4.3.2 MISSING PERSONS' LIST

This task is done to collect "the names of the persons known or thought to have been present when the disaster occurred and are not listed as survivors." [29] The primary objective is to rapidly produce a reliable victim list,[29] because many of the names reported are usually not involved in the incident. [9] In some cases, these efforts would also be hampered by the unofficial numbers published by independent news organizations. While this is not a major problem in airline crashes and other site-specific disasters, it has proven to be an overwhelming task after MCND. In the South Dakota flash flood, for example:

> *"the initial missing person's list had over 2,000 persons as many people phone in to report friends or relatives thought to have been in the disaster area."* [16]

The total number of presumed victims is critical, because any decision to stop searching for bodies must take into account the number of survivors and victims recovered with the number of people on the missing person list. There will be cases, however, "in which it will be very difficult to assert who and how many were present, and therefore who has died." [9] This is often the case in widespread disasters, whether natural or man-made, when it is difficult to establish the exact number of people present in the disaster area.

Missing persons' reports will usually be received by telephone, but in cases where communication services have collapsed or in rural areas of DC, it may be necessary to set up a well identified "missing persons' office" in order to receive such reports in person.

4.3.3 CLEAN UP AND INITIAL IDENTIFICATION

After a natural disaster, "when a cadaver arrives at the morgue, the first task attended to is cleaning in order to give the workers a clear image of the body" [4] but also to make the "visual identification process for the relatives as painless as possible." [9] This careful

attention given to the bodies can be seen basically as an "effort to restore a human composure to the body and as an act of respect." [4] The use of disinfectant is an unnecessary precaution as "there is no evidence of the real protecting value of spraying bodies with disinfectant, lime or cal viva." [12]

In the aftermath of a disaster, "identification of the dead is considered to be extremely important for two different but very essential reasons: firstly, by the family members and by the community in general, in order to perceive the loss of a relative or friend as a concrete, real event which attained closure in their minds, and second, by the authorities in the legal sphere." [5]

Body ID has two phases: "first, the *technical* phase of collecting *post mortem* data on the deceased and their belongings, and a second phase, the *tactical or positive* identification were the PM data is matched to AM records." [10] These processes are practiced in two distinct forms: ID of single unknown persons, and ID of large number of unknown bodies after a MCND.[34] Due to the large amount of information to be gathered, compiled and analyzed, the tasks involved in the ID of many bodies is a more demanding and elaborate process than identifying single unknown persons, which is quite organized and routine.[5] According to Blanshan (1977), "it is the differences in each of the phases of body handling that distinguishes disaster body handling from normal death procedures."

MacMeekin (1980) developed a four phase organizational concept in the identification process of mass casualties:

1) Preliminary evaluation;
2) Data collection;
3) Data analysis; and
4) Final verification of the identity.

While the author concludes that "the process of identifying the victims of a mass disaster can be simplified if approached in a logical and systematic manner, it is also emphasized that the flexibility of the process lends it to general application." [26]

PRELIMINARY EVALUATION

This phase involves the initial analysis of "the location and nature of the disaster, the number of casualties, the conditions of the bodies and the availability of resources." [26] Based on this preliminary information, the selection of the identification methods and type and number of personnel to assist in the process should be made. [26] At this point, "the social, cultural and legal aspects of the jurisdiction to proceed with the investigation should also be ascertained." [26]

DATA COLLECTION AND RECORDING

This is a very intensive phase in which the missing person's group is assigned obtain the AM records and any other valuable information that is required for the comparison with the PM observations.[26] Initial steps should also include procurement of a reliable missing persons' list to avoid unnecessary work.

The AM and PM data-recording processes described below are based on the use of the Interpol Victim Identification forms, "which will ensure that comprehensive information is obtained and coded, facilitating the comparison of both sets of data." [29]

Ante Mortem data

This part of the process involves gathering all the possible information that might help in the identification of a body that has been gathered previous to their death. The missing person's physician and dentist, his employer and friends should be contacted if at all possible, particularly the relatives as "they are valuable sources of information and records." [23] Many countries do not keep systematic dental and X-ray records, fingerprints or DNA databases for the general public due to the enormous cost involved. In the absence of such records, "the identification team should accept any type of identification information that will ensure the correct matching of identities," [34] such as photographs, dental and medical records. As a result, the task "could become a huge administrative burden where hundreds or thousands of records could rapidly overwhelm the physical facilities and mental capacity of the investigators."[34] In such situations, the use of

computerized databases might significantly reduce the workload. This is done in sharp contrast of a situation to a natural death situation, where there is no need for colleting AM data as "positive identification is a simple matter of the next of kin acknowledging the identity of the body." [4]

Post Mortem Data or technical identification

While this examination should be thorough and complete, "data must be collected as quickly as possible before changes in postmortem tissue obscure their presence." [26] The procedure consists of 1) taking fingerprints, 2) providing each body with a label showing the corpse number, 3) full description and recording of external characteristics of the body, 4) removing the clothes and other personal effects such as jewelry and money, and 5) photographing the body.[26] In the 1985 Earthquake in Mexico, for example:

> *"...all bodies were identified with a card that had the address where death had occurred, date, time, apparent age and sex, as well as external identifying marks and characteristics of personal belongings."* [17]

At this stage, the value of collecting body fluids for histologic and serologic studies is dependent upon the availability of AM data records for comparison. [26]

Besides the technical purpose for recording PM data, it can also keep relatives from viewing a large number of bodies as they can quickly look in the lists for a body that fits a general description: [9] this technique was used in the Halifax explosion, when persons came to the morgue looking for family members, friends or colleagues.[9] In a different manner, the information could be also published in local newspapers with the hope that someone would recognize the descriptions. Therefore, even when a computerized system is not available, all information that might help in identifying the victim has to be recorded.

Tracking the movement of the bodies through the different PM examination areas at the morgue is laborious; therefore, McMeekin (1980) "suggests assigning one person to follow one body at a time through each procedure station and to ensure that all paperwork and labels are correctly identified and intact." [26]

The identification of bodies following a MCND is a multidisciplinary operation.[21] The methods available are well known and include: [33,35]

1. Visual identification;
2. Fingerprinting;
3. Dental examination;
4. Radiological examination;
5. Forensic anthropology; and
6. DNA examination.

The choice of the method to be used is dependent on: 1) the nature of the disaster; 2) the number of fatalities and whether they are "known" (list of persons present at the disaster is available) or "unknown" victims; 3) the availability of technical resources; 4) the international support received, 5) the access to the disaster site; and 6) the context of occurrence. Another important factor is whether the corpses are recognizable and can be shown to relatives.

After careful consideration of the above factors, "there needs to be full accordance at an early stage among the identification group of which methods and identifying criteria will be used." [35]

Much of the literature reviewed in this paper recommends the use, whenever possible, "of all available means of identification in order to increase the validity of the identification." [33] In several MCND where "one or more victims have been initially misidentified when only one mean of ID has been used" [33] support this position.

DATA ANALYSIS

The aim of this phase is to ascertain the identity of every body by comparing and matching AM and PM information.[29] This is a crucial task in disaster body handling, as Blanshan and Quarantelli (1981) suggest:

> *"The establishment of a positive or legal identity is perhaps the most significant task in the management of the dead following a mass disaster....it is only after an identification has been revealed that the body has once again become a person."*

Three methods are in common usage: [26]

- Spotting;
- Mix and match; and
- Exclusion.

The first of these involves reviewing the AM records to "spot" obvious identities and "to stimulate the recollection of PM data that may have been recorded hastily, incompletely or not at all by the investigators." [26]

The "mix and match" method involves 2 steps: firstly, "logical grouping of records into groups that share certain characteristics in common: race, sex, age, availability of dental or fingerprint information, and second, the comparison of these factors. "As this mixing occurs, identities (matches) may become apparent." [26] Mix and match is the most valuable tools in data analysis because it provides "the best possibility of an identity match that can be subsequently verified by the forensic team." [34] However, it is recommended that "no positive ID should be based entirely upon this preliminary match." [26]

The "exclusion" method is of restricted use and of limited value, as there are risks in its application, particularly when trying to match the unidentified bodies to a missing persons' list that turns out to be incorrect.[26]

Regardless of the method selected, it is important to recognize that errors do occur while observing and recording AM or PM data, and the only way to minimize them is to adopt a systematic approach with strict quality control measures and the use of standardized forms.[26] Finally, when a preliminary match is found, it should be verified again by the all the working groups before it is forwarded to the next ID phase.[26]

4.3.4 POSITIVE OR TACTICAL IDENTIFICATION

This phase corresponds to the "final verification of identity phase" proposed by MacMeekin (1980). After a potential ID has been discovered, the information is sent to the identification board, usually formed by the most senior ID experts, who reexamine and confirm the findings that support the match before a positive ID is made.[26]

With unidentified bodies, "a thorough reexamination should be performed to ensure that no pertinent clue has been overlooked," [26] and all findings about the body and its belongings should be documented before its disposal. Regarding body fragments, "it may be possible to match them with previously identified bodies by means of blood grouping, injury pattern or hair and fingernail characteristics," [26] but in case a match is not possible, "unidentified fragments should be documented and retained for a reasonable period of time after which the decision to dispose of them must be made." [26]

4.3.5 CONSERVATION OF BODIES AND STORAGE

Any of the methods available for the conservation of bodies aims to retard the body's decaying process [36] Two modalities are described: temporary conservation, ideally by keeping the bodies at 4°C, [3] and final conservation through embalming.

Embalming is encouraged in cases where bodies need to be stored awaiting further ID investigation.[10] However, "no embalming or other thanato-cosmetic procedures can be allowed before the body has gone through a complete PM examination, as they alter the original features of the body." [10]

In warmer climates, temporary conservation of the bodies is particularly important and efforts should be made to obtain "context specific" means to keep bodies refrigerated, not frozen.[29] In the 1985 Earthquake in Mexico, unidentified or unclaimed bodies were maintained at cold temperatures with blocks of ice[17] in contrast to the Rapid City flash flood, where bodies were kept in a refrigerated truck.[5] Conserving the bodies is an important activity that should not be overlooked, as the lack of means to avoid rapid body decomposition has been used in the past as a justification for the inappropriate disposal of bodies in mass burials or mass cremations.

STORAGE

Unless there is already a morgue with a large storage capacity, one of the major problems following a MCND is the identification of a suitable place for the "temporary morgue." In remote areas, it may be necessary to establish this on the scene, sometimes in tents, "as the benefits of working near the site far outweigh the difficulties of transporting bodies away from the scene." [29] This place is usually the primary storage site for all the bodies, and the use of several morgues should be avoided in spite of how well prepared they might be.[10] In the Rapid City flash flood, for example:

> *"...once bodies were embalmed at different funeral homes, they were taken to the central temporary morgue, which had been set up at a hospital building unoccupied at the time of the disaster."* [5]

Regarding the logistical specifications of the mortuary as well as the organization of the corpses on arrival, there are clear guidelines to be followed (Annex 2). The use of surgical masks by litter bearers, morgue personnel and identifying relatives should be abandoned since "this only leads to further mystification of the old belief about the contagiousness of the deceased and death." [10] However, those who are directly handling the corpses may be exposed to hazards such as blood borne viruses, gastrointestinal infections and tuberculosis.[12] For these workers, simple protective equipment (e.g.,

disposable gloves) and training should be provided, and suitable precautions (e.g., vaccination for hepatitis B and Tuberculosis) as well as hygienic practices must be followed.[12]

4.3.6 DEATH CERTIFICATION

After the establishment of a positive ID, the delegated authorities can issue a certificate of death.[35] In addition to the emotional aspects related to the need of *certainty*, the legal aspects of a death certificate are of no less important, as they facilitate civil litigations proceedings (e.g., compensation of damages or guardianship of minors) and insurance claims.[35]

Although death certification of large numbers of dead is an enormous task, previous experiences show it is feasible when careful pre-planning and implementation of that plan is done. For example, after the 1985 earthquake in Mexico, the local authorities issued a total of 4,524 death certificates or body release forms from September 19 to October 30. According to the report, this enormous task of identification was accomplished due to the rapid presence of forensic physicians and representatives from the coroner's office at the disaster site.[17]

Regarding the certification of incomplete bodies, "the finding of an identifiable part of a body, whose loss is incompatible with life, is sufficient to conclude that the particular individual has perished in the disaster." [35]

In some cases the body of an individual is never found, or only fragments of unidentified bodies are retrieve, and yet the individual is known to have been present at the disaster site. In this instance, the issue of a death certificate is still possible when a policy investigation and other legal requirements to confirm the loss of the individual have been concluded.[35] After the 9/11 terrorists attacks in New York, "1361 death certificates were issued for people whose bodies were never found." [25]

CAUSE OF DEATH

The need to determine the exact cause of death is dependent on the type of disaster, the context where it occurred and on the medico-legal requirements of the country. [37] From the medico-legal identification perspective in a MCND, there is seldom an effort to establish the mode of death, as the investigation of the incident does not relate to human factors.[37] In the floods of Rapid City and in the Halifax explosion for example, the process of managing the bodies did not attempt to establish cause of death.[9] On the other hand, after the Kobe earthquake in Japan, due to legal requirements, the cause of death of all fatalities had to be established before a death certificate was issued.[9] Similarly, in the 1985 Earthquake in Mexico, autopsies were performed on some on the victims.[17]

In addition to the legal justification of performing autopsies to all the victims after a MCND, another purpose is to demonstrate the exact cause of death.[38] From that standpoint, it has been argued that "disaster autopsy is, above all, an exercise in preventive medicine." [38]

Although autopsy is a recommended standard practice of the Convention on International Civil Aviation, Mason (1989) recognizes that there are contextual difficulties in performing complete autopsies in many parts of the world as "there are religious, political and legal factors in clear opposition to this practice." [38] In addition, extensive PM dissections require time, personnel, and money, which might not be available in many DC.[37] For these reasons, it has been acknowledged that autopsy could remain as a procedure to be requested on individual bases but not as a systematic practice following a MCND.[37]

Deciding the cause of death will certainly lead to further delays in the release of a death certificate and in the distribution of the body to their relatives.[9] This delay may cause further distress and can result in pressure from families, authorities, and even the media, to quickly release the bodies. For instance, in the Mexico Earthquake in 1985, relatives of victims complained for the release of the corpses by organizing public protests.[17] In such

cases, a careful balance between ensuring a prompt release of the bodies to their relatives and guaranteeing the thoroughness of the investigation must be sought.[35]

In such situations, Busuttil and Jones (1992) proposed that the information regarding the exact cause of death could be given in two stages:[35]

1. After confirming the ID of the victim and once a thorough examination of the body have been completed, it may be possible in the majority of the victims to provide a general cause of death, e.g., drowning after a flash flood or multiple trauma after an earthquake. In such cases, the issue of a death certificate should not be delayed.
2. The establishment of the exact cause of death can be ascertained at a later stage after performing additional scientific investigations such as histological and toxicological examinations.

This two-stage death certification is a standard procedure performed on the victims of site-specific disasters, [35] and it might prove to be also a suitable practice to follow in the death certification of victims following a MCND.

4.3.7 DISPOSAL OF THE DEAD

After a positive ID of a body and issue of the death certificate, the bodies and personal belongings should be release to their relatives as quickly as possible.[10] At this stage of the process, the relatives are able again to follow the "routine" tasks which are performed in normal death situations, [5] in accordance with their family customs and religious beliefs.

In some cases such as in the 1985 Earthquake in Mexico, the distribution of bodies to family members has been done at the disaster site with the approval of the competent authorities, after relatives amply identified the body and a death certificate had been issued.[17] The advantages of such procedures are both operational, to avoid overloading the already limited storage capacity of the temporary morgue, and social, to allow the

relatives of the victims to organize the funerals as early as possible. However, in cases where there are a large number of unidentified, unclaimed or highly advanced decaying bodies exceeding the storage capacity of the local facilities, there is a rather urgent need to make suitable arrangements for the disposal of the bodies.

Geography, religion and social systems influence burial practices, and although burial in the ground is the oldest and simplest method of disposing of the dead, cremation, embalming and other type of ritual display of the dead are also common practices in many cultures.[22] For this reason and whenever possible, it is important to select the most suitable method to dispose the bodies according to social, legal and religious customs.[39] In general, it has been widely suggested that burial of bodies in individual, numbered graves is the method of choice for the rapid disposal of the dead[3] following a MCND. In such cases, photographs and full descriptions of the body and personal belongings must have been previously documented.[3] While in most countries there are cemeteries, after MCND it may be necessary to find a new suitable place to locate the bodies. For example, in Jimani, Dominican Republic,

> *"...an international cemetery was created for the burial of the bodies of Haitians and Dominicans after the flood destroyed the local cemetery."* [27]

Despite the little evidence of microbiological contamination of groundwater from burial[12], there are several issues to consider when choosing a new burial site and "distances are best chosen based on local hydro-geological conditions and with the agreement of nearby communities." [12] Once the site has been identified, individual graves can be dug manually or by mechanical means according to the context, the number of victims and the resources available.[3]

Unfortunately, misinformation about the infectiousness of large number of decaying bodies and the resource constraints faced by local services added to a lack of

preparedness, have sometimes led to the undignified disposal of bodies in mass graves or mass cremations, impeding any possibility for the identification of victims.[13]

Following a MCND, this practice cannot be justified on public health grounds as most of the victims usually die from injuries or trauma directly related to the disaster rather than from "acute or epidemic-causing infections" [12] such as typhus, cholera, or plague.[40] Moreover, although natural disasters can enhance the transmission of certain diseases, particularly water borne and respiratory infections, "outbreaks of communicable diseases following natural disasters have been unusual during the past 40 years." [40] On the other hand but also of public health concern, it has been suggested that performing mass burials or mass cremations represent a health risk to the surviving community, as disposing of bodies in such ways does not allow proper grieving.[13] Without the presence of a body to evidence an individual's death, there is a possibility of prolonging the grieving period.[41] The negative consequence of long periods of grief in the bereaved has psychological effects as well as physiological dysfunctions as demonstrated by several studies showing a high mortality rate in persons with protracted periods of grief.[42]

A part from these negative psychological and physiological effects, there is also a natural resistance from the general public to disposing of dead bodies in mass burials or mass cremations.[29] After the Halifax explosion, for example, Army plans to cremate a large many unidentified bodies had to be abandoned as this created public indignation among the affected community. As a result,

> *"...the authorities carried out mass funerals where cadavers were placed in individual caskets and buried in numbered graves."* [9]

In both the Italian dam disaster which left over 1,800 persons dead in 1963 and the Iranian earthquake in 1962 which killed about 12,000:

> *"...the public authorities had to abandon plans for mass burials due to the strong public outcry when such a disposition of bodies was proposed."* [4]

Similarly, in the Mexican earthquake in 1985:

> *"...people gathered in the streets in order to protest the use of common burials and cremations.*[17]

Cremation "is not justified on health grounds" [43] and mass cremations are unpractical time-consuming operations that should be avoided after a MCND,[12] particularly if identification of the victims did not take place.

After a MCND, human fragments are frequently retrieved that cannot be match with any particular individual. In such situations, the local authorities, in consensus with the legal and religious representatives of the community affected, should jointly decide about their disposal.[35]

Finally, while individual ceremonies can be organized by families and friends, it has been suggested that in order to begin the grieving process in the affected population as a whole, it is important to carry out collective burial ceremonies.[3]

4.4 PSYCOLOGICAL EFFECTS OF HANDLING DEAD BODIES

Any type of disaster, whether man-made or natural, is a devastating life event that presents a difficult coping process for both survivors and disaster workers. Many of the surviving victims of a MCND will experience acute stress syndrome, with disruption in "reasonable mastery", "caring attachments" and "meaningful purpose in life," the three

domains related with good physical and mental health.[31] In the first 2 weeks after the floods in Dominican Republic, a total of 1266 medical consultations were reported, 10.8% of them due to psychological problems.[19]

It has been reported that those who support the survivors may also present clinical symptoms of trauma similar to those of direct victims.[31] It is now widely recognized that disaster workers who are directly handling the bodies are at increased risk of developing posttraumatic stress disorder.[44] In the Halifax explosion, for example, the professional body handlers who were accustomed to deal with one of two bodies as a routine activity:

> *"...expressed their work dealing with hundreds bodies as depressing and emotionally draining."* [9]

Therefore, the issue of psychological trauma in both the survivors and those involved in body handling must be addressed by the authorities and relief agencies responding to a MCND.

5. CONCLUSIONS AND RECOMMENDATIONS

The process of handling dead bodies after a MCND is a complex, laborious and multidisciplinary operation with two aims: to enable the positive identification and timely release of bodies to their relatives. This clearly entitles that all the necessary legal and medical requirements must be followed with as much respect for the bodies as possible.

The management of the dead after a MCND is a neglected aspect of Disaster Management, and therefore, is frequently the result of an improvised response. Although proper disaster body handling is feasible, careful pre-planning and preparedness with the commitment and support of the international community is required, particularly in DC which already bear the greatest burden of exposure to natural disasters.

Much of the documentation in the management of dead bodies after a MCND comes from site-specific disasters and from developed countries. There are significant contextual differences between developed and DC, which influence the process and the actors involved in disaster body handling. On the other hand, while some of the tasks in managing dead bodies after a MCND and "site-specific incidents" are similar, there are important legal, operational and social discrepancies. For these reasons, further research in the management of the dead following a MCND, particularly in DC is needed. By answering some of the questions initially posed in this document, we will improve our understanding and therefore, our response to such events.

The theoretical framework used in this document provides a useful tool for the analysis of the management of dead bodies following a MCND in developed and DC, and it could also be used in the future for planning and evaluation.

RECOMMENDATIONS

Decision-makers at all levels must ensure that the proper management of mass casualties becomes part of every national disaster preparedness plan. The role of the international disaster management organizations should be to provide comprehensive guidelines and a

legal framework of support to the authorities handling the dead after a MCND. In addition, training courses for emergency managers and relief workers at national and international levels should also include the basic procedures in how to handle the dead. Just as Mason (1989) Hooft et al. (1989) propose the creation of an international *mass fatality team* for aviation disasters; there is also a case to be made for the establishment of an international "*natural disaster mass fatality team*," (NDMASSFATT) possibly under the guidance of the International Federation of Red Cross and Red Crescent Societies and the United Nations (WHO, PAHO, OCHA and UNDAC) which could be mobilized to a disaster zone upon the request of any government.

While this clearly requires further research and discussion, particularly in improving our understanding on how to manage large number of victims in developing country settings, the these teams could provide manpower, technology and, above all, expertise in body handling after a MCND.

Finally, demystifying the management of dead bodies following natural disasters by breaking it down into their component parts: *context, process and actors*, is as necessary as publishing comprehensive guidelines and supporting them with international legislation.

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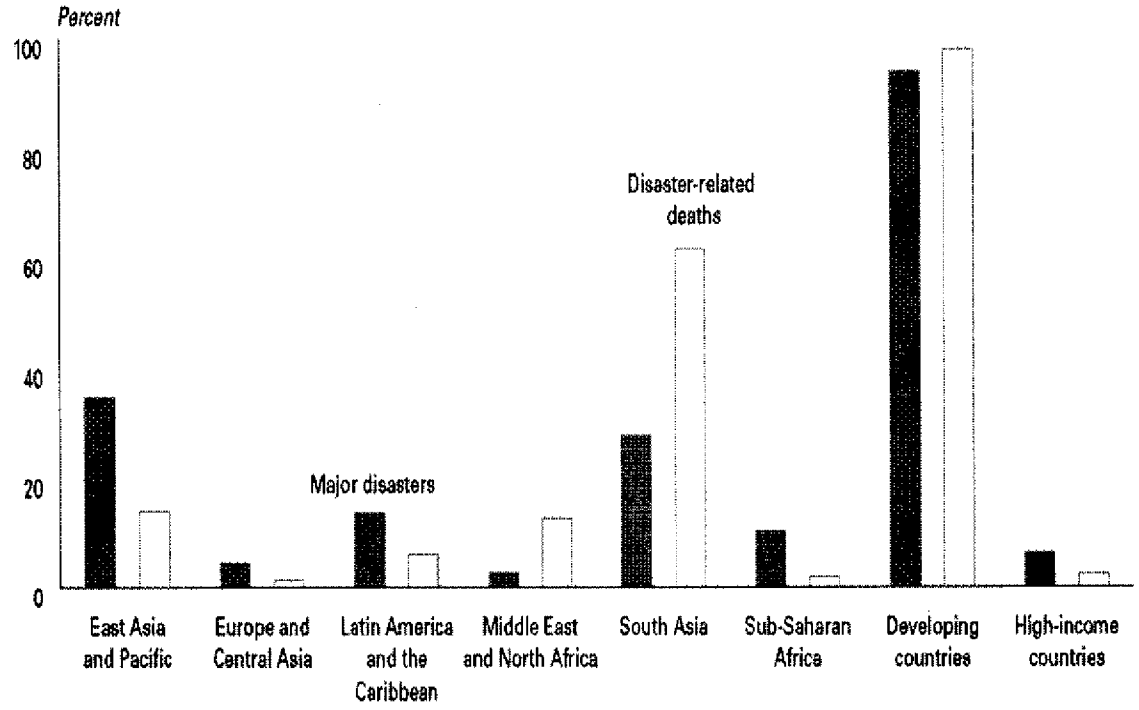
ANNEX 1

Figure 9.1
Developing countries bore the brunt of natural disasters in 1990–98



Note: A disaster is classified as major if it caused more than 50 deaths or affected more than 100,000 people.
Source: USAID, OFDA 1999.

From World Development Report 2000-2001. World Bank.

ANNEX 2

THE TEMPORARY MORGUE

The mortuary should be a secure structure, with at least 4 sections in addition to the body examination room: [3]

- Reception room;
- Viewing room;
- Storage chamber for bodies; and
- Room for records and storing personal effects.

It should have "adequate lighting and sufficient electrical outlets, running water and appropriate furniture to enable assembly line postmortem examinations" [10] but also to provide catering facilities for the workers.[29] Several independent phone lines should be operational, at least one for communication with the coordinating group and one for external communications. A minimum space of 6 x 2 ft (185 x 60 cm) should be provided for each body, with 2 ft. (60 cm) distance between bodies in a row and 5 ft. (150 cm) between rows." [10]

On arrival at the temporary morgue, "bodies, human remains and personal belongings should be given a sequential morgue number (M-number) in addition to the recovery number, and optimally, they should be placed in orderly rows in accordance to that number.[10]