Section Two
Social Sectors

Section Two of the Handbook refers to social sectors. It includes chapters describing methods for estimating the affected population, and damage to housing and human settlements, education and culture, and health. We begin by describing the evaluation methodology, offering practical examples to help the reader better understand and use the Handbook.

In Section Five of the Handbook, we discuss how to estimate effects on employment and income and the differential impact on women as part of comprehensive disaster analysis. Each chapter on individual sectors –whether social or economic– cites specific sources the specialist can use to obtain basic information needed for a complete, comprehensive analysis.

I. AFFECTED POPULATION

The quantitative expression of the size and characteristics of the population affected by a disaster is a central part of the assessment process. One of the first tasks of the specialist in social themes is to work closely with the other sectoral specialists in the assessment group to define the geographical area that has been affected. Then one must estimate the affected population, including the number of victims, the situation of the displaced population and the site of possible reconstruction activities.

Estimating the affected population –the one item where all intangible factors come together– is essential for attaining an overview of the disaster and assessing the damage and losses in each sector such as agriculture, health and housing. This population evaluation provides an independent measure against which the consistency of the rest of the estimates can be gauged, and it constitutes the starting point from which to direct all national and international relief efforts and to set priorities for rehabilitation and reconstruction plans.

1. Definition of affected geographical area and population

Disaster assessment must begin with a definition of the affected area. The dimensions and characteristics of the affected population should be determined immediately thereafter. If possible, an assessment should be made of the post-disaster situation in order to obtain an overall idea of the intangible deterioration (or improvement) of conditions governing the standard of living. The population specialists will have to use their own analytical criteria in choosing among the wide array of conflicting means for defining and measuring the affected population. It is generally useful to begin with a broad view of the affected area and population and then narrow it down.

The data most often used for such estimates are available in the most recent population and housing censuses, as well as in population estimates and projections derived from these and other sources, which can be found in official or academic publications. These data can be complemented by information from household surveys or by vital or administrative records.

A single procedure should be used to define the extent of the affected area, an exercise that should be completed before the assessment process for each sector is begun. Affected population estimates provide a common and essential reference point for later achieving a more precise damage assessment for each sector.

The strategy of choice for determining the affected population will depend on the kind of phenomenon that caused the disaster. (Examples of selection strategies are described in Appendix I.). Other factors influencing strategy choice include the availability of detailed and up-to-date census data or population projections; unforeseen demographic changes that might render such projections invalid ; and the time elapsed since the most recent census. The greater the time elapsed since the last census, the greater the number of necessary estimate assumptions and uncertainties regarding the validity of the projections. The more the census data is disaggregated, the more likely the estimates will be correct. Because of the need for a rapid assessment, one can take at face value any very recent census data, especially if no important pre-disaster demographic events have occurred in the area since the census, such as significant migratory flows and the emergence of new settlement areas.

The following are possible approaches based on two alternative scenarios:

(1) Annual population projections at a detailed (e.g., municipal) level are available, the disaster has occurred no more than five years after the most recent census, and there have been no important demographic changes in the affected area since the most recent census. In this case, once the geographical area has been defined (identification of the affected municipalities), the projected population for the year can be taken directly, or it can be estimated for the date of the disaster using the following exponential growth formula:

$$Pd = Po^{*}\, e^{rt} \qquad (1)$$

where:

> Pd = the population on the day of the disaster;
> Po = the most recent official estimate of the population;
> r = the annual exponential growth rate for the year or period in which the disaster occurs; and
> t = the length of time in years between the initial projection date used to calculate r and the time of the disaster.

Example: An assessment is made that a disaster that occurred on November 10, 2000, has affected 15 municipalities with a projected population of 3 590 000 on June 30, 2000 and 3 695 000 on June 30, 2001.

$$P_{10/11/2000} = P_{30/06/2000} * e^{rt}$$

The growth rate r can be calculated by applying formula (1):

$$r = [\ln (Pd/Po)]/t$$

$$r_{2000\text{-}2001} = [\ln(P_{30/06/2001} / P_{30/06/2000})] / 1$$

$$r_{2000\text{-}2001} = [\ln (3\ 695\ 000/3\ 590\ 000)] / 1$$

$$r_{2000\text{-}2001} = 0.02883$$

If

> t = date of the disaster minus initial date of the population estimate
> t = (November 11, 2000 – June 30, 2000)/365
> t = (134)/365= 0.36712

then,

$$P_{10/11/2000} = P_{30/06/2000} * e^{rt}$$

$$P_{10/11/2000} = 3\ 590\ 000 * e^{0.02883*0.36712}$$

$$P_{10/11/2000} = 3\ 628\ 199$$

When significant changes have occurred in any of the affected areas (significant emigration or immigration flows before the disaster and after the census, for example), appropriate adjustments to the projected population figures and new projected totals must be made before undertaking the estimate shown above. Adjustments can be made by following the procedures shown in case (2). Once the new adjusted totals for the population of the affected area have been calculated, the procedure shown in (1) should be followed.

(2) The disaster has occurred five or more years after the most recent census, and, therefore, the projections at a disaggregated level may not be updated or do not exist. In this case, once the geographical area has been defined, either a projection of the population should be done or the available estimates should be analyzed to determine whether there is any evidence of municipalities whose population has increased or declined to a greater degree than that observed in the preceding inter-census period.

If there is no disaggregate population projection or if the existing one is out of date, it will be necessary to make a projection of the population in the affected area.

It is possible that projected information is available for a larger geographical area. In this case, the population of the affected area should be projected by applying the growth rate for the population of the department, province or state in which the area is located for the year or period that includes the date of the disaster.

Example: An estimate is required for the population of the area affected by a disaster that included 20 districts of Province X on January 15, 2001. According to the census taken on June 30, 2000, the corrected population figure for the area is 1 536 000. According to the department's own projections, the population of Province X will grow at a rate of 1.89 percent in the 2000–2005 period.

In this case, the estimated population of the affected area on the day of the disaster is calculated as shown below:

According to formula (1)

$$P_{15/01/2001} = P_{30/06/2000} * e^{0.0189*0.54110}$$

$$P_{15/01/2001} = 1\ 536\ 000 * e^{0.0189*0.54110}$$

$$P_{15/01/2001} = 1\ 551\ 789$$

In the previous example, it is assumed that no sudden demographic flows have occurred in the corresponding districts or municipalities, or that they were confined to displacement directly within the impact area. If this is not the case, it will be necessary to make separate projections for those municipalities or districts whose population growth or decline was greater than expected before continuing with the rest of the procedure. Additional sources of information (e.g., school rolls, new building permits and other administrative records) are necessary for such estimates, which involve specific methodologies.

The following two case studies demonstrate how to determine the affected geographical areas and population for two different disasters that occurred recently.

First case: In the case of an earthquake that occurred recently in a Central American country, there were conflicting versions as to the affected area and population. The population specialist made his or her own estimate by adopting the following procedure:

- To arrive at a broad initial estimate, the specialist marked on a map showing political and administrative divisions the geographical area where the population felt the earthquake, which registered V on the modified Mercalli intensity scale.

- The specialist then narrowed the area to include only those sections that reported victims or damage by reconciling official and unofficial partial data, figures obtained from an exhaustive study of press reports following the disaster and estimates gathered by visiting some of the affected areas.

- Some of the areas thus defined were virtually inaccessible, their population scattered or the latest census figures unreliable. The specialist then excluded those sections where only slight damage had been reported, and made "guesstimates" of damage in the remaining area (this was unavoidable given the limited time available to complete the assessment of damage).

- Census information was used as the basis for choosing the political-administrative unit with the most detailed population data. The area was thus defined, and the adjustments and projections needed to prepare a definitive estimate of the affected population were made.

Second case: In a similar case, where an earthquake affected a relatively inaccessible area of the Andes Mountains, it was necessary to determine the size and whereabouts of the population most affected by the disaster. The task was made more difficult because this was a rural area with a scattered population, and maps with current information about the population had not been located.

The following procedure was adopted:

- Information needed to identify the small, scattered population nuclei with sufficient accuracy was obtained from the cartographic bureau.

- By using this and other information related to material losses and the number of people affected, the population specialist was able to estimate the damage and the affected population in the hamlets, villages, and towns that were accessible by land. Information provided by teams sent to inspect nearby places (mainly to check the reliability and validity of the figures) made it possible to determine what percentage of the population had been severely affected in those localities. Although it was not feasible to visit large areas nearer to the epicenter, observations made in settlements with a concentrated population provided rough but clear evidence that as one got further away from the epicenter, the damage tended to diminish.

- With the resulting population data in hand, the specialist drew two concentric circles around the epicenter. The radius of the inner circle was the distance between the epicenter and the severely affected population centers furthest from it. The radius of the outer circle extended to the furthest population center in which the earthquake had been felt. Since the construction features of rural housing were also known, it was possible to estimate the size and location of the most severely affected population in the inner circle. Estimates of the total affected population (both urban and rural) were made on the basis of the population located within the circumference of the outer circle.

2. Software for accessing pre-disaster population data

a. General comments

As noted in the preceding paragraphs, the specialist must first define the affected area before estimating the varying degrees of population affectation. It is relatively easy to estimate the primary affected population by using available information about the number of people that are dead, wounded and housed in temporary shelters. To estimate the size of the remainder of the affected population (secondary and tertiary levels), baseline data on the total population living in the affected area at the time of the disaster is needed.

Once the disaster area has been defined, the sectoral teams work separately to gather and analyze information. Reports of deaths, injuries and shelter occupancy are the first field data on the primary affected population to become available. The analyst must then make estimates to compensate for holes in existing data on the pre-disaster population; here baseline information is essential. Population censuses (even when they were made well before the disaster) and household surveys (even if presented at less disaggregated geographical levels) may be used for this purpose. Detailed population data is generally more readily available when the affected area is very large (such as an entire region or province), but less accessible for smaller areas. In these cases, researchers should make use of computer software that is able to process population data from censuses and household surveys. A number of such software alternatives exist.

CELADE has developed and offers free of charge a programme called Redatam that can process population information from censuses and/or household surveys. Its ease of use and availability at no cost are advantages that cannot be overlooked. Furthermore, it has been tried and proven by ECLAC during several special assessment field missions.

Redatam G4 and its interface applications, such as R+G4xPlan, are designed to help generate population indicators from a variety of data sources. This facilitates decision-making at different geographical levels, from a country down to a municipality. The programme’s features make it ideal for estimating the population and its characteristics in user-defined disaggregated areas, such as a set of districts added to another group of city blocks or rural sectors. Such a user-defined selection in combination with basic census or survey information can serve as a starting point for estimating the characteristics of the population and housing in these areas. These findings can be used to project population size. Alternatively, the increase in population up to the date of the disaster can be estimated using the methods mentioned earlier. This process is shown in Appendix III.

b. R+G4xPlan (pre-designed interfaces)

CELADE also makes available another Redatam-related tool. This is a Redatam interface known as RxPlan that makes it possible to use the database without needing to know how to use Redatam directly. This interface, which is very simple to create, can be generated before undertaking an assessment activity. It makes it possible to build modular applications tailored to the needs and specifications of the country and the disaster and to create predefined indicators (e.g., the number of households headed by women and the number headed by men; the number of unoccupied dwellings in comparison to occupied ones; the distribution of the affected population sorted by basic characteristics such as age, sex, marital status, education and employment) and to produce thematic maps.

Its interface consists of question forms or windows that produce output tables once a geographical area has been selected. It requires a census database in Redatam format and a map, if one is available.

This tool can assist in gathering information in a study of victims according to the optimum disaggregation level by considering the following items of information that should be obtained from data collected before and after the event:

- Total affected population (dead, wounded and those who have suffered material and economic loss);

- Disaggregation by age, sex and other basic characteristics; and

- Identification of high-risk categories (children under five, nursing mothers and pregnant women, the disabled or wounded and the aged).

3. Estimating the affected population

Since the population may be affected in different ways and to various degrees depending on the source of the disaster and the resulting damage and losses, we can break it down into primary, secondary and tertiary categories.

We thus establish a link between the affected population and the type of direct or indirect damage sustained, which may consist of lost capital or production or an increase in the cost of providing services. This link allows for a classification of the affected population in accordance with the three main components of total damage mentioned above.

a. Primary affected population

This category includes people affected by the direct effects of the disaster and consists of the dead, the injured and the disabled (primary trauma victims), as well as those who suffer material losses as a direct and immediate consequence of the disaster. This segment is made up of people who were in the affected area at the time the disaster occurred.

b. Secondary and tertiary affected population

These two types of affected population are defined as those segments of the population that suffer a disaster's indirect effects. The difference between the two groups is that the secondary affected population is located within or near the boundaries of the affected area, while the tertiary affected population usually resides outside or far away from the affected area.

Estimates of damages and losses sustained by secondary and tertiary affected population will be given by the sectoral assessments. Examples of the secondary affected population are the merchants in the affected area and people traditionally involved in marketing the lost crops, both of whom lose income as a result of the recessionary post-disaster environment. Examples of the tertiary affected population include people who have to assume the higher transport costs generated in the affected area, although they themselves live and work outside of it, and those who lose some benefits because public expenditure is reallocated to priority emergency activities.

In slowly evolving disasters, such as droughts or floods, secondarily affected people often take refuge in institutional or informal shelters. It is useful to keep a separate record of such people since their presence may provide an early warning of significant internal migration flows.

c. Assessing the direct and indirect effects on the population

Each sectoral assessment measures, in monetary terms, all direct damages and indirect losses sustained by the affected population. Damage to personal property is usually recorded in the housing sectors, while losses in production are included in the assessments of the productive sectors. Estimates of employment and income losses are made separately, as shown later in the Handbook.

The monetary loss due to deaths caused by a disaster may be high. From a methodological standpoint, it is possible to allocate a monetary value to such losses based on the victims' expected remaining period of useful life and the corresponding income that they would have earned, or based on life-insurance benefits. However, we do not engage in these estimates for two reasons. First, the purpose of this Handbook is to determine an amount of damage that can reflect the socio-economic impact of a disaster on the economic performance of an affected country or region. Second, using per capita earnings would result in the adoption of "second- or third-class" citizenship standards when comparing the victims with those in relatively more developed countries. In conclusion, loss of life is considered by ECLAC to be a permanent loss to society that cannot be substituted or recovered.

The most widely recognized effect on disaster victims is the deterioration in living standards. The physical environment is degraded, as are networks of social interaction whether they be on-the-job contact, communications systems, culture, and recreational activities; people begin to feel insecure and lose confidence in their way of life; access to education, health, and food is made more difficult; and the loss of homes and belongings reduces normal living standards.

Effects differ depending on the sex of the affected population: men generally sustain higher capital stock losses, while women usually end up facing increased reproductive workloads.

Other effects on the population –psychological harm and societal change, the solidarity or generosity shown in confronting the disaster, the despair of those who do not receive aid and many similar intangible costs or benefits– can only be estimated using indirect methods.

Disasters also produce psychological after-effects. Episodes of depression, anxiety, fatigue, nervousness, irritability, loss of appetite, modified sleep patterns and psychosomatic symptoms, such as diarrhea and headaches, have been observed and measured both during and after the emergency stage. Psychiatric interpretations of disaster effects suggest that damage of this nature may have significant short- and long-term effects. On the other hand, sociological research shows that while disasters produce significant stress, victims do not seem to behave in a dysfunctional way: profound pathologies are not common, psychological damage eventually disappears, and recovery is speedy.

The affected population's response mechanisms do not coincide with the alarmist version of events that dominates the media. Experience shows that victims tend to respond positively rather than panicking. Although cases of looting, plunder and social disruption have been observed in some cases, expressions of solidarity and support are the rule rather than the exception. Therefore, the population specialist should not try to estimate a probable cost for social disruption as a specific aspect of damage to victims.

Few events reveal societal inequalities better than the destruction caused by a disaster, especially in developing countries. The devastation suffered by the poorest people is so disproportionate that it becomes obvious where the cause lies: one is vulnerable because one is poor. These population strata are disproportionately affected by environmental degradation and the depletion of natural resources that are the basis of their urban and rural livelihood. In addition, inequalities among men and women become more acute. It is not unusual, therefore, for disasters to be followed by sweeping societal changes. To an even greater degree than intangible effects and psychological damage, the effects that cause societal change defy precise identification and measurement when making a quick damage assessment.

4. Estimating demographic effects after a disaster

Direct and indirect demographic effects of disasters are apparent in the components of population growth (mortality, fertility and migration), increased morbidity rates and/or the aggregate effect on population growth itself.

Direct effects on mortality rates refer to deaths that were an immediate consequence of the disaster and are included in the fatalities report. However, there are indirect effects on mortality rates that lead to loss of life in the short or medium term. In the short term, deaths, both in temporary shelters and elsewhere, may occur as a consequence of the increase in morbidity (such as acute respiratory ailments and infectious or parasitic diseases) caused by the disaster.

The deterioration in living conditions stemming from the disaster may still be felt in the medium term as a result of increased vulnerability and the deterioration of health, housing and basic-service infrastructure in general. The effects of a disaster on mortality and morbidity rates are determined in the health chapter of this Handbook. It is worth mentioning that the assistance provided after a disaster may have an indirect positive effect on the mortality rate if it brings about changes in health policy that improve the coverage and quality of services.

To estimate the specific demographic impact on the mortality rate by age and on the average life of the population, it is necessary to determine the age and sex structure of direct fatalities (and indirect ones, if feasible). Estimated life expectancy is calculated with the aid of a life table. The same table is then used to obtain a different average life expectancy figure by adding the additional fatalities caused by the disaster to each age and sex group. The difference between both is the number of years lost as a result of the disaster.

It is not as easy to calculate the indirect effects on fertility. The postponement or cancellation of marriages and a temporary drop in the frequency of sexual relations after a large-scale disaster or one with a long-lasting impact might lead to a short-term decline in the fertility rate. But there might be an effect whereby it recovers in the long term, as has been observed in the case of wars or other great crises. Sudden disasters, such as earthquakes or hurricanes, have substantial effects on the fertility rate only if the primary affected population is significant, thereby reducing the number of women of fertile age.

The link between cause and effect is very clear in the case of a disaster's impact on migration, but population specialists are likely to encounter difficulties in assessing the effects. Loss of property (land, homes, etc.) as a result of a disaster may lead to temporary population displacement. Other medium-term effects may be more significant. A change in production structure and in levels of employment may have a significant destabilizing effect. For many, this may create an opportunity to look for a new job or to emigrate, as was the case in the 1985 Mexico City earthquake. Since it is impossible to assess these impacts immediately after a disaster occurs, this analysis will have to be done later.

The full impact on demographic growth may be assessed only after the effects on the three previous components are known. Given the difficulties mentioned earlier in relation to fertility and migration, it will at least be possible to calculate a disaster's impact on demographic growth by taking loss of life into account. For example, if a disaster causes 200 deaths in an area whose population, in the year of the disaster, would normally have grown from 35 000 to 37 000 (that is an absolute growth of 2 000 people), it may be estimated that 10 percent (200/2 000) of the area's total growth failed to materialize as a result of the additional loss of life arising from the disaster.

Finally the effects on the elderly and the young must not be overlooked. These are especially vulnerable population groups that can be affected more intensively depending on the type or origin of any given disaster. A large impact on these groups may modify the prevailing demographic structure of the affected country, region or locality.