIREMENTS OR NEEDS

The members of the manufacturing or industry sector assessment team need to be fully aware that the estimation of post-disaster financial requirements to achieve recovery and disaster-resilient reconstruction of the sector should not be initiated and carried out until they have delivered to the macroeconomic or global assessment team the estimated results of the value of destroyed assets (damage) and of changes in production flows. This condition is essential to ensure the accuracy and consistency of the entire assessment and to guarantee that no undue influence is exerted in the estimation of post-disaster needs.

Financial requirements or needs for economic recovery of the manufacturing or industry sector are defined as the amounts of funding required to ensure returning the sector to its normal or non-disaster level of functioning or production. The value of such needs would include the availability of credit to provide the affected industrial establishments with sufficient working capital to restart and conduct operations, which also may include financing to reschedule non-performing loans arising from the disaster. Such financing is not expected to necessarily come from the government; rather, the government should make the necessary representations to the development and private banking system to ensure the availability of sufficient fresh funding for recovery purposes. Recovery financial resources may be channeled to industrial entrepreneurs through a set of alternative ways, depending on their size and credit-worthiness, including: (i) cash grants to micro-enterprises; (ii) soft-term credit with lower-than-normal interest rates and long repayment periods for small to medium sized enterprises (SMEs), channeled through the development and private banks; (iii) possible temporary tax relief schemes for large industries that may be partially insured or non-insured.

The amounts required for such recovery financing may be estimated by industrial economists in the industry sector assessment team on the basis of the value of production decline caused by the disaster for each type and kind of industrial establishment. Experience acquired in the application of disaster impact assessment over the past 40 years shows that industrial sector recovery needs may range between 25 to 40 percent of the estimated value of production losses. Data arising from the sample survey of industrial establishments may assist the industry sector assessment team members to define the actual range of working capital needs as a function of production losses.

The industry sector assessment team should next deduct from the above-estimated recovery needs any expected amounts of insurance-on-production proceeds that would be forthcoming to the industrial enterprises that may have had such type of insurance, to arrive at the net value of economic recovery needs.

Financial requirements for reconstruction under a “building-back-better” strategy that includes disaster-resilient features are to be estimated by taking the estimated value of replacement of destroyed assets (including buildings, equipment and machinery) and increasing it by a certain percentage whose magnitude is a function of the degree of technological modernization and disaster-risk reduction defined in the reconstruction strategy. This means that the value of reconstruction needs will be higher than the estimated value of damage.

In this connection, the industry sector assessment team should keep in mind the fact that replacement of destroyed equipment and machinery may not be possible using the same characteristics and capacities the assets had prior to the disaster, because of technological obsolescence. Also, the replacement equipment and machinery may have improved characteristics and performance as well as different unit costs. Such issues need to be factored in when estimating post-disaster reconstruction requirements.

Experience acquired in this regard over the past 40 years of disaster impact assessment reveals that the range to be used for increasing needs over damages in the industry sector may range from 15 to 30 percent, depending on the type of equipment and machinery. The exact percentage to be adopted in each case of equipment and machinery to be replaced is to be defined by industrial engineers in the industry sector assessment team.

The estimated value of reconstruction needs is to be reduced whenever the industrial enterprises had insurance on destruction of assets, after data is obtained from insurance companies in regard to the likely value of insurance proceeds.

ESTIMATION OF POST-DISASTER HUMAN DEVELOPMENT RECOVERY REQUIREMENTS OR NEEDS

Interruptions or stoppage of industrial production may result in losses in employment and income for the sector's employed labor force. In order to estimate the possible personal or household income decline that the industry sector labor force may sustain after a disaster, the industry sector assessment team must deliver the estimated value of industrial production decline and of the time over which these losses would likely occur, to the team in charge of the estimation of human development impact and recovery needs. On the basis of this information, the latter team would be able to estimate the financial requirements for the funding of temporary "cash-for-work" schemes, and other similar assistance projects.