

The use of catastrophe models in the TCIP and other national insurance schemes

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6th DPRI-IIASA Forum
15 August 2006, Istanbul, Turkey

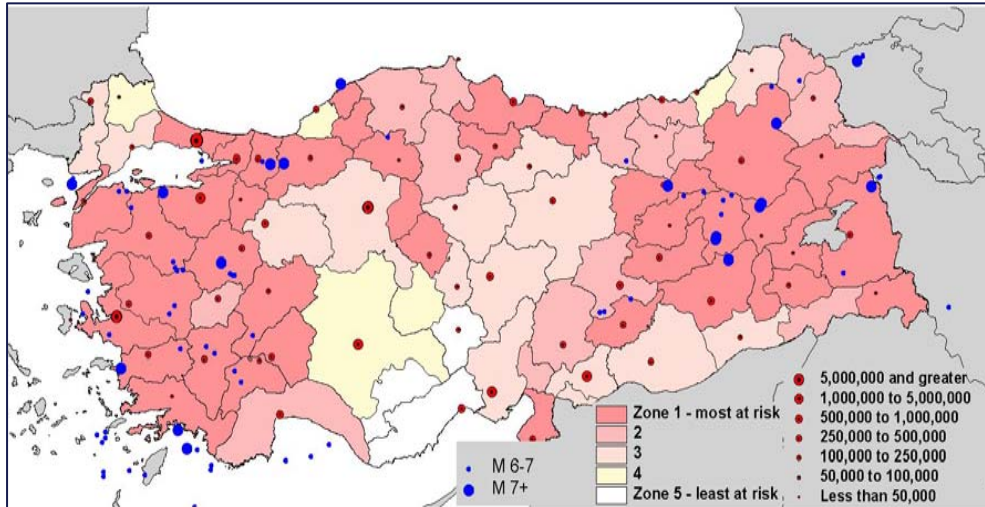
Making better reinsurance decisions...

Willis

about Willis

- A leading global insurance broker
 - We are one of the world's leading risk management and insurance intermediaries
 - We are in the business of identifying, analyzing and managing risk
 - We deliver professional risk transfer, risk management, loss management and actuarial services to companies, as well as financial and employee benefits consulting.
- Company originated in 1828
- We have approximately 15,800 people around the world, with 300 offices in 80 countries
- We serve both private and public clients in over 180 countries
 - clients include; corporations, public entities and institutions
- Willis Analytics & Solutions
 - The team has 150 staff in the UK, US and a network of specialists
 - Expertise split between:
 - o Catastrophe Management Services
 - o Development & Support
 - o Financial Management Services
 - o Marketing, Applications and Delivery
 - o Willis Integrated Solutions

why model catastrophe risks ?



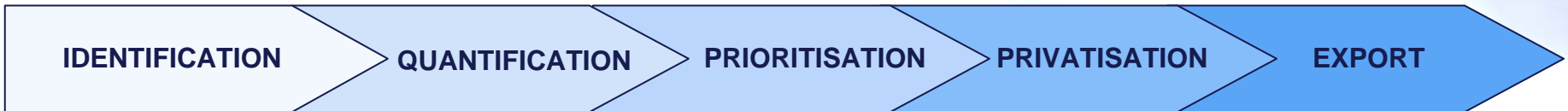
A high proportion of the population is in the highest risk zone

...and there has been significant seismic activity in the most populated areas in Turkey

- Catastrophe (natural perils) risks are the major hazards that insurers are exposed to
 - earthquake
 - flood
 - windstorm
- The cost of natural hazards is continually increasing
 - Increased urbanisation
 - More people buy insurance
- Every major city in the world is exposed to one or more natural hazards

why national natural catastrophe pools and programmes?

- To lessen the effect of natural catastrophes on public and private finances
- To achieve risk distribution and to spread the financial costs of natural catastrophe to international reinsurance and capital markets
- For pools, to build up funds within a pool to reduce the requirement for external risk distribution



Which hazard exposures? e.g.

- Volcano
- Earthquake
- Windstorm
- Biohazard
- Flood
- Hail
- Drought

Impact of natural hazard

- Economic
- Government finances
- Social

- Actual (current cost)
- Potential cost
- Recovery potential
- Financing options
- Action plans

- Pooling mechanism
- Pricing
- Premium collection
- Distribution channels
- Claims payment
- Mitigation

- Structure
- Price
- Marketing
- Leverage
- Economic benefit

example of Turkish Catastrophe Insurance Pool (TCIP)

- Launch: 2000
- Scope: residential buildings
- Peril: earthquake, flood
- Compulsory: yes
- Cover: originally US\$ 28,000 (2000), currently approx. US\$ 70,000.
liable to change due to inflation and fluctuations in Turkish New Lira exchange rate
- Administration: premium collected by insurers and scheme administered by the pool manager
- Risk transfer: international reinsurance
- Guarantee: Turkey Government (via World Bank loans)

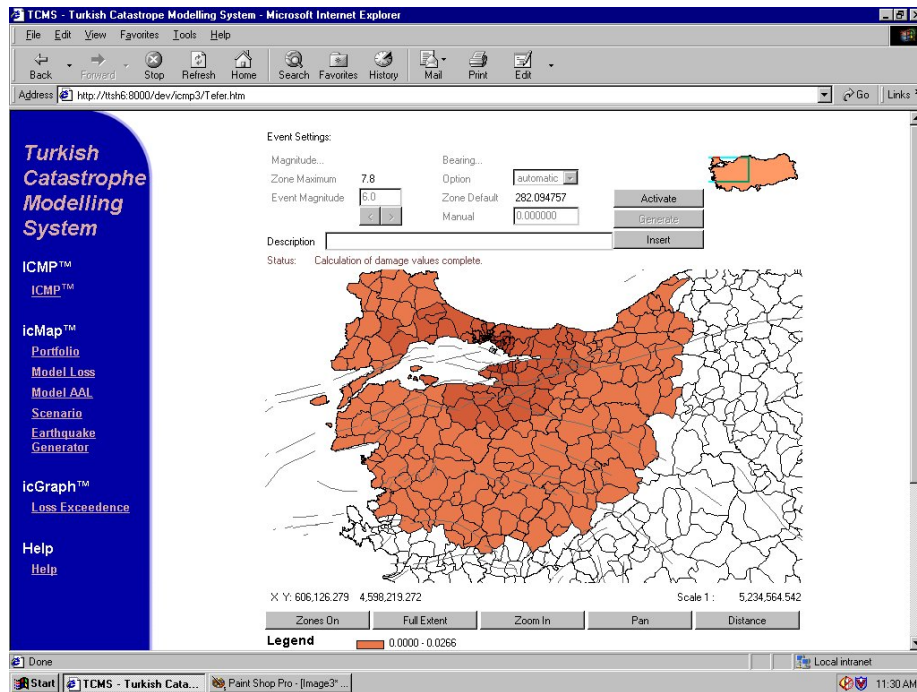
Points of interest:

- Regarded as a success, and many other countries are interested to follow its example
- First project to carry out the whole process from catastrophe modelling to risk transfer for a whole country
- First World Bank risk privatisation project
- Take up rate for cover is average of C.15% to maximum of C.25% (in Istanbul).
- Large capacity for reinsurance programme was available shortly after major earthquake event (Izmit 1999).

risk modelling at national level - Turkey

Turkish Emergency Flood and Earthquake Recovery project (TEFER)

- The World Bank wanted to avoid acting as a quasi-(catastrophe) reinsurer
- The catastrophe risk modelling and establishment of an insurance pool were requirements of the World Bank, in order for emergency funds to be released after the Kocaeli earthquake in 1999
- The project was tendered according to strict World Bank rules, with a requirement for a very high “technical score”
- Willis Re was appointed by the Turkish Government and the World Bank to create a new earthquake insurance model and design / reinsure a national pool



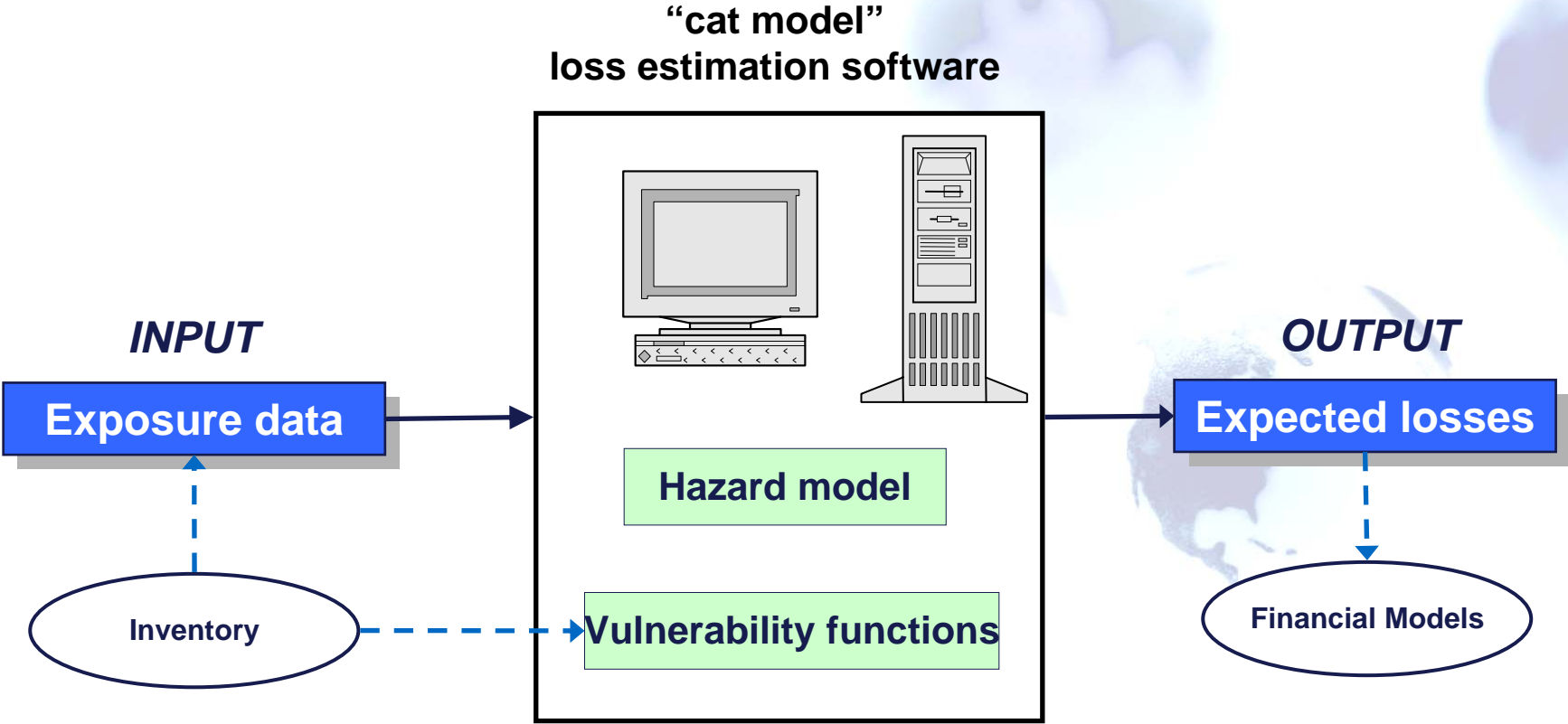
example of Algerian Catastrophe Insurance Programme (ACIP)

- Launch: 2004
- Scope: residential buildings, commercial buildings and contents
- Peril: earthquake, flood, other natural catastrophe
- Compulsory: TBD
- Cover: under the Obligatory Insurance against Natural Catastrophe
- Administration: local insurers provide insurance cover to property owners,
- Risk transfer: Insurers have 30% (retained) to 70% (ceded) quota-share with CCR (government owned, state reinsurer) and CCR purchases reinsurance internationally
- Guarantee: CCR does not have a reserve fund but Algerian state provides unlimited guarantee to CCR

Points of interest:

- Take up rate is not as high as TCIP but slowly picking up
- Covers commercial properties
- High population and high seismic risk area along the northern coast
- Large capacity for reinsurance programme available

how do catastrophe models work?



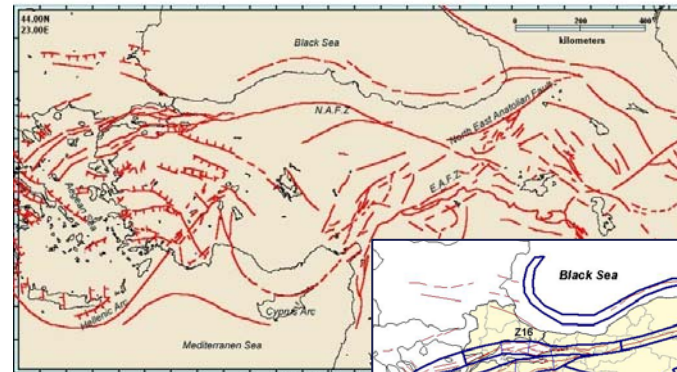
earthquake model – key inputs

Key inputs:

- Historical events database
- Neotectonic data
- Seismic source zones
- Ground condition data

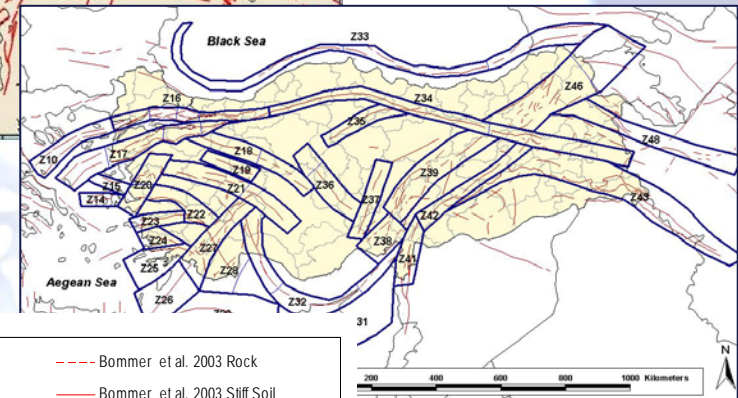
Mathematical relationships:

- Fault rupture dimensions
- Recurrence relationship - to calculate annual occurrence of an event
- Attenuation equation - to calculate ground motion or intensity values at a given location

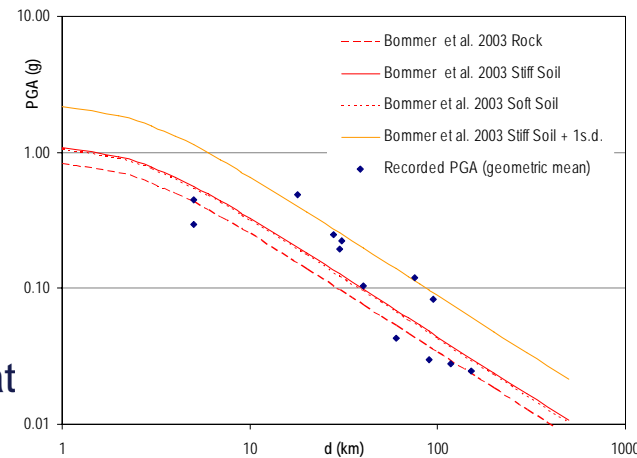


Active faults

Source: KOERI



Seismic source zones



Attenuation equation

vulnerability functions

Damage / Loss experience

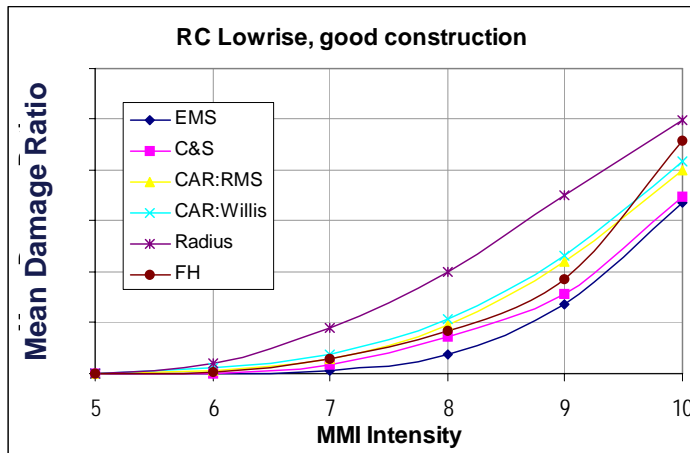
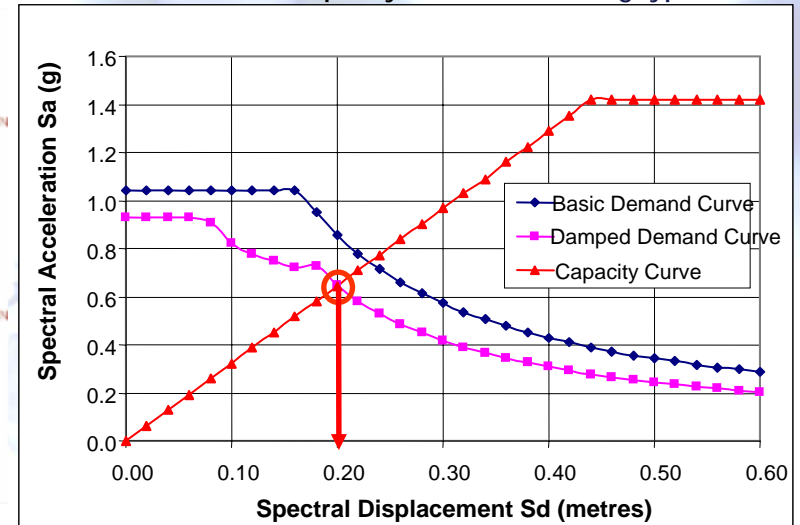
2003 Boumerdes earthquake



Source: CRAAG

Engineering approach

Demand Curve v Capacity Curve for building type A



Source: CAR

exposure information

Where is it?

- Location information (country, state/province, district, city, postcode, full address, latitude-longitude...)

What is it?

- Risk type (residential, commercial, industrial)
- Coverage type (Building, Contents, Business Interruption)
- Building construction type, age, height,

How much is it worth?

- Property value
- Sum Insured and Policy Count
- Insurance policy conditions (deductible, limit, coinsurance)

CRESTA Zone



Province



District



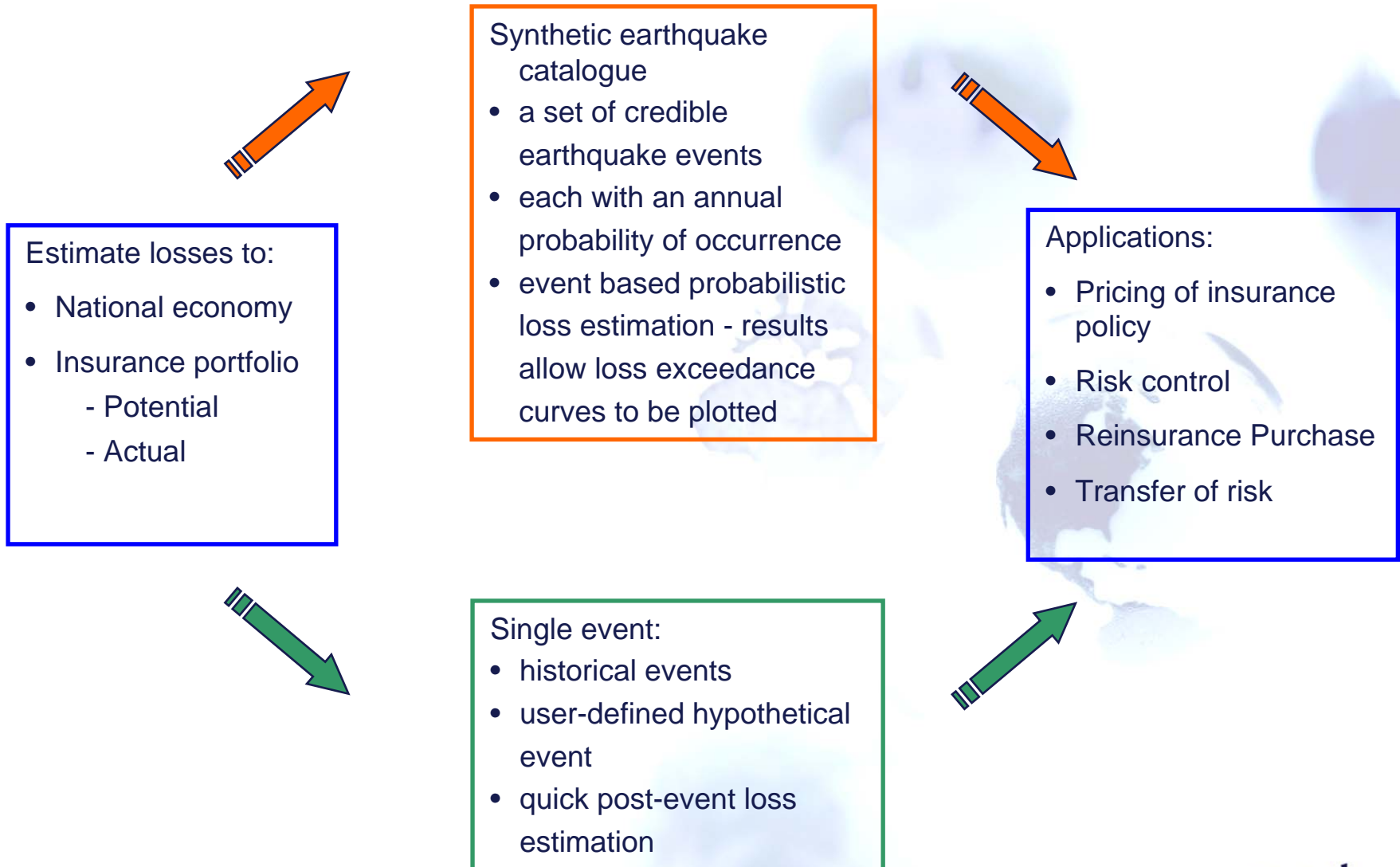
national building stock dataset

- Turkish building classified into 15 buildings types according to their known seismic performance
- National building census data used with local data for validation
- Used to estimate:
 - National economic loss
 - Potential TCIP exposure and loss
- Algerian building classified into 15 building types
- National census data other official database (from CNRC and ONS) and existing local insurance exposure data
- Structures are classified based on building dates
 - Ottoman period (Kasbah)
 - French Colonial period
 - Engineered structures post 1975
 - Building codes
- Used to estimate:
 - Potential ACIP exposure and loss
 - Loss to local insurance market



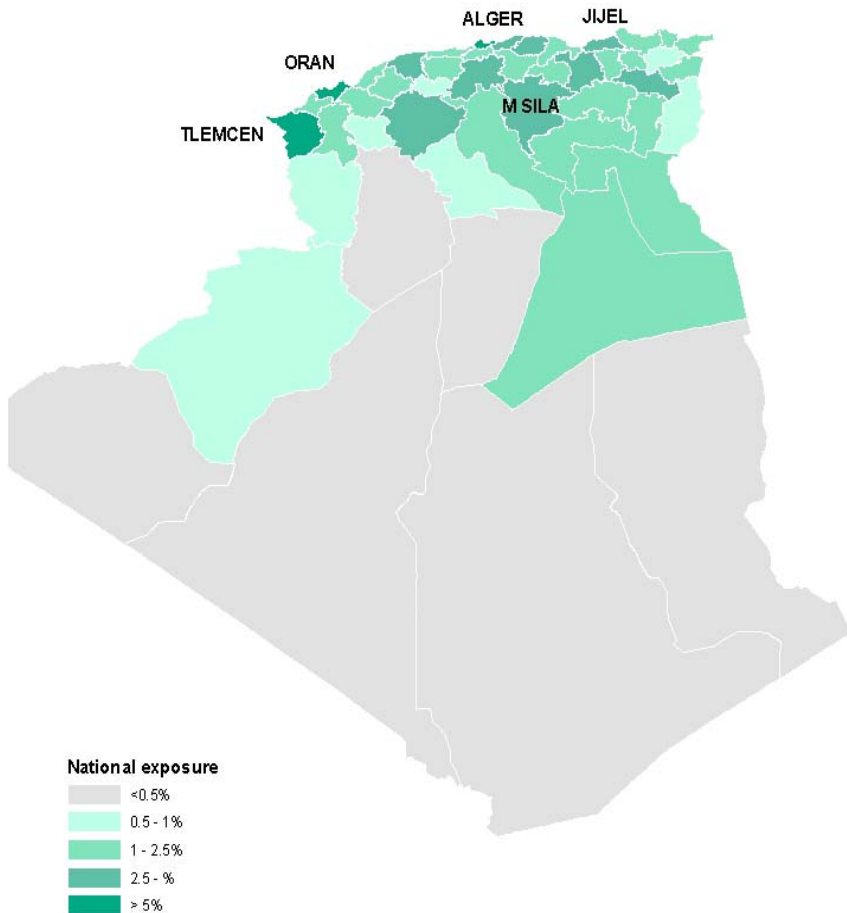
(Source: CAR)

loss estimation (1)



loss estimation (2)

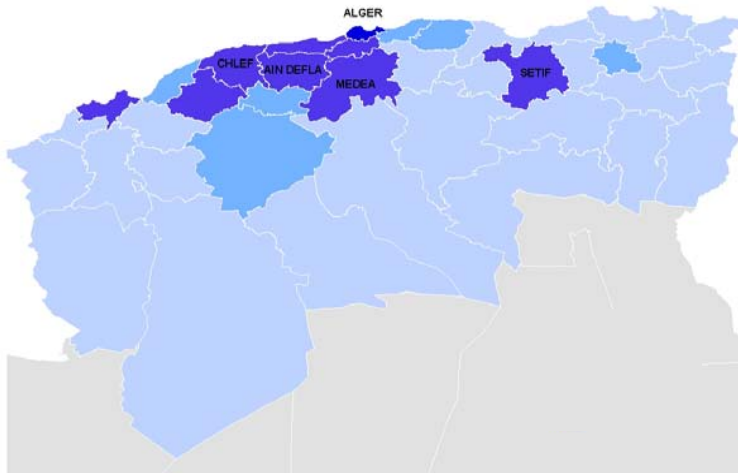
example: ACIP and local market exposure



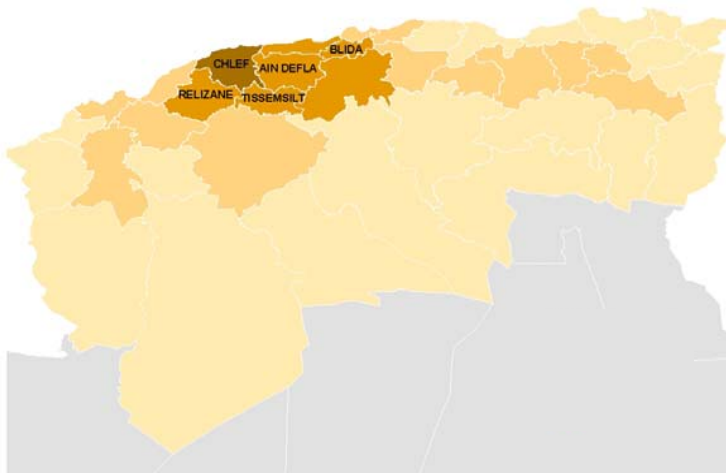
Risk type	Total Sum Insured
Immobilier	\$\$\$\$,\$\$\$\$,\$\$\$\$
Commercial	\$\$,\$\$\$\$,\$\$\$\$,\$\$\$\$
ACIP Total	\$\$\$\$,\$\$\$\$,\$\$\$\$,\$\$\$\$
Industrial	\$\$,\$\$\$\$,\$\$\$\$,\$\$\$\$
Algerian Market Total	\$\$\$\$,\$\$\$\$,\$\$\$\$,\$\$\$\$

Risk type	Percentage deductible on Loss	Minimum deductible (in DZD)	Co-insurance (property-owner's share)
Immobilier	2%	30,000	20%
Commercial	10%	0	50%
Industrial	10%	0	50%

loss estimation (3)

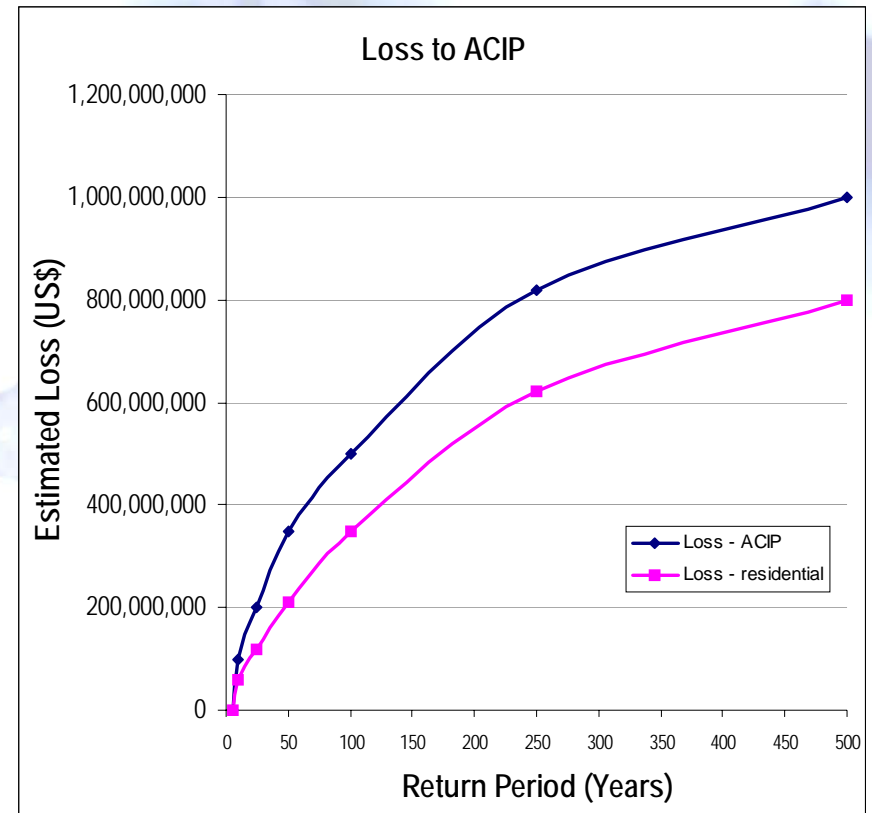


Annual Average Loss



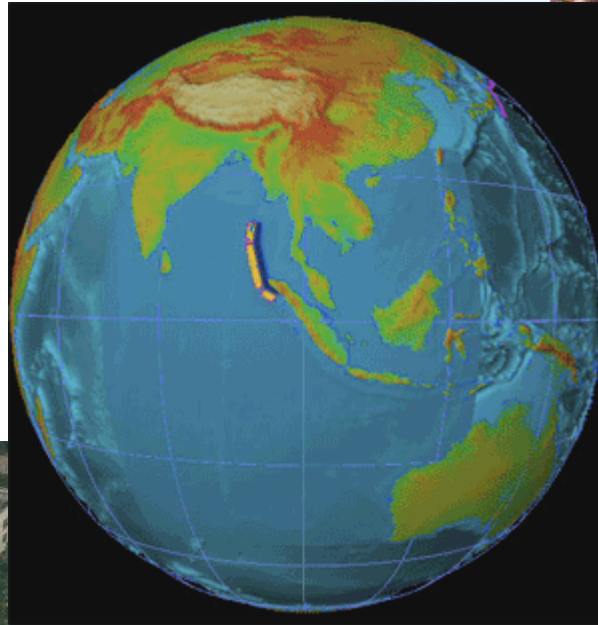
Earthquake Damage Ratio

For illustration only



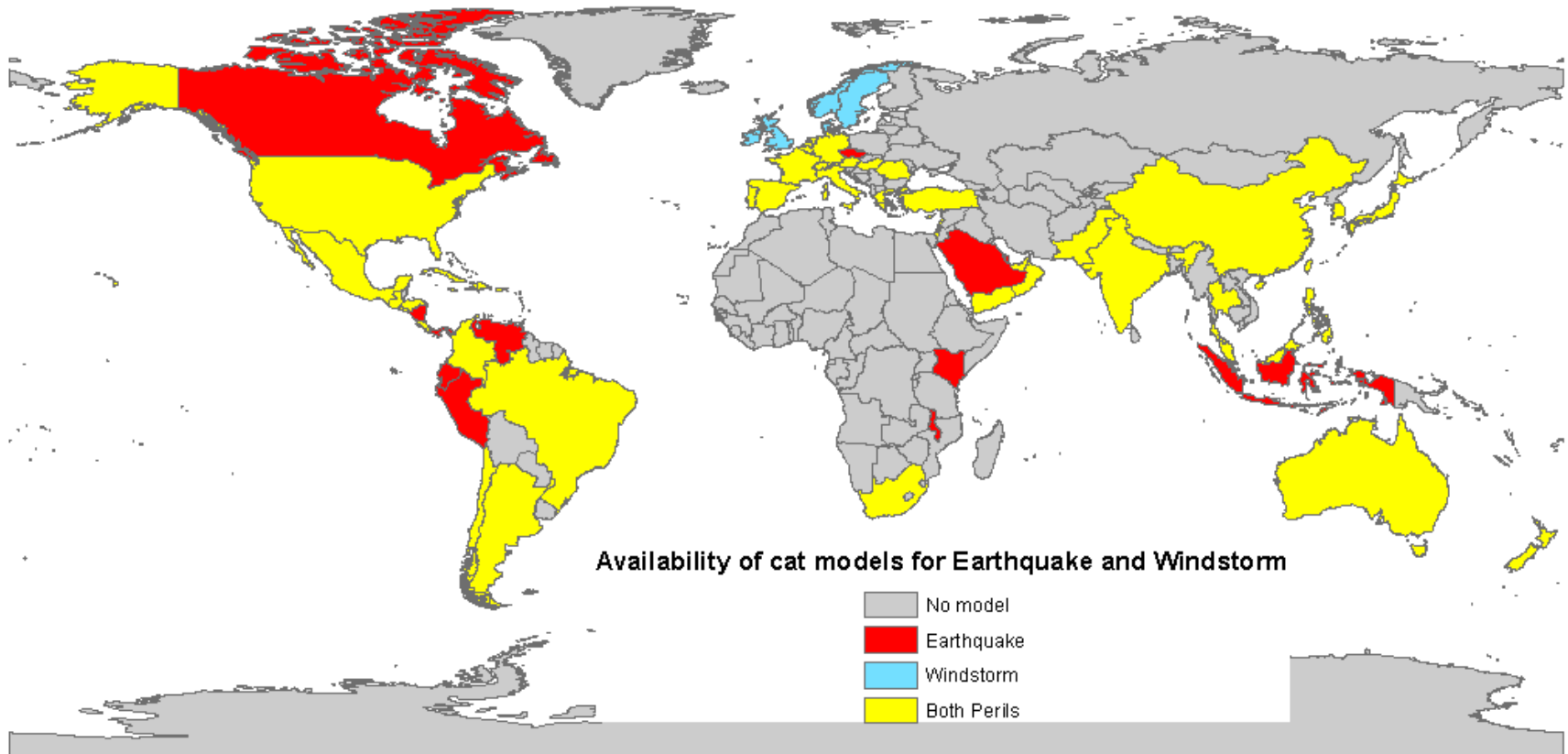
effects of an earthquake

- a) ground shaking
- b) liquefaction
- c) landslide
- d) tsunami, seiche
- e) fire following earthquake

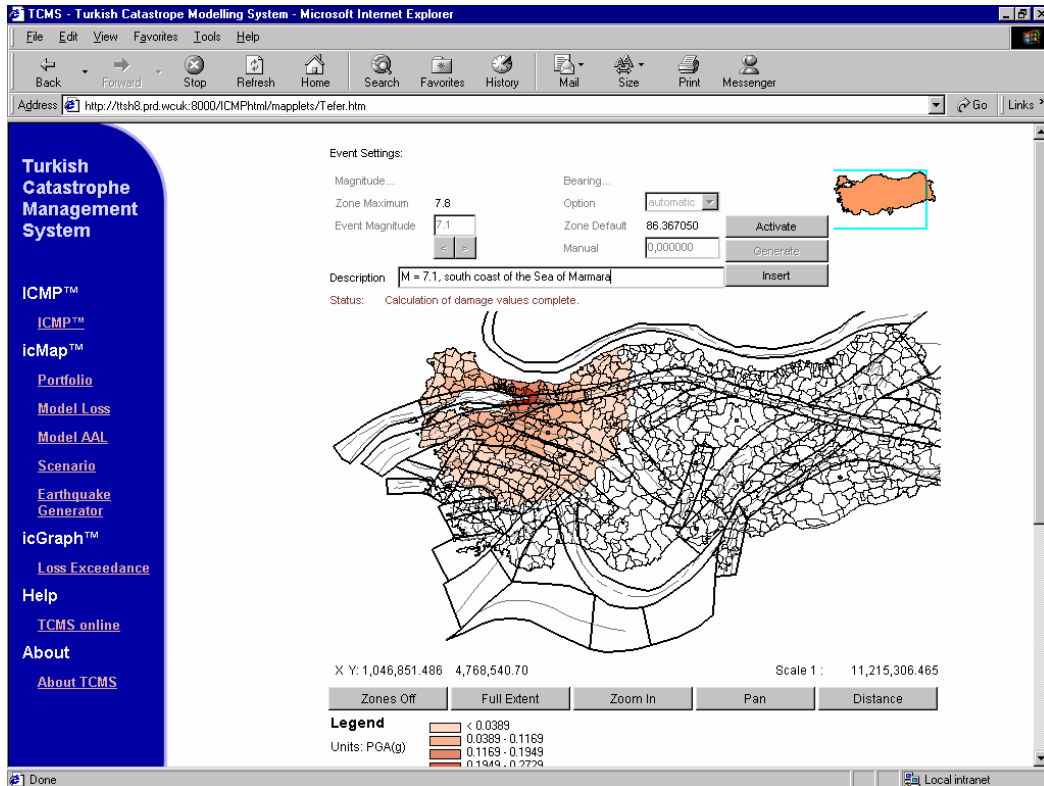


catastrophe model coverage

by main catastrophe modelling software companies



application of earthquake modelling



- Our earthquake models are designed in conjunction with international and local academics and industry experts
- In addition to hazard and vulnerability issues, we have carried out a national buildings census and provided rating recommendations
- The models are used for reinsurance design and marketing activities
- We have since applied earthquake modelling experience in other countries

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