#### Earthquake, Exposure & Capacity Management

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## Property Insurance: Challenges for the (re)insurer to resolve

- Risk Pricing
- Accumulation Management



#### General Tectonic Setting of Middle East





## North Anatolian Fault System (NAF)

- Ruptures in a sequence of large earthquakes
- The largest contributor to seismic hazard in Istanbul and northwestern Turkey
- Latest events in current sequence are the 1999 M 7.4 Izmit and M 7.2 Duzce earthquakes
- Next event in sequence is likely to be in Marmara Sea (Yalova and/or Prince's Islands Faults?)





#### Major Plate Boundaries Highlighted with High Seismic Activity

- GPS-Measured plate movement
- Well Documented Historical Seismicit
- Large Population Exposed to Major Active Zones
- Demanding High Building Standard



#### Events which happened before and could happen again



#### And consistent with our knowledge on plate movement



Turkey-Syria EQ sequence Mw 7.8 and 7.5 Earthquake (2023)





# Masonry Buildings vs Engineering Designed Structures



## Well performed structures components but non structural failure



#### Do we have clear idea of the actual scale of losses?





## Cat Risk Portfolio Management / History



1800-pin mapping



- 70's-80's-computer revolution
- Mid 80's, early models: AIR, RMS, EQECAT
- Turning point: Hurricane Andrew (1992) and Northridge Earthquake (1994)
- Insolvent insurance companies
  - > 12 after 1906 San Francisco EQ
  - > 8 after Hurricane Andrew in 1992
  - > 1 after the 2011 Christchurch EQ

## Cat Risk Portfolio Management



#### Catastrophe Risk Modeling







#### Damage Calculation by Full Numerical Integration of Intensity and Damage Uncertainties



## Catastrophe Loss Assessment



#### **Reinsurance Structure Implementation**



## **Tools for Catastrophe Underwriting**

#### Why?

- > Pricing
  - > Profit
  - Expenses
  - > Claims
- Risk Selection/Underwriting
  - > Geographic Diversification
- > Capital management and Solvency
  - Accumulation
- > Reinsurance Purchase
  - > Pricing
  - > CAT XL, Proportional or FAC
  - Risk Transfer
- Solvency/Regulation
  - > Internal Capital Model
  - > Rating Agency Capital Model
- Event Response
  - > Claims handling
  - Loss adjustment









#### Modelled Residential Losses from Last 1000 Years Historical Eqs.



# Dead Sea Fault with well reported historical EQ





## Stochastically simulated Eqs for longer time span





#### Probabilistic Earthquake Loss Assessment





## Design of Alternative Risk Transfer Mech. (ILS)





#### Simulated Market Lass for Jordan - AAL



1000

## **Developing Countries and Post-Disaster Recovery Plan**

- Subsequent macroeconomic cost due to Uninsured losses
- Relaying on Subsidiary Governmental help but not always adequate
- Challenges for Catastrophe Insurance as a more effective recovery-plan
  - > Small size domestic insurance industry
  - > Low property insurance penetration
  - > Limited range of insurance policies
  - > Thin capitalization
  - Lack of a regulatory framework for effective risk pricing and validation of vulnerabilities
  - Existing vulnerable building stock and general affordability to pay adequate premium
  - > High costs of reinsurance
  - > Insufficient expertise and capital to adequately protect policyholders
  - > Insolvency or failure to pay claims in case of a large earthquake
  - > Inability to control Moral Hazard
  - > Cat insurance not a financial priority for all
- Cat Pool, a schemes that provide all households a minimum level of protection