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Healthcare Facilities

Judith Mitrani-Reiser
EERI, PEER, and Johns Hopkins University

Talk Outline

- Health system impacts
- Hospital functionality: space, supplies, and staff
- Health system survey and team
- Disruption to space (e.g., structural, nonstructural, utilities)
- Disruption in supplies (supply chains)
- Disruption of staff (reporting, damage to homes
- Pre-existing building issues (poor maintenance, lack of fire suppression systems)
- Conclusions
- Future actions

Health System Impacts

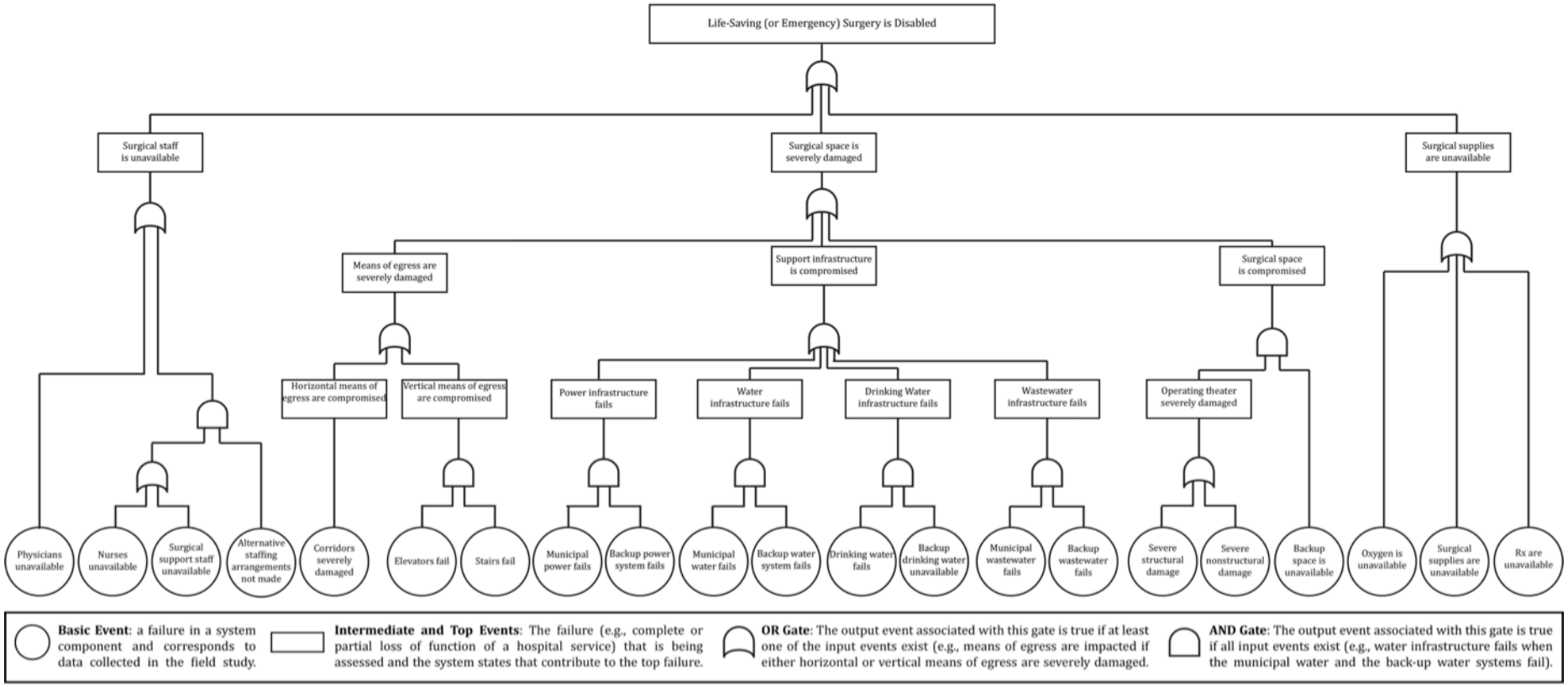
Human Impacts (Nepal Ministry of Health 2015)

- 8,702 deaths (45% male and 55% female) due to earthquake
- 22,303 injuries due to the earthquake
- 18 health workers and volunteers lost their lives.
- 75 health workers and volunteers were injured.

Infrastructure Impacts (Nepal Ministry of Health 2015)

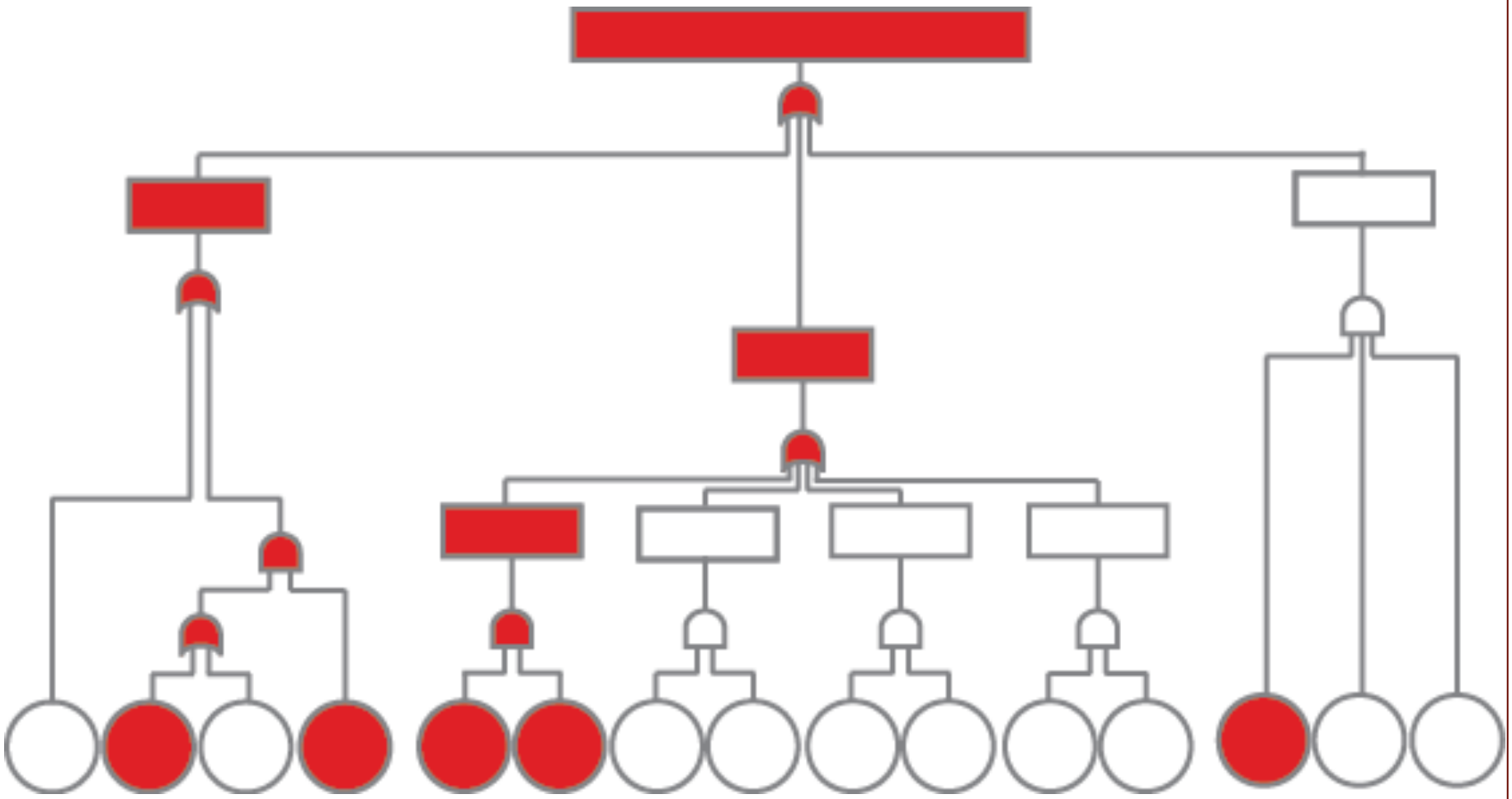
- 4,118 public health facilities, ranging from Health Posts to specialized regional hospitals; 350 private health facilities
- Completely destroyed health facilities: 446 public & 16 private
- Partially damaged health facilities: 701 public & 64 private
- Health facilities losses estimated as $63.4 million USD.

Hospital Functionality



Jacques et al., 2014

Hospital Functionality



Health System Survey

Methods (Mitrani-Reiser et al., 2012)

- Structured survey capturing baseline hospital information; damage to the physical infrastructure by hospital treatment areas; impact on health service delivery; supply change disruptions; staff response; and patient evacuations, discharges, and transfers
- Interviews with facility directors and facilities managers, ranging from 1-3 hours

Multidisciplinary Team

- 3 engineers from EERI/NSET team, 1 physician and disaster expert from Johns Hopkins University, and 2 additional from NSET and Ministry of Health and Population.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Locations of Surveyed Facilities

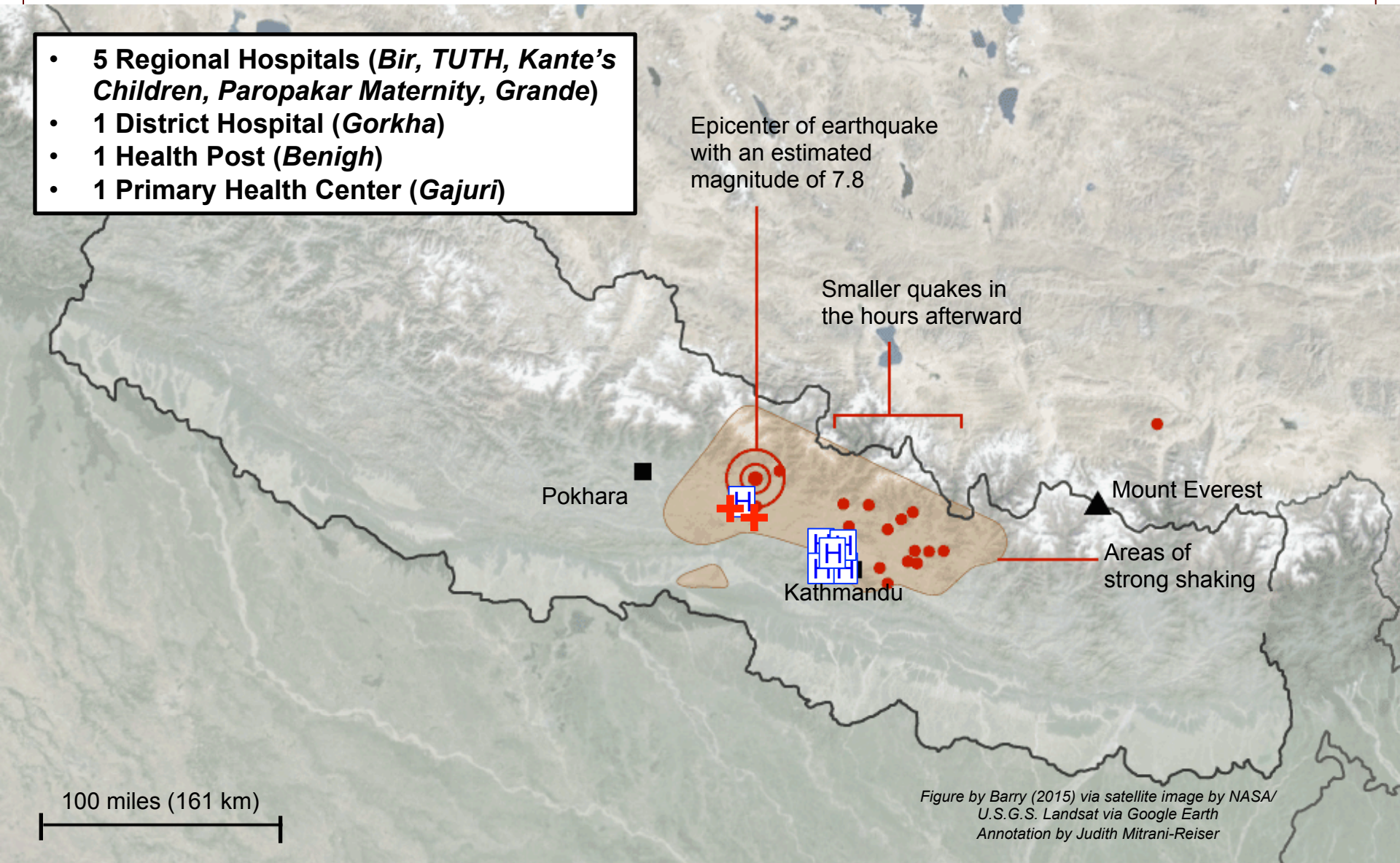

Figure by Barry (2015) via satellite image by NASA/ U.S.G.S. Landsat via Google Earth
Annotation by Judith Mitrani-Reiser

Structural Damage

- Buildings with simple plans performed well.
- Poorly built concrete and unreinforced masonry buildings didn't fare well.
- Extensions and additions made buildings more vulnerable.
- Poorly maintained buildings did not do well.

- Separate building codes for hospitals?


स्थापित २०१६ वि.सं.
AMBULANCE
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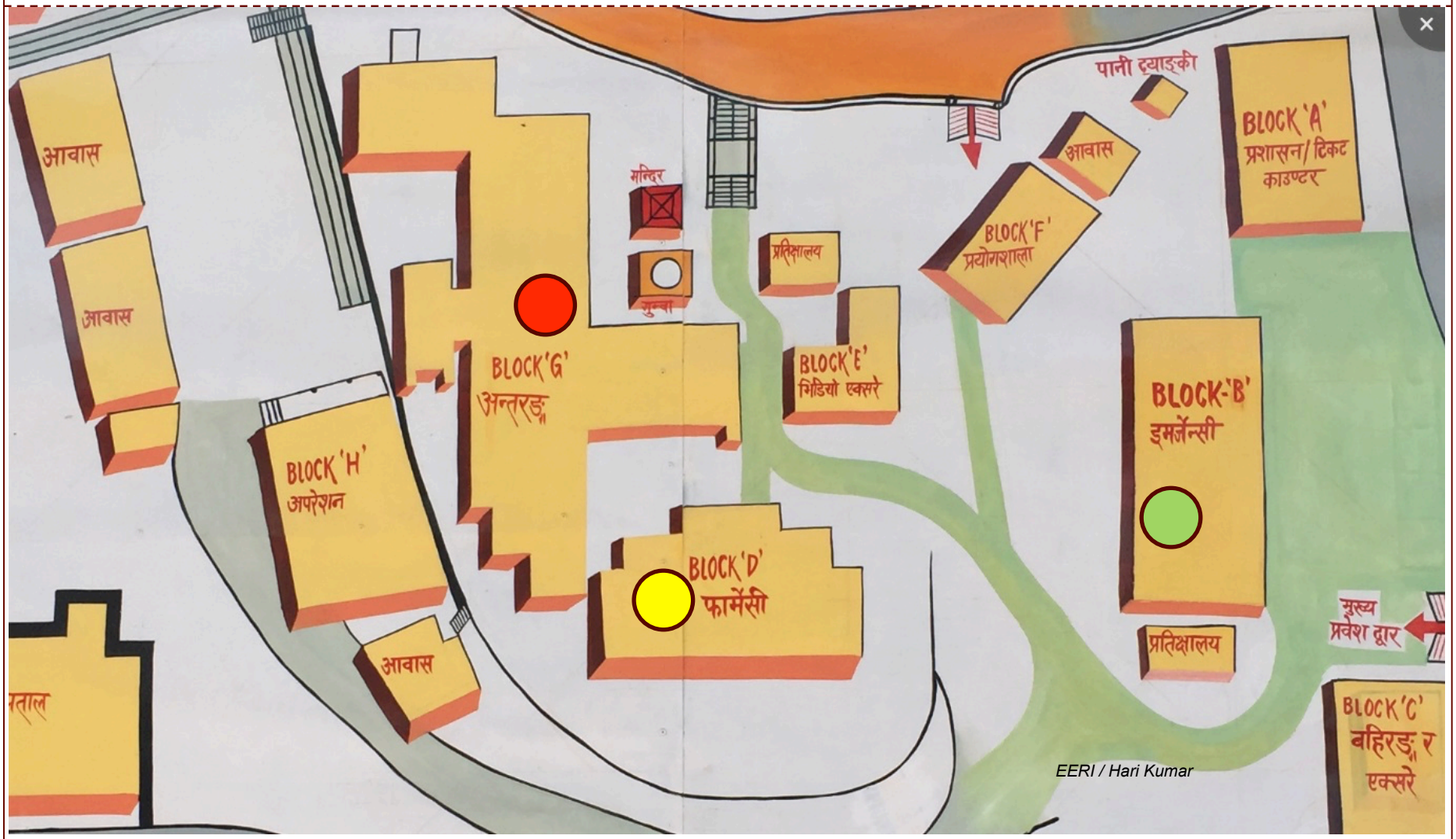
कृपया ध्यान दिनु हो
श्री पार्वतीश्वर सोलार एण्ड वाटर ट्रिटमेन्ट

Buildings with Simple Plans Worked Well



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Nonstructural Damage

- Widespread infill-wall damage
- Limited medical equipment damage
- Limited false-ceiling damage
- Some glazing damage
- Many unbraced oxygen cylinders fell


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Utilities: Power

- Power outages were limited.
- Back up generators worked.
- Electrical equipment damage was not seen.
- Diesel supply was replenished adequately.
- WHO recommends enough fuel to provide back up to critical functions for 72 hours.

Unanchored power supply equipment

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Capacity of fuel tank – 6,000 litres.

However, these were empty.

Utilities: Water

- Not reliant on municipal water supply
- However, many hospitals have a single source.
- Many relied on private supply by tankers.
- Leaks developed in some cases which lead to disruptions.
- WHO recommends a reserve of 300 litres per bed per day.

Generators for backup water supply

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Flexible pipe joint

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Unanchored water tanks

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Anchored water tanks

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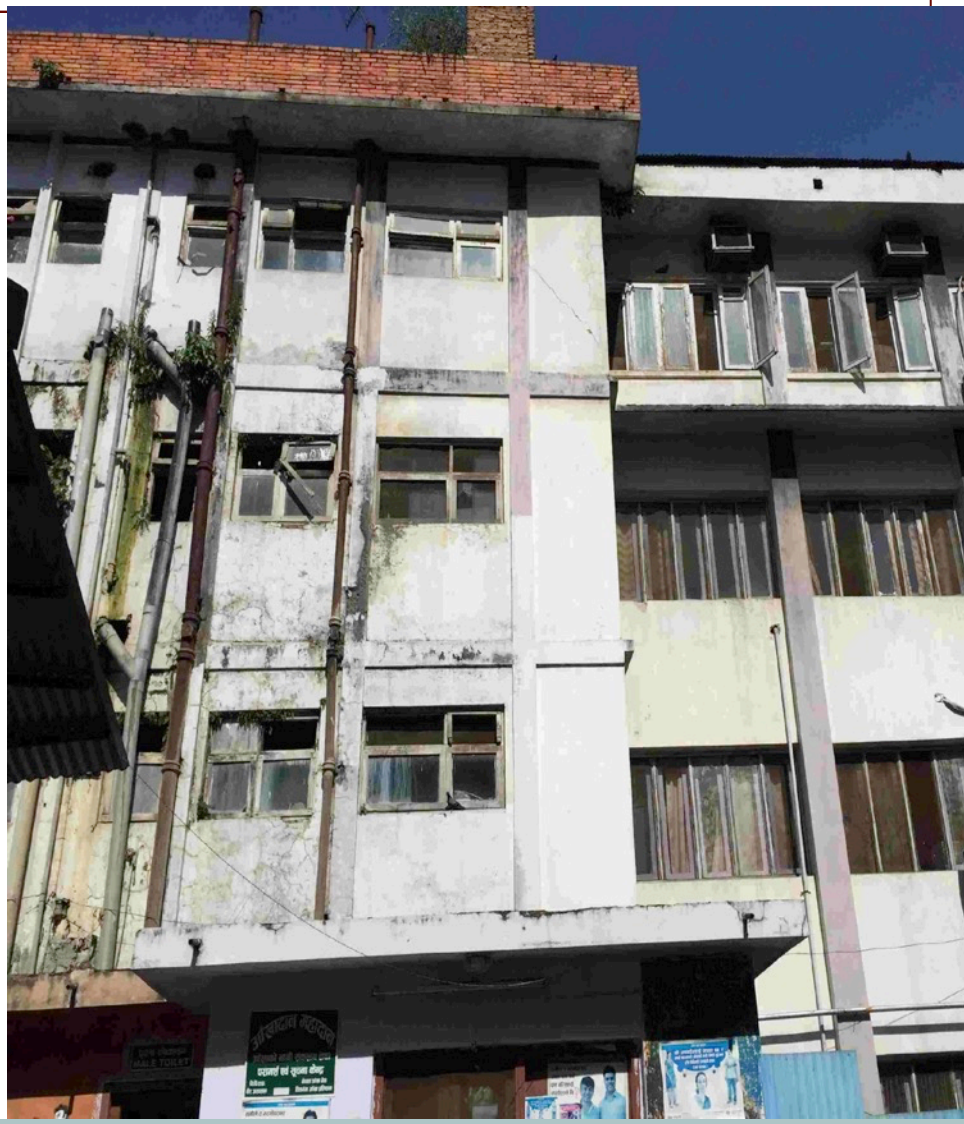
Utilities: Medical Gases

- Very few hospitals have on-site oxygen plants and instead rely on external suppliers.
- Many hospitals had to send vehicles to private oxygen plants to collect portable gas cylinders.
- In almost all hospitals, large unanchored oxygen cylinders fell down.
- Damage to the oxygen cylinder manifold due to falling cylinders
- Crashing sounds of falling cylinders scared patients and their families.

- WHO recommends storage of 3 days supply of med gases.

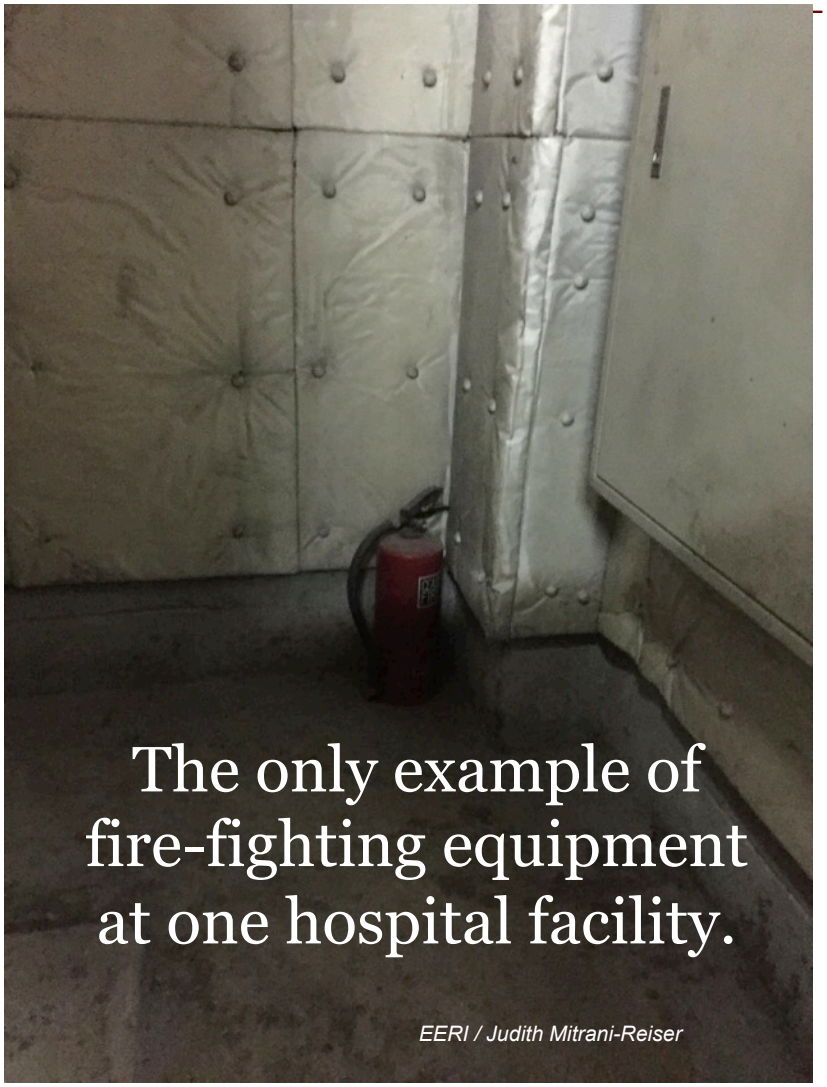
Maintenance

- Much neglected department in most hospitals
- Several buildings deteriorating due to poor maintenance.
- Maintenance planning and funding
- Need for staff training



Fire Suppression Systems

- Very few hospitals are fire-ready
- Major hospitals without ANY fire detection or fire-fighting systems
- Staff have limited training in handling fire-fighting equipment, if present



Staff Preparedness

- On-site housing ensured excellent staff reporting.
- Staff responded as best as they could without adequate preparedness planning and drills.
- Leadership played an important role in response.
- Many workers lost homes, relatives and attended duties after one or two days.
- The M7.3 event of May 12 affected the confidence of staff to continue functioning inside hospitals.
- Need for psycho-social care for staff
- Need for staff training, planning and table top exercises

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Supplies

- Some hospitals ran out of specific supplies, but in general there were not critical supplies issues.
- In Kathmandu hospitals were supported by the Ministry of Health and Population.
- Most hospitals rejected offers of medicines and doctors.
- NGOs were mostly used in remote areas to provide supplies and care.
- Need for consistent planning for stockpiling supplies

Conclusions of Health System Survey

Conclusions of Health System Survey

- Healthcare system is a patchwork of building-code implementation and building performance because of significant foreign assistance in this sector; some facilities are models for US and the rest of the world.
- All facilities evacuated completely—even patients in ICUs—regardless of damage level.
- Many health facilities managed to function in alternative spaces (most in tents outdoors) after the earthquake, offering less than optimal care.
- The facilities visited had implemented a wide range of disaster preparedness plans.
- Most external utilities failed or were severely disrupted, but back-up facilities were mostly functional.

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Conclusions of Health System Survey

- Backups were tested regularly in most facilities, ensuring they worked when most needed.
- Most hospitals reported less-than-normal patient intake; there was significant outmigration from Kathmandu after the earthquake.
- Unbraced medical gas cylinders fell, scaring occupants
- Buildings with poor construction quality and with many additions did not fare well.
- Poor building maintenance contributed to the damage.
- Widespread damage of infill walls concerned occupants.
- Staffing numbers were normal or above normal due to onsite staff residences and preparedness training.

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Future Actions

- Building standards for critical buildings
- Considerations for performance of nonstructural elements
- Fire-fighting systems
- Robust back up for utilities
- Staff preparedness and planning
- Internalize, operationalize plans based on recent experiences
- Table-top exercises
- National Action Plan for safety of health facilities?

References

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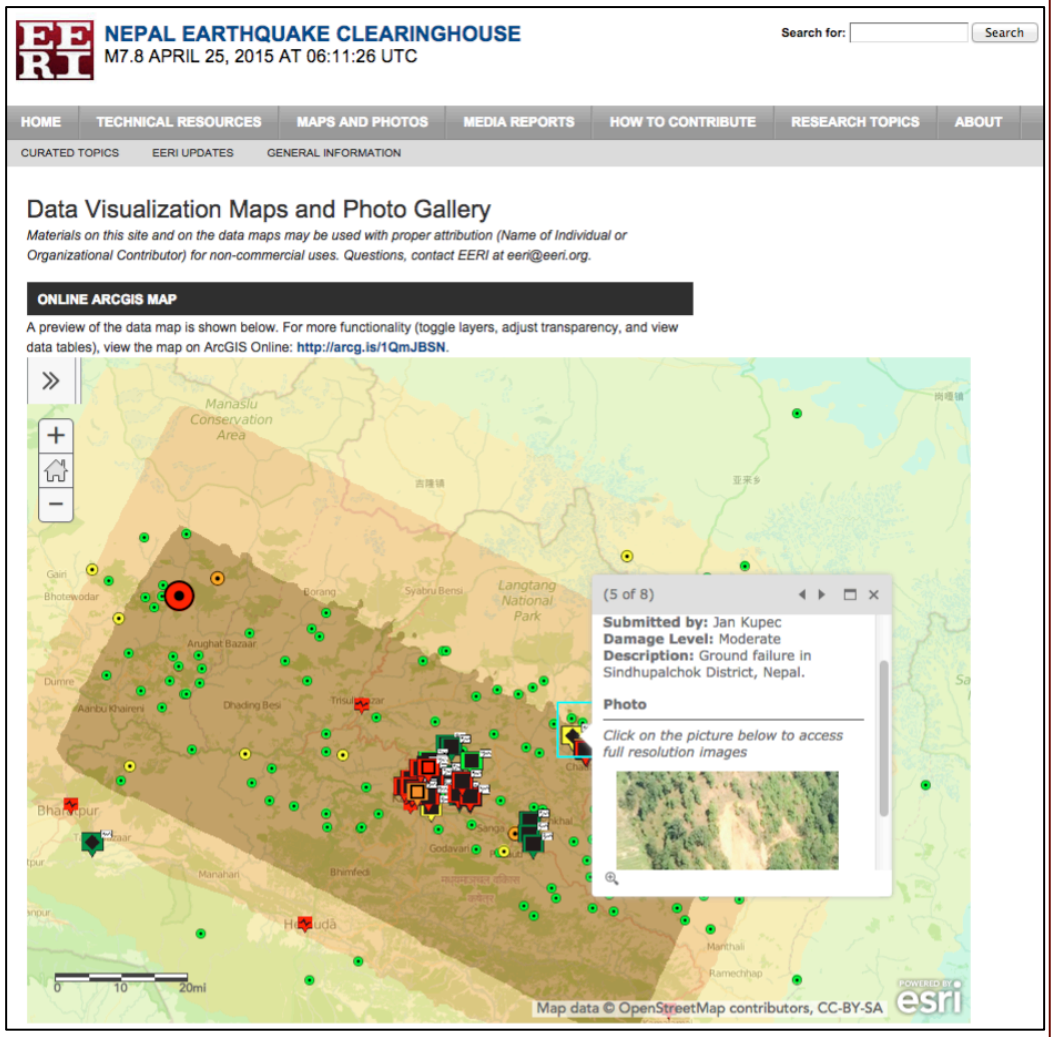
Nepal Ministry of Health and Population, 2015. *Post Disaster Needs Assessment and Recovery Plan of Health and Population Sector*, June 10, 2015.

More Information: Reports, Data & Photos

http://www.eqclearinghouse.org/2015-04-25-nepal/

- Visit EERI's Virtual Clearinghouse Website for:
  - Geolocated Data Map
  - Photo Gallery
  - Team Report *(available in late summer 2015)*
  - Reports from other teams & organizations
  - Curated Topic Posts
- Thanks to our Virtual Team Collaborators, Lisa Krain , Tracy Becker and Chiara McKenney, who uploaded my photos to the EERI map and assisted with this presentation.



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Thank you