

| HEALTH PROMOTION AND DISEASE PREVENTION A Handbook for Teachers, Researchers, Health Professionals and Decision Makers | |
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| Title | Global Public Health Threats and Disaster Management |
| Module: 5.14 | ECTS: 1 |
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| Key words | Environmental and public health; disasters; natural disasters; accidents; disaster planning; emergency medicine. |
| Learning objectives | After completing this module students and public health professionals should: <ul style="list-style-type: none"> • understand public health importance of disasters and disaster management; • be aware of needs for public health preparedness and response; • define/classify major crisis, emergencies and disasters using relevant definitions and criteria; • increase knowledge about epidemiological aspects of main disasters and their public health consequences; • list and describe different phases of disaster management; • improve their knowledge and skills for quantitative risk assessment; • describe and understand the needs for hazard, vulnerability and emergency plans in different phases of disaster management; • describe different response activities. |

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| <p>Abstract</p> | <p>Major emergencies, disasters and other crises do not respect national borders and never occur at convenient times. The magnitude of human suffering caused by these events is huge, and many aspects of people’s lives are affected – health, security, housing, access to food, water and other life commodities, to name just a few. That is why it is vital to strengthen public health preparedness and response to different natural and man-made disasters. Disaster management has a crucial role in mitigation of disaster consequences. The aim of disaster management is to support countries in building their emergency response capacities, stressing a multisectoral and comprehensive approach in terms of risk reduction. Since the risk is a function of the hazards to which a community is exposed and the vulnerabilities of that community, the risk can be modified by the level of the emergency preparedness of the community at risk. The challenge is to put in place systematic capacities such as: legislation, plans, coordination mechanisms and procedures, institutional capacities and budgets, skilled personnel, information, and public awareness and participation that can measurably reduce future risks and losses. Emergency preparedness is a programme of long-term activities whose goals are to strengthen the overall capacity and capability of a country to manage efficiently all types of emergencies. It requires development of emergency plans, training of personnel at all levels and in all sectors, education of communities at risk, and monitoring and regular evaluation of these measures. The main goal of this module is to give more detailed and comprehensive approach to the definition of the major incidents, scientific evidence for public health importance of specific type of emergencies/disasters and basic elements for disaster management with special emphasis to risk assessment and emergency preparedness programmes.</p> |
| <p>Teaching methods</p> | <p>Teaching methods should include: lectures, interactive small group discussion, seminars, tutorials and case studies. Students should apply the new knowledge by working in small groups identifying public health preparedness and response priorities and respective reduction plans. Basic skills like quantitative risk assessment have to be trained.</p> |
| <p>Specific recommendations for the teachers</p> | <p>This module should be assigned by 1.0 ECTS from which 70% should include work under the direct supervision of teachers including lectures and guided discussion, and 30% is individual work of the students – case studies and writing assignments; searching Internet in order to find the latest available data regarding frequency of events, International Health Regulation (2005), strategies, plans and preparedness.</p> |
| <p>Assessment of students</p> | <p>Assessment could be based on multiple choice questionnaire (MCQ), structured essay and case problem presentations.</p> |

GLOBAL PUBLIC HEALTH THREATS AND DISASTER MANAGEMENT

Elisaveta Stikova, Pande Lazarevski, Ilija Gligorov

Introduction

Technological innovation and economic development of the past century have brought improved living standards and longer lives to most of the population. Nevertheless, these developments have not eliminated or decreased threats to human health and security.

Threats to health security are many and diverse. They include sudden shocks to health and economies from emerging diseases, humanitarian emergencies, effects of climate change or environmental degradation, bioterrorism, natural disasters and other acute health risks.

Threats to health and security are multiplying and moving faster than ever before. Tackling the health effects of these threats involves working collectively to improve preparedness and effective responses when they occur.

In a globalized world, they cross national borders and threaten our collective security. In recent years, the world has faced numerous events that put at risk the health and security of people and societies. Some of these events have triggered public health emergencies with cross-border consequences; others have had a more local, but still severe, impact on affected communities.

Within the traditional categories of health threats, such as epidemic prone diseases and natural and technological health hazards, there are scenarios of new or re-emerging threats, such as an influenza pandemic or the accidental release or deliberate use of biological and chemical agents or radio nuclear material, creating a sense of insecurity and a climate of fear and posing new challenges to national health systems and governments.

Some communicable diseases, such as severe acute respiratory syndrome (SARS), influenza, HIV/AIDS, increasing incidence of multi-drug resistant TB cases and other, have the potential to cause sudden, large-scale harm to the health and welfare of entire populations from developed and developing countries.

Food safety and food security, access to safe water and sanitation, air pollution and affordable energy supply, climate change and other related phenomenon are also intimately linked to health and health security in a number of ways.

There are many other threats to public health that are closely linked to individual behaviour, such as suicide, interpersonal violence, road crashes and accidents at work and at home. Public health recognizes well the link between the health of individuals, communities and countries and their safety and security of their living environments. The question of whether these are health security issues is worth further discussion.

The enjoyment of the highest attainable standard of health as a state of complete physical, mental and social well-being is one of the fundamental rights of every human being. On the other hand, health of all peoples is fundamental to the attainment of peace and security. This is because UNDP identifies health security as one of the seven components of human security. The other categories encompassing most of the threats to human security are economic, food, environmental, personal, community and political security (13).

There are four criteria that have influence on the links strength between health and human security. These include:

- a) scale of the disease/injuries burden;
- b) urgency for action;
- c) scale of the impact on society;
- d) interdependencies or externalities with potential to cause ripple effects.

By applying these criteria the following four health challenges stand out as closely linked to human security:

- global epidemic prone disease;
- natural disasters:
 - hydrometeorological disasters
 - geophysical disasters
- accidental and deliberate outbreaks:
 - toxic chemical agents;
 - radionuclear accidents.
- environmental disasters:
 - climate change;
 - foodborne diseases.

Some communicable diseases, such as severe acute respiratory syndrome (SARS) and influenza, have the potential to cause sudden, large-scale harm to the health and welfare of entire populations, including those in high income countries such as Western Europe.

These and other epidemic-prone diseases have therefore been generally considered as threats to health security. Other communicable diseases, such as HIV disease and multydrug-resistant tuberculosis (TB), avian influenza A/H5N1 outbreaks with human cases and threatening influenza pandemic and other new (re)emerging diseases add significantly to the overall disease burden globally and in parts of the European Region.

The eradication of communicable disease threats such as smallpox in the 1970s and poliomyelitis and measles targeted for elimination may paradoxically create novel threat scenarios if the public health capacity required at the national and international levels is not maintained.

Natural disasters can have significant public health and environmental impacts which, depending on the event, may affect more than one country. Extreme storms, for instance, may be very damaging for forests and other natural habitats; forest fires may destroy rich forest ecosystems and adversely affect rare plant and animal species; landslides and snow avalanches often remove or damage the biotic stock of the areas located along their paths. Extreme events can cause a “domino effect” of other, more indirect impacts, such as the mobilisation by floods of toxic substances in the soil that then infiltrate aquifers, the degradation of soils by forest fires, fires and explosions triggered by earthquakes, or a deterioration in water quality caused by drought.

Food safety and food security, access to safe water, clean air and affordable energy supply are also intimately linked to health in a number of ways. Nevertheless, this chapter does not discuss further health security issues even bovine spongiform encephalopathy (“mad cow” disease) and the related variant Creutzfeldt-Jakob disease that threatens our security from the late 1980s onwards.

Europeans regard terrorism as one of the key challenges the European Union is facing today. The numerous terrorist attacks using explosives around the world, including the Madrid train bombings on 11 March 2004 and the underground London bombings on 7 July 2005 and elsewhere in the world made it clear that terrorism is a threat to all states and to all peoples. The world can't forget the terrorist attacks on 11 September 2001, the anthrax attacks of autumn 2001 in the United States of America, the deliberate use of nerve gas (sarin) in Japan - Matsumoto incident on 27–28 June 1994 and the deliberate use in the Tokyo subway on 20 March 1995 and many other terrorist attacks around the world (7).

Terrorists target our security, the values of our democratic societies and the basic rights and freedoms of our citizens. Terrorists may resort to non-conventional means such as biological, chemical and nuclear weapons or materials. Some of these materials have the capacity to infect, harm and injure thousands of people, contaminate soil, buildings and transport assets, destroy agriculture and infect animal populations and eventually affect food and feed at any stage in the food supply chain. The risk of “bioterrorist” attack has been statistically low, but its consequences can be devastating. If a deliberate introduction of deadly pathogens or a naturally occurring disease outbreak were to occur in the European Union or be imported from a third country, it is possible that it could spread across borders and have considerable economic and social impact.

Although chronic conditions related to such lifestyle factors as smoking, drinking, an unhealthy diet, unsafe sex, insufficient physical activity or obesity bring much more suffering, disability and loss to the people of the European Region than do communicable diseases, they do not have a direct health security dimension. Other threats to public health are also closely linked to individual behaviour, such as suicide, interpersonal violence, road crashes and accidents at work and at home.

The likely effects of a major incident are dead and missing of the overall population or of some more vulnerable population's group, mental and physical injuries, mental and physical diseases, secondary hazards (fire, disease etc), contamination of environmental media such as water, air pollution, soil... Displacement of people, damage to infrastructure, breakdown in essential services, loss of property and loss of income are other connected consequences of the major incidents and disasters that influence on the global and public health security (3,4).

In respect to this, every country should strengthen its national public health preparedness capacity. The term “preparedness” covers all aspects, such as: prevention, protection, response and recovery. The term also covers the steps taken to minimise the threat of natural and man-made disasters including deliberate release of chemical, biological and radiological agents.

Definitions

There are so many different kinds of public health threats. They differ in terms of their nature, duration, level of damage, cost... Leading by methodological purpose it's very important to make very clear definition and strict distinction in terms of the name of the events, sources and etiological agents. Some most important definitions are given below.

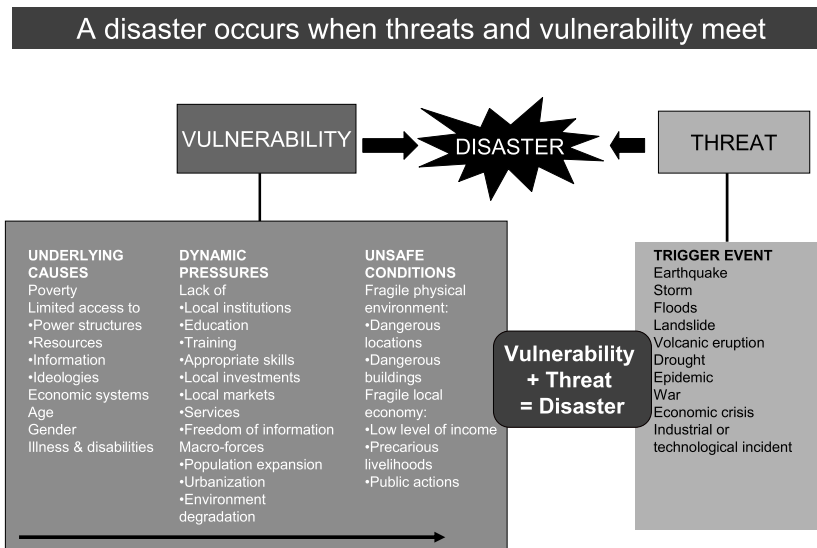
Emergency is a state in which normal procedures are suspended and extraordinary measures are taken. Emergency presents a sudden occurrence of demanding event that may be due to epidemics, to natural, to technological catastrophes or to other man-made causes. WHO and the IHR (2005) define emergency as an “extraordinary” event that could spread internationally or might require a coordinate international response. Events that may

constitute a public health emergency of international concern must be detected, assessed, notified and reported.

Major incident is an emergency that cannot be managed within normal working practices. If you require special provision to handle it, it's a major incident. Major incident means an incident where its location or number, severity and type of life casualties require extraordinary resources.

Disaster means serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community or society to cope using its own resources (WHO). A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk (1). Disasters combine two elements: events and vulnerable people. A disaster occurs when a disaster agent (the event) exposes the vulnerability of individuals and communities in such a way that their lives are directly threatened or sufficient harm has been done to their community's economic and social structures to undermine their ability to survive. A disaster is fundamentally a socio-economic phenomenon. It is an extreme but not necessarily abnormal state of everyday life in which the continuity of community structures and processes temporarily fails. There is a problem of definition which affects the interpretation of vulnerability to disasters. Therefore, a list of important questions often cannot be answered clearly: When does a disaster begin? Who decides about shortcomings in the coping capacity of a society? When does the disaster end? What are the appropriate indicators for disasters? In addition, many definitions do not take differing vulnerabilities of population groups into account. A disaster occurs when the treats and vulnerability meet. The balance between the component of vulnerability and threats is essential for disaster occurrence.

Figure 1. The main components of vulnerability and trigger threat's events in disaster occurrence



Source: *Preparing WHO for better action in crisis, WHO*

The term disaster can enter into the database of the UN's International Strategy for Disaster Reduction (ISDR), only if at least one of the following criteria is met:

- a report of 10 or more people killed;
- a report of 100 people affected;
- a declaration of a state of emergency by the relevant government;
- a request by the national government for international assistance.

A disaster is “a disruption of the human ecology that exceeds the capacity of the community to function normally”.

There are 5 different elements/constituents of a community that should be affected in terms of the disaster's definition:

- People;
- Property (infrastructure, possessions and assets, public, private and cultural);
- Services (governmental, NGO);
- Livelihoods of the people (e.g. urban/ rural);
- Environment (air, water, soil, built and natural, urban and rural).

Crisis is an event or series of events which represents a critical threat to the health, safety, security or wellbeing of a community or other large group of people, usually over a wide area. Armed conflicts, epidemics, famine, natural disasters, environmental emergencies and other major harmful events may involve or lead to a humanitarian crisis.

Hazard is any phenomenon that has the potential to cause disruption or damage to people and their environment. A hazard might lead to a disaster.

Risk is defined as a probability of harmful consequences, or expected losses (deaths, injuries, property, livelihood, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerabilities.

Risk is a function of the hazards to which a community is exposed and the vulnerabilities of that community. The risk exposure decreases proportionally to the level of the local preparedness of the community at risk. It is expressed by the following notation:

$$\text{Risk: } \frac{\text{Hazard probability X Vulnerability}}{\text{Local Capacity (Preparedness)}}$$

Vulnerability encompasses the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. The vulnerability can be defined as a degree to which a population or an individual is unable to anticipate, cope with, resist and recover from the impact (expected loss) of a disaster.

Emergency Preparedness designates all those activities that aim at preventing, mitigating and preparing for emergencies, disasters and other crises. Emergency preparedness is a programme of long-term activities whose goals are to strengthen the overall capacity and capability of a country or a community to manage efficiently all types of emergency and bring about an orderly transition from relief through recovery, and back to sustained development. It requires development of emergency plans, training of personnel at all levels and in all sectors, and education of communities at risk. In terms of emergency preparedness all these

measures should be monitored and evaluated regularly. Emergency prevention and mitigation involves measures designed either to prevent hazards from causing emergencies or to lessen the likely effects of emergencies (1, 4).

Classification of major incidents and emergencies

There are so many criteria for classification of major incidents and emergencies. Regarding their nature they have been divided in two big categories – *natural and man-made* major incidents/emergencies.

In terms of their occurrence they can appear *suddenly or insidiously*. The major incidents/emergencies can cause *mechanical or medical* casualties and the most affected group can be adult population or children.

As a consequence of the emergency the social structure can be intact or destroyed. In the first case we speak about *simple* and in the second one about *compound* emergency/disaster.

A *compensated* type means that emergency/disaster can be managed by additional resources mobilisation. *Uncompensated* emergency/disaster means that it can't be managed by additional mobilisation of available resources.

Numerous and different classifications by type and origin of disasters are available and they have been reviewed.

The US Center for Disease Control (CDC 1989) identified three major categories of disasters:

- *geographical events* such as earthquakes and volcanic eruptions;
- *weather-related problems* including hurricanes, tornadoes, heat waves, cold environments and floods;
- *human-generated problems* which encompass famines, air pollutions, industrial disasters, fires and nuclear reactor incidents.

The classification by *World Disaster Report 1993* (4), compiled many different aspects of classification in 3 main groups:

I. Two main categories classification:

- natural (weather and geological events);
- no natural (human-made) technological and purposeful events caused by people [transport, war, fire/ explosion, chemical and radioactive release].

II. Three categories classification:

- geographical events (earthquakes and volcanic eruptions);
- weather-related problems (including hurricanes, tornadoes, heat waves, cold environments and floods);
- human generated problems (famines, air pollutions, industrial disasters, fires and nuclear reactor incidents).

III. Four main categories classification:

- sudden natural (avalanche, cold and heat wave, earthquake, aftershock, floods, volcanic eruption, storm etc.);
- long-term natural (epidemics, drought, desertification, famine, food shortage etc);
- sudden human-made (structural collapses, building collapse, air disaster, land disaster, industrial/technological disaster, explosions – chemical, nuclear, mine explosions, pollution, acid rains, fires etc.);

- long-term human-made (national civil strife and civil war, international war-like encounters, displaced population, displaced persons, refugees etc.).

EM-DAT distinguishes two generic categories for disasters: *natural* and *technological*. These are then divided into 15 main categories, each covering more than 50 sub-categories.

Natural disasters are split into two groups:

- *Hydro meteorological disasters*: avalanches/landslides, droughts/famines, extreme temperatures, floods, forest/scrub fires, windstorms and other disasters, such as insect infestations and wave surges.
- *Geophysical disasters*: earthquakes, tsunamis and volcanic eruptions.

Technological disasters comprise three groups:

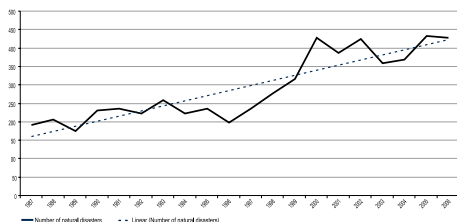
- *Industrial accidents*: chemical spills, collapses of industrial infrastructure, explosions, fires, gas leaks, poisoning and radiation.
- *Transport accidents*: by air, rail, road or water means of transport.
- *Miscellaneous accidents*: collapses of domestic/non-industrial structures, explosions and fires.

Some epidemiological characteristics of natural disasters – global overview

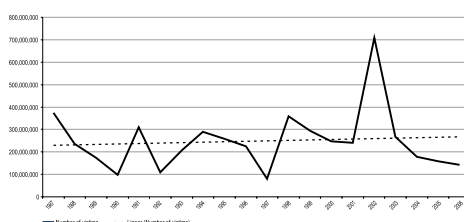
Over time, natural disasters are not stationary and may exhibit various kinds of trends, cycles, or seasonal patterns. The evolutions of these patterns can be summarized and made evident by using trend lines showing long-term movements in natural disasters time series data. The linear trend lines that we present in the following figures demonstrate simply the general orientation of the numbers.

Figure 2. Natural disaster occurrence 1987-2006

a) number of disasters



b) number of victims (deaths+affected)



Source: Annual Disaster Statistical Review: Number and Trends 2006. CRED, Brussels, 2007.

During the period between 1987 and 1997 the number of disasters varied generally between 200 and 250, but in 2000-2006 the number of disasters increased by nearly a multiple factor of two. An increase of this magnitude can be partially explained by increased reporting of disasters, particularly by press organizations and specialized agencies.

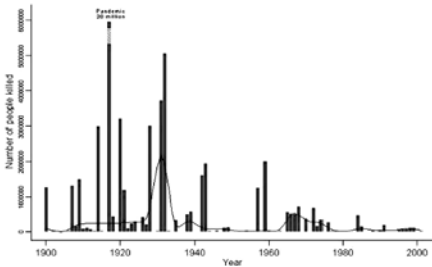
During the period between 1987 and 2006 the number of victims registered in the natural disasters was ranged between 100,000,000 and 300,000,000 persons in almost all years. The highest number of victims in 2002 (more than 700 000 000 deaths and affected people) was due to the droughts that affected 300 million people in India and 60 million in China. In the

same year China was affected by a wind storm with 100 million affected people and a flood that affected 60 million people.

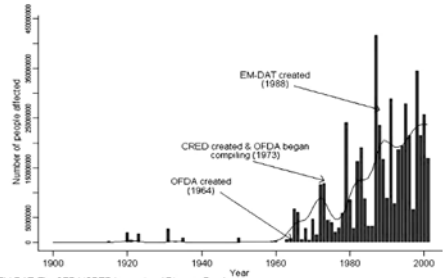
It's very important to stress that natural disasters are connected with less mortality rate (smaller number of deaths) in the period of 1900-2000, but the last century data have shown that the number of affected people is continuously increased.

Figure 3. Number of deaths and affected people in natural disasters in period 1900-2000

a) number of deaths



b) number of affected people



Source: EM-DAT. The OFDA/CRED International Disaster Database

In 2006, a total of 427 natural disasters occurred around the world. China, USA and India were the most affected countries by natural disasters in 2006. The most frequent natural disasters are floods. In 2006, 254 floods were reported, which accounted for 59% of all reported disasters.

Table 2. Occurrence by major type of natural disasters in 2006

| Major types of natural disasters | 2006 |
|----------------------------------|------|
| Geological | 36 |
| Floods & related | 254 |
| Droughts & related | 60 |
| Windstorms | 77 |
| Total | 427 |

| | Country | No. of Natural disasters |
|----|---------------|--------------------------|
| 1 | China P.Rep. | 38 |
| 2 | United States | 31 |
| 3 | India | 21 |
| 4 | Philippines | 20 |
| 5 | Indonesia | 20 |
| 6 | Afganistan | 13 |
| 7 | Viet Nam | 11 |
| 8 | Pakistan | 9 |
| 9 | Bangladesh | 8 |
| 10 | Romania | 8 |

Source: Annual Disaster Statistical Review: Number and Trends 2006.CRED, Brussels, 2007.

In terms of the geographical distribution of total number of victims by continents it's very important to emphasize that Asia remains the most affected region with over 119 millions reported victims (83% of all reported victims).

Table 3. Most affected continents and countries by natural disasters- number of victims

| Continent | 2006 | 2005 | 2000-04 Average |
|-----------|-------------|-------------|-----------------|
| Africa | 21.858.117 | 21.779.142 | 38.802.923 |
| Americas | 1.446.491 | 8.291.822 | 5.405.748 |
| Asia | 119.050.089 | 127.513.978 | 283.120.528 |
| Europe | 259.900 | 529.359 | 1.452.740 |
| Oceania | 37.886 | 28.278 | 48.351 |
| Total | 142.652.483 | 158.142.579 | 328.830.291 |

| Continent | 2006 | 2005 | 2000-04 Average |
|-----------|--------|--------|-----------------|
| Africa | 15.32% | 13.77% | 11.80% |
| Americas | 1.01% | 5.24% | 1.64% |
| Asia | 83.45% | 80.63% | 86.10% |
| Europe | 0.18% | 0.33% | 0.44% |
| Oceania | 0.03% | 0.02% | 0.01% |
| Total | 100% | 100% | 100% |

Source: Annual Disaster Statistical Review: Number and Trends 2006.CRED, Brussels, 2007.

In 2006, the three deadliest disasters were the earthquake in Indonesia in May (5,778 killed), Typhoon Durian in the Philippines in December (1,399 killed) and the European heat-wave in July (3 392 killed).

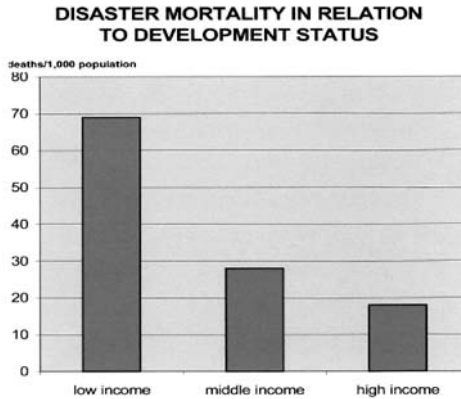
The most significant disasters in terms of economic damages were: the flood in India (US\$ 3.39 billion), Typhoon Bilis in China (US\$ 3.32 billion) and the Indonesian earthquake (US\$ 3.1 billion)

Table 4. Top 10 of 2006 most significant disasters by economic damages (in US\$ million)

| | Disaster type | Country | Economic damages |
|----|-----------------------------------|---------------|------------------|
| 1 | Flood | India | 3.390 |
| 2 | Wind Storm (Typhoon Bilis) | China P. Rep. | 3.325 |
| 3 | Earthquake (Yogyakarta) | Indonesia | 3.100 |
| 4 | Extreme Temperature (heat-wave) | China P. Rep. | 2.910 |
| 5 | Wind Storm (Typhoon Saomai) | China P. Rep. | 2.510 |
| 6 | Wind Storm (Typhoon Shanshan) | Japan | 2.500 |
| 7 | Wind Storm (Tornado) | United States | 1.200 |
| 8 | Wind Storm (Tropical Storm Larry) | Australia | 1.180 |
| 9 | Flood | United States | 1.000 |
| 10 | Extreme Temperature (cold-wave) | Russia | 1.000 |

Source: Annual Disaster Statistical Review: Number and Trends 2006.CRED, Brussels, 2007.

In 2005, the hurricane Katrina resulted in the highest damages ever reported for a hydrometeorological natural disaster: almost US\$ 129 billion. The same year, two other hurricanes, Wilma and Rita, caused damages estimated at more than US\$ 21 billion and 16 billion, respectively.

Figure 4. Disaster mortality in relation with developing status

Source: WHO-role in disaster and emergencies. *Strengthening National Capacities*, WHO, 2005.

In terms of disaster mortality there is scientific evidence that dying is higher in less developed countries.

Statistical data show that mortality is higher in less developed and developing countries in comparison with developed countries. It means that poor countries and population more suffer and they need better programs for vulnerability reduction and public health preparedness as a prerequisite for mitigation of the consequences (17).

Over the last decades, the WHO European Region has been affected by numerous events that have endangered health and security. Some of these events have created crises and public health emergencies of an international nature, others have been more localized. Newly emerging public health risks like avian influenza have sparked international concern, and health is increasingly discussed in terms of its potential implications for the national security and safety of people, and national health systems.

Several serious crises have affected the Region; between 1990 and 2006, 1469 events – disasters and crises – caused 95 700 deaths, and affected more than 42 million human beings. Extreme temperature events and earthquakes accounted for the highest mortality rates, whereas floods – although the most frequent events – caused a relatively lower mortality.

Table 5. Natural disasters and accidents in the WHO European Region, 1990–2006

| Type of events | Number of events | Deaths | Affected population | Economical cost (thousands US\$) |
|-------------------------|------------------|--------|---------------------|----------------------------------|
| Flood | 344 | 3593 | 11 566 509 | 66 093 052 |
| Extreme temperature | 112 | 52119 | 1 389 529 | 9 024 788 |
| Drought | 31 | 2 | 14 865 575 | 14 297 309 |
| Wildfire | 58 | 228 | 286 969 | 3 540 357 |
| Earthquake | 102 | 21 840 | 5 875 138 | 3 022 549 |
| Accidents | 609 | 16 856 | 137 638 | 11 697 048 |
| Landslide and avalanche | 57 | 2 084 | 90 196 | 156 589 |
| Windstorm | 170 | 1 397 | 8 063 234 | 33 114 822 |
| Total | 1483 | 98 119 | 42 274 788 | 168 149 414 |

Source: *Towards Health Security*, WHO, 2007; EM-DAT: *Emergency Disasters Data Base*

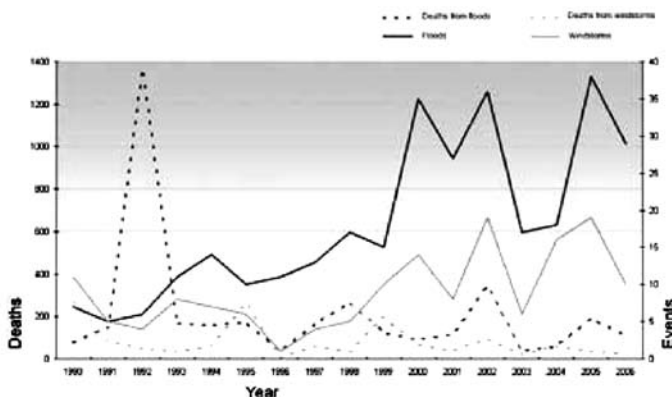
Natural disasters and technological accidents are not always singular or isolated events. They can occur in complex combinations and/or in rapid succession, thereby triggering multiple effects (for example, forest fires that cause soil erosion or heavy rainfall that causes the breach of dams holding back hazardous wastes). Future policies should consider an integrated approach to addressing these issues. More integrated policies, in particular regarding land use planning but also in sectors that are vulnerable to disasters and accidents, such as transport and industry, could also help to reduce the socio-economic and environmental costs of such events.

The environmental impacts of natural disasters and technological accidents are often difficult to assess. In some cases environmental impacts are not apparent immediately after an event. The impacts may be considerable in the short term but disappear over time due to the ability of some natural systems to recover relatively quickly.

Time trends of natural disasters – specific overview by type of disasters

According to EM-DAT, floods comprised 43 % of all disaster events for the period 1998–2002. During this period, Europe suffered about 100 major damaging floods, causing some 700 fatalities, the displacement of about half a million people or 1.5% of European population and at least 25 billion euro in insured economic losses (3,12).

Figure 5. Frequency of floods and windstorms with numbers of related deaths in the European region in 1990-2006



Source: *Towards Health Security, WHO, 2007*

Floods can also have important beneficial effects for river ecosystems, groundwater recharge and soil fertility. Over the past five years floods affected an estimated land area of one million square kilometres.

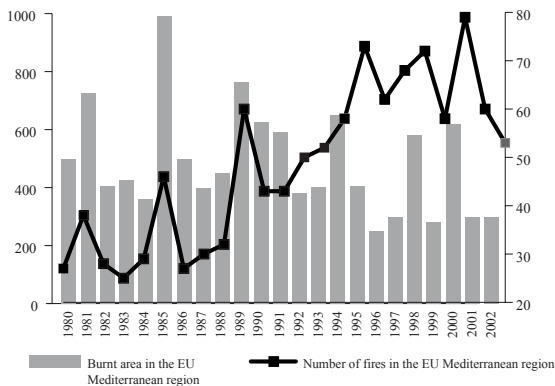
Storms are among the most costly types of disasters. Until the summer 2002 floods in central Europe, windstorm *Daria* in January 1990 and then storms *Lothar* and *Martin* in late December 1999 held the record for Europe’s most expensive disasters in terms of insured losses, at nearly six billion euro and around 6.7 billion euro, respectively. The three storms killed around 220 people in total. Major storms occur most frequently in autumn and winter and can happen in rapid succession.

Forest fires, like drought (which can be a contributing factor), mostly affect

Mediterranean and Black Sea countries but occur throughout Europe, including as far north as northern Norway. In the five Mediterranean Member States of the European Union — France, Greece, Italy, Portugal and Spain — the area burnt in forest fires has varied between 200 000 and 600 000 hectares a year over the past 20 years. In that period the total number of fires reported has risen sharply from around 20 000/year to 60 000/year, although this may partly reflect improved reporting procedures.

Between 1998 and 2002, 62% of forest fires occurred in the Mediterranean biogeographical region even though this makes up only 14% of the total European land area.

Figure 6. Numbers of fires and burnt area from 1980-2002 in some EU countries



Source: *Mapping the impacts of recent natural disasters and technological accidents in Europe. Environmental issue report No 35.EEA, Copenhagen, 2003.*

The summer of 2003 was particularly bad for forest fires in much of southern Europe.

Portugal experienced its worst forest fire season in 23 years as at least 215 000 hectares (5.6% of its total forest area) burned. The French regions of Var, southern Corsica and Upper Corsica were also seriously affected by fires, with between 1.1% and 2.5% of their total area being completely burnt.

Forest fires often claim human victims, especially among fire fighters. The summer 2003 fires in Portugal, for instance, caused 15 deaths. Economic losses generated by fires are estimated at 1 000–5 000 euro/hectare burnt, but other costs such as landscape loss, with consequences for rural and eco-tourism, are much harder to quantify.

In environmental terms, the most significant impact of forest fires is destruction of valuable species and their habitats. The summer 2000 and 2006 heat wave in south-eastern Europe encouraged the spread of fires in Croatia, Bulgaria, Romania, Macedonia and especially Greece where flames reached almost all forests on the island of Samos.

In Europe, earthquakes have killed far more people than any other extreme event and have caused extensive damage. Europe's major earthquake-prone areas are in the Mediterranean and Black Sea basins, along the active fault lines between the Eurasian and African plates.

The most dramatic events in recent decades include the 1977 earthquake in Romania, which seriously affected the capital, Bucharest; the 1980 earthquake in southern Italy, which

killed 4 500 people and left more than a quarter of a million homeless; the Izmir earthquake in Turkey in August 1999, which killed an estimated 17 000 people and caused more than 15 billion euro in losses and many other like this one that took place in Turkey in April 2003 and in Algeria in May 2003.

In Europe, droughts do not trigger famines and thus, do not kill people. However, human, environmental and economic impacts can be devastating, especially when droughts are associated with heat waves. The fatal effects of heat waves were demonstrated during the summer of 2003, when temperatures in some areas (France, western Germany, south-west England) climbed to record highs. A heat wave across much of Europe during August 2003, considered the warmest August month on hemisphere, claimed possibly as many as 35 000 lives, with France alone recording almost 15 000 deaths, mostly among elderly people.

Droughts can have very heavy economic impacts, especially when they last a long time. In the late 1990s, a drought that particularly affected the central and southern parts of Spain caused losses of more than 800 million euro in the cereal, olive oil and livestock sectors (more than 50% of the total value of these crops). The combination of a long drought and a heat wave that swept across Eastern Europe in 2000 reduced the corn output of Romania by one third and significantly diminished agricultural yields in Hungary, Croatia and Serbia (USDA, 2000).

The environmental impacts of droughts can be exacerbated by unsustainable trends in water use. The worst combination appears when drought strikes freshwater ecosystems already weakened by excessive water withdrawals. For example, Lake Iliki, some 100 km northeast of Athens, has been reduced to a third of its original size, partly by a severe drought in 2000 but also as a result of increasing drinking water demand. Likewise, Lake Dojran, located between Greece and Macedonia, is at risk of drying up, thus threatening one of the richest inland fishing stocks in Europe. Droughts can cause deterioration of water quality in rivers, lakes and reservoirs by exacerbating algal blooms that reduce the oxygen available for aquatic species.

Droughts may also trigger soil erosion, mainly in Mediterranean areas. One way this happens is through a reduction in vegetation cover caused by forest fires or by increased plant mortality due to water stress

Technological disasters

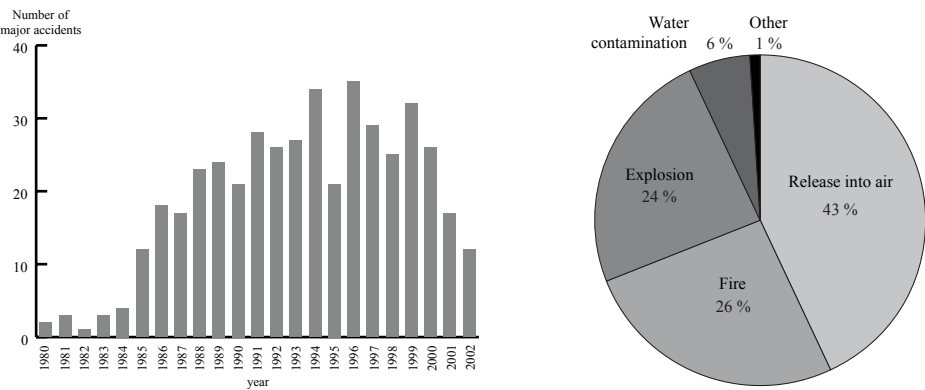
Compared with disasters of natural origin, most technological accidents do not tend to cause many deaths or much economic damage. However, their catastrophic potential, especially in environmental terms, can be much greater than that of natural events. The worst non-natural disasters resulting in human suffering and death have been caused by wars, transport and industrial activities. At first, industrial disasters mainly affected people engaged in specific occupations, but later, particularly after the Second World War with the rapid growth and expansion of the chemical industry and the use of nuclear power, these occurrences led to serious danger even to people outside work areas, and to the general environment.

The first documented chemical disaster with industrial origins was described by Bernardino Ramazzini in 1600s (8). Today's chemical disasters differ in the way they happen and in the type of chemicals involved (5). Their potential hazard is a function both of the inherent nature of the chemical and the quantity that is present on site. A common feature is that they usually are uncontrolled events involving fires, explosions or releases of toxic substances that result

either in the death and injury of a large number of people inside or outside the plant, extensive property and environmental damage, or both (8).

Figure 7 presents the data for technological incidents by type and frequency of their occurrence in the period between 1980 and 2002. The most prevalent technological accidents are connected with releases of toxic substances in air (43%). Fire and explosion participate in the structure of technological accidents with almost equal parts (26% and 24%). The geographical and temporal impact of fires and explosions alone tends to be relatively limited but can be greatly magnified if, in a ‘domino effect’, they result in toxic substances being released to air, water or soil (3, 12).

Figure 7. Major technological accidents and their distribution by type in period 1988-2002



Source: *Mapping the impacts of recent natural disasters and technological accidents in Europe, 2003; Major accident reporting system (MARS) managed by MAHB Major Accident Hazards Bureau*

Fires or explosions account for half of all industrial accidents recorded in Europe over the past two decades. They are also the most dangerous type of industrial accident. The impact of industrial accidents can vary widely depending on the intensity and persistence of any hazardous substances involved. Airborne toxic pollutants can be very damaging for flora and fauna, but the strongest environmental impacts are seen when toxic substances are released into rivers and other watercourses, with possible contamination of drinking water resources or lethal consequences for aquatic ecosystems and especially for fish. The impacts can be transboundary if international rivers or lakes are affected.

By methodological needs technological accidents can be divided in five groups:

- Overt disasters
- Slow-onset disasters
- Mass food poisonings
- Transnational disasters
- “Developing” disasters

Overt disasters are environmental releases which leave no ambiguity about their sources and their potential harm. Examples are Seveso and Bhopal. Seveso’s accident took place in 1976 and it caused contamination of several square kilometres of populated countryside

by the powerfully toxic 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). More than 700 people were evacuated, and restrictions were applied to another 30,000 inhabitants. Bhopal represents, probably, the worst chemical industrial disaster ever. It happened in 1984 when gas leak caused a deadly cloud to spread over the city of Bhopal, in central India, leaving thousands of dead and hundreds of thousands injured in the space in few hours. One of the most impressive and instructive examples of the slow-onset disasters is “Minamata disease”. In 1953 unusual neurological disorders similar to that due to poisoning by alkyl mercury compounds began to strike people living in fishing villages along Minamata Bay, Japan. A source was found in a factory discharging of mercury into Minamata Bay and the subsequent biological transformation into organic compound into the fish that were used as food. Outbreaks of food poisoning can be caused also by toxic chemicals released into the environment through the use of chemicals in the handling and processing of food. One of the most serious episodes of this type occurred in Spain in 1981 when previously unknown syndrome with signs of toxic pneumonitis, and gastro-intestinal symptoms affected over 20 000 persons with 315 deaths. The illness was found to be associated with the consumption of inexpensive denatured rapeseed oil, sold in unlabelled plastic containers that caused contamination with polychlorinated biphenyls (PCBs). Similar poisoning was reported in Japan and in Taiwan and dioxin poisoning was detected in Belgium. An obvious example of transnational disasters is Chernobyl, whose contamination reached from the Atlantic Ocean to the Ural Mountains. The Chernobyl disaster in 1986 is regarded as the worst accident in the history of nuclear power. The explosion in the plant resulted in radioactive contamination of the surrounding geographical area, and a cloud of radioactive fallout drifted over western parts of the former Soviet Union, eastern and western Europe, some Nordic countries and eastern North America. Large areas of Ukraine, the Republic of Belarus and the Russian Federation were badly contaminated, resulting in the evacuation and resettlement of over 336 000 people (6, 1).

The occurrence of ‘developing’ disasters is connected with industrialization and modernization of agriculture in developing countries and application of imported or adopted technology and products, which are quite different from those in which they were intended to be used. It was estimated that about 500,000 acute pesticide poisonings occur annually, resulting in about 9,000 deaths, and that only about 1% of the deadly cases occur in industrialized countries, although those countries consume about 80% of the total world agrochemical production (5).

Disaster management

Nobody dies by “disaster”. During the crises, emergencies or disasters people die of well recognisable, often banal causes that in other circumstances could be prevented. This is the main reason for better preparedness for appropriate response to crises and disasters.

There are four essential phases in the management of disasters: preparedness or warning phase, response or emergency phase, rehabilitation and recovery (16). More appropriate disaster management means more detailed planning as follows:

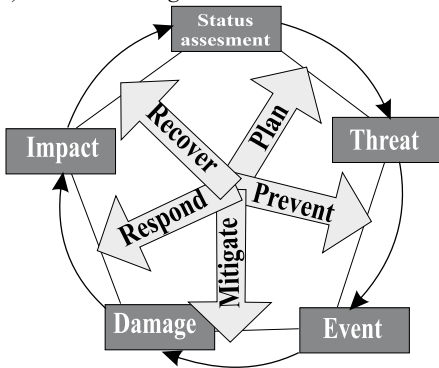
- *Anticipation;*
- *Assessment;*
- *Prevention;*
- *Preparation;*
- *Response:*
 - *Specific incident algorithm;*

- Command and control;
- Safety;
- Communication;
- Triage;
- Treatment;
- Transport.
- Recovery;
- Post Incident Audit.

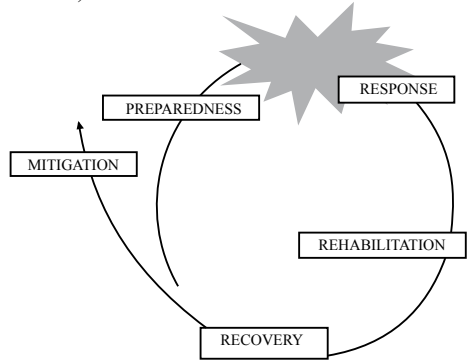
Main phases of disaster management – planning, prevention, preparation (mitigation), respond and recovery are closely linked. Focus of action of each of these phases is placed between different periods in relation of disaster events or hazard spectrum (15). Good preparedness and response planning and activities are essentially important for disaster risk reduction or mitigation in the next cycle of hazard spectrum. This is shown on the following schemes:

Schemes 1. Disaster management and disaster reduction activities

a) Disaster management



b) Disaster reduction activitiest



Source: *Preparing WHO for better action in crises. WHO, 2005.*

Anticipation

This involves taking a proactive approach to major incident management. It means that the expert and responsible people should identify the possible hazards and predict the possibility for their occurrence. For example, the presence of a river may increase the likelihood of flooding in a district for which planning should be undertaken. Another one is connected with occurrence of the highly pathogenic H5N1 influenza virus and increase of the likelihood for mutation and appearance of the more easily transmissible human to human strain with bigger pandemic potential.

Assessment

Assessment is a crucial management task which contributes directly to effective decision-making, planning and control of the organized response. Assessment of needs and resources is required in all types of disasters, whatever the cause and whatever the speed of onset (15, 17).

Assessment is needed during all identifiable phases of a disaster: from the start of emergency life-saving through the period of stabilization and rehabilitation, and into long-term recovery, reconstruction and return to normalcy.

Three general priorities are to be identified for early assessment: location of problem, magnitude of problem and immediate priorities. The assessment process is as follows:

- identify information, needs and resources;
- collect data;
- analyze and interpret;
- report conclusions;
- design/modify disaster response.

For better public health preparedness we need information for better risk determination and appropriate quantitative risk assessment.

The purpose of risk analysis is to guide communities in planning for protecting health and safety. It is possible to be done by developing and maintaining 3 sets of plans:

- hazard reduction plans
- vulnerability reduction plans
- emergency preparedness plans

The main task of these plans is prevention, preparation and response in case of preparedness for disaster occurrence and appropriate handling if disaster appears.

There are many different approaches for estimation, but it seems that USA Federal Emergency Management Agency (FEMA) approach is the most valuable and useable approach for now (9).

FEMA approach to hazards assessments is composed by 5 different steps with proposed very strict measurable scales and criteria for estimation as well as scale for overall ranking (16, 9). These different scales and proposed criteria for application of FEMA hazard analysis are based on:

- History of disaster
- Vulnerability of the population/properties
- Maximum threat for affecting/damaging
- Probability of occurrence
- Trends in occurrence

History - the occurrence of a potentially damaging event

| Criteria | Class | Score |
|--------------------------------------|--------|-------|
| 0-1 times in the past 100 years | Low | 2 |
| 2-3 times in the past 100 years | Medium | 5 |
| 4 or more times in the past 10 years | High | 10 |

Weighting score = 2

There have been 4 pandemic influenza in the past 100 years so that the score for **HISTORY** is $10 * 2 = 20$

Vulnerability - the people (and property) damaged as a result of the incident

| Criteria | Class | Score |
|----------|--------|-------|
| < 1% | Low | 2 |
| 1-10% | Medium | 5 |
| > 10% | High | 10 |

Weighting score = 5

Applied to pandemic influenza, it would be expected that about 25% of the population would be affected so that the score for VULNERABILITY is $10 * 5 = 20$

Maximum threat - the maximum numbers of people (and property) damaged in a worst case scenario

| Criteria | Class | Score |
|----------|--------|-------|
| <1% | Low | 1 |
| 1-4.9% | Low | 2 |
| 5-25% | Medium | 5 |
| >25% | High | 10 |

Weighting score = 10

Applied to pandemic influenza, it would be expected that 25% of the population would be affected so that the score for VULNERABILITY is $10 * 10 = 100$

Probability - the chance per year of the event (expressed per 1000)

| Criteria | Class | Score |
|----------|--------|-------|
| <1 | Low | 1 |
| 1-4.9 | Medium | 3 |
| 5-9.9 | Medium | 7 |
| 10-19.9 | Medium | 8 |
| 20-100 | Medium | 9 |
| >100 | High | 10 |

Weighting score = 7

Applied to pandemic influenza, it would be expected that ~ 1 in 20 years there will be a pandemic so that the score for PROBABILITY is $9 * 7 = 63$

Trend

| CRITERIA | SCORE |
|--------------------|-------|
| Likely to increase | 10 |
| Possibly increase | 5 |
| Stay the same | 0 |
| 10-19.9 | 5 |
| 20-100 | 10 |

Weighting score = 2

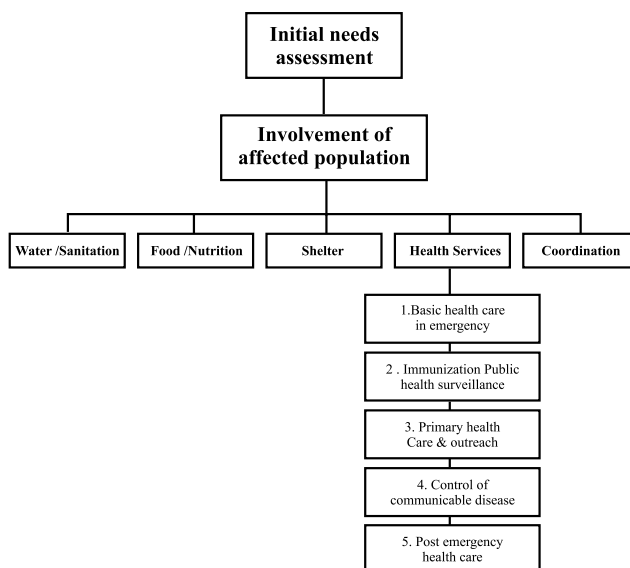
Applied to pandemic influenza, it would be expected that ~ 1 in 20 years there will be a pandemic so that the score for TREND is $2 * 0 = 0$

Overall ranking – determination of the risk

| Parameter | Class | Raw score | | FEMA weighting | | Weighted score |
|----------------|--------------|-----------|---|----------------|---|----------------|
| History | >4/100 years | 10 | * | 2 | = | 20 |
| Vulnerability | >10% | 10 | * | 5 | = | 50 |
| Maximum threat | >25% | 10 | * | 10 | = | 100 |
| Probability | 10-100/1000 | 9 | * | 7 | = | 63 |
| Trend | Stay same | 0 | * | 2 | = | 0 |

On the basis of available data, it can be determined that overall ranking for pandemic influenza is 233 of maximum rank of 260. It means that the risk for pandemic influenza occurrence and weighted score is very high.

The initial assessment of the health situation should be followed up with more detailed assessment during the rehabilitation and recovery phase as shown in the following flow diagram:



Prevention

This describes those activities that can be implemented following the risk assessment to stop the designated major disaster/incident from occurring (or minimising its likelihood) – these are examples of **hazard reduction programmes**.

Reduction is “identifying and analysing long-term risks to human life and property from natural or non-natural hazards; taking steps to eliminate these risks if practicable and, if not, reducing the magnitude of their impact and the likelihood of their occurring” (10).

Risk reduction methods are based on the principles of acceptance, avoidance, and mitigation. Some examples of hazard reduction plans are remediation of contaminated land before building on or building barriers to reduce a flooding risk.

Preparation

This describes those activities, whose implementation as soon as there is advance warning of an imminent threat will minimise the impact of the incident. Activities include

both forecasting and implementing the precautionary measures.

It involves both organisations and individuals who are involved in the response, recovery and post-incident audit phases.

The processes of interagency working are also clarified including how they will be controlled and how they will work with each other. Roles are clearly delineated for organisations and individuals.

These are examples of *vulnerability reduction programmes*. Vulnerability reduction describes those activities whose implementation is designed to minimise the consequences of a natural hazard event. This is achieved by lowering the vulnerability to natural hazards and /or reducing the number of elements at risk. Measures will usually be aimed at modifying behaviour.

Some examples of vulnerability reduction plans are designing earthquake proof buildings or heat wave watch scheme.

Response

This describes those activities whose implementation in the immediate aftermath of a major disaster/ incident will provide health and social care (to casualties/ those affected by the incident), and will rehabilitate or reconstruct the physical structures of the community. Essential elements of the response include equitable access to adequate safe water, hygienic sanitation, and food and shelter, and protection of affected populations from ill-health and violation. Responses should give priority to the most vulnerable people: women (especially when pregnant), young children, older people and persons who are disabled or chronically ill.

It includes how the *emergency preparedness and response plan* is activated (including Alert and Standby). There are many different emergency plans, some of them being:

- generic (all hazards) or specific;
- single agency or multi-agency;
- local, regional or national;
- business continuity plans.

All-hazards plans approach is based on the premise that an organisation's (service's) response to the range of potential major incidents. Single generic plan can provide a basic structured response for any incident – clearly it will ensure that it is flexible and robust enough to deal with the usually expected hazards including sites (airports, sports stadium and industrial complexes) and substances (including chemicals, fuel, electricity and flooding).

Specific plans approach is designed to meet specific needs. It is developed following the risk assessment and decision by that service/ organisation that managing a specific risk requires a specific plan. Plans may be risk specific, site specific or organisation function specific (13).

Multi-agency /integrated emergency plan aims to ensure that the activities of all services/ organisations involved in managing a major incident operate in an integrated manner.

Specific preparation for emergencies and crises alleviates their impact on health systems and decisively reduces the level of suffering, spread of epidemics, and number of deaths. For the health sector, preparedness typically means assuring resiliency of: health facilities to extreme conditions, availability of priority hospital services (focusing on trauma, women's health, child care and chronic conditions), management and triage of mass casualties, evacuation

of the injured and quarantine procedures, capacity for search and rescue operations, and the ability to establish disease surveillance and control measures rapidly. The key requirement is that those who need to respond are ready to do so. Careful planning is essential in order to assign responsibilities, identify challenges, introduce special procedures, and establish fall-back mechanisms.

Preparations and training should focus on identifying essential staff, establishing roster systems, testing procedures, and stockpiling essential supplies.

Response activities include many different actions as follows:

- Development of specific incident algorithm;
- Command and control;
- Safety (self, scene and survivors);
- Communication;
- Scene assessment;
- Triage;
- Treatment;
- Transport.

Command and control

This identifies who is in charge of the individuals/ organisations involved in managing the incident. Effective command requires good communication both horizontally between incident officers and vertically (up and down the individual service chains of command).

It is usually based on *bronze (operational)*, *silver (tactical)* and *gold (strategic) levels of command*.

On arrival at the scene of an event, the emergency services will take appropriate immediate measures and assess the extent of the problem, under the command of their respective officers. This is the *bronze* management level.

Silver is a tactical level of management introduced in order to determine priority in allocating resources, to plan and co-ordinate when a task will be undertaken, and to obtain other resources as required. Most, but not all, of the tactical functions will be discharged at or close to the scene of the incident.

The purpose of the *gold* or strategic level of management is to establish a framework of policy within which Tactical Commanders will work, to give support to the Tactical Commander(s) by the provision of resources, to give consideration to the prioritisation of demands from any number of incidents (18).

Safety

This embraces the rescuer's own safety, the safety of the scene and the safety of the casualties (in that order of priority).

Communications

This involves the process of communication between individuals/ organisations at bronze and between bronze and silver/ gold as appropriate.

Scene Assessment

The information required at this stage is contained in the acronym METHANE (16). The initial information to be passed from the scene assessment of a major incident that should be done is:

- *M* -Has a major incident been declared
- *E* -What is the exact location (grid reference)
- *T* - What type of incident is it (e.g. rail, chemical or road)
- *H* - What hazards are on site (current and potential?)
- *A* - How is incident accessed (i.e. approach direction)
- *N* - Numbers of casualties (type and severity)
- *E* - Emergency services (present and required)

Triage

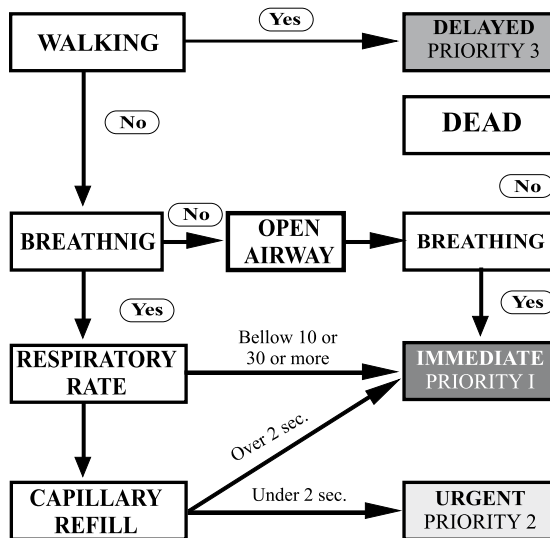
Triage activities (sieve and sort) are undertaken to sort casualties into priority groups for treatment (13). Whenever the numbers of casualties exceeds the numbers of skilled rescuers present, then the following triage principles should be used:

- Get the right patient to the right place at the right time
- Do the most for the most
- Triage is a dynamic process

The aim is to prioritise the casualties into groups on the basis of the treatment required:

- *Priority 1* (immediate) Casualties who require life-saving procedures
- *Priority 2* (urgent) Casualties who require procedures within 4-6 hours
- *Priority 3* (delayed) less serious casualties who do not require treatment within the times given above
- *Priority 4* (expectant) Casualties whose injuries are so severe that either they would not be expected to survive or their treatment would require so much input from existing resources that it would compromise the survival of other less seriously ill casualties

Figure 8. The adult triage priority



* If you are unable to obtain a capillary refill and the pulse is over 120 beats then the patient is PRIORITY 1.

Treatment

This involves applying those medical interventions that will enable the patient be stabilised prior to scene evacuation.

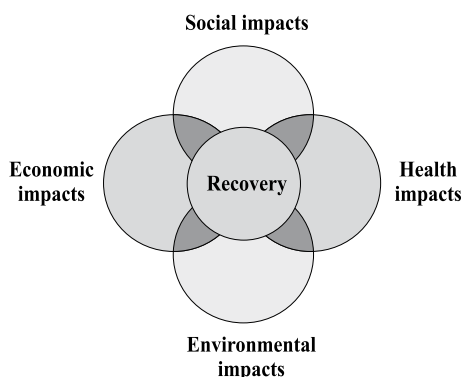
Transport

This involves getting the right patient, to the right facility at the right time.

Recovery

This encompasses all those activities designed to “address the enduring human, physical, environmental, social and economic consequences of major disasters/ incidents.” Its objective is to rebuild, restore, and rehabilitate the community and all possible disasters’ impacts.

Figure 9. The component parts of the recovery challenge



Source: Global Health Network Supercourse Project.

Recovery means that the crises are resolved. The recovery phase begins at the earliest opportunity after the onset of the disaster, running simultaneously with the response phase and continues until disruption has been rectified, demands on services have returned to normal levels, and the needs of those affected (directly or indirectly) have been met.

The common objectives of recovery (and response) are:

- saving and protecting life;
- relieving suffering;
- containing the emergency – limiting its escalation or spread;
- providing the public with warnings, advice and information;
- protecting the health and safety of personnel;
- safeguarding the environment;
- protecting property;
- maintaining normal services at an appropriate level;
- promoting and facilitating self-help in the community;
- facilitating the physical, social, economic and psychological recovery of the community.

From a health perspective the crises are resolved when essential health systems have been repaired and rebuilt; when the major health needs of the most vulnerable populations

receive attention; and when the health-care environment is secured for both patients and health personnel. To achieve this, a health sector recovery plan is essential. Such plans focus on essential lifelines to those in need, the restoration of services in primary health centres and hospitals, rehabilitation of laboratory services, disease surveillance and public health programmes. They include the identification of vital staff, their support and training, and the provision of essential supplies and equipment.

The specialty of emergency medicine meets the scientific, clinical and organisational need for a medical discipline that has a primary concern with emergencies. Emergency medical care of a high standard should be available to every person in need in all situations and at all times. The scope of activities is early diagnosis and treatment of all life, organ or limb-threatening conditions. Objective of emergency medicine is to provide an integrated system of pre-hospital, in-hospital emergency care, to reduce the mortality, morbidity, disability and suffering associated with injury and sudden illness and to study the epidemiology and management of major incidents and disasters.

The provision of high quality emergency care requires physicians with specialised training. Unfortunately this kind of education is not available in all Western-Balkan countries. The implementation of EU standards of training in emergency medicine and pan-European examination should be one of the national health care priorities (13).

Post Incident Audit

This involves conducting an assessment of the management of the incident to identify lessons learned. By definition, audits are an independent assessment and evaluation of an institution's activities.

The purposes may include gaining an understanding of the service's/ organisation's operations, evaluating the adequacy of the control structure for potential key issues and areas of concern, providing on-going feedback to management, validating and reviewing data for completeness, accuracy, and authorisation, benchmarking, or assessing a data centre for security, operations, application maintenance, and system implementations.

Potential health sector response strategies - Implementing the legal framework

The first legally binding WHO instrument, the International Health Regulations (IHR), has been revised in 2005. This revised version, IHR (2005), constitutes a renewed legal framework for WHO to collectively address public health emergencies of international concern, of whatever nature (infectious agent, chemical, nuclear, etc.) or origin (natural, accidental, deliberate). IHR (2005) came into force on 15 June 2007. WHO has a mandate to support the countries in preparing their health systems to cope effectively with the health aspects of crises and to strengthen their public health readiness. It requires complex prevention and preparedness strategies. Good governance and good management of health systems are particularly the most important prerequisites for effective operational crisis response.

References

1. Towards health Security, edited Gerald Rockenschaub, Jukka Pukkila and Maria Cristina Profili. WHO, 2007.
2. Hoyois P., Below J.M., Guha-Sapir D.: Annual Disaster Statistical Review: Numbers and trends 2006. CRED, Brussels, 2007.
3. Mapping the impacts of recent natural disasters and technological accidents in Europe. Environmental issue report No 35. EEA, Copenhagen, 2003.
4. D. Rockenschaub.: *WHO-role in disaster and emergencies. Staringhtening National Capacities, WHO, Disaster Preparednes and Response Programme, 2005.*

5. Bertazzi P.: *Disasters and major accidents. Encyclopedia of occupational health and safety. Fourth edition.* <http://www.ilo.org/encyclopedia/> access 15.09.2007
6. Enhancing health security: the challenges in the WHO European Region and the health sector response. WHO, Copenhagen, 2006.
7. Cummings C.E., Stikova E. *Strengthening National Public Health Preparedness and Response to Chemical, Biological and Radiological Threats.* Amsterdam: IOS Press; 2007.
8. *Encyclopedia of occupational health and safety. Fourth edition.* <http://www.ilo.org/encyclopedia/> access 15.09.2007
9. *Multy hazard identification and risk assessment. MHIRA,* <http://www.fema.gov/library/viewRecord.do?id=2214> available 18.09.2007.
10. *Risk reduction and emergency preparednes. WHO six-year strategy for the health sector and community capacity development.* WHO, 2007.
11. *Health in emergency. WHO humanitarian assistance in Europe:1996-1998.* WHO, Copenhagen, 1999.
12. *The World Health Report 2007: A safer future: Global Public Health Security in 21st century.* WHO, 2007.
13. *Basic Life Support Course, American Medical Association, copyright 2004.*
14. *Global Health Network Supercourse Project.* www.pitt.edu/~super1/
15. *Preparing WHO for better action in crises.* WHO, Copenhagen, 2005.
16. D. Baxter.: *Major Incident Management. Emergency Management and Preparedness.* Sheffield University, June, 2007.
17. *WHO-role in disaster and emergencies. Straightening National Capacities,* WHO, 2005.
18. Copola D.: *Introduction to International Disaster Management.* Available from: http://books.google.com/books?id=s6oxEraQWWwC&pg=RA1-PA23&ots=tOk9au7c-j&dq=OFDA/CRED+International+Disaster+Databasa&ei=UyHxRrigPjf26wKpp9HrBg&sig=1dLUFv-xyo1XOxsdBnI93eiPnPpk#PRA1-PA23_M1 (access 18.09.2007)