CHAPTER 9

OCCUPATIONAL HEALTH ASPECTS OF NATURAL DISASTERS

by

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Introduction

The political impact of disasters of all kinds is constantly tending to increase because of the increasing population of the world. This element is most marked in the developing countries. The industrial development which brings its own bazards also attracts new residential areas to its immediate vicinity, thus exposing even greater numbers of the people to the risk. Moreover these people are often those who can least afford to take any precautionary measures to protect themselves in case a disaster should occur.

Disasters may be divided into 2 main groups.

1. Disasters resulting from natural phenoms like earthquakes, vulcanic eruptions, storm surges, cyclones, floods avalanches and massive insect infestation even in this group may be included droughts.

2. Disastrous events occurring by man's impact upon the environment, as armes conflicts, indistrial accidents, radiation accidents, factory fires, explosions and escape to toxic gases or chemical substances, mining or other structural collapses, aircraft crashes over built-up areas, collisions of vehicles carrying inflammable liquids, oil spills at sea and dam failers. It has to be taken into consideration that the second group may be the direct result of one of members of the first group. In this way may be included epidemics of infectious diseases.

What does a Disaster mean to an Industrial Plant

Disasters whether natural or manmade lead to damage common to both civil life and indistrial plants as :

- Fires
- Falling of buildings
- Flooding with water
- With subsequent injury and death of individuals.

Industrial plants have in addition their own problems. These may be summed as follows :

First

Industrial plants usually gather large collections of the population. So localized as the stroke might be, yet damage to both buildings and workers is usually very extensive.

Second

Leakage of radio active substances as a result of damage to nuclear power stations or similar installations.

Third

Emission of noxious gases or harmful substances into the atmosphere. Such an environmental risk may include :

- Carbon monoxide
- Sulphur dioxide
- Nitrogen oxides
- Arsenic comounds
- Chlorine and other chemicals

Fourth

Raising temperature as might happen from extensive fires increases the rate of volatilization of chemicals their water solubility and the rates of reactions in which they are involved. Within limits, it also increases the rate of uptake of toxicants by living organisms and promotes metabolism.

It has to be stressed that emission of industrial toxicants may add a heavy burden during rescue operations. This is due to the different type of fatalities that arise e.g. chemical burns, asphysia chocking in addition to injury by radiations.

Monitoring Environmental Toxicants

Reliance must be placed on well designed monitoring schemes to provide the necessary information for appropriate steps to be taken in the prevention of environmental damage and the treatment of casualities. Monitoring requires good methods of chemical analysis. Often these are available, but it may not be clear what chemicals the analyst should try to detect. In addition to the suspected toxicant, there will be its metabolites of varying toxicity. There may be synergists and antagonists.

Pre-disaster Planning

To help to reduce adverse effects pre-disaster planning is a necessity from the occupational health aspect this must include :

First

The government must should set up a national emergency organisation entrusted with complete responsibility for these matters. Organisations of this kind, already exist in a large nulber of countries. They must extend to other countries particularly the developing countries which are in urgent need to such organisations. Their function remain much the same, irrespective of the title and composition and location within the governmental structure.

Second

A national plan is drawn up for approval by the government setting up :

- policies
- guidelines
- and procedures

for :- precautionary measures
- early warning systems
- emergency operations during and after disasters.

So :

1. Identification first of the disaster prone areas and industrial establishments and types of events caused naturally or otherwise, most likely to occur. So this needs a thorough study of the hazards that may arise from nuclear power stations and factories.

2. Accordingly precautionary measures should be taken during the planning and construction of such huge factories to facilitate the rescue procedures and minimize the damage, in case any catastrophe might happen.

Data obtained from damaged factories elsewhere are useful in designing projects. Thus provide a sound basis for policy decisions on appropriate technical measures in the fields of building, engineering, legislation and physical and economic planning. These analysis should be carried out systematically as an integral part of any new development plan, for no country is immuno from every type of disaster.

3. Establishment of early warning systems.

4. National coordination and defining the respective roles and responsibilities of the various ministries, departments and agencies concerned, whether these are national regional or local.

5. Laying plans for evacuating schemas, training of personnel in rescue operations, setting of procedures for quick deployment of

labour for site slearance, stockpiling of relief equipment, foodstuffs drugs and medicines making arrangements for internal transportation for the rapid clearance and channelling of relief supplies to disaster sites and distribution to the survivors.

6. Collection of data on resources available.

7. Simulation excercises to test the efficiency of the plan and to make its provisions known to the population.

Post-disaster Procedures

As the initial emergency period draws to a close and rescue and relief operations come to an end, attention will be turned towards the repair and reconstruction work to follow. This is usually done in the following steps :

1. Needs and priorities will vary according to the type of the natural disaster or man-made, accident which caused the disaster and damage experienced.

2. It will be necessary to make safety inspections of damaged buildings, destroyed engines, engines emilting harmful gases or toxic substances. Work must proceed on the most urgent repairs and rebuilding needed to permit as early as possible, the reumption of daily activities.

Public works schemes for site clearance and urgent projects needed to prevent a second disaster have a further benefit in that they relieve problems of unemployment caused by the disaster.

3. Attention must be given to the special problems of the newly disabled, for it is inevitable that some of the injured will be handicapped, this may need rehabillitation or shift to other jobs.

4. When a reconstruction programme has been planned it may be necessary to introduce training in new techniques for managers and workers in the construction, civil engineering and public works.

Conclusions

Lessons learned from an industrial disaster may lead to the enacting of new legislation to improve conditions of work and safety. New environmental measures especially land-use planning and construction codes may be used to avoid or reduce the impact of future disasters, and at the same time improve standards of living. A disaster can provide the impetus not only to rebuild the old but to rebuild in such a way to provide a better life for survivors.

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RECOMMENDED READINGS IN NATURAL DISASTERS :

AN ANNOTATED BIBLIOGRAPHY

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1. WESTERN A. The Epidemiology of Natural and Man-made Disasters: the present state of the art. Unpublished dissertation, London School of Hygiene and Tropical Medicine, 1 June 1972, 123 p.

Western presents a critical and detailed assessment of current disaster research and relief services and discusses how the application of epidemiological methodology - as demonstrated during the Nigerian civil war, the Sahel drought, the Bangladesh cyclone and civil war, and several natural disasters in Latin America - can lead to improvements in knowledge, prevention, and relief interventions in general, especially in developing countries. Epidemiological evaluation should be applied to:

1. Compiling case studies of disasters
2. Gathering disaster intelligence
3. Evaluating effectiveness of relief actions
4. Analyzing long term effects
5. Evaluating new techniques of disaster warning and damage mitigation

Logistic problems due to extreme physical events are discussed in relation to environmental effects, exposure, water supply, sanitation, food supplies, traumatic injuries, communicable diseases, and other health hazards.

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2. CUNY FC. Disaster and Development. Oxford University Press 1983, 278 p.

This detailed review of the multifaceted aspects of various international relief systems tells the effects of both disasters and relief efforts vis a vis development on Third World societies. Disaster impact, response, and planning are discussed using four major disasters as examples. The book might be considered essential background reading for briefings.

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3. BURTON I et al. The Environment as Hazard. Oxford University Press, 1978, 240 p.

This evaluation of human response to natural disasters is based on field investigations in 20 countries. The extreme events covered include volcanic eruption, drought, flood, earthquake, tropical cyclone, avalanche, tsunami, snow and ice storms, forest and range fires, and coastal erosion. The lessons learned are examined and recommendations for preventions and mitigation enumarated. Helpful background information for briefings.

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4. BROWN B. Disaster Preparedness: the Role of the U.N. in Advance Planning for Disaster Relief. Pergamon, 1978, 147 p.

This U.N. study of problems inherent in formulating national disaster preparedness plans in disaster-prone countries of the Third World devises solutions and suggets ways for implementing plans. Useful background reading for briefings.

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5. The Role of Technology in International Disaster Assistance. Proceedings of the Committee on International Disaster Assistance Workshop. NRC/NAS, 1977, 102 p.

The report provides an evaluation of the extent to which scientific and technical knowledge can be applied to prevent, prepare for, and mitigate the effects of earthquakes, floods, and tsunamis. The main topics covered include search and rescue, emergency shelter, and communications. A discussion of the use of space satellites is somewhat futuristic. Major emphasis, however, is placed on indigenous solutions rather than on the use of high technology. The book contains useful information for persons responsible for briefing of public health officers assigned to postdisaster interventions.

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6. SEAMAN J. et al. Epidemiology of Natural Disasters. Basel: S. Karger, 1984, 177 p.

The title is somewhat misleading for a descriptive rather than an analytic discussion, and the cost of $ 88.75 is unfortunate. Nevertheless, John Seaman provides not only an historically interesting overview of disaster epidemiology, but more importantly, gives helpful summaries of the most common effects on health of different natural disasters. Copies of select pages as indicated in individual sections may be helpful to persons assigned to specific disaster interventions.

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7. Emergency Health Management After Natural Disaster. PAHO slide lectures, 1982.

Eight presentations of approximately 45 captioned slides each are accompanied by a script for each set that elaborates the slide captions. Directed toward health professionals who provide emergency relief after a natural disaster, the slides illustrate key points of health relief management and planning and cover the following topics:

1. Variable effects of disasters upon health
2. Epidemiological assessment and surveillance
3. The management of mass casualties
4. Environmental health following natural disasters
5. Relief supplies and transport
6. Setting priorities and mobilizing assistance
7. A summary of relief procedures

The points illustrated are basic, but selective use of the sets could be helpful for briefings of public health personnel assigned to disaster interventions.

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8. Environmental Health Management After Natural Disaster. PAHO, 1982,58 p.

This brief overview of the different types of natural disasters and their likely effects on environmental health discusses and provides checklists for important environmental health measures following disasters. The booklet contains helpful background information and

can be useful for briefings of public health officers assigned to postdisaster interventions and refugee emergencies. A copy of Annexes 2 and 3, pages 47-53, might serve as handy reference on disinfectants and general environmental measures.

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9. Assessing International Disaster Needs. NRC/NAS, 1979, 146 p.

This is a review by a National Research Council study committee of information requirements for effective emergency assistance in determining damage, needs, and risks priorities, methods of assessment, and recommendations for improvement of past performance. Two appendices of the potential role of remote sensing for early warning systems of floods, earthquakes, and droughts are somewhat futuristic. Important background for briefings.

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10. University of Louvain: Medico-nutritional Information on Disaster-prone Countries and Glossary of Common Illnesses. Centre for Epidemiology of Disasters, School of Public Health, University of Louvain, Brussels, 1979, 167 p.

Comprehensive baseline assessment of predominant common illnesses, nutritional deficiencies, health service structure, and diet pattern in 70 disaster-prone countries of the developing world. Written in plain language, the book aims to serve non-medical as well as medical relief administrators.

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11. WHITTOW J. The Anatomy of Environmental Hazards. University of Georgia Press, 1979, 411 p. Excerpt pages 211-247.

Following a brief historical review, the chapter describes wind physics and the origins of air turbulence, individual hazards of different types of destructive high winds, and their usual geographic distribution.

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12. ASSAR M. Guide to Sanitation in Natural Disasters. Geneva: World Health Organization, 1971, 134 p.

This book contains comprehensive guidelines on environmental health measures and their management following natural disasters and refugee emergencies. Even though some sections call for facilities unlikely to be available in Third World countries, the text is still considered to represent the most authoritative publication currently available on emergency sanitation.

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13. SOMMER A, MOSLEY WH. East Bengal Cyclone of November 1970: Epidemiological Approach to Disaster Assessment. Lancet 1972, 5: 1029-1036.

With the help of helicopters, two relief assessments were carried out in the coastal region affected by the cyclone and tidal wave of November 1970. The first, a rapid survey of 18 sites, documented the adequacy of existing water supplies and the absence of significant morbidity or exceptional levels of epidemic diseases. The second, wider in scope, was done two months later. Studies were carried out on 2,973 families, comprising 1.4% of the population of the area. Male mortality, at 16.5%, represented a minimum of 224,000 deaths. More than 180,000 homes were destroyed. Details of food and shelter needs were assessed. The report represents essential background information for briefings and helpful reading for field assignments.

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14. PEAVY JE. Hurricane Beulah. Am. J. Public. Health 1970, 60: 481-484.

This is an outline of effective public health measures following Hurricane Beulah, which struck Texas in September 1967 and was considered the third most destructive hurricane in history. Eighteen lives were lost, more than 8 000 persons were injured, and property loss came to about one billion dollars. The main focus of

the report is on the logistics of public health management following disaster.

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15. ROMERO AB et al. Some Epidemiological Features of Disaster in Guatemala. Disasters 1978; 2:39-46.

Discussion of the potential role of epidemiological surveillance in previous disasters in Guatemala (e.g. floods, fires, volcanic eruptions, hurricanes, earthquakes) on the basis of experience gained from the epidemiological information system organized immediately after the February 1976 earthquake. Mortality/morbidity data and 14 graphs of a simplified system of surveillance of the affected population demonstrate how epidemiological information can assist effective decision making at the local, regional, or central level.

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16. ALEXANDER D. Epidemiological Surveillance of Disease Following the Earthquake of 23rd Nov. 1980 in Southern Italy: Discussion. Disasters 1982: 6, 149-153.

The author provides a detailed review of lessons learned. The earthquake was not followed by any major disease, and morbidity/mortality patterns were in line with previous experience (PAHO Pub. n°407, 1981). Considerable emphasis is being placed on comprehensive epidemiological surveil- lance and detailed subsequent analysis of the data obtained.

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17. BOLT BA et al. Earthquakes and Volcanoes: Readings from Scientific American. San Francisco: W.H. Freeman & Company, 1980, 154 p.

The book contains eleven articles on earthquake properties, earth structure, volcanoes, and heat flow. The articles give a lucid presentation with multiple graphs, maps, photographs, and tables on the physical properties of earthquakes and volcanoes, their sources, geographic distribution, and effects on society. The book

also contains informative details on seismology and plate tectonics. Its represents useful background information for personnel assigned to postdisaster interventions.

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18. BLIX G. et al. A Symposium Dealing with Nutrition and Relief Operation in Time of Disaster. Stockholm: Swedish Nutrition Foundation, 1971,200 p.

This is one of the best, a collection of practical guidelines and experience in famine relief. Of particular interest to public health officers is the contribution by W.H. Foege: "Famine, Infections, and Epidemics." Throughout recorded history, famines have frequently been followed by epidemic outbreaks. The author documents how famines lead to increased severity and transmission of communicable diseases and contribute to mortality rates. On the basis of an analysis of this interrelation, emphasis is placed on giving priority to prevention and control of infectious disease by the provision of food. Effective epidemiological surveillance and enforcement of environmental control measures must also be standard procedures.

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19. WHO Emergency Health Kit. WHO/UNCHR, 1982, 10 p. Subsequently published in: Simmonds S. et al. Refugee Community Health Care. Oxford University Press, 1983, 332-336.

The kit lists standard drugs and clinic equipment for 10,000 persons for 3 months. Essential information for interventions.

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20. GLASS R.I., URRUTIA J.J., et al. Earthquake injuries related to housing in a Guatemalan village. Science, Vol. 197, 12 August 1977, pp. 638-43.

Study findings :

1. The risk for earthquake-related trauma increases with age.
2. Women and children 5-9 years of age are high risk groups for earthquake-related trauma.

3. A trend appears among age-specific mortality rates for four towns in two earthquakes.
4. Rates are highest among children 5-9 years of age and in older people.
5. Next-to-the-youngest children had significantly more deaths than did their first- or last-born siblings.

Overall, the study is methodologically sound. Post studies on the village of Santa Maria Cauque provide a reliable base upon which denominators can be established. The results visà-vis age-sex-specific mortality were replicated in 3 Central American towns in 2 different earthquakes. The findings are therefore generalizable, conclusions are warranted. Given the analyses, the study appears to be valid.