همایش ارزیابی اقتصاد سوانح

IIEES
پژوهشگاه بین‌المللی زلزله‌شناسی و مهندسی زلزله

صندوق بیمه حوادث طبیعی ساختمان

پژوهشکده بیمه

بنیاد ملی علم ایران
Iran National Science Foundation

unesco
Category 2 Centre under the auspices of UNESCO

RCECWA
Regional Education and Research Center on Earthquake Risk Management and Resilience for West and Central Asia

مدل ارزیابی اقتصادی سوانح برای مدلسازی مدیریت مالی صندوق بیمه همگانی حوادث طبیعی ساختمان(FiCat-EQ)

سه‌شنبه، ۱۵ مهر ۱۴۰۴، ساعت ۹:۰۰ الی ۱۴:۰۰

برگزارکنندگان: پژوهشگاه بین‌المللی زلزله‌شناسی و مهندسی زلزله، بنیاد ملی علم ایران، صندوق بیمه سوانح طبیعی و پژوهشکده بیمه

گروه هدف: متخصصان ارشد اجرایی و پژوهشگران ارشد حوزه ریسک، اقتصاد و بیمه

بابک منصوری

دانشیار و سرپرست پژوهشکده مدیریت خطرپذیری و بحران


EMME
EARTHQUAKE MODEL OF
THE MIDDLE EAST REGION
www.emme-gem.org
EMME
EARTHQUAKE MODEL OF
THE MIDDLE EAST REGION
EMME Earthquake Model of Middle East:
Hazard, Risk Assessment, Economics & Mitigation

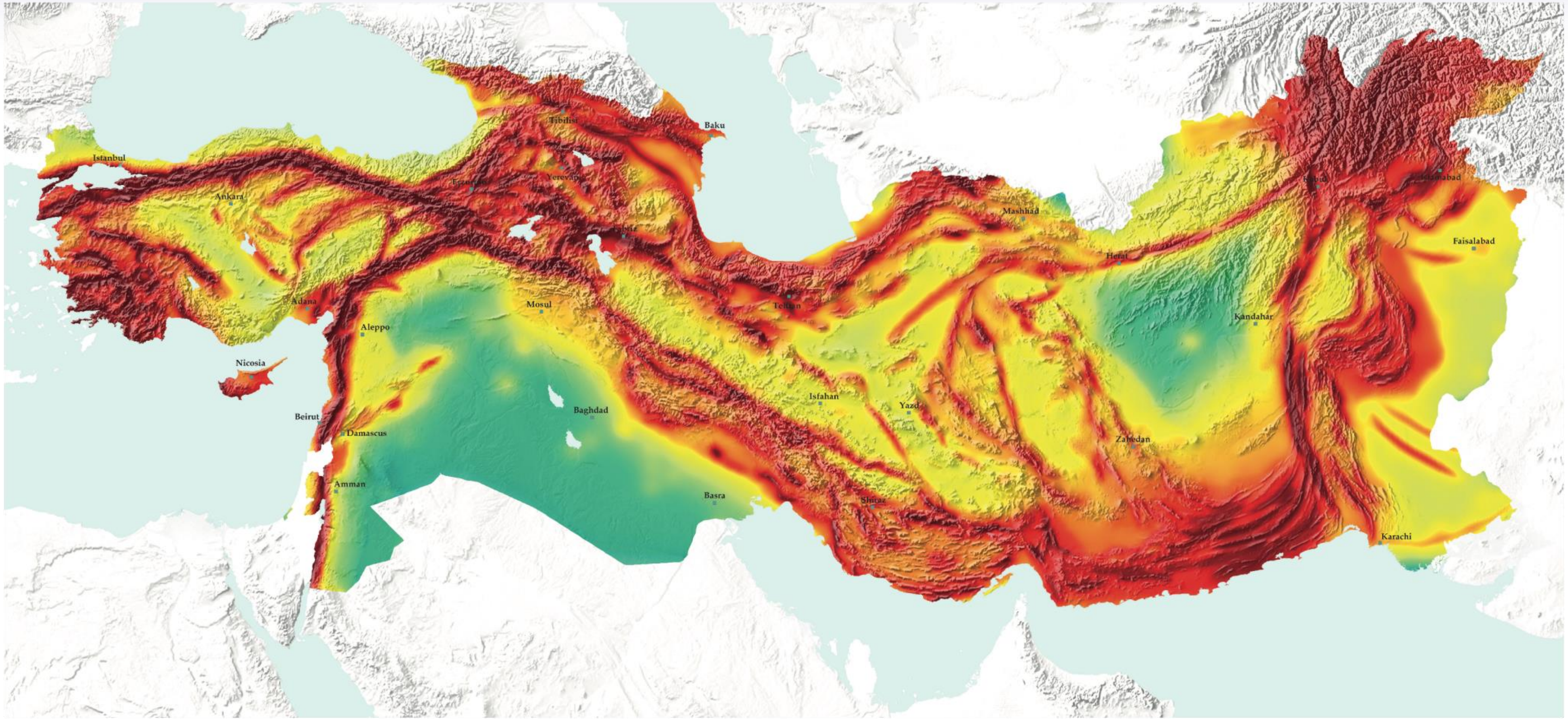
WP4 – RISK

Seismic Hazard Map of the Middle East

EMME
EARTHQUAKE MODEL OF THE MIDDLE EAST REGION

IIEES

edited by D. Giardini, L. Danciu, M. Erdik, K. Sesetyan, M. Demircioglu, June 2016



Peak Ground Acceleration [g]
Probability of Exceedence in 50 years

Low | Moderate | High

0.00 0.10 0.20 0.30 0.40 0.50

Map Content

The Seismic Hazard Map of the Middle East displays the ground shaking (i.e. Peak Horizontal Ground Acceleration, PGA) to be reached or exceeded with a 10% probability in 50 years. This reference value represents the shaking to be expected during the human lifetime, corresponding to the average recurrence of such ground motions every 475 years, as prescribed by the national building codes for standard buildings in the Middle Eastern countries. Blue to green colors depict comparatively low hazard (PGA ≤ 10% of the gravitational acceleration), yellow to orange colors moderate hazard (10% < PGA ≤ 30% g) and red to brown colors identify high hazard areas (PGA > 30% g).

The Earthquake Model of the Middle East project (EMME)

The Middle East region has a long history of destructive earthquakes, and seismic risk can severely affect our modern society, as shown by the tragic events of Izmit (Turkey, 1999), Bam (Iran, 2003), Kashmir (Pakistan, 2005), Van (Turkey, 2011) and Hindu Kush (Afghanistan, 2015). Minimization of the loss of life, property damage, and social and economic disruption due to earthquakes depends on reliable estimates of seismic hazard.

National, state, and local governments, decision makers, engineers, planners, emergency response organizations, builders, universities, and the general public require seismic hazard estimates for land use planning, improved building design and construction, adoption of modern building construction codes, emergency response preparedness plans, economic forecasts, housing and employment decisions, and other measures for risk mitigation.

The collaborative project "Earthquake Model of the Middle East (EMME, 2010-2015)" brought together scientists and engineers from the leading research institutions in the region and delivers state-of-the-art seismic hazard assessment covering Afghanistan, Armenia, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Jordan, Lebanon, Palestine, Pakistan, Syria and Turkey. The project generated new earthquake catalogues, regional maps of active faults and the first ever set of harmonized seismic hazard results and maps for the region, characterizing the seismic activity and its effects.

The EMME seismic hazard results describe the potential shaking associated with future earthquakes in the Middle East and serve as input to develop strategies for seismic risk governance and earthquake resistant design for different applications - ranging from private homes to multi-story public buildings and critical infrastructures such as bridges and dams.

EMME contributes its results to the Global Earthquake Model (GEM), a program initiated by the Organization for Economic Cooperation and Development (OECD).

Main contributors

Together with the editors, the main contributors to the Seismic Hazard Map of the Middle East are: M. Ghafory-Ashtiany, H. Babayan, A. Axundov, A. Karakhanian, A. Khan, L. Gülen A. Gvencadze, A. Elias, N. Tsereteli, B. Mansouri, K. Hessami, S. Adamia, S. Al Quraan, S. Akkar, A. Askan, M. Al-Qaryouti, H. Al-Nimry, M. Avanesyan, M. Awawdeh, R. Basili, C. Chrysostomou, R. El-Khoury, U. Hancilar, R. Helou, Y. İnce, R. Jaradat, M. D. Köksal, N. Kyriakides, S.H. Lodi, T. Mammadli, A. Rovida, S.F.A. Rafeeqi, N. Sadradze, M. Sayab, M. Stucchi, B. Sungay, M. Utkucu, H. Yalçin, G. Yetirmishli, M. Zare, and C. Zulfikar.

Disclaimer

The EMME map does not replace the existing national design regulations and seismic provisions, which are compulsory for today's design and construction of buildings.

Acknowledgements

We would like to acknowledge the collaborative efforts of numerous researchers and engineers from the Middle East region throughout the EMME project. We thank M. Pagani, D. Monelli and G. Weatherill (GEM Foundation), J. Woessner (SHARE project), and S. Parolai, D. Bindi and S. Ullah (EMCA project) for the integration with neighboring regions.

The EMME hazard was computed using OpenQuake software, developed and supported by the Global Earthquake Model (GEM). The EMME map is produced using the Generic Mapping Tools (GMT) with an Equidistant Conic Projection.

The EMME program was supported by JTI.

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For more information, data and models visit: www.emme-gem.org and www.efehr.org

Schweizerischer Erdbebendienst
Service Sismologique Suisse
Servizio Sismico Svizzero
Swiss Seismological Service

ETH zürich

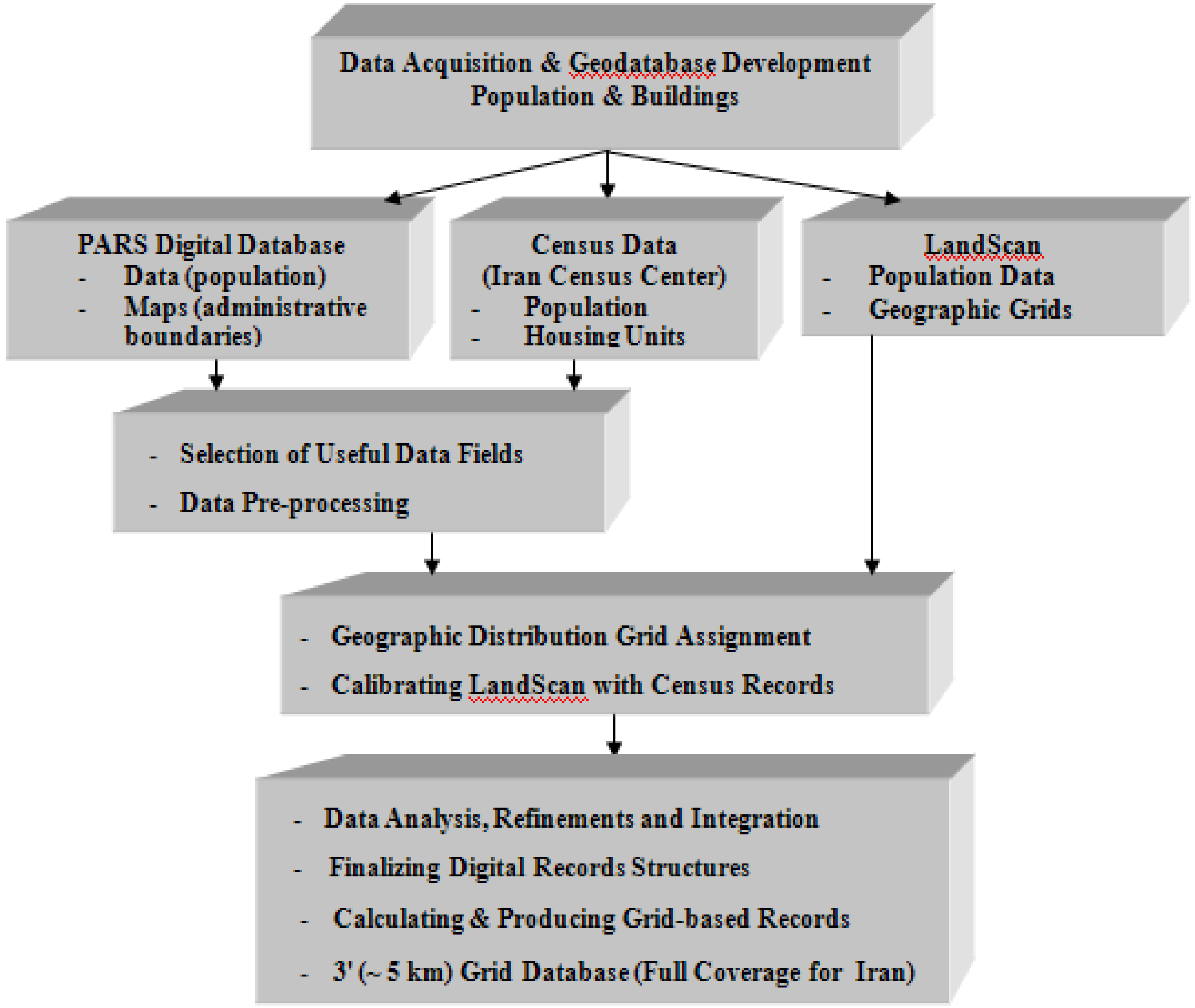
KANDILLI

AUB

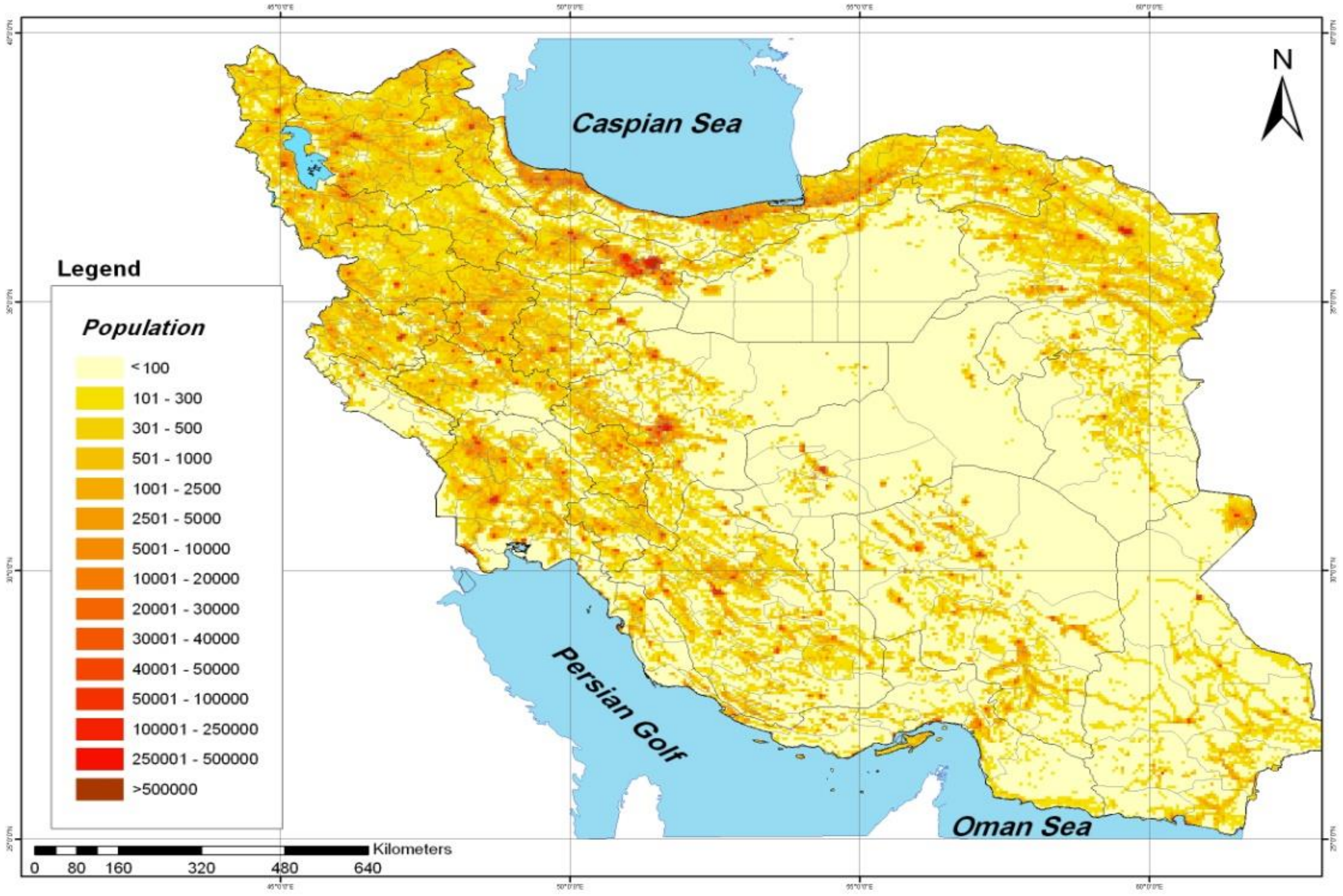
پژوهشگاه بین المللی زلزله شناسی و مهندسی زلزله

GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk

Database Development



Population and Building Information according to 0.05 Degrees or Approximately 5km grids for Iran



Population Distribution for Iran (30 provinces)
0.05 ^{o} (~ 5 km) grids

Vulnerability Function Parameters (EMS-98 Method)

Typology	Description	Earthquake Resistant Design Level	Building Height	Quality Index (Q)	Total Vulnerability Index (V)
Ad	Adobe	-	Low	1.80	1.00
M1	Reinforced Masonry Walls	(High Code)	Low	2.3	0.63
M2 & M3	Unreinforced Masonry	(Pre or Low Code)	Low	2.00	0.89
RC1	RC Frame + Infill Walls	(High Code)	Medium	2.3	0.62
RC2	RC Frame + Infill Walls	(Medium Code)	Medium	2.0	0.69
RC3	RC Frame + Infill Walls	(Pre or Low Code)	Medium	2.0	0.82
S1	Steel Frame (Braced) + Infill Walls	(High Code)	Medium	2.3	0.59
S2	Steel Frame + Infill Walls	(Medium Code)	Medium	2.1	0.75
S3	Steel Frame + Infill Walls	(Pre or Low Code)	Medium	2.0	0.82

Islamic Republic of Iran

Earthquake Model of the Middle East Region (EMME)

Final Report of Work Package 4:

WP4: Seismic Risk Assessment

Global Earthquake Risk Model Project

Prepared by:

International Institute of Earthquake Engineering and Seismology

November 2013

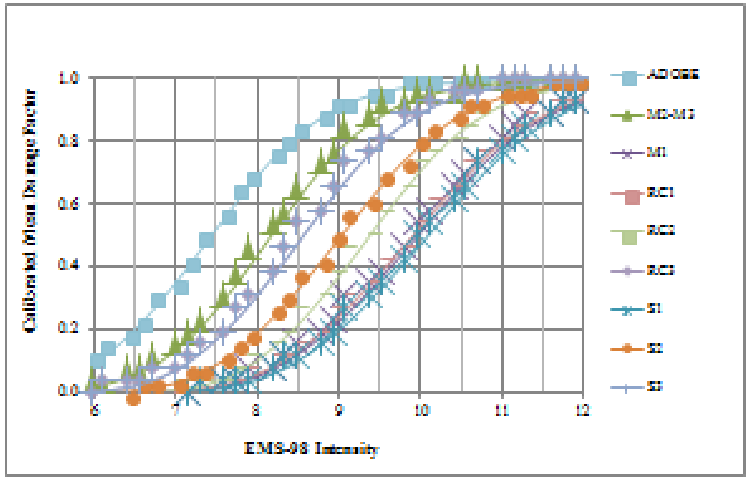


Figure (32): Vulnerability curves for Iran (according to EMS-98 method)

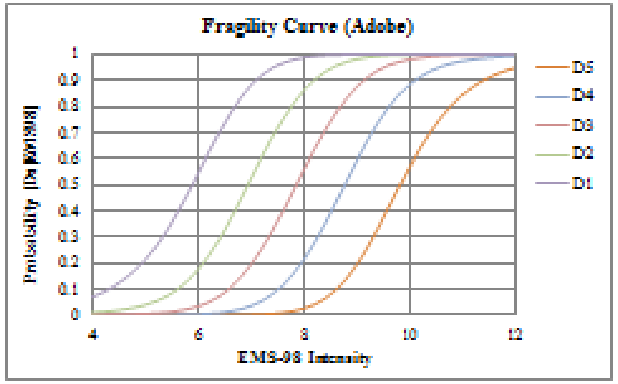
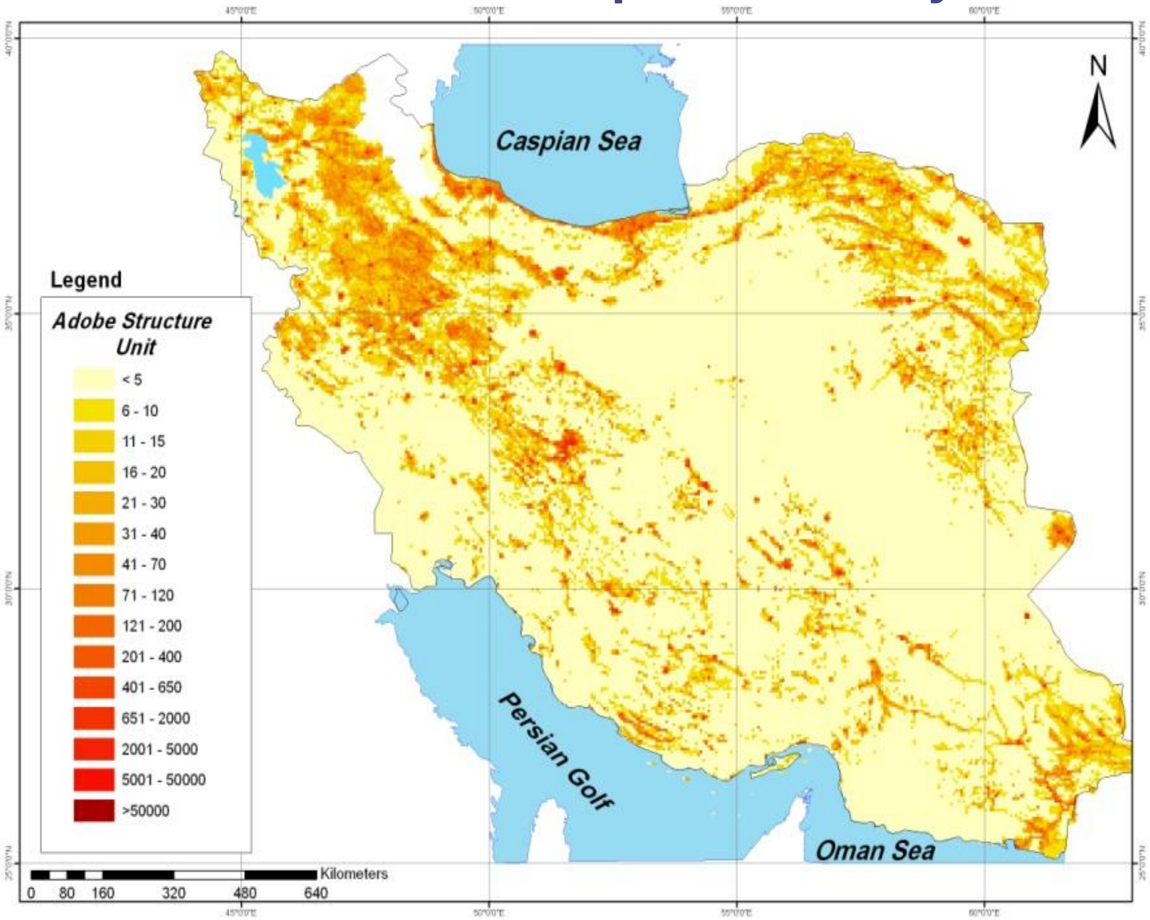
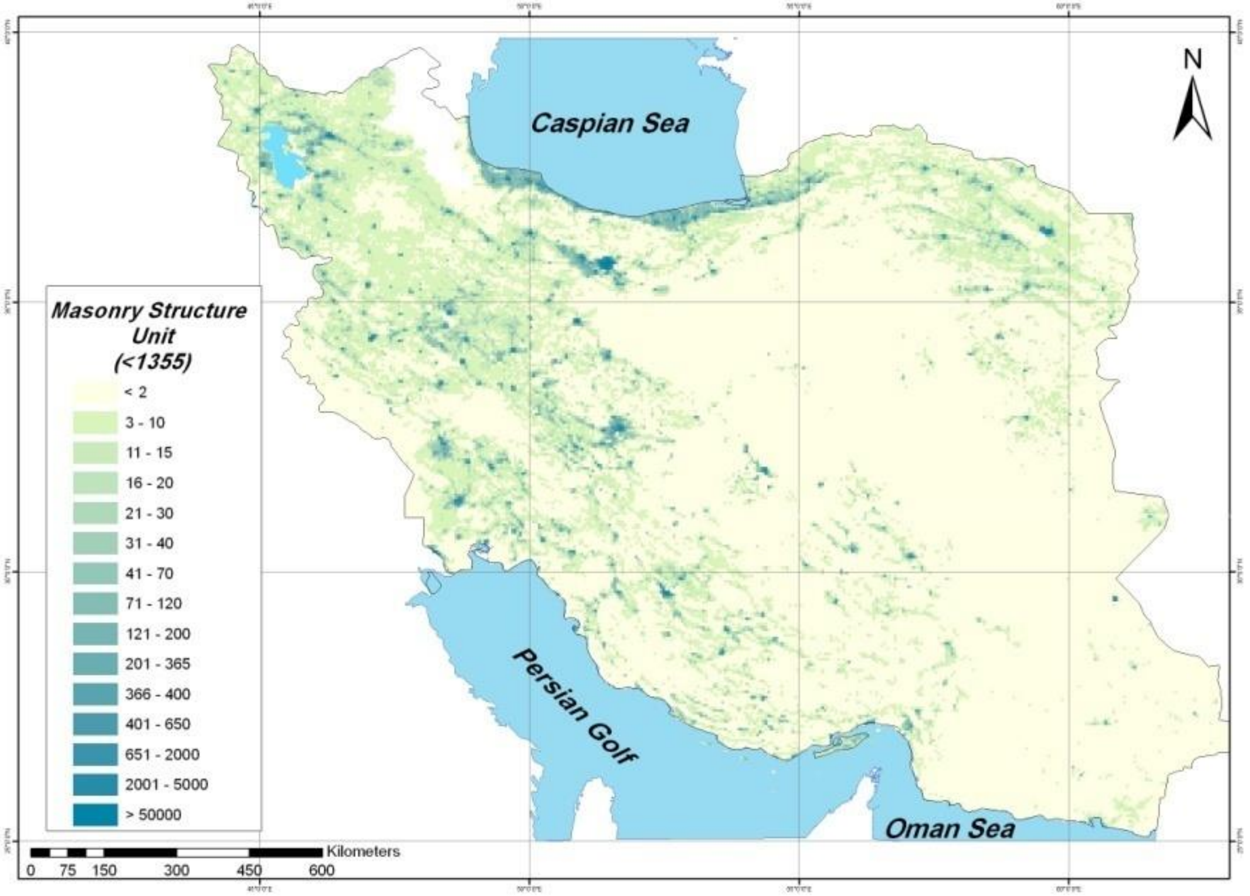


Figure (33): Fragility Curve for Adobe Buildings

Maps of Country-wide Housing Taxonomy Distribution



Distribution of Adobe housing units



Distribution of Masonry (Pre or Low Code) housing units

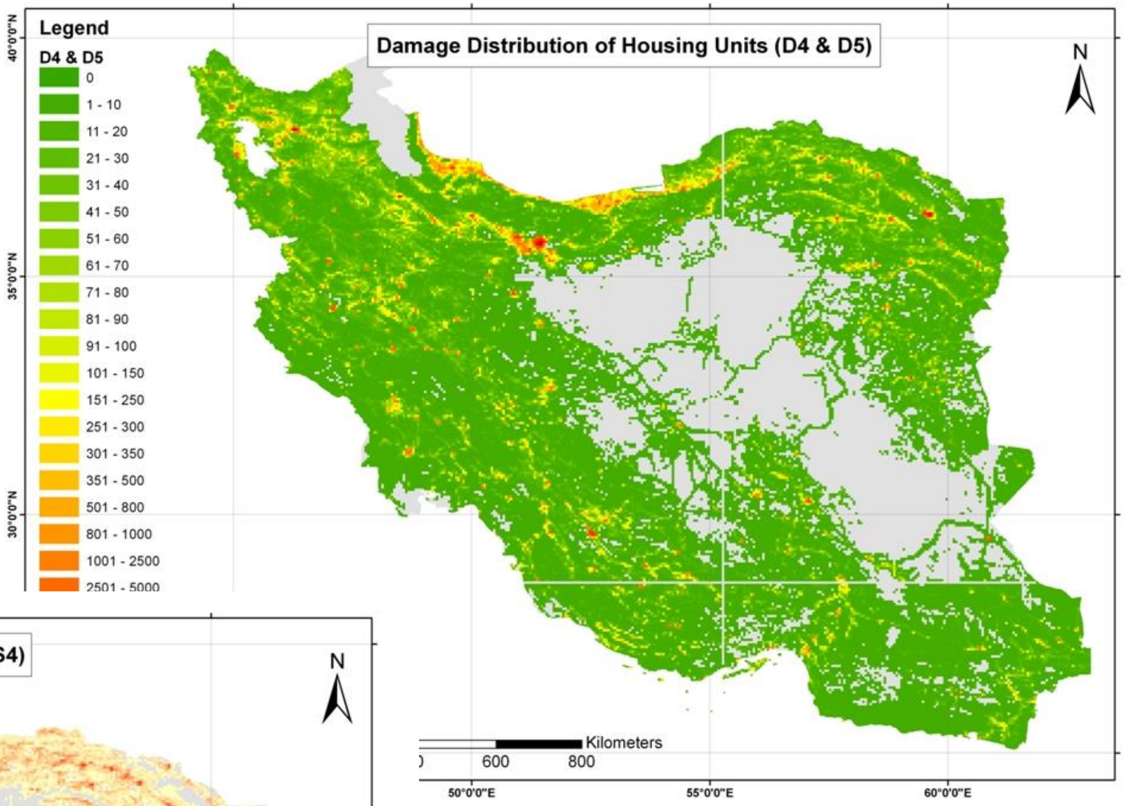
Grid size: 5km by 5km

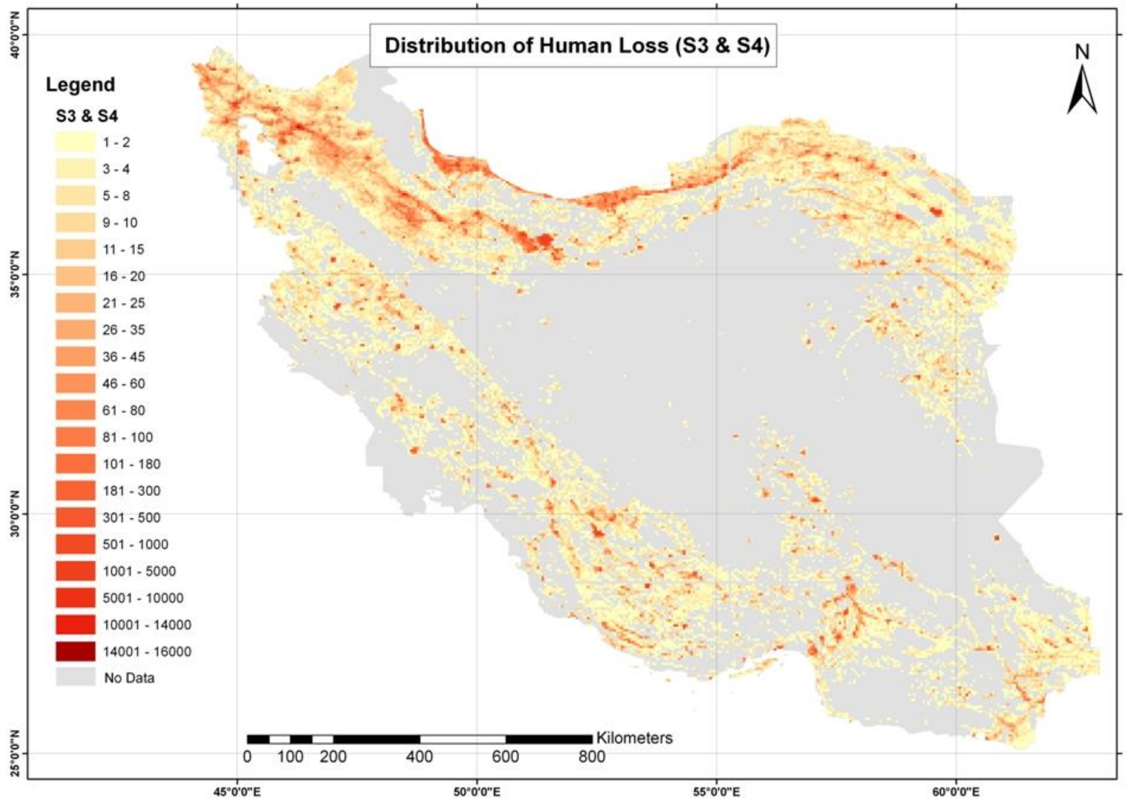
Vs300_475

Damage Distribution (Aggregated Damage) & Casualty Map (Severely Injured and Death)

475 years return period

VS: 300 m/s (Soil)





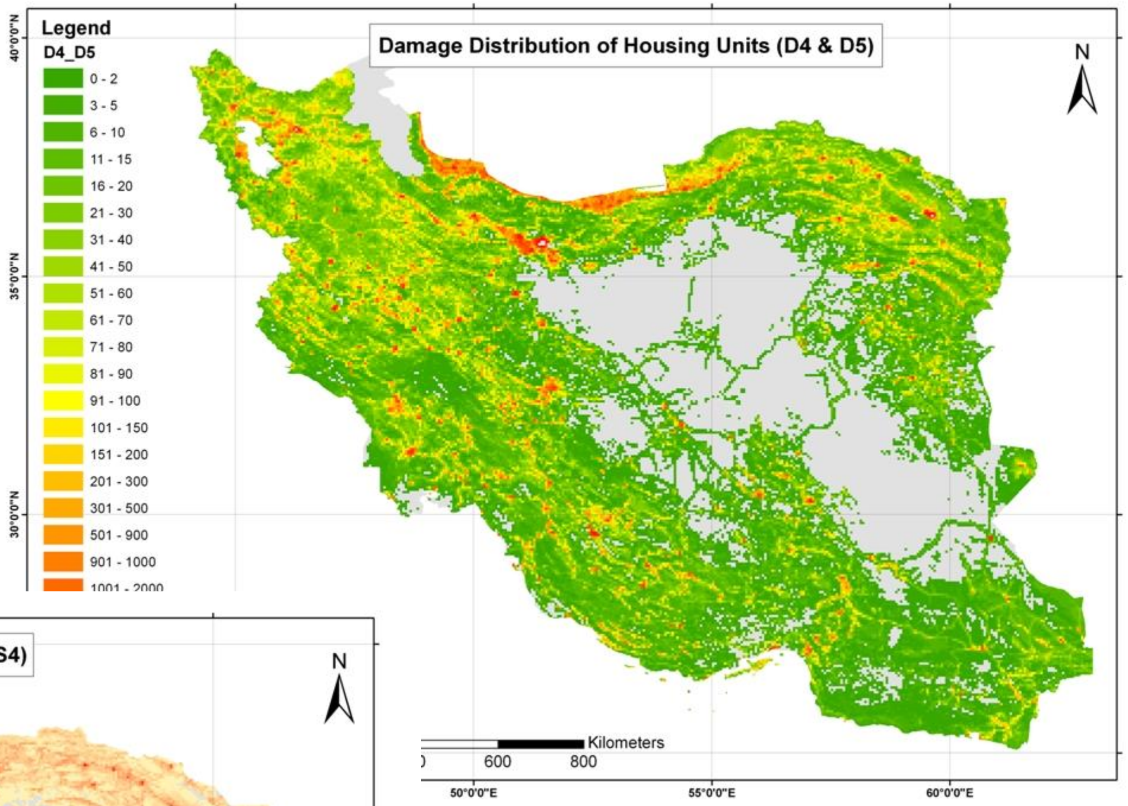
Damage Grades	Damaged Housing Units
D3	2956497
D5	684597
D4 & D5	2740266

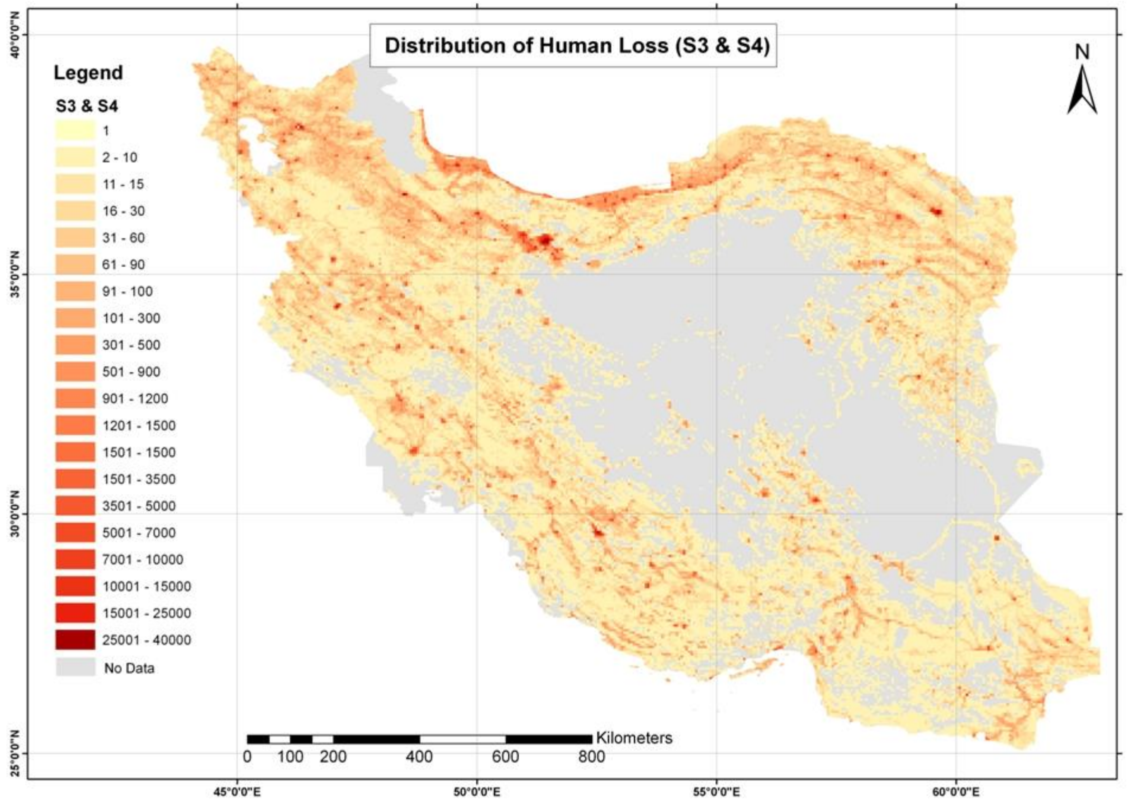
Severity	Human Loss
S4	220050
S3 & S4	537733

Grid size: 5km by 5km

Damage Distribution
(Aggregated Damage)
&
Casualty Map
(Severely Injured and Death)

2475 years return period
VS: 300 m/s (Soil)





Damage Grades	Damaged Housing Units
D3	3515187
D5	2932976
D4 & D5	6458107

Severity	Human Loss
S4	1718899
S3 & S4	3975164

Grid size: 5km by 5km

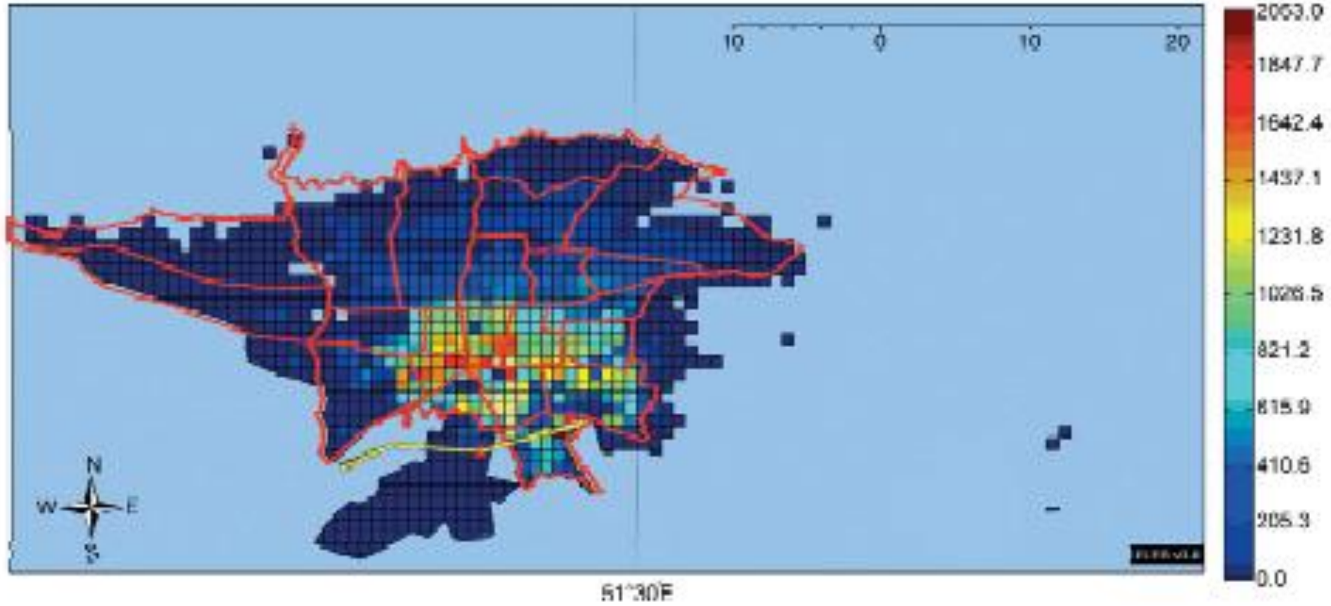


Figure 13. Distribution of damaged housing units for RF scenario (Grades of D4+D5).

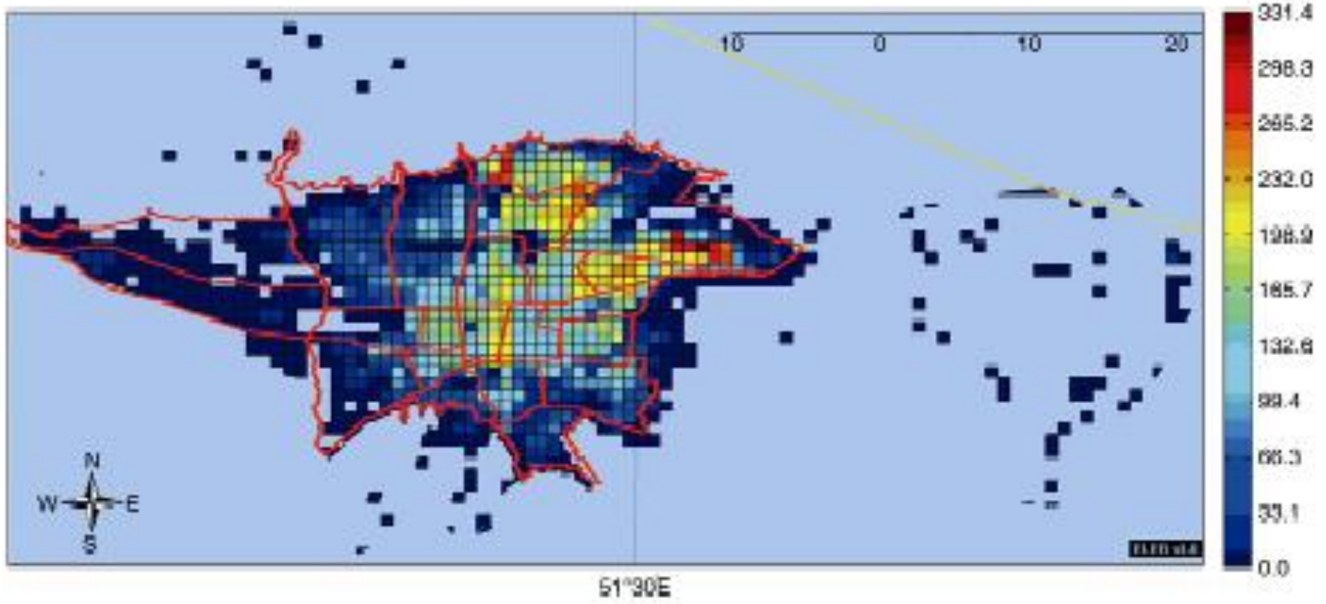


Figure 14. Distribution of damaged housing units for MF scenario (Grades of D4+D5).

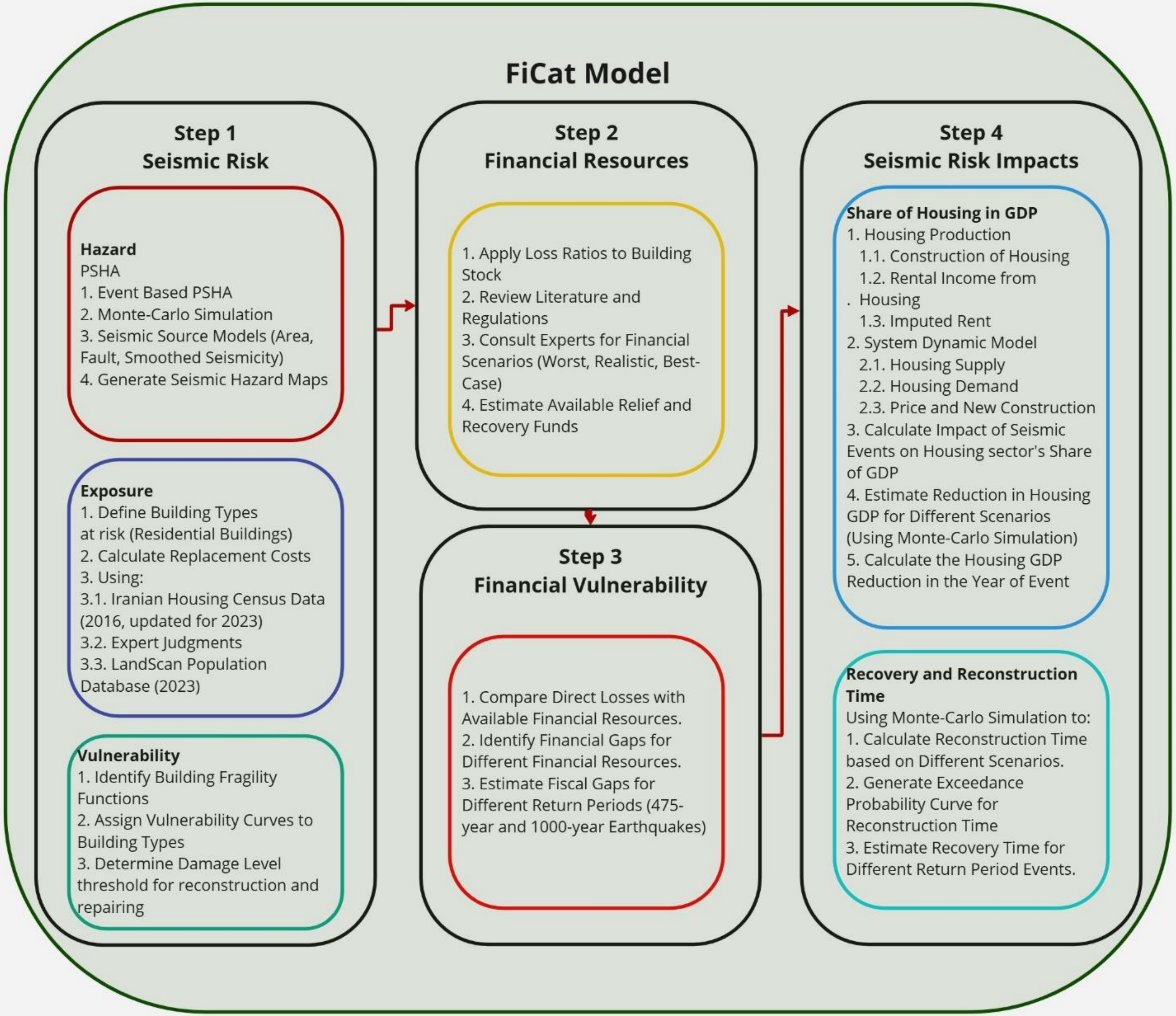
Grid size: 1km by 1km

- اثرات ریسک لرزه ای بر اقتصاد و تاب آوری
  - مدلسازی پویایی شناسی سیستم ها
  - تاثیر ریسک لرزه ای بر تولید ناخالص داخلی (GDP)
  - تاثیر شکاف مالی بر مدت زمان بازسازی و بازتوانی
- آسیب پذیری مالی
  - برآورد شکاف مالی
  - میزان وابستگی به منابع خارجی
  - تاخیر در تامین بودجه
- ظرفیت مالی
  - ابزار های مالی پسین (پس از رخداد سوانح)
  - ابزار های مالی پیشین (قبل از رخداد سوانح)
- تحلیل ریسک Risk-EQ
  - تحلیل خطر لرزه ای
  - دارایی های در معرض خطر
  - آسیب پذیری

مراحل و ماژول های اصلی ابزار FiCat-EQ

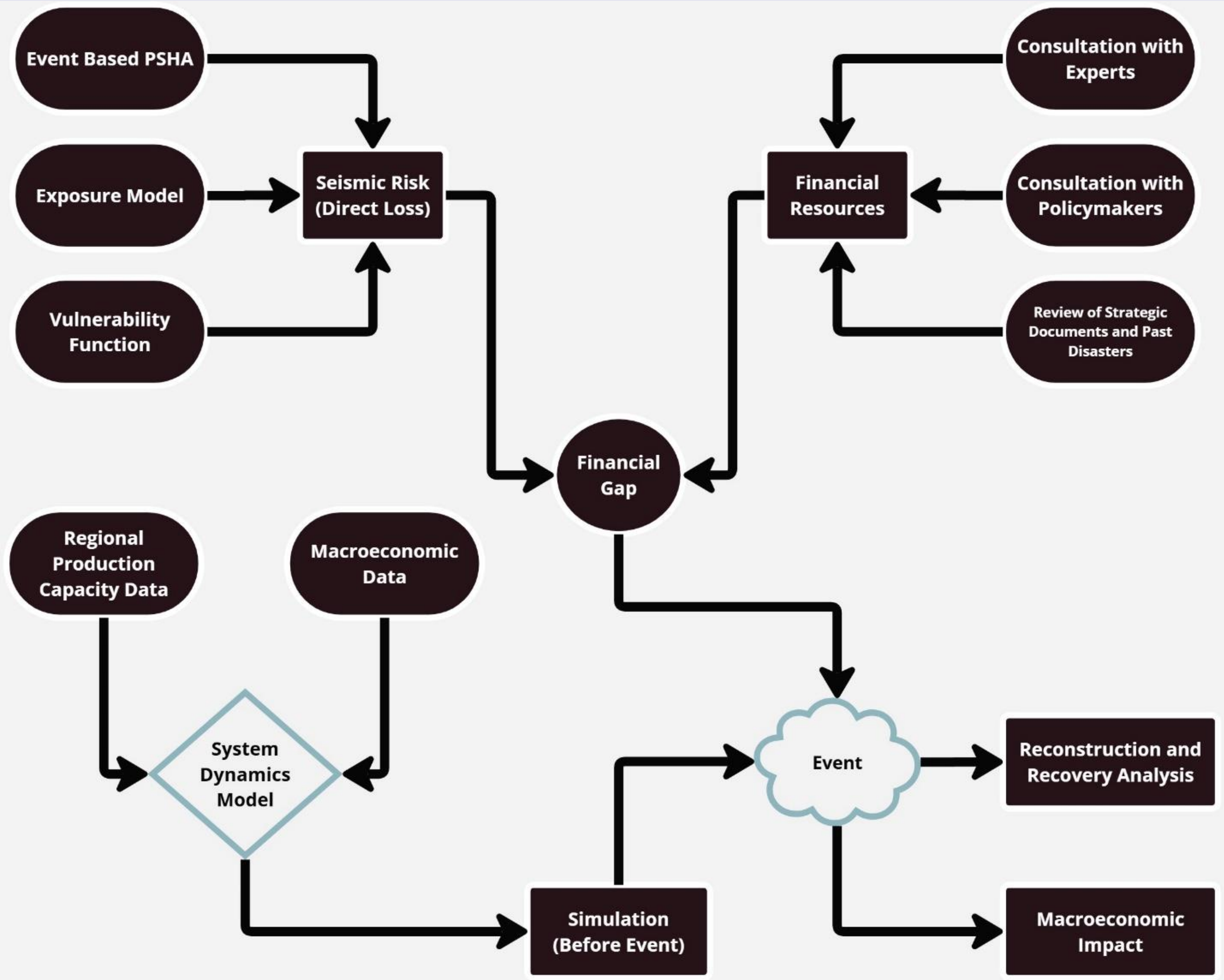
Methodology:

- FiCat-EQ toolbox:
  - An integrated, modular tool designed to comprehensively assess:
    - Step 1: Seismic Risk.
    - Step 2: Catastrophe (Disaster) Financial Resources.
    - Step 3: Financial Gaps and Vulnerability
    - Step 4: Impact of Financial Gap on Housing Sector Economy and Recovery

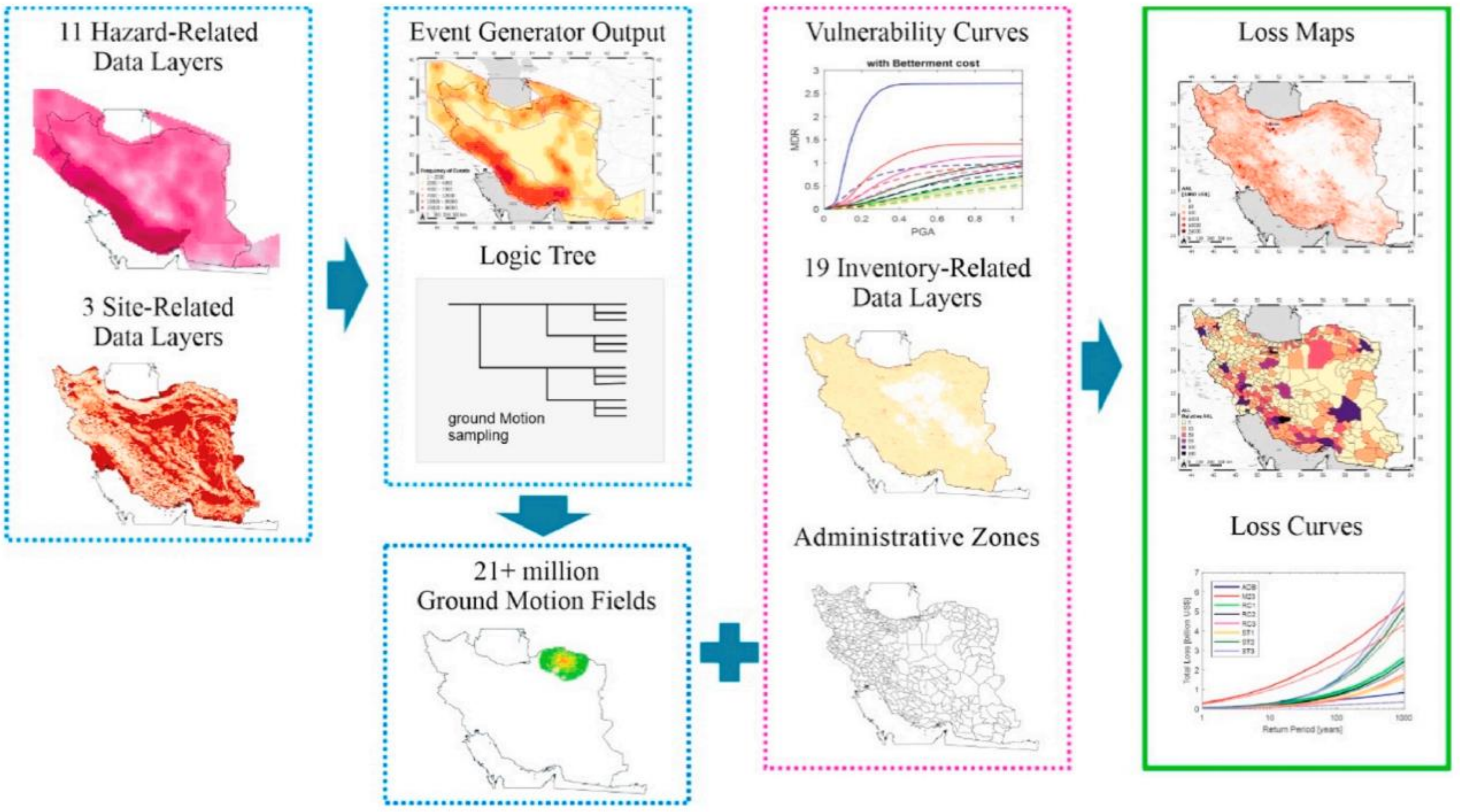


Methodology:

- FiCat_EQ Toolbox Architecture:
  - Modular Architecture and Design:
    - Developed using Python
    - Designed with a modular architecture
    - Flexibility, scalability, and integration capabilities
  - Flexibility & Customization:
    - Expandable analytical engine.
    - Easily customizable to fit various regional and macroeconomic contexts.
  - Integration with External Platforms.
    - Seamless integration with external systems or platforms (GIS).
  - Robust Framework

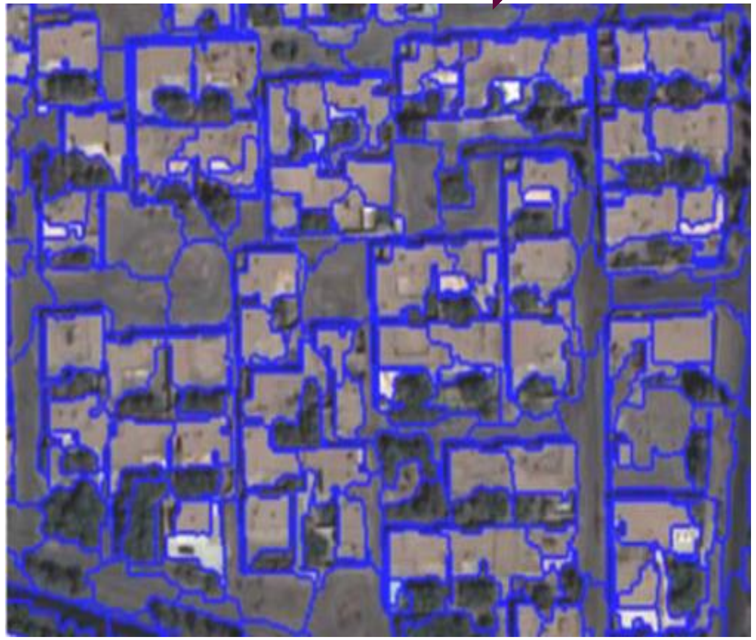


RISK-EQ Seismic Risk Module

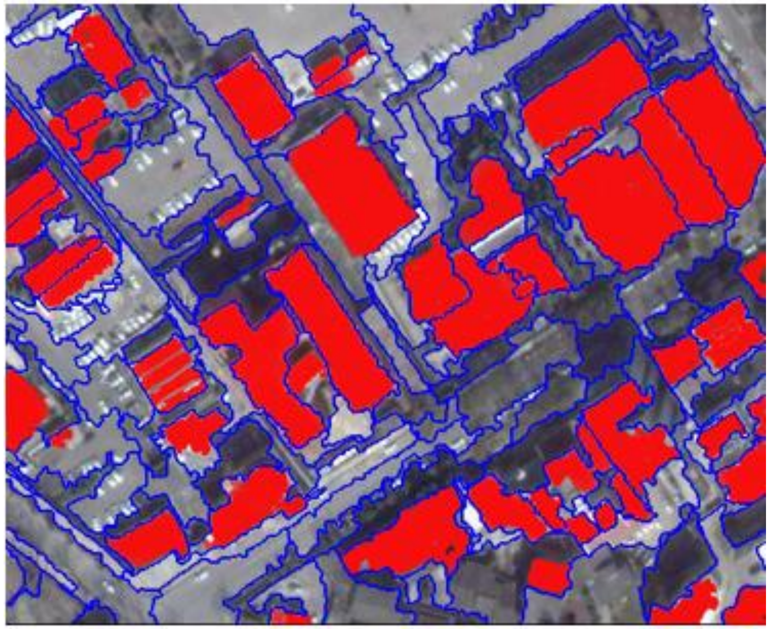


Building Extraction by AI Algorithm (Object-based image analysis by eCognition)

DATASET (VHR ,UAV) → **pre-processing** (Geo ref, Co-register, enhancing ,fusion, adjusting, Histogram matching, sharpening ,..) → **Classification and segmentation** → **Building extraction**



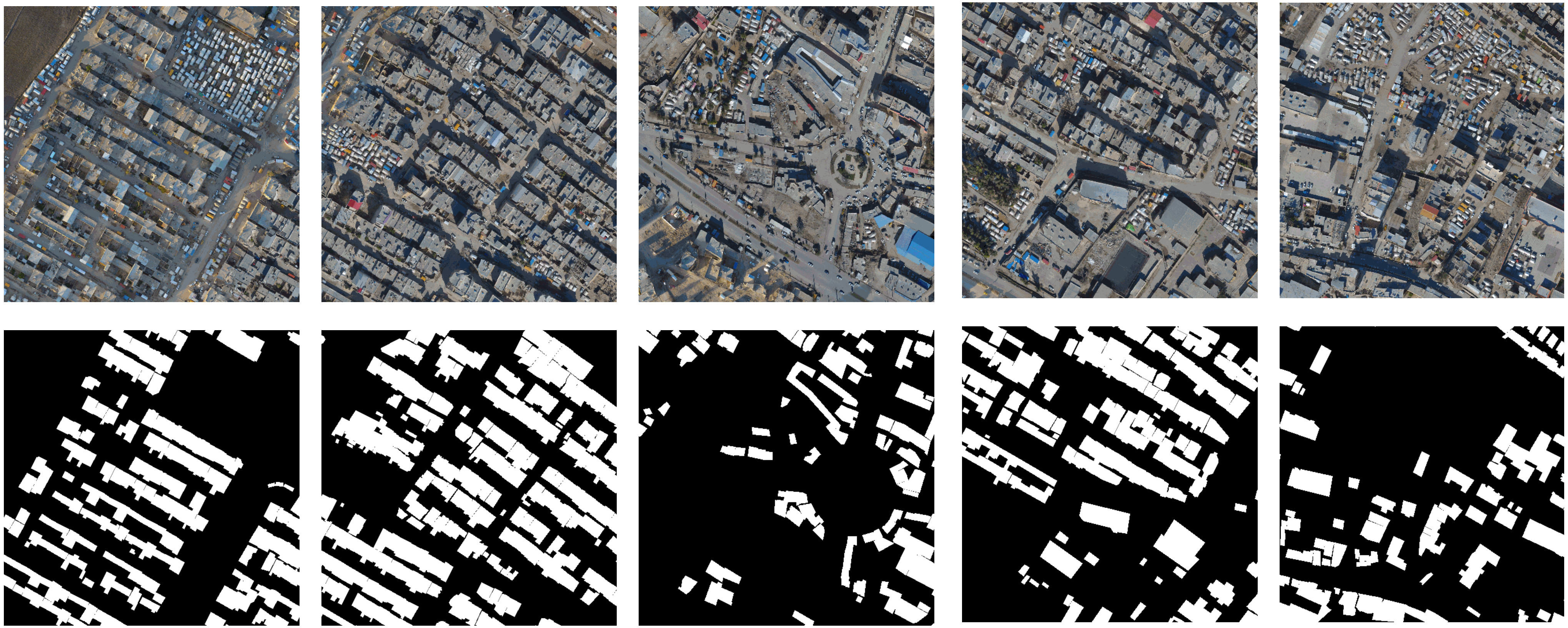
Segmentation by Region merging Multi-resolution Algorithm



Classification

Building extraction

Domestic dataset created – Building Extraction



Domestic dataset created – Damage Mapping