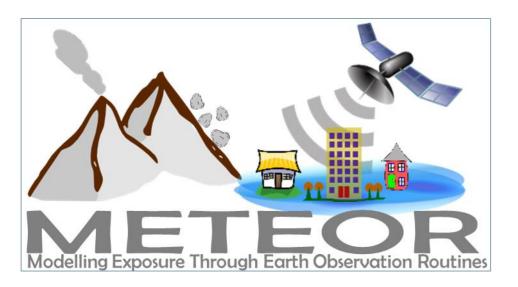METEOR
Modelling Exposure Through Earth Observation Routines

Shubharoop Ghosh[1], Charlie Huyck[1], Ronald Eguchi[1], Zhenghui Hu [1], Paul Amyx[1], Georgiana Esquivious[1], Michael Eguchi[1], Melisa Huyck[1], Colm Jordan[2], Kay Smith[3], John Rees[2], Annie Winson[2], Paul Henshaw[4], Vitor Silva[4], Mhairi O'Hara[5], Tyler Radford[5], Luca Petrarulo[6], Aileen Lyon[6], Claire Simon[6], Lucrezia Tincani[6], Charles Msangi[7], Ganesh Jimee[8] and Suman Pradhan[8]
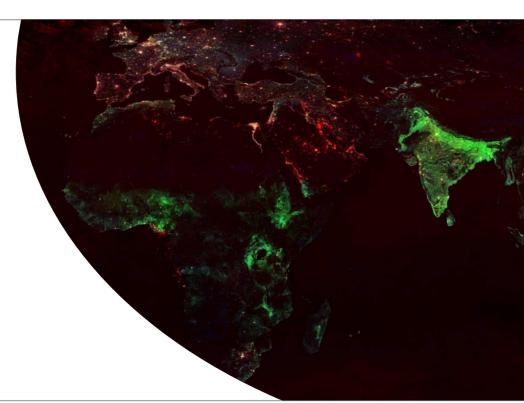
[1]ImageCat Inc, Long Beach, CA, USA, [2]British Geological Survey (BGS), Keyworth, UK; [3]British Geological Survey (BGS), Edinburgh, UK; [4]Global Earthquake Model Foundation (GEM), Pavia, Italy; [5]Humanitarian OpenStreetMap Team (HOT), Washington DC, USA; [6]Oxford Policy Management Limited (OPM), Oxford, UK; [7]Disaster Management Department of the Prime Minister's Office (DMD), Tanzania; [8]National Society for Earthquake Technology (NSET), Nepal

National-scale exposure datasets for multi-hazard risk analysis for Nepal, Tanzania and global stakeholders

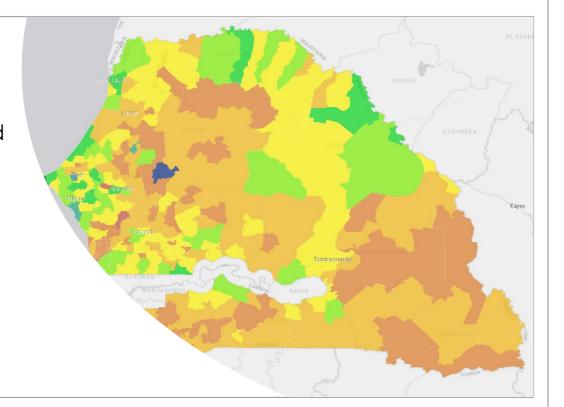## Building Classification Scheme for Risk Assessment

Level 1- Global Data

- Typically global but can be continental or regional
- Country-specific information available is minimal
- Typically generated using a global population dataset as basis for building count and location
- Nearby country's construction statistics may be used as proxy

Level 2- Country-level exposure data

- Exposure generated using data collected and reviewed at national level
- Typically, building counts are estimated through census population
- Structure type distributions
- Number of people per household
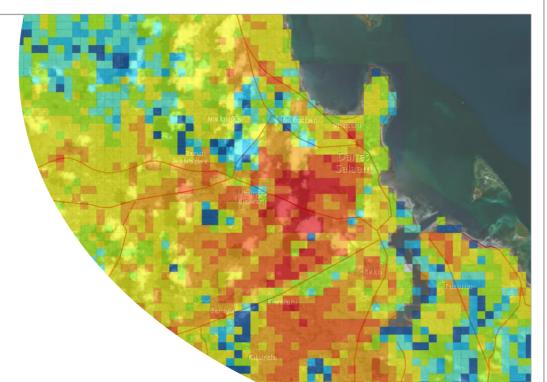- Building replacement cost per square meter

Level 3- Data improvement at the sub-national scale

- Use of remote sensing data to improve spatial distribution of building stock
- Better characterization of construction patterns within different climate, cultural or economic regions in a country
- Improvement of major urban areas in terms of building counts, and structural mapping schemes

Level 4- Aggregated building-specific data

- Aggregate building level data to obtain accurate spatial distribution
- Apply occupancy and structural distributions to assign proper vulnerability
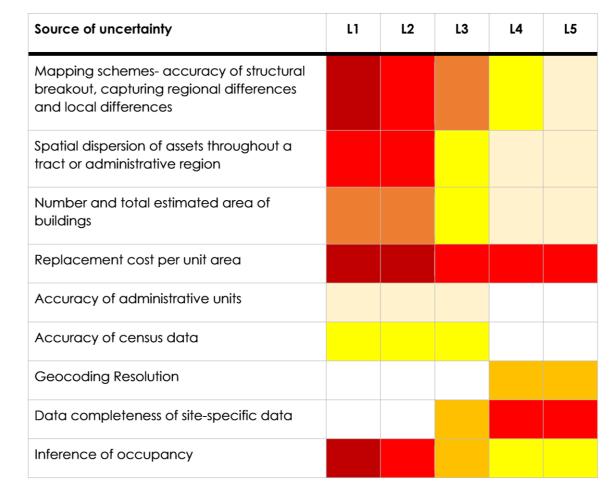

Level 5- Site-specific data

- Data collected and provided at site level
- Usually available for a smaller region

Afghanistan
Angola
Bangladesh
Benin
Bhutan
Burkina Faso Burundi
Cambodia
Central African Republic
Chad
Comoros
Democratic Republic of the Congo
Djibouti
Eritrea
Ethiopia
Gambia
Guinea
Guinea-Bissau
Haiti
Kiribati

Lao People's Democratic Republic
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mozambique
Myanmar
Nepal
Niger
Rwanda
Sao Tome and Principe
Senegal
Sierra Leone
Solomon Islands
Somalia
South Sudan
Sudan
Tanzania

Timor-Leste
Togo
Tuvalu
Uganda
Vanuatu
Yemen
Zambia

Sources of Uncertainty for Exposure Levels

Given the various exposure levels 1-5, uncertainty exists from different sources. As a part of project METEOR, we will provide guidance on sources of uncertainty given typical development practices and illustrate the importance of factoring it in the decision making process.

Source of uncertainty	L1	L2	L3	L4	L5
Mapping schemes- accuracy of structural breakout, capturing regional differences and local differences					
Spatial dispersion of assets throughout a tract or administrative region					
Number and total estimated area of buildings					
Replacement cost per unit area					
Accuracy of administrative units					
Accuracy of census data					
Geocoding Resolution					
Data completeness of site-specific data					
Inference of occupancy					

Sustainability and Capacity Building

Project METEOR will develop processes of building capacity and co-delivering new consistent data to promote welfare and economic development in 47 of the least developed countries, and demonstrate the applicability of the techniques elsewhere.

Network of Stakeholders
a) Governments / Policy Makers
b) IGOs and NGOs
c) Commercial clients in insurance, micro-insurance
d) Academic and Research organizations

Stakeholder Needs Assessment
a) Extensive research, interviews, and discussions
b) Review the challenges and gaps between existing products and needs of the DRR / DRM users

Business Model and Implementation Strategies
a) Products for underwriting risk by insurers
b) Public Private Partnership for natural catastrophe schemes
c) Research on exposure, vulnerability, and hazard topics for advancing discipline

Outreach, Workshops, Publications
a) Provide material and databases for knowledge sharing
b) Capacity building to support activities of International Partners
c) Attend global developmental conferences and workshops

Sustainable Development Goals (SDGs) of the project METEOR:

1 NO POVERTY

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL

FATHOM

GEM GLOBAL EARTHQUAKE MODEL working together to assess risk

HOT Humanitarian OpenStreetMap Team

ImageCat

NSET

Oxford Policy Management