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۲۷ و ۲۸ مهر
تهران، مرکز همایش‌های برج میلاد

نشست ۴
بلایای طبیعی و اقتصاد بیمه در عصر تغییر اقلیم

بابک منصوری
دانشیار و سرپرست پژوهشکده مدیریت خطرپذیری و بحران

Seismic Hazard Map of the Middle East

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

EMME
EARTHQUAKE MODEL OF THE MIDDLE EAST REGION

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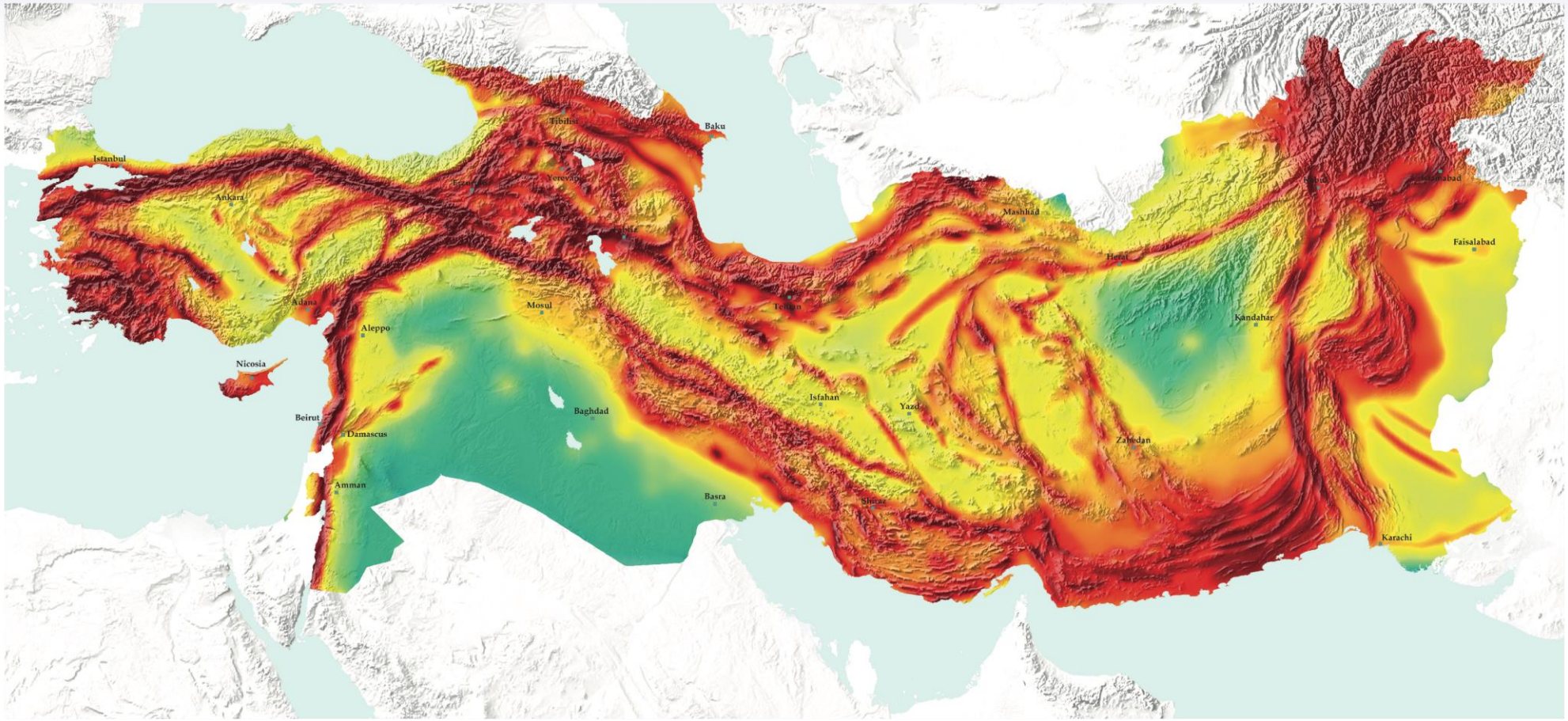
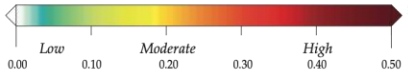


Peak Ground Acceleration [g]
Probability of Exceedence in 50 years



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. Ince, 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. Farolai, 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

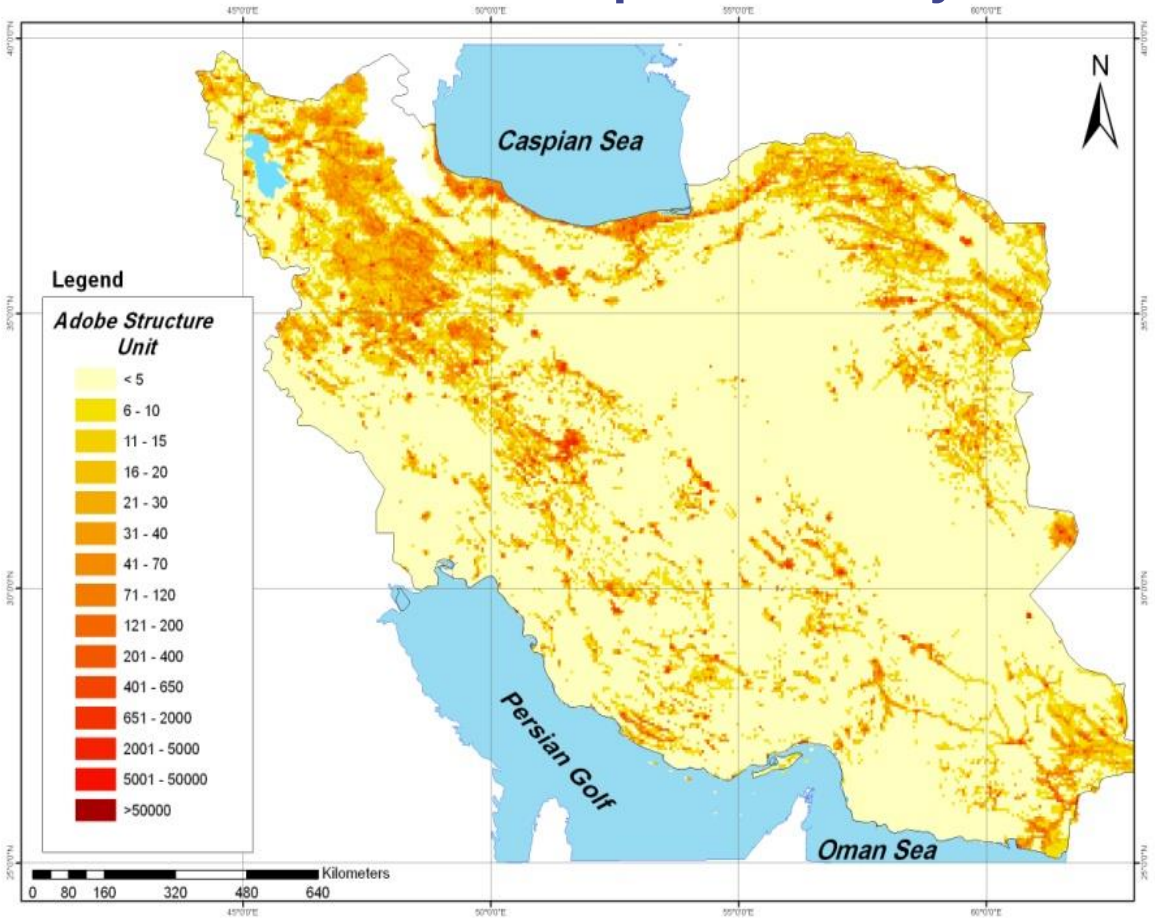
ETH zürich

AUB

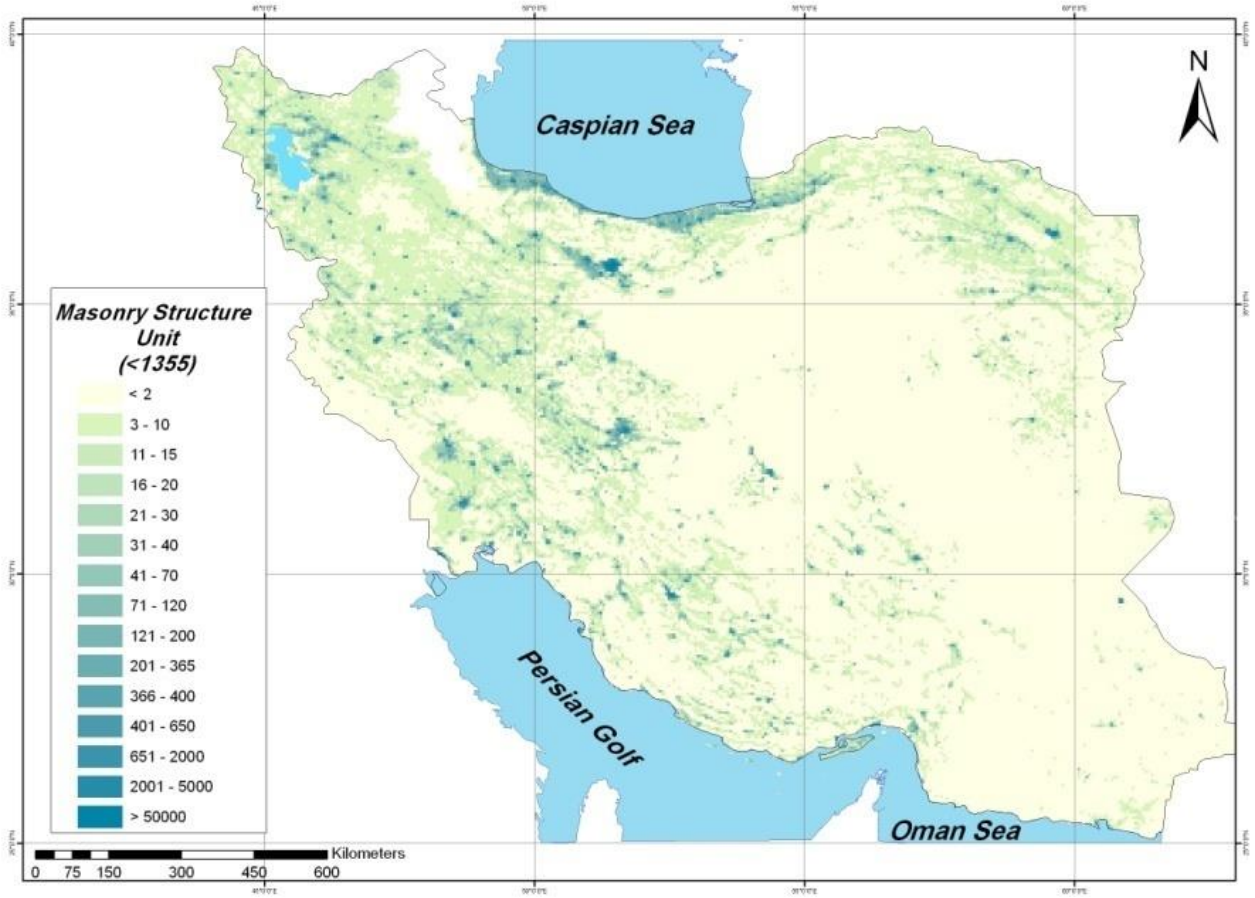
GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk

JTI

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

IIEES

توسعه و گسترش مدل ارزیابی اقتصادی سوانح برای مدلسازی مدیریت مالی صندوق بیمه همگانی حوادث طبیعی ساختمان ایران و کاهش ریسک سوانح با رویکرد تحلیل سیستم

توسعه یک مدل جامع اقتصاد سوانح (فاجعه بار) ، با در نظر گرفتن تاثیرات اقتصادی و تاب آوری

ارزیابی آسیب پذیری مالی (کلان) – محاسبه شکاف مالی - توسعه ابزارهای مالی (بیمه) - کاهش ریسک سوانح

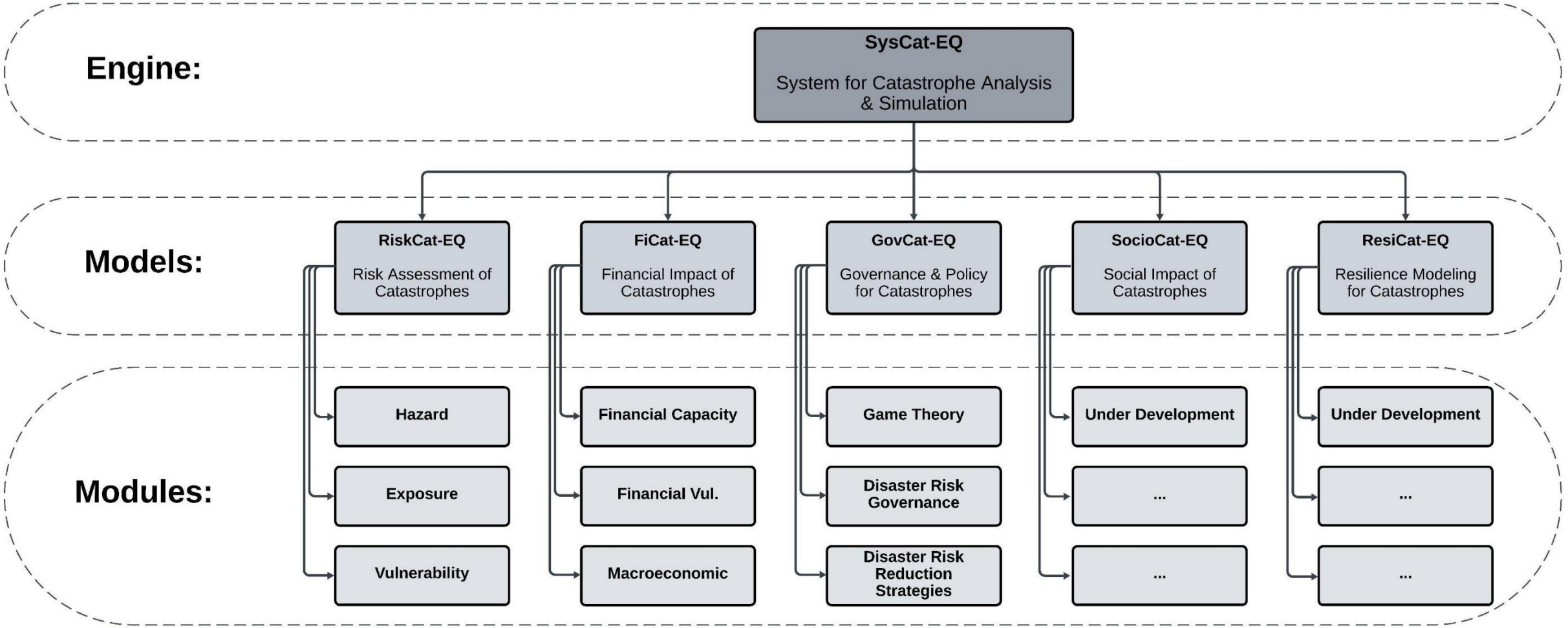
توسعه ابزارهای شبیه سازی و محاسباتی

SysCat
Systemic Framework for Catastrophe Simulation and Analysis
FiCat-EQ
Risk-EQ

مراحل و ماژول های اصلی ابزار FiCat-EQ

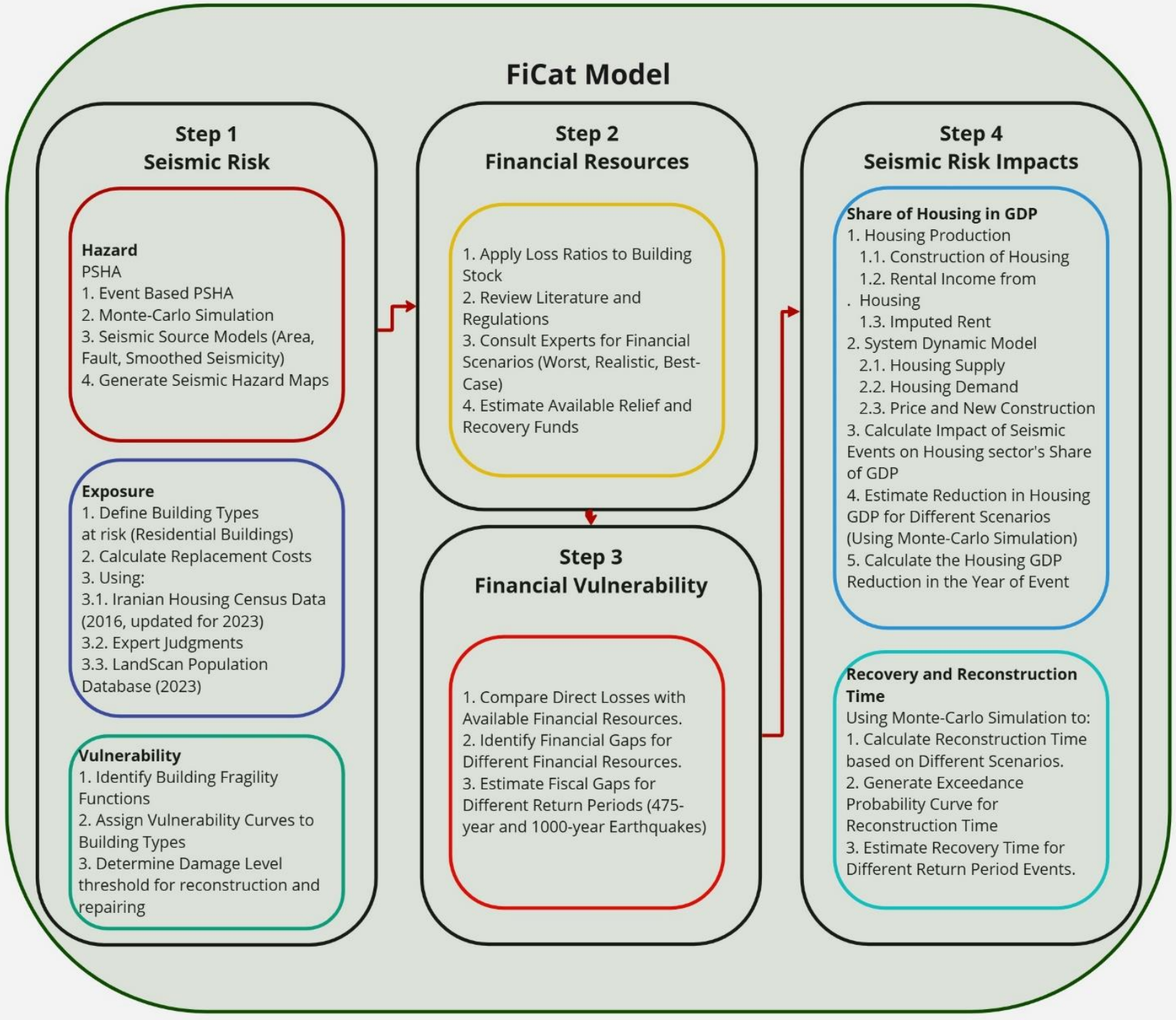
An Integrated Catastrophe Model for Economic, Financial Impacts & Resilience (SysCat – Systemic Framework for Catastrophe Simulation and Analysis)

SysCat-EQ: An Integrated System for Catastrophe Risk Governance:



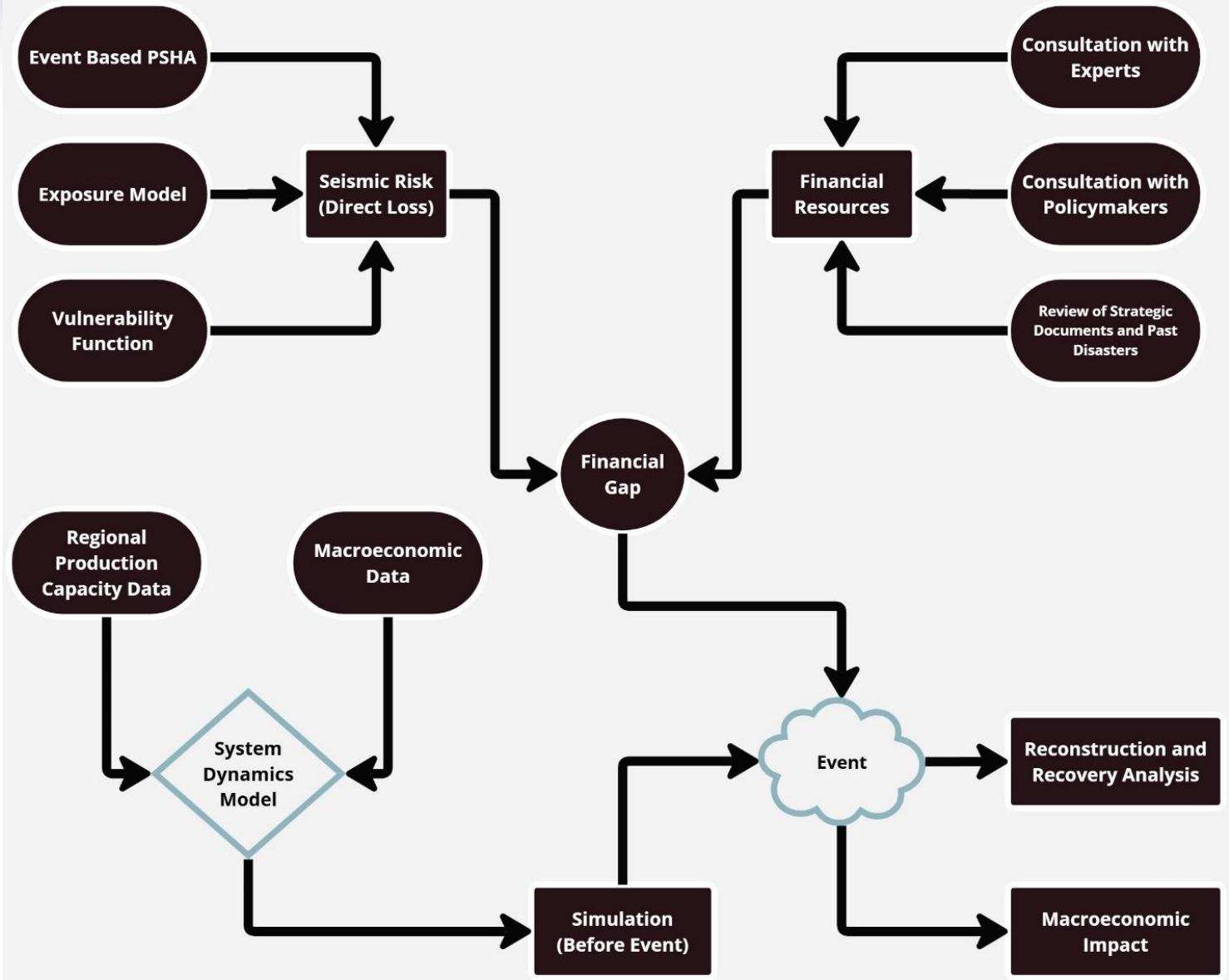
Methodology:

- 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

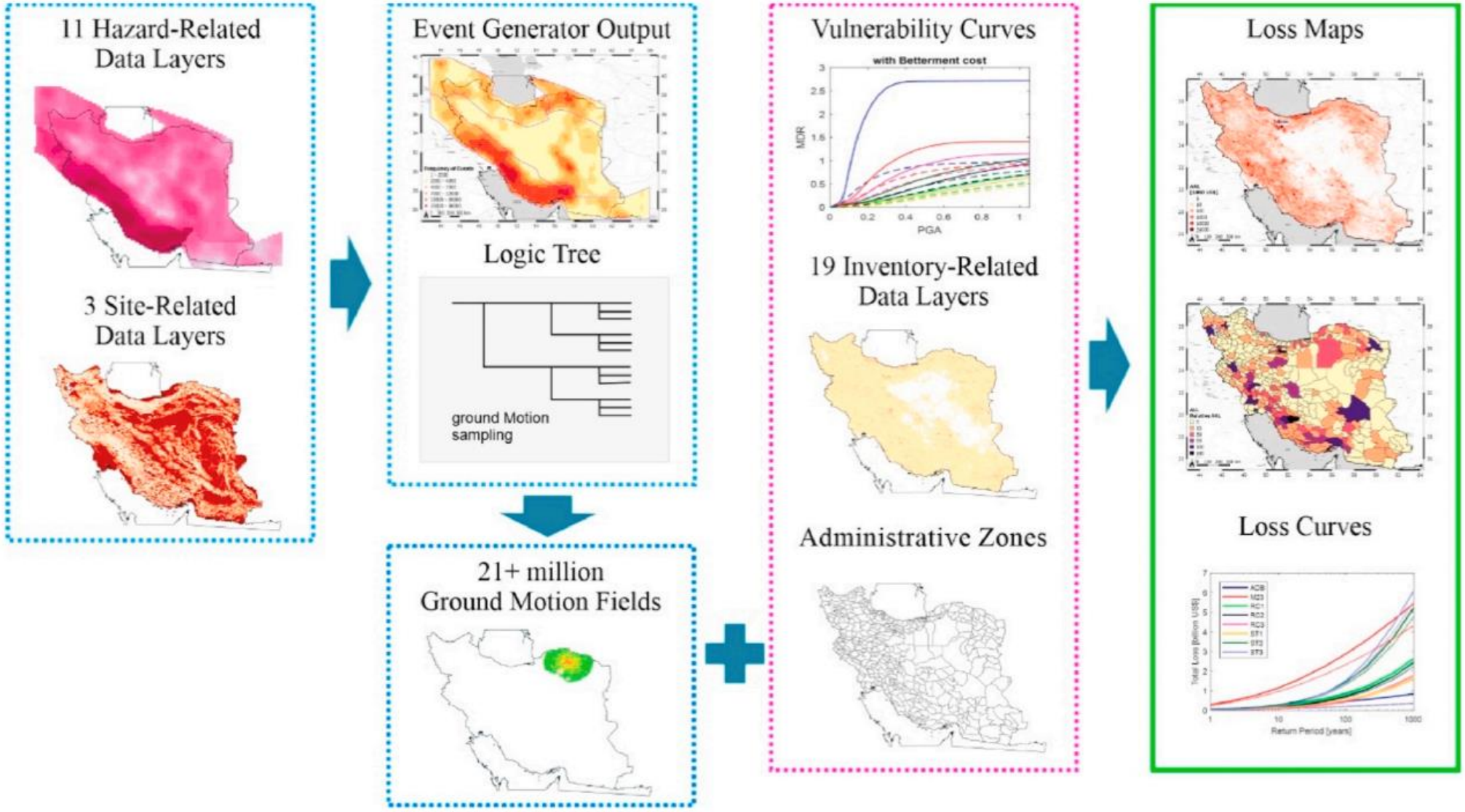


Methodology:

- 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



Step 1: Seismic Risk Module



امکان تهیه بانک داده های سکونتگاهها با ریز نمایی در حد ساختمانها
فناوری سنجش از دور – هوش مصنوعی – یادگیری عمیق

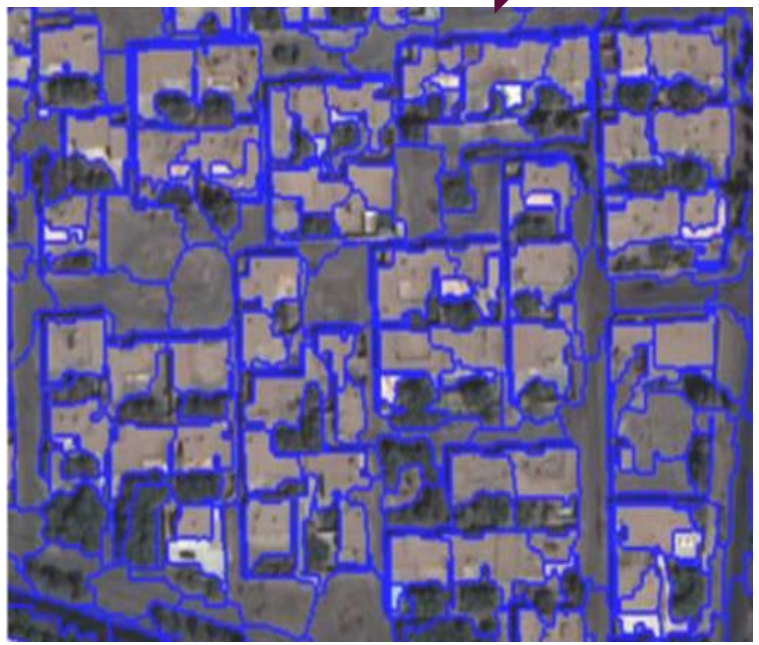
Building Extraction by AI Algorithm (Object-based image analysis by eCognition)

DATASET
(VHR ,UAV)

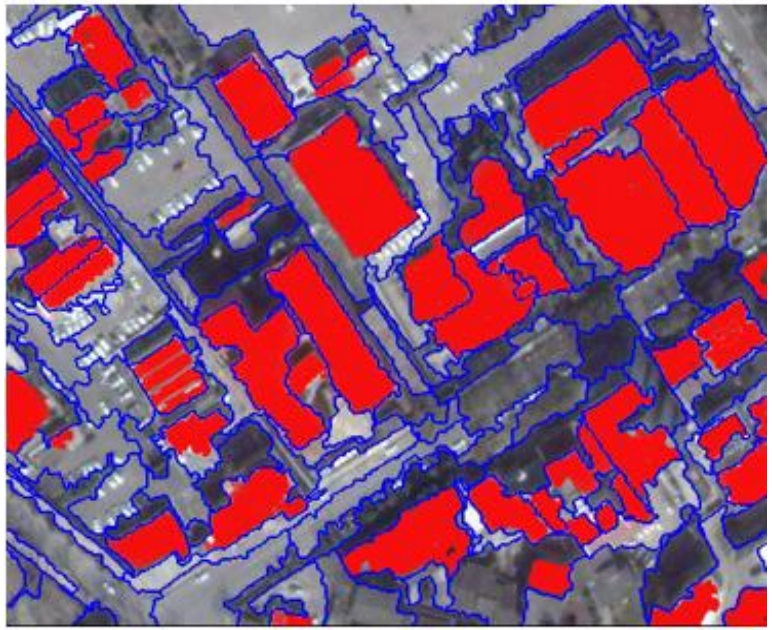
→ **pre-processing**
(Geo ref, Co-register, enhancing ,fusion, adjusting, Histogram matching, sharpening ,..)

→ **Classification and segmentation**

→ **Building extraction**



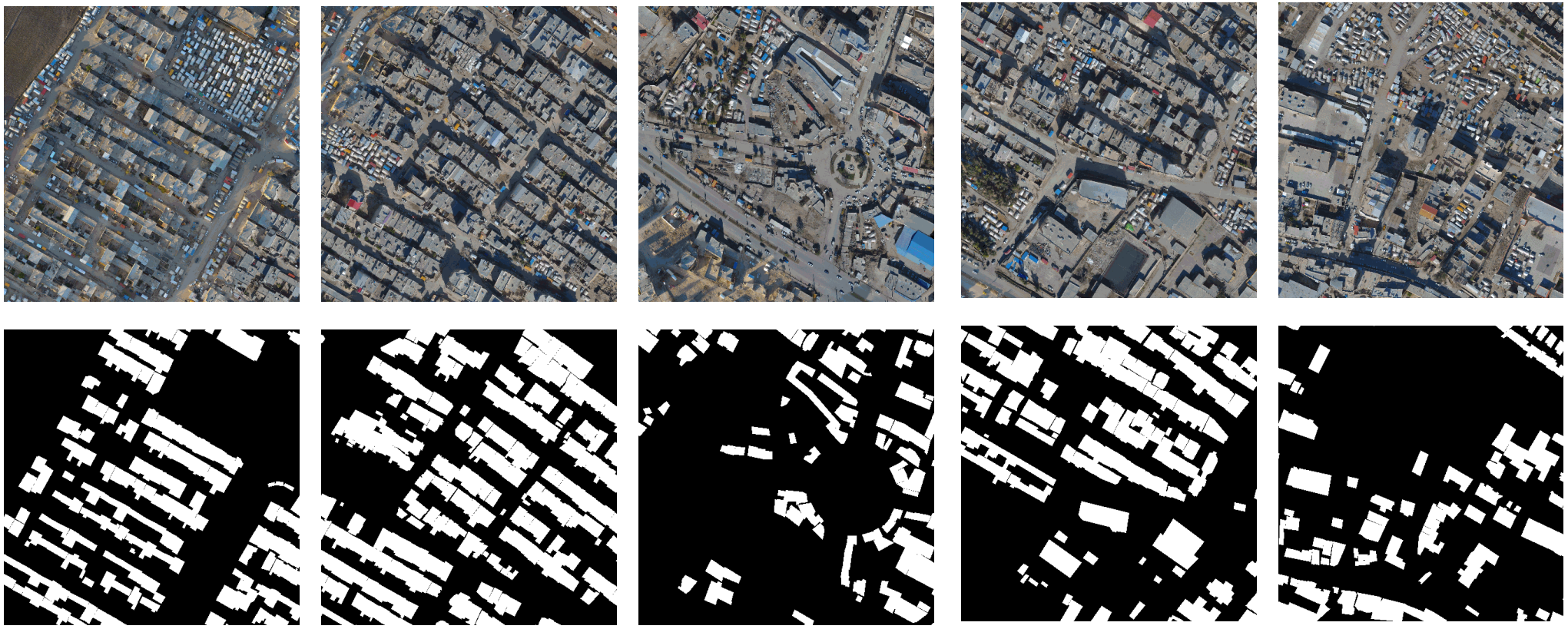
Segmentation by Region merging Multi-resolution Algorithm



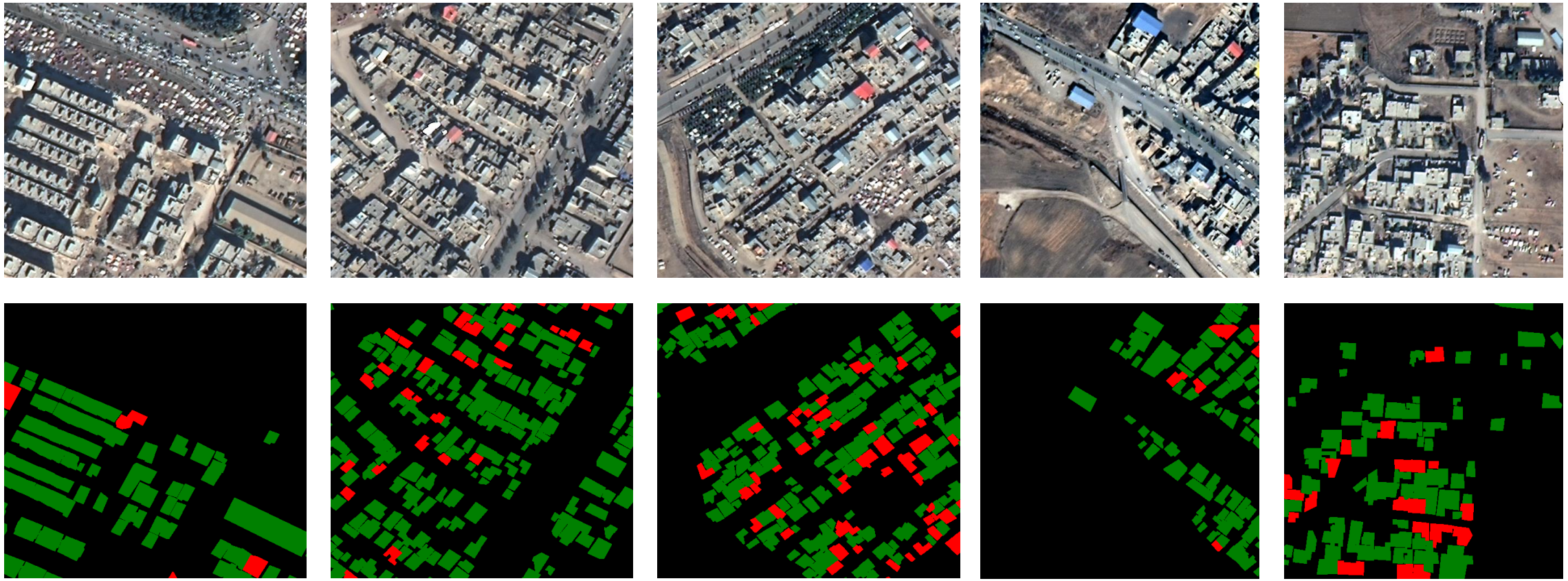
Classification

Building extraction

Domestic dataset created – Building Extraction



Domestic dataset created – Damage Mapping



مثالی از ترسیم شکاف مالی