A method for qualitative assessment of safety risks in health infrastructure exposed to natural and human-made hazards

OBSERVATIONS DURING FIELD TRIP TO LAAMU AND THAA ATTOLS

New Regional Hospital at Laamu Atoll – Ground Floor at Road Level

Risk Safety Assessment for Health Infrastructure in the Republic of Maldives, Jaime F. Argudo, Ph.D., P.E. – WHO Consultant
OBSERVATIONS DURING FIELD TRIP TO LAAMU AND THAA ATTOLS

New Regional Hospital at Laamu Atoll – Fire and Emergency Lighting Systems

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Form 1

General Information About the Health Facility

The aim is to collect basic information such as:

- Population served
- Services available
- Area of influence
- Personnel available
- Physical distribution of services and buildings
- Key architectural plans, sketches, drawings, etc.
Form 2
Safe Hospitals Checklist

(MNBC–2010 Hazard Maps and Specs)
Elements relating to the geographic location ................................................................. 13
(Maintenance Engineer)
Elements related to the structural safety of the facility .................................................. 16
(Maintenance Engineer)
Elements related to non-structural safety ........................................................................ 18
(Hospital Administrator)
Functional capacity of the hospital .................................................................................. 26

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An example of Questionnaire Part 2
for
Indira Gandhi Memorial Hospital (IGMH)
Observations on Structural Safety at IGMH

IGMH – Strong columns at basement

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1. Elements relating to the geographic location of the health facility (mark with an X where applicable).

<table>
<thead>
<tr>
<th>Hazard Level</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No hazard</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

1.1 Geographical phenomena

- Landslides: Refer to hazard maps to locate the level of hazard for the hospital in terms of landslide susceptibility (other causes).
- Current threat is considered as a threat. But in 2010, "the tsunami's direct impact was to eastern side of Maldives. This is the first event of such nature recorded in history of Maldives.

<table>
<thead>
<tr>
<th>Hazard Level</th>
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</tr>
</thead>
<tbody>
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<td>No hazard</td>
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<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Hydro-meteorological phenomena

- Storm surges: Refer to hazard maps to locate the level of hazard for the hospital in terms of storm surges and flooding.
- Recent storm surges have not flooded the hospital.

<table>
<thead>
<tr>
<th>Hazard Level</th>
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</tr>
</thead>
<tbody>
<tr>
<td>No hazard</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

- Other hazards: Refer to hazard maps to locate the level of hazard for the hospital in terms of other hazards.

<table>
<thead>
<tr>
<th>Hazard Level</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No hazard</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Note: The building extends out to sea level, but the basement is at or below sea level. The building is considered to be a "safe" building due to the effects of sea level rise caused by tropical cyclones and low pressure systems.
Table I.4.2 Zone Factors (Z) for Building Design in Earthquake Hazard Zones

<table>
<thead>
<tr>
<th>ZONE</th>
<th>T = 475 years, for life safety design using IS 1893 (Part I)**</th>
<th>T = 50 years, for Property Loss Protection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.10</td>
<td>0.02</td>
</tr>
<tr>
<td>2</td>
<td>0.16</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*Best estimate – not computed

** Revised from values computed in UNDP – RMSI (2006) study for T = 475 years

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**MNBC-2010 COMPLIANCE DOCUMENTS**

Earthquake Design Parameters and Hazard Chart

**B Stability**

**B1 Structure**
Site Assessment for Tsunami Hazard

The following conditions shall be considered:

- Tide elevation during previous tsunamis
- Proximity to shore
- Ground floor elevation
- Sacrificial Fences

Table I.4.1 Sustained Wind Speeds for Building Design in Wind Hazard Zones

<table>
<thead>
<tr>
<th>ZONE</th>
<th>T = 50 years, Vb ** for life safety design using BS 6399-2 KM/H</th>
<th>T = 25 years, for Property Loss Protection* KM/H</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>140</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>1</td>
<td>80</td>
<td>50</td>
</tr>
</tbody>
</table>

*Best estimate – not computed
**Adapted from values computed in UNDP – RMSI (2006) study for gusty winds with T = 500 years

MNBC–2010 COMPLIANCE DOCUMENTS

Wind Design Parameters and Hazard Chart
Table I.4.3 Rain Precipitation Values for Building Design in Rain Hazard Zones

<table>
<thead>
<tr>
<th>Rain Hazard Zone</th>
<th>Maximum Rain Precipitation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$T = 10$ years, for Section E1.3.1 in MBC*</td>
</tr>
<tr>
<td>1</td>
<td>130</td>
</tr>
<tr>
<td>2</td>
<td>180</td>
</tr>
<tr>
<td>3</td>
<td>210</td>
</tr>
</tbody>
</table>

*Best estimate – not computed by the UNDP – RMSI (2006) study
**Computed by the UNDP – RMSI (2006) study
1.2 Geotechnical properties of soils

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquefaction</td>
<td>With reference to the geotechnical validation at the hospital site, there is the need for further exposure to hazards from saturated and loose clays.</td>
<td>☑️ ☑️ ☑️</td>
</tr>
<tr>
<td>Clay soils</td>
<td>With reference to soft mud, there is the hospital exposure to hazards from clay slope.</td>
<td>☑️ ☑️</td>
</tr>
<tr>
<td>网红研究</td>
<td>Refer to geological maps and specify the hospital's exposure to hazards from the presence of suba.</td>
<td>☑️ ☑️</td>
</tr>
</tbody>
</table>

Comments on the results of Form 2 Module 1: The evaluation should show the space below to comment on the results of this module (4), and provide the name and signature.

Hospital Liquid Waste System - No treatment is provided and waste is discharged to Island Sewage System, which discharges to Sea close to hospital premises (< 300 m distance).

Hospital uses Potable Water from Male Desalination Water Plant - Desalinated water is collected through a bore-hole 40 metres deep.

Water from a well is used for toilets and non-potable usage.

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2. Elements related to the structural safety of the building

Columns, beams, walls, floor slabs, etc., are structural elements that form part of the load-bearing system of the building. These elements should be evaluated by structural engineers.

### 2.2 Safety of the structural system and type of materials used in the building

<table>
<thead>
<tr>
<th>Safety level</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>EER</td>
<td>EPR</td>
</tr>
<tr>
<td>☑️</td>
<td>☑️</td>
</tr>
</tbody>
</table>

**Observations**

1. No debris or prior structural damage to the hospital as a result of natural phenomena? LEAVE THIS BOX BLANK (REMOVE MARK FROM BOX)

2. Was the hospital built and/or repaired using current safety standards? Currently working on a programme to determine the risk of a fire event within the hospital, and taking measures to reduce this.

3. Are the structural modifications to structural elements of the facility? MODIFICATIONS HAVE NOT SIGNIFICANTLY AFFECTED STRUCTURAL SAFETY

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<table>
<thead>
<tr>
<th><strong>Observations on Non–Structural Safety at IGMH</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IGMH – Narrow Corridors, Fire System need rehab and Inadequate Means of Egress (No signs and open doors)</strong></td>
</tr>
</tbody>
</table>

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3. Elements related to non-structural safety

3.1 Critical systems

<table>
<thead>
<tr>
<th>Safety level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>✓</td>
</tr>
<tr>
<td>Average</td>
<td>✓</td>
</tr>
<tr>
<td>High</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Observations**

- Generator can power the hospital for up to 3 hours.
- Generator capacity is of 1 MegaWatt, which can provide 5% of the requirement of the hospital.
- Tested every week.
- Certified by the power company; no issues.
- Generator is not operational; power supplied from diesel generator.
- Safety of electrical equipment, cables, and wires are checked.
- Redundant systems for local electric power supply.
- Protected from external hazards; overhead power lines and cables checked.
- Protection for control panel, overhead power lines, and cables.
- Lightning system for critical areas of the hospital.
- Lighting system for emergency, patient care, and operating theatres, etc.
- Internal electrical systems installed on hospital grounds.

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3.1.2 Telecommunications systems

- Conditions of intercom and emergency calling.
- Conditions of intercom and emergency calling.
- Conditions of telecommunications equipment and cable.
- Service communications systems.
- Conditions of telecommunications systems with hospital communications.
- Conditions of telecommunications systems with hospital communications.
- Conditions of telecommunications systems with hospital communications.
- Conditions of telecommunications systems with hospital communications.
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3.1.3 Water supply systems

- Water tank has water reserve that is sufficient to provide at least 300 liters daily, per bed, for 72 hours.
- Water storage capacity is sufficient and easily accessible for the entire hospital.
- Water storage capacity is sufficient and easily accessible for the entire hospital.
- Water storage tank is protected and secure location.

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3.1.3 Water supply systems

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- Water storage capacity is sufficient and easily accessible for the entire hospital.
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- Water storage tank is protected and secure location.

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13. Water supply is through the State Water Supply Company. No other alternative at present.

90% of pipes renovated recently.

2 pumps, not in good condition.

2.3.4 Fuel storage (gas, petrol, diesel)

1 FUEL TANK 4000 LITRES – DIESEL – Gives for 7 days approximately. NOT LOCATED IS A SAFE PLACE

4-6 FEET FROM NICU
NOT EASY to access by fire fighting means

Leaking from tanks, malfunctioning valves.

3.1.5 Medical gases (oxygen, nitrous oxide, etc.)

SUFFICIENT MEDICAL GAS STORES FOR OPERATION OF 15 DAY SUPPLY

TANK OF OXYGEN 15 - 18 CUBIC METERS

LEAVE THIS BOX BLANK NO CONCERN ON MODERATE TO HIGH EARTHQUAKE OR WIND LOADS, THEREFORE THIS VULNERABILITY FACTOR IS NOT AN ISSUE

Currently working on a plan to verify this problem

Currently working on a plan to verify this problem

NOT EASY to access by fire fighting means

No reliable system for medical gases

3.2 Heating, ventilation, and air-conditioning (HVAC) systems in critical areas

LEAVE THIS BOX BLANK NO CONCERN ON MODERATE TO HIGH EARTHQUAKE OR WIND LOADS, THEREFORE THIS VULNERABILITY FACTOR IS NOT AN ISSUE

BASEMENT ACs – OUTFLOWS FROM THE HOSPITAL

4 EXHAUST – NOT WORKING.

3.3 Office and storeroom furnishings and equipment (fixed and movable) including computers, printers, etc.

LEAVE THIS BOX BLANK NO CONCERN ON MODERATE TO HIGH EARTHQUAKE OR WIND LOADS, THEREFORE THIS VULNERABILITY FACTOR IS NOT AN ISSUE

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22/08/2012

56. Condition of office furniture and other equipment.
Check seating and seating or location is ergonomic.
Low = Average = Subjective assessment of good condition and stable or not subject to damage. High = Equipment is in good condition and is secured.

57. Office equipment in operating theaters and recovery rooms.
Low = Equipment is in poor condition and is not secured. Average = Equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

58. Condition of laboratory equipment.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

59. Condition of medical equipment in emergency service unit.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

60. Condition and safety of medical equipment on a temporary or intermediate care unit.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

61. Condition and safety of medical equipment in the intensive care.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

63. Condition of medical equipment in emergency service unit.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

64. Condition and safety of medical equipment for nuclear medicine and radiation therapy.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

65. Condition and safety of medical equipment in the intensive care.
Low = The equipment is in poor condition and is not secured. Average = The equipment is in fair condition and is not secured. High = Equipment is in good condition and is secured.

66. Need for shelving and safety of medical contents.
Low = Shelving is not provided for medical contents. Average = Shelving is provided but not adequate. High = Shelving is adequate and contents are secured.

67. Condition and safety of doors and entrances.
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

68. Condition and safety of windows and shutters.
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

69. Condition and safety of structural elements of the building and roof (ceilings, facings, etc.)
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

70. Condition and safety of walls and flooring.
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

71. Condition and safety of ventilation and air conditioning systems.
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

72. Condition and safety of fire alarms and sprinklers.
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

73. Condition and safety of other structural elements (corridors, entrances, etc.)
Low = Subjective assessment of good condition and stable or not subject to damage. Average = Subjective assessment of fair condition and is not secured. High = Subjective assessment of good condition and is secured.

74. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

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100. Observations.
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Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

102. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

103. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

104. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

105. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.

106. Observations.
Low = The box is blank. Moderate to high earthquake or wind loads. Therefore, this vulnerability factor is not an issue.
74. Safe conditions for movement: movable/Fixed models
Low: Damage to structure is possible and areas of impact are outside walls, doors, and windows. medium: Damage to structure is possible and areas of impact are near walls, doors, and windows. high: Damage to structure is possible and areas of impact are inside walls, doors, and windows.

75. Safe conditions for movement: the building’s design, stairways, and doors, etc.
Low: Subject to wind damage: movement of a small door is possible and doors/doors are not secured in place. medium: Damage to structure is possible and doors/doors are not secured in place. high: Damage to structure is possible and doors/doors are not secured in place.

76. Condition and safety of internal walls and partitions
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

77. Condition and safety of loading and unloading equipment
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

78. Condition and safety of internal and external lighting systems
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

79. Condition and safety of the protection system
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

80. Condition and safety of elevator systems
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

81. Condition and safety of stairways
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

82. Condition and safety of floor coverage
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

83. Hospital access routes
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

84. Other architectural elements, including emergency signage
Low: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. medium: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment. high: Elements subject to damage and damage would lead to performance of loss of conduct and other component, systems, or equipment.

Comments on the results of Form 2, Module 3:

MANY QUESTIONS MAY BE ANSWERED AS FOLLOWS:

“LEAVE THIS BOX BLANK NO CONCERN ON MODERATE TO HIGH EARTHQUAKE OR WIND LOADS, THEREFORE THIS VULNERABILITY FACTOR IS NOT AN ISSUE.”

THE STRUCTURE IS EXPOSED TO THE EFFECTS OF SERVICE GRAVITY LOADS, FLOODS AND FIRES, THUS SOME OF THE QUESTIONS COULD BE ANSWERED ACCORDINGLY (LOW, MODERATE OR HIGH) DEPENDING ON THE VULNERABILITY FACTOR UNDER CONSIDERATION COULD AFFECTED STRUCTURE STABILITY AND DURABILITY TO SERVICE GRAVITY LOADS AND THE PREVAILING NATURAL AND MAN-MADE HAZARDS.

EXCEPTIONS: HOSPITALS IN THE UPMOST NORTH PARTS ARE EXPOSED TO HIGH WIND HAZARD AND IN THE UPMOST SOUTH ARE EXPOSED TO MODERATE SEISMIC EVENTS. SEE HAZARD MAPS FROM THE MALDIVIAN BUILDING CODE REVIEW PROJECT 2010 (UNDP-MHITE PROJECT)

Risk Safety Assessment for Health Infrastructure In the Republic of Maldives
Jaime F. Argudo, Ph.D., P.E. – WHO Consultant
OBSERVATIONS DURING SITE VISIT TO INDIRA GANDHI MEMORIAL HOSPITAL AT MALE

IGMH – Fire system inoperative and Storage Areas at Basement

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4. Safety based on functional capacity of hospital

The level of preparedness of hospital staff for major emergencies and disasters as well as the level of implementation of the hospital disaster plan.

<table>
<thead>
<tr>
<th>4.1 Organization of the Hospital Disaster Committee and the Emergency Operations Center</th>
<th>Level of organization</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committee has been formally established to respond to major emergencies or disasters. A copy of the Committee terms of reference and a list of members comprising the committee is submitted.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Committee members are assigned regular duties in the event of an emergency.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Committee membership is multidisciplinary.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Each member is assigned a specific responsibility.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Space is designated for the Hospital Emergency Operations Center (EOC).</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>The EOC is in a protected and safe location.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>The EOC has a computer system and computer</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>The EOC has a telephone system and computer</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>The EOC has a communication system in the EOC operable</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>1% of all hospital staff can be reached within 2 minutes.</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>The EOC is in an alternative secure location.</td>
<td>Average</td>
<td></td>
</tr>
</tbody>
</table>

No Committee See Question 85

No Committee See Question 86
4.2 Operational plan for internal or external disasters

Level of implementation

<table>
<thead>
<tr>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>High</td>
</tr>
</tbody>
</table>

PEOPLE TRAINED - PARTICIPATED IN WORKSHOP STAFF YEARLY WITH HIGH TURN OVER.

PLAN EXISTS

RESOURCES ARE POOR

FUND OF 50,000 RUFIYAA - FOR EMERGENCY SITUATIONS (NOT SPECIFIC TO DISASTERS)

DURING TSUNAMI - THAJUDHEEN SCHOOL HALL WAS USED AS AN INPATIENT CARE AREA BUT AS FOR A PROTOCOL THIS DOES NOT EXIST.

EMERGENCY STOCK OF MEDICATIONS - NON EXISTENT.

103. Procedure for expanding emergency department and other critical services

The plan should include actions to expand hospital services for (e.g., drinking water supply, power, water, medication) to the maximum extent practical.

Law: Procedures do not include actions to expand hospital services to the maximum extent practical.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

104. Procedure for generating patients' medical records

The plan indicates how medical and other critical patient records can be safely moved while in transit and stored.

Low: Procedures do not exist or are in a draft stage.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

105. Procedure for regular inspections conducted by the appropriate authority

The plan includes regular inspections of all departments and of equipment that plays an important role in the hospital's operations.

Low: Inspections do not exist or are in a draft stage.

High: Inspections do not exist or are in a draft stage.

106. Procedure for preparing sites for temporary placement of deadbodies and for forensic medicine

The plan includes specific arrangements for the temporary placement of deadbodies and for forensic medicine.

Low: Procedures do not exist or are in a draft stage.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

107. Procedure for transportation and logistics support

The plan includes specific arrangements for transportation and logistics support.

Low: Procedures do not exist or are in a draft stage.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

108. Procedure for food for hospital staff during the emergency

The plan includes specific arrangements for supplying food during the emergency and backup for these arrangements.

Low: Procedures do not exist or are in a draft stage.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

Vehicles are insufficient, Ministry of Police Services / Public vehicles can be used for transportation.

109. Procedure for supplementary personnel mobilized during the emergency

The plan includes specific arrangements for supplementary personnel mobilization during the emergency.

Low: Procedures do not exist or are in a draft stage.

High: Procedures exist but personnel have not been trained, and resources are not in place to implement them.

No plan specified.
### 4.3 Contingency plans for medical treatment in disasters

<table>
<thead>
<tr>
<th>Level of Implementation</th>
<th>Level of Risk</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Earthquakes, tsunamis, volcanoes, and floods</td>
<td>Extra-ordinary incidents - Tsunami 2004</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earthquakes - Low intensity MMI = V-VI</td>
<td>For major fire and tsunami - not prepared.</td>
</tr>
<tr>
<td>12. Social conflict and terrorism</td>
<td>Level of Risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low: Risk exists only as a document</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average: Plans exist and personnel have been trained.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: Plans exist, personnel have been trained, and resources exist to carry out the plan.</td>
<td></td>
</tr>
<tr>
<td>12. Floods and hurricanes</td>
<td>Level of Risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low: Risk exists only as a document</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average: Plans exist and personnel have been trained.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: Plans exist, personnel have been trained, and resources exist to carry out the plan.</td>
<td></td>
</tr>
<tr>
<td>12. Fires and explosions</td>
<td>Level of Risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low: Risk exists only as a document</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average: Plans exist, personnel have been trained.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: Plans exist, personnel have been trained, and resources exist to carry out the plan.</td>
<td></td>
</tr>
<tr>
<td>12. Chemical accident, GSI exposure to作文 ending</td>
<td>Level of Risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low: Risk exists only as a document</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average: Plans exist, personnel have been trained.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High: Plans exist, personnel have been trained, and resources exist to carry out the plan.</td>
<td></td>
</tr>
</tbody>
</table>

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**Risk Safety Assessment for Health Infrastructure in the Republic of Maldives**, Jaime F. Argudo, Ph.D., P.E. - WHO Consultant

- COOPERATION WITH THE FOLLOWING DEPARTMENTS: PORT HEALTH SERVICES, MALDIVES NATIONAL DEFENCE FORCE, CONCERNED AIRLINE (ISLAND AIR)
### 4.4 Plans for the operation, preventive maintenance, and restoration of critical services

<table>
<thead>
<tr>
<th>Level of availability</th>
<th>Un</th>
<th>Satisfactory</th>
<th>Not</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.10. Electrical power supply and backup generation</strong>&lt;br&gt;The maintenance section should provide the operations manual for the backup electric power generator. (Low = Procedure not exist, or exist only in abridged version. Average = Procedure exist, and person not have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
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</tr>
<tr>
<td><strong>1.11. Chilling water storage</strong>&lt;br&gt;The maintenance section should provide the operations manual for the water storage tank, as well as records for maintaining and water quality control. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>1.12. Fuel storage</strong>&lt;br&gt;The maintenance section should provide the operations manual for fuel storage, as well as records for maintaining and safety records. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>1.13. Medical gases</strong>&lt;br&gt;The maintenance section should provide the operations manual for the medical gas supply, record as current, and maintain maintenance records. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>1.14. Standards and up-keeping automation systems</strong>&lt;br&gt;The maintenance section should provide the operations manual for automation systems, record as current, and maintain maintenance records. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>1.15. Water management systems</strong>&lt;br&gt;The maintenance section should provide the operations manual for the water management systems, record as current, and maintain maintenance records. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>1.16. Solid waste management</strong>&lt;br&gt;The maintenance section should provide the operations manual for the solid waste management systems, record as current, and maintain maintenance records. (Low = Procedure do not exist or exist only in abridged version. Average = Procedure exist, and personnel have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)</td>
<td>☑</td>
<td>☐</td>
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<td></td>
</tr>
</tbody>
</table>

### 4.5 Availability of medicines, supplies, instruments, and other equipment for use in emergency

<table>
<thead>
<tr>
<th>Level of availability</th>
<th>Un</th>
<th>Satisfactory</th>
<th>Not</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.1. Water</strong>&lt;br&gt;Check the availability of emergency from the Water Office of essential drugs can be used as necessary. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.2. Medical equipment</strong>&lt;br&gt;Check whether the equipment in the case of breakdown or failure in an emergency (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.3. Instruments</strong>&lt;br&gt;With the existence and maintenance of specific instruments used in an emergency. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.4. Medical gases</strong>&lt;br&gt;With a telephone number and a address of medical gas supplier, and ensure availability in an emergency from the supplier. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.5. Mechanical ventilation</strong>&lt;br&gt;The hospital’s Disaster Committee should provide documentation on quantity and condition of the equipment. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.6. Medical equipment</strong>&lt;br&gt;The hospital’s Disaster Committee should provide documentation on quantity and condition of the equipment. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.7. Life support equipment</strong>&lt;br&gt;The hospital’s Disaster Committee should provide documentation on quantity and condition of the equipment. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>2.8. Personal protective equipment</strong>&lt;br&gt;The hospital’s Disaster Committee should provide documentation on quantity and condition of the equipment. (Low = No staff, Average = Supply guaranteed less than 24 hours, High = Supply guaranteed at least 72 hours.)</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

**Risk Safety Assessment for Health Infrastructure in the Republic of Maldives, Jaime F. Argudo, Ph.D., P.E. – WHO Consultant**

**13. Maintenance of the fire protection system**<br>The maintenance section should provide the operations manual for the fire protection system, as well as records for maintaining and maintaining records on fire fighting devices used for hydrants. (Low = Procedures do not exist, or exist only in abridged version. Average = Procedure exist, and personnel not have been trained. High = Procedure exist, personnel have been trained, and scenarios are in place to implement them.)

**14. Availability of medicines, supplies, instruments, and other equipment for use in emergency**

- **2.1. Water** Existing stock of the hospital = provides medications for drinking approximately, and can be made available in less than 24 hours.

- **2.2. Medical equipment** AT PRESENT OUR SUPPLIES HAVE RUN DOWN - LAST 15 DAYS DUE TO FINANCIAL ISSUES, CURRENTLY ON A PROSPECT TO PROVIDE 02 OF OUR (5 DAYS STOCK - 150 LARGE CYLINDERS.

- **2.3. Instruments** 2 VENTILATORS

- **2.4. Medical gases** GLOVES AND MASK - 5 MONTHS

- **2.5. Mechanical ventilation** DISPOSABLE GOWNS - AND EYE WEAR - < 72 HOURS

- **2.6. Medical equipment** 12 PORTABLE VENTILATORS

- **2.7. Life support equipment** ALMOST ALL IN A HOSPITAL MEANS HOSPITAL = 8 VENTILATORS (CAN BE MADE AVAILABLE)
The Safe Index Assessment will provide the technical background to:

- Identify prevailing safety risks on the built infrastructure, environment, personnel and general public
- Identify actions to reduce risks against natural and human-made hazards
- Develop guidelines and tools for Sustainable Development Planning of Health Infrastructure and Services
- Develop Health Care Infrastructure and Service Standards for the Republic of Maldives
- Prioritize future investments on Health Infrastructure and Services in the Republic of Maldives