Safe Hospitals

KEY PRACTICES
for DRR Implementers

Humanitarian Aid
and Civil Protection

COOPI
COOPERAZIONE INTERNAZIONALE

Safe Hospitals: Key Practices for DRR Implementers

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This brief is part of the series, *A Field Guide for Disaster Risk Reduction in Southern Africa: Key Practices for DRR Implementers*, coordinated by the FAO Subregional Office for Disaster Risk Reduction/Management for Southern Africa. This series has been produced with contributions from COOPI, FAO, OCHA and UN-Habitat, and comprises the following technical briefs:

- Information and Knowledge Management (COOPI)
- Mobile Health Technology (COOPI)
- Safe Hospitals (COOPI)
- Disaster Risk Reduction for Food and Nutrition Security (FAO)
- Appropriate Seed Varieties for Small-scale Farmers (FAO)
- Appropriate Seed and Grain Storage Systems for Small-scale Farmers (FAO)
- Farmer Field Schools (FAO)
- Irrigation Techniques for Small-scale Farmers (FAO)
- Management of Crop Diversity (FAO)
- Community-based Early Warning Systems (OCHA and FAO)
- Disaster Risk Reduction Architecture (UN-Habitat)

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Humanitarian Aid and Civil Protection

The European Commission's Humanitarian Aid department funds relief operations for victims of natural disasters and conflicts outside the European Union. Aid is channelled impartially, straight to people in need, regardless of their race, ethnic group, religion, gender, age, nationality or political affiliation.

Foreword by ECHO

The southern Africa and Indian Ocean region is extremely vulnerable to cyclones, floods, droughts and tropical storms. These recurrent climate-related shocks negatively affect the highly sensitive livelihoods and economies in the region, and erode communities' ability to fully recover, leading to increased fragility and vulnerability to subsequent disasters. The nature and pattern of weather-related disasters is shifting, becoming unpredictable, and increasing in frequency, intensity and magnitude as a result of climate change. Vulnerability in the region is further compounded by prevailing negative socio-economic factors, such as high HIV rates, extreme poverty, growing insecurity and demographic growth and trends (including intra-regional migration and increasing urbanization).

The European Commission's Office for Humanitarian Affairs (ECHO) has actively engaged in the region through the Disaster Preparedness ECHO (DIPECHO) programme since 2009, supporting multi-sectorial disaster risk reduction interventions in food security and agriculture, infrastructure and adapted architecture, information and knowledge management, water, sanitation and hygiene, and health. This programme operates with two objectives, notably:

- Emergency preparedness by building local capacities for sustainable weather-hazard preparedness and management, including seasonal preparedness plans, training, emergency stocks and rescue equipment, as well as Early Warning Systems.
- Empowering communities through multi-sectorial and multi-level approaches with DRR mainstreamed as a central component and improved food and nutrition security as an outcome.

This is done in alignment with national and regional strategies and frameworks.

For DIPECHO, one of the main measures of success is replicability. To this end, technical support through guidelines established for DRR implementers is a welcome output of the DIPECHO interventions in the region. ECHO has supported regional partners, namely COOPI, FAO, UN-Habitat and UN-OCHA, to enhance the resilience of vulnerable populations in southern Africa by providing the funding to field-test and establish good practices, and to develop a toolkit for their replication in southern Africa. It is the aim of the European Commission Office for Humanitarian Affairs and its partners to fulfil the two objectives sustainably and efficiently through the practices contained in this toolkit to ensure the increased resilience of the most vulnerable populations in the region.

Cees Wittebrood
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European Commission

Foreword by COOPI

In 2013, Cooperazione Internazionale (COOPI) adopted a specific environment and disaster risk reduction policy.[1] The main goal of the organization is to increase communities' and institutions' resilience by promoting environmental sustainability, fostering participation, and integrating prevention, mitigation and preparedness actions. COOPI aligns itself with international legal frameworks such as the Kyoto Protocol (1997), the United Nations Millennium Declaration (2000) and the Hyogo Framework for Action 2005–2015. COOPI enacts these frameworks using experience and knowledge in three key concepts: environmental sustainability, participation, and the integration of prevention, mitigation and preparedness. COOPI uses six well-established approaches to implementation:

- Land analysis and information system: an essential tool for crisis and risk management which allows the optimization of resources. COOPI has developed a series of good practices in these areas of intervention, promoting the use and development of research.
- Natural resources conservation and DRR-oriented land management: orienting the focus of land management interventions towards protection and appropriate resource management through interventions on protection, value, efficient use and optimization of land.
- Capacity building and knowledge transfer enhancing capacities of communities and institutions is essential. COOPI stresses the importance of empowering emergency management structures both at the institutional and at community level through decentralization strategies.
- Education, communication and information combining education, communication and information to create a culture of risk management.
- Risk mitigation and supporting infrastructures: strengthening responses, mitigation and early recovery by identifying vulnerable and useful resources.
- Scientific research and know-how transfer: establishing relationships with DRR academics, scientific institutions and bodies for alternative energies innovations, monitoring methodologies

1 Policy available at http://www.coopi.org/repository/pagine/coopi_ambiente_2013.pdf

and vulnerability analysis, natural hazard assessment, sharing good practices etc.

The *Safe Hospitals: Key Practices for DRR Implementers* resource toolkit presented here provides support to DRR practitioners working in the health sector and particularly to those dealing with safety of health facilities. The toolkit provides guidelines and practical examples on the application of the hospital safety index, originally developed by the Pan American Health Organization and adapted to the context of the southern Africa region.

In particular, the tool is based on the lesson learnt from COOPI's three years of experience in using the index to assess safety of hospital and health centres in Malawi and Madagascar. The toolkit and the Hospital Safety Index adapted by COOPI to the southern Africa region are also available at www.seadrr.org.

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Acronyms and Abbreviations

COOPI	Cooperazione Internazionale
DIPECHO	Disaster Preparedness European Commission's Humanitarian Aid Department
DoDMA	Department of Disaster Management Affairs
DRR	disaster risk reduction
ISDR	International Strategy for Disaster Reduction
m^2	square metre
NGO	non-governmental organization
PAHO	Pan American Health Organization
SHI	Hospital Safety Index
UN	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
WHO	World Health Organization

Preface

The health care system plays a key role within the disaster risk reduction context. Hospitals, health centres and other health structures need to guarantee their ability to function before, during and after disasters strike. In order to achieve this objective, it is important to assess whether these structures are able to cope with eventual disasters that may occur.

A campaign promoted by the Pan American Health Organization (PAHO) and called *Hospitals Safe from Disasters: Reduce Risk, Protect Health Facilities, Save Lives* has been working in this direction and promoting the assessment of health infrastructures to verify their level of safety in normal and emergency operating conditions. This involves the use of a set of indicators called the Hospital Safety Index.

The campaign started in South America and was then expanded in Asia and is currently being implemented in Africa.

This toolkit describes the methodology developed by PAHO and adapted to the southeast Africa and Indian Ocean region, with specific examples of practical applications in Malawi and Madagascar.

1. Introduction

In order to understand disasters, it is necessary to analyse the types of hazards that might affect people, as well as social, political and economic dynamics among different population groups: e.g. how they vary in relation to health, income, building safety, location of work and houses, etc. (Blaikie, P., Cannon, T., Davis, I. & Wismer, B. 2003). Once the concept of vulnerability[2] and its main causes are defined, there are two types of interventions to face risks: mitigation/prevention measures and emergency responses. Mitigation actions aim at building processes that can reduce the impact of disasters. Some natural hazards (earthquakes, droughts, volcanic eruptions, etc.) cannot be controlled or eliminated by human actions; therefore, the processes focus on reducing the anthropic vulnerability[3] to these types of events. Prevention actions aim at reducing vulnerability, but unlike the mitigation that substantially reduces the effect, it prevents a disaster from happening. On the other hand, emergency responses intervene after a disaster occurs and it helps to minimize the effects of a disaster to people and infrastructures.

Several studies, supported by data and statistics,[4] showed that in recent decades there has been a substantial increase in the number of disasters occurring in the world and, in particular, in the developing world. The reasons for this dramatic increase cannot be attributed exclusively to a particular geological or climatic factor, but it is increasingly clear how human actions and the same human presence heavily influence the occurrence of disasters. The comparison between the data for the year 2011 with the average for the decade 2001/2010,[5] shows that the number of victims of natural disasters has increased by more than 200 million. This alarming fact can be largely understood as a result of the growth of hydrogeological disasters, which in 2011 alone resulted in 57.1 percent of the total number of victims. The number of casualties as a result of natural disasters has increased in Africa, due to climatic disasters, particularly the drought in the Horn of Africa which has significantly increased the number of victims.

The need to reduce vulnerability to natural disasters has led in recent years to the development of a number of programmes and campaigns focused on the theme, in its various manifestations: capacity building, environmental protection, safe construction, etc.

2 The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNIDSR, 2009).

3 Anthropic vulnerability refers to the economic, political and cultural aspects of vulnerability. Wilches-Chaux, 1989.

4 EM-DATA – www.emdat.be

5 Guha-Sapir, D., Vos, F., Below, R. & Ponserre, S., 2012. Annual Disaster. Statistical review 2011. The numbers and trends. Available at www.cred.be/sites/default/files/ADRS_2011.pdf

One of the most significant processes was the one that affected the health sector and that involved different agencies, most notably the World Health Organization and the United Nations.

It is clear that in mitigation/prevention measures, as in emergency responses, the issue of health – and specifically the ability of health care facilities to function – is of crucial importance, as the health system is involved in both the mitigation process and the emergency response. Therefore, specific attention has been given to the health care sector involving different agencies. In 2008–2009 the International Strategy for Disaster Reduction (UNISDR) and the World Health Organization (WHO), with support from the Global Facility for Disaster Reduction and Recovery of the World Bank and many other organizations, promoted the *Hospitals Safe from Disasters: Reduce Risk, Protect Health Facilities* and the *Save Lives* objective in the World DRR campaign. The campaign posited that an efficient and effective health system can deal with problems associated with the occurrence of disasters at different levels and thus act as an agent to mitigate vulnerability, either in prevention or emergency response. For example, when faced with a hazard (e.g. an earthquake, flood) a safe health facility can:[6]

- prevent the occurrence of a disaster if the hospital buildings do not collapse, there are no casualties among the patients and the medical staff;
- reduce the effects of a disaster if the health facilities remain structurally sound and operational even after a hazard and in emergency situations when the demand on the facility and its systems to treat casualties or injuries is likely to increase; and
- reduce vulnerability through prevention: if health facilities are adequately dimensioned, they can contribute to the reduction of certain health risks (contamination, disease, treatment of the wounded, etc.) and prevent the occurrence of health disasters (epidemics).

The present brief about the assessment of health facilities provides practical support to meet the objectives outlined above.

General objective of promoting safer hospitals

In keeping with the aims of the World DRR Campaign, the overall goal is to make health facilities less vulnerable to natural disasters and safer overall. A hospital or health facility is considered safe if it:

- provides health services efficiently during both normal and critical times after disaster or during an emergency;
- is structurally sound and will not collapse due to hazards, injuring patients and staff;
- is resilient to operational malfunctions as contingency plans are in place and health workforce is trained to keep the network operational in times of crisis; and

6 International Strategy for Disaster Reduction (UNISDR), World Health Organization (WHO), World Bank, Reduce Risk, Protect Health Facilities, Save Lives Hospitals Safe from Disasters. 2008–2009 World Disaster Reduction Campaign.

- the workforce is trained to keep the network operational in times of crisis.

Therefore, the objectives of making hospitals safe from disasters are to:
- Protect patients' and health workers' lives by ensuring the structural resilience of health facilities
- Make sure health facilities and health services are able to function in the aftermath of emergencies and disasters, when they are most needed
- Improve the risk reduction capacity of health workers and institutions, including emergency management.

In order to achieve these objectives it is necessary to work at different levels:
- *High-level summits:* Raise awareness by including the topic on the agendas of high-level summits and technical meetings, documenting and sharing good practices to make hospitals safe from disasters.
- *Health service networks:* Take into consideration all key components of the health service network such as primary health care centres, blood banks, laboratories, warehouses and emergency medical services.
- *Professionals:* Involve the widest possible variety of professionals – including all health disciplines: engineers, architects, managers and maintenance staff – in identifying and reducing risk and building the resilience of communities.
- *Policy-makers:* Identify health service safety as a specific target for policy action and facilitate formulation of strategic action plans involving governments, health sector and any other actors to address it.[7]

Intended applications of safe hospital guidelines

The use of the safe hospital concept and its tools are important in order to achieve the following:

1. Monitor and evaluate existing health facilities using the Hospital Safety Index. The use of the Hospital Safety Index helps to evaluate a health structure's level of safety, through a standardized and structured methodology. This can contribute to a clear picture of the state of safety of health structures in a certain region or area and allows to:
- *Plan for emergency response at a regional scale:* Knowledge of the real functionality and safety of health facilities makes it possible to establish a plan for responding to emergency situations, according to the capacity and capabilities of the different centres.

7 International Strategy for Disaster Reduction (UNISDR), World Health Organization (WHO), World Bank, Reduce Risk, Protect Health Facilities, Save Lives Hospitals Safe from Disasters. 2008–2009 World Disaster Reduction Campaign.

- *Plan the use of resources aimed at strengthening weak structures:* Knowledge of the critical issues of individual health centres makes it possible to prioritize interventions, indicating where economic resources should be invested in order to satisfy real needs.

2. Provide examples of good practices in various fields to sensitize on safety issues. The safety of a health facility depends on both structural parameters linked to the building, i.e. how it was designed and built, as well on behavioural practices among the staff and patients. Sharing good standards and making stakeholders aware of the risks may be the first element to reduce internal risks and improving safety.

3. Create awareness within the hospital staff and the emergency committee. Awareness about disaster risks, and security and management of activities and resources, both in emergencies and in normal situations, aims at reducing vulnerability of the health centre. Empowering and informing staff through the evaluation process helps the staff to undertake an active role in ensuring the safety of the structure in which they work. The method for achieving this goal has been identified in the formulation of a checklist for the assessment of parameters easily understood even by non-technical stakeholders and accompanied by specific explanations for each heading and a list of good practices.

4. Development of a standard method. This allows comparison between different health facilities and replicability of use, and provision of results that are representative of the level of safety. The method is based on a checklist; each parameter is rated with a score obtained by a comparison to threshold values.

5. Provide guidelines for the construction of new health facilities in a specific area. The Hospital Safety Index helps to identify good and bad practices that are implemented in hospitals, thereby helping to define guidelines for the construction of new health infrastructure.

2. Steps/Introductions for the Field-Based Implementation of Safe Hospitals

Key principles for safe hospitals

As indicated by the World Disaster Reduction Campaign, there are ten principles that help to define the Safe Hospital concept:[8]

1. Many factors put hospitals and health facilities at risk: buildings, number of patients, hospital beds, health workforce, equipment, basic lifelines and services.

2. Components of a hospital or health facility which are typically divided into two categories – structural elements: those essential elements that determine the overall safety of the system such as beams, columns, etc. and non-structural elements: all other elements that enable the facility to operate, including water heaters or storage tanks, mechanical equipment, etc. In the case of hospitals, 80 percent or more of the total cost of the facility can be the price of non-structural components.

3. Functional collapse, not structural damage, is the usual reason for hospitals being put out of service during emergencies: this happens when the elements that allow a hospital to operate on a day-to-day basis are unable to perform because the disaster has overloaded the system.

4. Hospitals and health facilities can be built to different levels of protection. This happens when the elements that allow a hospital to operate on a day-to-day basis are unable to perform because the disaster has overloaded the system.

5. Making new, safer hospitals and health facilities is not costly. It has been estimated that the incorporation of mitigation measures into the design and construction of a new hospital will account for less than 4 percent of the total initial investment. For example, non-structural elements – the contents, rather than the building – represent most of the value of hospitals. Damage to non-structural

8 International Strategy for Disaster Reduction (UNISDR), World Health Organization (WHO), World Bank, Reduce Risk, Protect Health Facilities, Save Lives Hospitals Safe from Disasters. 2008–2009 World Disaster Reduction Campaign

elements is also what most often renders a hospital inoperable during a natural disaster. Retrofitting non-structural elements costs only about 1 percent[9] while protecting up to 90 percent[10] of the value of a hospital. Retrofitted health centres in the Cayman Islands were virtually undamaged during Hurricane Ivan in 2004.[11] Had they not been retrofitted, specialists estimate structural damages could reach 20 percent of the hospital's value, and non-structural damage potentially 40 percent.[12]

6. Field hospitals are not necessarily the best solution to compensate for the loss of a hospital or health facility. Field hospitals have been used successfully in complex disasters (civil conflicts and wars), but experience in the aftermath of disasters caused by natural hazards in developing countries has shown these extremely expensive solutions not to be satisfactorily cost-effective. The establishment of field hospitals involves several costs associated with the transportation of material and equipment, site selection and related costs of safety measures. These costs, however, are all related to a temporary service that cannot be used after the initial emergency and therefore do not allow the reabsorption of the initial investment costs. For example, in the aftermath of the Bam earthquake (Iran, 2003), it is estimated that the 14 foreign field hospitals cost US$12 million for two months of service, equivalent to about 40 percent of the cost of rebuilding Bam's two damaged and unserviceable hospitals. Deployment was more rapid than it had been in the Gujarat earthquake two years earlier (24–48 hours versus 5–7 days), but nevertheless, by the time the first field hospitals were active, injured patients had either died or been airlifted to other cities.[13]

7. It is critical to seek the right expertise. An independent 'check consultant' should be engaged to ensure that building standards are in place and are respected. The check consultant ensures that norms and building standards are in place, and can be contracted to oversee the construction of any building, but their thorough knowledge of building codes and natural hazard mitigation measures are particularly important to ensuring the disaster safety of critical facilities such as hospitals.[14]

8. Building codes are of utmost importance. In order to guarantee safety of the infrastructures, building codes must be reviewed and respected from the planning and consultation phases, and

9 Tony Gibbs, Consulting Engineers Partners Ltd.
10 Guidelines for Seismic Vulnerability Assessment of Hospitals, WHO & NSET, Kathmandu, April 2004.
11 Safe Hospitals: A Collective Responsibility, PAHO & WHO, 2005.
12 Tony Gibbs, Consulting Engineers Partners Ltd.
13 Von Schreeb, J., L. Riddez, H. Samnegård, H. Rosling & C. de Ville de Goyet, 2008.
14 International Strategy for Disaster Reduction (UNISDR), World Health Organization (WHO), World Bank, Reduce Risk, Protect Health Facilities, Save Lives Hospitals Safe from Disasters. 2008–2009 World Disaster Reduction Campaign.

throughout construction, and should also be considered for the maintenance of the facility.

9. Creating safe hospitals is as much about having vision and commitment as it is about actual resources. The responsibility of creating safe hospitals must be shared among many sectors: planning, finance, public works, urban and land-use planning, together with the health sector.

10. The most costly hospital is the one that fails. While adequate resources are critical to ensuring the quality of the hospital's construction and the services to be provided therein, the construction of a hospital should be feasible and its various elements should be specific to the needs assessed in the particular context.

The Hospital Safety Index: the central tool for realising safer health facilities

The assessment of hospital safety is based on the use of the Hospital Safety Index, which was developed through a lengthy process of dialogue, testing and revision initially by the Pan American Health Organization's Disaster Mitigation Advisory Group and later with inputs from other specialists in Latin America and the Caribbean. The goal of the project was to implement a rapid assessment method based on specific indicators to determine the level of safety of health care facilities. Through the Hospital Safety Index, both general information (population it serves, the number of health staff, and type of natural hazards prevalent in the area and disaster history) and more technical data (dimension and materials of structural elements) are collected. Evaluators use a checklist to measure aspects that contribute to a facility's safety, considering: structural components (load-bearing walls, foundations, columns, etc.), non-structural components (architectural elements and laboratory equipment, furnishings, ventilation or electrical systems) and organizational/functional elements such as the emergency operations centre, contingency plans, backup systems for water and electricity, etc. The level of safety for each component is ranked as high, medium or low, based on specific standards, according to general procedures, local context and building codes. These scores are weighted according to the importance of the aspect being evaluated. A programme (Excel) automates and standardizes the assessment and evaluation phase, reducing bias and lessening the chance of mathematical error.[15]

The structure of this version of the Hospital Safety Index toolkit is described in the figure hereunder.

15 International Strategy for Disaster Reduction (UNISDR), World Health Organization (WHO), World Bank, Reduce Risk, Protect Health Facilities, Save Lives Hospitals Safe from Disasters. 2008–2009 World Disaster Reduction Campaign.

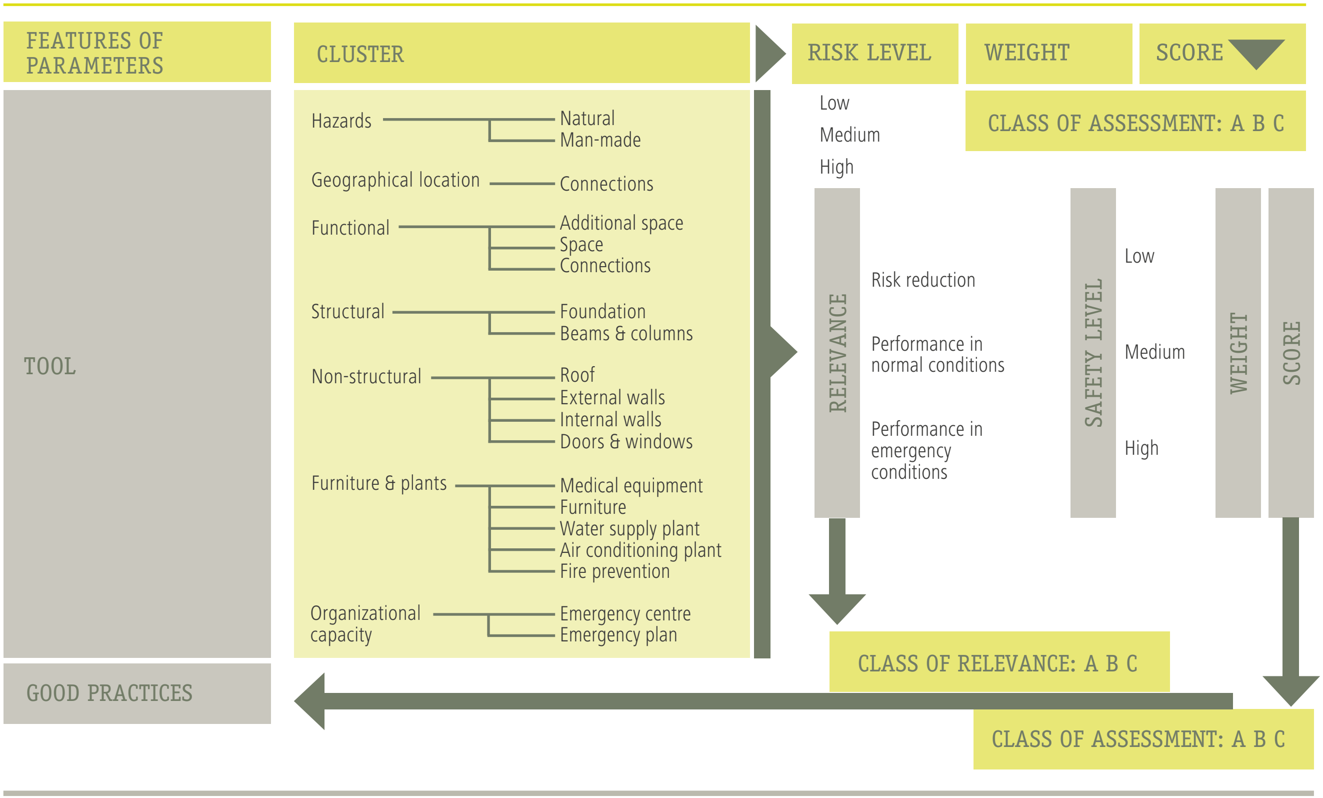

Figure 1: Functional diagram of Hospital Safety Index

There are four main sections to the Safe Hospital Toolkit:

1. General description: data collection, necessary for file keeping of the hospital and for general knowledge of the facility. The information is divided into:

- *Demographic structure:* Name, year of construction, address, telephone number and email management (public or private), type of structure, number of staff, patients per day, total number of beds, number of buildings, number of units, height of buildings, presence of expansions, total floor area, presence of parking, number of access roads, electrical supply, water supply.
- *Constructive:* For each unit it is asked to specify the number of beds and the number of beds which can be added, the type of structure (frame in reinforced concrete, steel frame, masonry bearing), the type of masonry (bricks, concrete blocks, panels, blocks of clay) and the type of cover (sheet metal, tiles).
- *Personal data of compilers:* Compilers are asked to enter their personal information, such as their names, name of the organization, job title, etc.

2. Seven clusters to be assessed, consisting of 133 parameters. The clusters of Hospital Safety Index are:

- *Hazards:* natural and man-made (12 parameters);
- *Geographical location:* connection with settlements (6 indicators);
- *Spatial and functional:* additional functions (staff and family houses), spatial, connections (21 indicators);
- *Structural:* foundations and structural frame (14 indicators);
- *Non-structural:* roof, walls, doors and windows (20 indicators);
- *Furniture and plants:* furniture and equipment, electrical system, water supply and sanitation, fuel storage, heating, ventilation and air conditioning system, fire prevention (47 indicators); and
- *Organizational capacity:* emergency operations centre and disaster committee, plan for internal and external disasters (24 indicators).

There are several indicators per cluster. For each indicator, the compiler is asked to answer a specific question by assigning a level of safety (30 percent low, 70 percent average, 100 percent level high); the score of each indicator is then multiplied by a weighting coefficient and it contributes to the final score. The maximum sum of the scores for all indicators of a cluster is always equal to 100. If the compiler does not know the answer to some questions, or if the indicator refers to an element not present in the structure, this has to be indicated by ticking a specific box which gives a contribution for that indicator equal to zero in the calculation of the final result. All clusters are organized with this structure. In the 'hazards' cluster, the level of security is replaced by the level of risk, but the process of compilation and calculation remains the same. Each cluster is followed by a section that describes the related indicators together with the criteria for assigning the security level.

3. Results. The scores obtained from the assessment are displayed automatically in the Results section according to two criteria:

a. Typology and functionality. A coefficient (weight) is attributed to the final score of each cluster, based on the relevance of that cluster within the global system. This cluster score is multiplied by its coefficient in order to contribute to the total score. The final score of the overall assessment of the health facility is obtained by the sum of the weighted scores of each cluster. This value is always between 1 and 100. Finally, a specific class of safety is attributed to the health facility as indicated below:

- 'Class A' if final score is higher than 70
- 'Class B' if final score is between 41 and 70
- 'Class C' if final score is less than 40.

b. Areas of significance. Each indicator is also classified based on the area of significance, i.e. risk reduction, performance in normal conditions and performance in emergency situations. Therefore, the final results are also calculated based on this classification, resulting in the ability to identify which sector requires an immediate response, through interventions focused on specific indicators.

4. Good practices. The last section of the toolkit is dedicated to good practices. They are divided according to the three areas of significance described above and structured in a series of actions related to a specific area, i.e. hygiene and waste, structural safety, etc. In order to facilitate the understanding of the practice by non-technical personnel, two images are included: one demonstrating successful implementation of safe hospital principles or management of space and another about an incorrect solution. The level of priority and cost for the intervention are also elaborated in this section. This section does not represent an exhaustive list of possible interventions or good standards of construction and operation of health care facilities, but provides some suggestions and actions, including related financial commitments, based on the results of the evaluation.

The entire version of the checklist is available at the DRR Information Knowledge Management System web portal www.seadrr.org.

Technical considerations and specifications

Some considerations and specifications in order to properly apply the safe hospital procedures are summarized below:

Ease and fast use of the toolkit by non-technical staff: the method is easily understood and applied by non-technical and non-trained staff. Moreover, despite the high total number of indicators, field assessments can be carried out in a day's work.

PN2	CHECKLIST		PICTURES	
	Action: 2.A The shape of the hospital should allow air flow through many openings, such as windows, louvres and doors. Openings in the same hall should be placed opposite to each other in order to improve cross ventilation. 2.B Placement of mosquito nets at every window or door to the hospital. 2.C Creation of openings in the roof to enable warm and humid air to exit. 2.D Construction of detached or double roofing which allows better air circulation and provides protection from the sun. 2.E Construction of protection panels for walls in order to reduce insulation and overheating and improve inner conditions. 2.F Improvement of light systems; the light system of operating theatres and laboratories should be realized with adequate measurements in order to allow the best operating conditions.			
	Description of pictures: Fig. 1 This is an example of wrong realization; hygienic and comfort conditions are inadequate: • metal sheet roof heats room; • walls are dirty; • windows are small and they do not guarantee enough light; and • there are no partitions or furniture for patients. Fig. 2 This is an example of correct realization; Space is well lit and well sized; transversal ventilation is guaranteed by windows on opposite sites. Only problem is related to metal sheet that heats space.			
	PRIORITY	HIGH	COST	$$

Figure 2: Extract of Hospital Safety Index table: Indicators

D1.3	Do drainage systems exist?	☐	☐	☐	☐	☐	15	
	Area of relevance	Risk reduction						
D1.4	Are the foundations properly designed and sized also in relation to the possibility of adding additional floors to the building?	☐	☐	☐	☐	☐	15	0
	Additional data is available from product drawings and/or calculation report							Y/N
	Area of relevance	Risk reduction						
D1.5	Are there anchorage systems between foundations and vertical frame?	☐	☐	☐	☐	☐	20	0
	Data is available in project drawings and calculation report or as results of diagnostic investigations.							Y/N
	Area of relevance	Risk reduction						

Score obtained for specific indicator

Area of relevance for the indicator

Question about availability of supporting technical documentation

Figure 3: Extract of Hospital Safety Index table: Indicators

C2.6	**WELL-SIZED UNITS:**
	In hospital design it is necessary to properly size the unit based on the number of patients.
	• Low if less of 25% of rooms are considered adequate. • Medium if adequate rooms are between 25% and 50%. • High if adequate rooms are more than 50%. • Inadequate space is considered if there are usually more patients than bed and there are waiting patients in passages.
C2.7	**CRITICAL FUNCTIONS:**
	The importance of well-designed space is highlighted for critical functions (operational theatre, pharmacy) both in normal and emergency contingencies; these key questions assess quality, dimension and maintenance of locals.
	• Low if all critical functions are in unsafe area. • Medium if critical functions are in both unsafe and safe areas. • High if all critical functions are in safe area.
C2.8	**ISOLATION UNIT:**
	Isolation unit is a ward that needs supplementary control in terms of security and hygienic measurements.
	• Low if isolation unit is not in a separate building and/or there is no filter between this unit and the other ones. • Medium if isolation unit is in the same building as the other units, but it is well separated. • High if it is in separate building.

Figure 4: Extract from Hospital Safety Index table: Practices

Safety level definitions are clear: The division into three security levels – low, medium, high – could lead to some degree of approximation and of subjectivity of the results. However, thanks to the detailed descriptions provided by individual indicators and the correct interpretation of the threshold values has proven that the methodology is solid and leaves little room for misunderstanding, and makes the findings more objective and reliable.

Structural indicators are simplified: Structural indicators have been simplified as much as possible, even though the argument is technical and complex, especially if the phenomena of risk are earthquakes or strong winds. It is clear that this section is significant within the overall safety assessment of the complex as it gives an approximation of the ability of the building to be sustained over time and also in case of disasters.

Technical staff or specialists may be required for specific issues. Although the toolkit has been developed to be used by personnel with non-technical and non-engineering skills, implementing partners should look to employ engineers or architects in order to evaluate specific elements (i.e. foundations, beams, water system, etc.) that require further investigation or urgent action. Furthermore questions have been added to the toolkit in order to verify the availability of technical documentation, particularly in the section concerning the structural components. The positive or negative answers to these questions influence the final score: if there is no technical documentation, the final score is reduced.

Indicators should have standard characteristics to make them comparable. Generally, indicators should take into consideration:

- *Relevance:* Relevance to the scope of the system to be evaluated and consistency with the environment that the indicator refers to.
- *Representativeness:* The ability to represent clearly and effectively the issues affecting the system the indicator is measuring;
- *Traceability:* Indicators should be monitored over time by both technical and non-specialist individuals.
- *Comparability:* Indicators should help users to compare and detect differences and disparities among hospital units and buildings located in different contexts.
- *Objectivity:* Indicators should be evaluated with neutral evaluation criteria and shared, in order to ensure the reliability of the results.
- *Measurability:* Indicators must be measurable according to established criteria, and shared in an objective manner.
- *Ease of collection:* In the interests of a rapid assessment, indicators should be easily collected. Data is generally available through existing records, desktop resources, public information sources, and/or published research, or is easily observed by data collectors.

Activities and key steps required in the field

In order to evaluate hospital safety the following field activities are required.

Step 1. Plenary session: The committee of the health care facility where applicable, or staff members designated to do the evaluation, are invited to attend the presentation of the toolkit. This allows external parties to get to know the structure to be evaluated and to fill in the general description section of the Hospital Safety Index. This also helps to brainstorm with the local staff about the safety and functionality of the site where they work, and helps to highlight those elements that the staff feels requires urgent action.

Step 2. Testing the compiling of indicators for one cluster: Technical staff and local hospital staff try to analyse and answer all the questions within a specific cluster, in order to properly understand the procedure to be used for the whole evaluation of the hospital. This step helps users to become confident with the tool.

Step 3. Division of staff into subgroups for separate evaluations: Each group should be comprised of a multidisciplinary team. Each group then tries to make the assessment of the health facility

Figure 5: Plenary session during the Safe Hospital Assessment

independently. This step tests the ease of use of the tool, helps to understand descriptions and indicators, and to evaluate the appropriateness of the established thresholds for the different levels of safety.

Step 4. Compiling of Hospital Safety Index (SHI) sections in the field: The staff in charge of carrying out the assessment shall indicate the safety level of indicators, following the instructions provided in the descriptions. Once the assessment is completed, it is possible to get a picture of the security level of the health facility straight away, just by analysing the single indicators and even without having the final score obtained with the automated program.

Step 5. Compiling of the automated Excel sheet: The hospital staff or, if not possible, governmental or non-governmental organizations supporting the evaluation, should report in the Excel file (freely downloadable) the results of the assessment, as indicated in Step 4. Just by entering the results in the automated file, a formula integrated in the program will generate the final scores, indicate the safety class and generate graphs that represent the outcome of the evaluation process.

Step 6. Definition of intervention: Based on the results from Step 5, priority interventions to increase the safety of the health facility are identified.

During the assessment process, the compiling of the indicators may be supported by visual and photographic material that document the elements of the structure and help to better understand and analyse some specific issues.

3. Practical Example to Guide Implementation of the Hospital Safety Index

Specific context in southeast Africa and Indian Ocean

Although the concept of Safe Hospital and the Hospital Safety Index may be applied in many situations, it is important to verify its applicability to specific contexts. This led to the implementation of the Safe Hospitals approach to the context of the southeast Africa and Indian Ocean region, where the practice had not yet been commonly implemented.

The Safe Hospital project "Assessment of two health-care infrastructures and promotion of hospital safety in two countries: Malawi and Madagascar", contained in the Disaster Preparedness European Commission's Humanitarian Aid Department III (DIPECHO III) regional programme, focused on the development of an assessment method for health care facilities in the region of southeast Africa and Indian Ocean region, placing itself in continuity with the campaign to promote the health safety which started in 2008–2009.

The process of adaptation of the toolkit to the southern Africa and Indian Ocean region for assessing the safety of health facilities was divided into three phases: preliminary research, development of a prototype toolkit and development of two case studies. During the preliminary research, a literature review of the subject and the research of the right indicators have been conducted. This led to the development of the prototype toolkit and the application of two case studies, one in Malawi and one in Madagascar.

In both cases, a final workshop involving representatives from the Ministry of Health and other key actors at national and international level in the health sector helped to reshape and adjust the indicators or add elements that were not initially included, but that were instead relevant in the southeast Africa and Indian Ocean region.

Experiences in southern Africa and the Indian Ocean

The two case studies applied in the region were an evaluation of Salima District Hospital safety in Malawi and an evaluation of Hôpital Be safety in Vangaindrano, Madagascar. Although these two experiences have been quite different in terms of hospital size and human resources, there were also some common elements (i.e.

functional or structural failures), that have proved the applicability of the SHI to any type of health facility.

Background information on the two practical cases, as well as a description of the specific experiences in implementing the SHI, is provided hereunder.

Hospital description

Salima District Hospital

According to Ministry of Health policy, the district hospital should service more than 50 000 people. The district has one hospital situated at the district headquarters, which is run by the Ministry of Health and Population, which is the main referral centre for all health units (14 health centres, 4 dispensaries and 59 outreach clinics) in the district. The hospital also provides preventive, curative, rehabilitative and support services to peripheral health units. In order to provide quality services, the hospital has medical equipment in the minor and major surgery units, and dental surgery and labour wards, and it has diagnostic equipment in X-ray, laboratory and Volume Computed Tomography rooms. The hospital actually cares for over 285 444 people. Apart from being a referral hospital for the district health facilities, the hospital also provides outpatient services for the urban population and the surrounding villages.

Figure 6: Salima District Hospital entrance and corridors

The Salima District Hospital was built in 1986; it is divided into 13 halls and has total area of about 5 500 m^2. The current form of the complex has been not changed substantially over the years: the only structural changes have been the addition of two pavilions and houses for medical staff, using the same materials and processes as the rest of the original structure. The evaluation was performed by the emergency committee of the hospital with the technical support of the University of Pavia.

Vangaindrano, Hôpital Be

Vangaindrano is a small rural town in the region of Atsimo-Atsinanana in southeast Madagascar; it is about 70 km from Farafangana, the capital of the region. The region is also periodically exposed to strong cyclones contributing to increased population vulnerability.

The local health system refers patients to the hospital district that is located in Farafangana; however, the infrastructure network between the health centres is inadequate, resulting in the lack of access to the main hospital because of no roads. This causes overcrowding in the smaller towns' medical centres, which must respond to situations for which they have inadequate space, equipment or staff. A further problem is the provision of medicines: the centres should be supplied with drugs from Antananarivo on a monthly basis, but this often does not occur because of the inaccessibility of the roads, leaving structures devoid of basic drugs.

Figure 7: Hôpital Be, Vangaindrano

Hôpital Be was constructed in 1963. It is divided into four halls which house the general medicine, paediatrics, delivery room, outpatient clinics and offices, laboratory and pharmacy. The current form of the complex has changed little over the years: the main changes since its construction have been the reroofing of the hospital and the doctor's house, which were destroyed as a result of a cyclone in 1996.

The local staff is composed solely of three doctors, three nurse, a dentist and four midwives who work on alternating rotations for up to 100 patients per day, a volume for which the structure is undersized and spaces are inadequate. The assessment was conducted with the medical inspector; it offered an opportunity to raise awareness and suggest a course of action for the management of the hospital from an emergency and disaster response point of view, but also in relation to the management and maintenance in normal circumstances.

Key issues for practical implementation of hospital evaluation

Non-governmental organizations (NGOs) interested in performing a hospital evaluation need to understand the importance of involving hospital staff and, particularly, personnel in charge of hospital safety. This can be a challenge for some of the hospitals and health

Figure 8: Outside Hôpital Be, Vangaindrano

Figure 9: Hôpital Be, Vangaindrano

facilities without specialized staff for these issues. For example, in Malawi at Salima District Hospital, the District Hospital Disaster Committee is a technical body of the hospital that is responsible to address safety hospital issues. This body was established by the government but it has been mostly inactive.

The evaluation was an opportunity to revitalize and strengthen the position of the committee to suggest a course of action for the hospital management from the point of view of emergency and disaster response. About a dozen members of the committee took part to the evaluation exercise: clinicians, nurses, administrators, district health officers, etc. Each member deals with a specific issue within the hospital and this allows the committee to have a multidisciplinary approach to safety.

While the Salima District Hospital represents a good case scenario, the situation at Hôpital Be in Vangaindrano, Madagascar, was quite different. Here a local committee does not exist and the assessment of hospital safety was carried out with only the support of the Medical Inspector (Médecin Inspecteur).

NGOs interested in performing a safe hospital evaluation should also look into the possibility to partner with local NGOs specialized in health care, which can also contribute to the sustainability of the project. In Salima, COOPI partnered with Innovative Health Initiative, which provided support in the reinforcement of the District Hospital Disaster Committee. In Vangaindrano DIPECHO partners supported COOPI to engage with the hospital and organize the final workshop for the presentation of the results.

Before performing the actual hospital evaluation through the Hospital Safety Index, hospital staff should be trained on the use of the SHI. Generally, the training does not require participants to have specific technical skills but a deep knowledge of hospital history in terms of safety certainly helps to improve the accuracy of the evaluation results. Trainers from the implementing NGO or external consultants should be engineers and/or architects, preferably with experience in health care structures. In both case studies, COOPI collaborated with the University of Pavia in order to train

Figure 10: District Hospital Disaster Committee during the evaluation exercise

staff on the use of the SHI tool and to perform the evaluation of the two hospitals. It is good practice for hospitals to perform this type of evaluation on a regular basis. It is advisable to do it at least once a year, so that hospital safety and critical elements are always monitored and kept under control.

Before carrying out the evaluation process, it is important that all staff involved understand clearly the SHI and that any documentation related to the hospital is made available for the exercise. This includes, for example, hospital maps and any data related to previous disasters that occurred in the region where the hospital or its affiliated health centres operate. In the case of Salima District Hospital, the map was provided by the Ministry of Health while it was not possible to provide the map for Hôpital Be in Madagascar.

The evaluation exercise took two days for Salima District Hospital and one day for Vangaindrano Hospital, as the former has a much bigger and more complex structure compared to the latter. The costs of the evaluation exercise concerned mostly the employment of external consultants to adapt the tool to the local context, to train hospital staff on the use of SHI and to perform the first hospital evaluation. Once the hospital staff has been trained, then the evaluation can be performed internally by the hospital

Figure 11: Part of Vangaindrano Hospital

Figure 12: University of Pavia Team training Salima Hospital Committee on the use of the SHI

personnel or with NGO support. Costs will be mostly related to organizing meetings for carrying out the assessment and for the final presentation of results. The cost of the evaluation increases if external specialized consultants need to be employed to assess specific critical issues.

The plenary is a key moment that introduces the committee or hospital staff to the hospital safety evaluation. In this phase, the committee or the hospital staff needs to get familiar with the SHI, and answer the questions in the 'general information' section. From COOPI's experience in both Salima and Vangaindrano, at the start of the evaluation, the trainees found it challenging to grasp the SHI concept but after a few practical exercises where they were asked to select an indicator and try to assign its level of safety, upon reading the indicator definition, they became familiarized with the tool and they felt confident with it.

In Salima, the committee played an active part in the process, highlighting main deficiencies or problems of the hospital. From the beginning of the exercise the committee suggested some changes to the SHI, for example with regard to specific indicators for housing of doctors and nurses, or to the quarantine department, or in regards to the layout of the toolkit in order to ease its use by

Figure 13: District hospital disaster committee analysing hospital map

Figure 14: Use of the SHI in Salima District Hospital

the staff. Furthermore, during the plenary session, the map of the hospital was analysed and this helped to identify buildings that required specific attention (i.e. old, damaged buildings).

After the level of safety for each indicator in the general information section had been identified, evaluators were asked to fill in the SHI sections related to structural, non-structural and functional components. In order to do so in Salima, the committee was divided into groups, with each focusing on a specific section. In order to answer some of the questions, the groups had to walk through the hospital and perform a visual assessment to define the level of safety of the specific indicators.

Each group managed to carry out the work autonomously, demonstrating the toolkit's accessibility. Also the structural section was well understood by the staff thanks to the presence of a technician/maintenance officer within the committee.

In Vangaindrano, the manager was active in the evaluation process, highlighting, from his point of view, the main deficiencies or problems of the hospital. In the early stages it was highlighted, in comparison with the previous case, that many indicators were not applicable due to the size and condition of the hospital (generator, fuel storage, heating, ventilation and air conditioning system). The toolkit layout was also adjusted by applying the suggestions

F3	WATER SUPPLY AND SANITATION								
	Key question			Safety level				Weight	Score
		No present	Unknown	Low	Medium	High		%	
F3.7	Are latrines placed outside the hospital in a place where contamination with the sources of water used in the hospital is not possible?	☐	☐	☐	☐	☐		15	
	Area of relevance	Risk reduction							

Figure 15: SHI indicator on water supply and sanitation: Questions

provided by the committee in Salima and which was effective in expediting the compilation of the toolkit.

In general, if specific technical issues arise during an evaluation, then engineers or architects should be consulted in order to properly assess the safety of specific elements that require technical expertise (i.e. construction techniques, etc.).

In order to help implementers to better understand the evaluation process, a practical example from the Salima case study concerning an indicator related to hospital water supply and sanitation is described in Figure 15.

The consultants from Pavia University, together with the hospital committee, attributed a low safety level to indicator F3.7, according to the definitions of safety in Figure 16.

F3.7	SANITATION FEATURES:
	If the latrines are located within the health facility buildings, they must be positioned so that the discharges and the septic tank, even in case of rupture, cannot contaminate the water supply.
	Low = latrines are not in a safe place; Medium = they are in a safe place but they are undersized; High = they are in a safe place and they are well sized.

Figure 16: SHI indicator on water supply and sanitation: Description

As shown in Figure 17, the committee indicated that latrines were built near the well and they contaminate the water that women in the family and pregnant women use for washing and drinking. Furthermore, tap drill is too low and this also contributes to water contamination.

The SHI also suggests some possible actions that can be taken by the hospital committee in order to address the issue:

ACTIONS:

A. Build adequate septic tank.
B. Increase septic tank or build a new septic tank, if necessary
C. Periodically check the septic tank contamination of water and soil, with particular attention if drilling is located in the proximity of latrines.
D. Construction of new safe latrines.

Once the level of safety has been assigned to each indicator, the final score is computed by entering the results for each indicator in a specific Excel file. Results should be then presented to the Head of the hospital and then to representatives from the Ministry of Health. In the case of Salima and Vangaindrano, results were also presented during two workshops: one held in Lilongwe and another in Antananarivo. While explaining the results, it is extremely important to describe both good and bad practices that have been identified, as the toolkit's objective is to provide constructive feedback about both

the strengths and weaknesses of the facility. During the final workshop it was also possible to analyse some of the items that generated concerns among the hospital staff; this helped to understand and refine good practices and to adjust inaccuracies in the draft version of the toolkit such as description of indicators, inappropriate values in the context of Malawi or Madagascar and missing information.

In Salima, the assessment has ranked the Salima District Hospital as a Class B, with an overall score of 59 points. This result is accurate, as the condition of the structure is quite good: there are no significant environmental risks that directly affect the complex; the spaces are well organized and fairly clean and hygienic (despite some shortcomings, e.g. missing mosquito nets, broken doors and windows); the operating room is divided from the rest of the department and from the preparation for the air-handling system, although the instruments are not placed properly. The pharmacy is equipped with air-conditioning for the storage of drugs; there is an electrical generator and there are preparations for a fire-alarm system; and a disaster management committee exists (although it is not fully operational).

In Vangaindrano, the assessment has ranked the hospital as Class C, with an overall score of 33 points. This result is accurate, as

Figure 17: Latrines at Salima District Hospital

Figure 18: Insights on Salima Hospital

the condition of the structure is poor both during normal operating and emergency conditions:

- In some departments, the structure is affected by flooding; this is exacerbated by the region's exposure to cyclones.
- The hospital is undersized both in terms of physical dimensions as well as number of staff compared to the population that it must serve – even in non-emergency situations.
- There are two access roads which are both difficult to access by emergency vehicles, even during dry seasons.
- The hygienic and sanitary conditions of the facilities are precarious: the latrines do not have an effective water management system. The water supply is not always functional.
- The lack of a generator and a connection to the network does not allow the use of electric current continuously, causing serious problems in the use of machinery and storage of medicines.
- Machinery is inadequate or non-functional.
- The supporting structures (home to the medical staff, offices) have problems of both size and healthiness.

Based on the above, the assessment helped to identify water management of latrines and provision of a backup generator as priorities for future interventions.

Figure 19: Insights on Salima Hospital

Figure 20: Salima Hospital

4. Conclusion

To summarize, the two case studies had two distinct positive results:

- They allowed the testing and adaptation of the toolkit to the Malawi and Madagascar contexts.
- They raised awareness among the committee members or hospital staff about existing issues that require immediate attention and possible interventions.

Generally, the SHI is a tool that helps organizations and hospitals in applying a precise methodology to evaluate the safety of a health facility. The results of the assessment can guide NGOs and institutions in taking further actions and trying to reduce the vulnerability of the health structures to disasters.

5. Bibliography and References for Further Reading

Agenda 21. Chapter 40.

Blaikie, P., Cannon, T., Davis, I., Wismer, B. 2003. At Risk: Natural Hazards, People's Vulnerability and Disasters. London. Routeledge. (P 17)

International Strategy for Disaster Risk Reduction (UNISDR). 2009. Hospitals Safe from Disasters. Reduce Risk, Protect Health Facilities, Save Lives. 2008-2009 World Disaster Reduction Campaign Report. Available at: http://www.unisdr.org/2009/campaign/pdf/wdrc-2008-2009-information-kit.pdf

National Statistical Office. 2008. Population and Housing Census Preliminary Report. Report. Available at http://unstats.un.org/unsd/demographic/sources/census/2010_phc/malawi/malawi_report.pdf

United Nations Human Settlements Programme (UN-Habitat) and United Nations Office For Disaster Risk Reduction (UNISDR). 2012. Tools for the Assessment of School and Hospital Safety for Multihazards in South Asia. Toolkit.

Z_GIS & COOPI. 2012. Consultancy to assess the current hazard mapping capacity and effectiveness of scenario-based tools for long-term planning mechanisms. Report. Available at http://www.gi4drr.org/wp-content/uploads/2010/11/09March2012_Final_report_UNDP_Malawi-ReadyToPrint.pdf).

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