

This poster presents the layout involved in modelling flood insurance penetration and complexities involved in it. Nature of flood peril, in particular adverse selection, has led to a complex system of different insurance covers and policies across Europe owing to its public and private distinctions based on premiums provided as ex ante or ex post, socio-economic characterization and various compensation schemes.

Each step of the development requires careful evaluation and analysis of information require to assigning economic risk and spatial distribution of insured portfolios to quantify economic to insured portfolio. From insurance perspective such a model is quite beneficial in making informed decision and portfolio allocation

Research

Country specific Research

- In Hungary, there is
 - 40% penetration in high risk areas
 - 30% insurance in upper Tisza region
 - Policies generally exclude mud brick houses.
 - Poor people don't buy insurance.

Insurance Coverage and Penetration Rate for Flood across Europe

Country	AT	BE	CH	CZ	DE	FR	GB	PL	SE
Flood	O	C	CH	O	S	C	O	O	O

Key (type of insurance cover)

- C: Compulsory by law
- P: Obligatory Pool
- O: Optional cover
- S: Cover proposed but generally not taken

Rate of penetration of cover

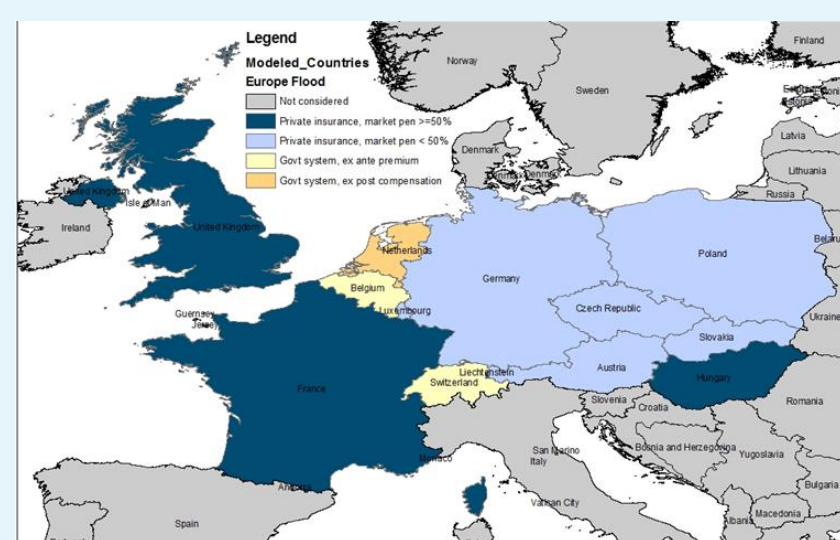
- greater than or equal to 75%
- between 25% and 75%
- less than 10%
- cover not known

Source: CEA

Insurance Information

- In UK, there is Public – Private partnership between the govt and Association of British Insurers (ABI) till 2013
- In Hungary, there is penetration rate of over 70% of households out of which 80% policies are extended to include flood.

Insurance and Compensation in Europe



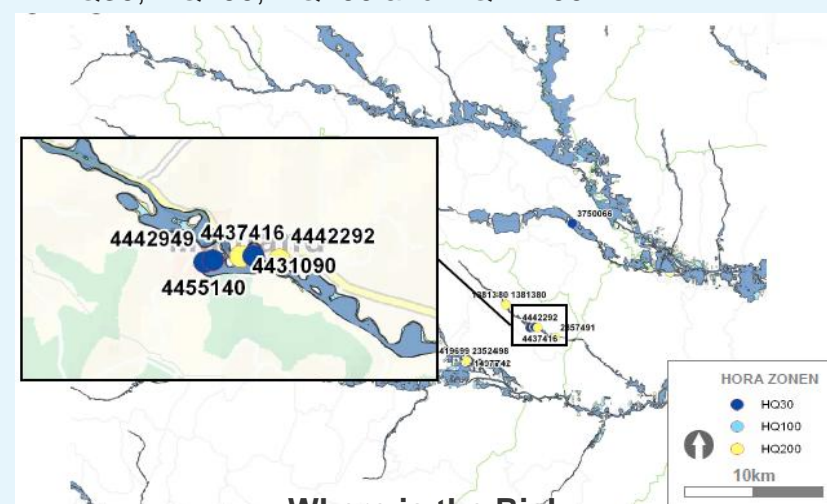
- In Switzerland, 19 cantons have public cantonal property insurers (KGV) and remaining seven (called GUSTAVO), have private insurance

Data Research and existing literature

- In Germany, there is Zuers system for Insurers
 - Zone 1: flood phenomenon every 200 years
 - Zone 2: flood phenomenon every 50-200 years
 - Zone 3: flood phenomenon every 10-50 years
 - Zone 4: flood phenomenon every 10 years

Insurance cover is generally not available for risks classified in zone 3 or 4 by the ZUERS system.

- Based on HORA, Austria is characterised into 4 flood risk areas as per flood event probability:
 - HQ30, HQ100, HQ200 and HQ →200



Where is the Risk

<http://www.afpcn.org/081126Risque/AFPNC-081126-Hatky.pdf>

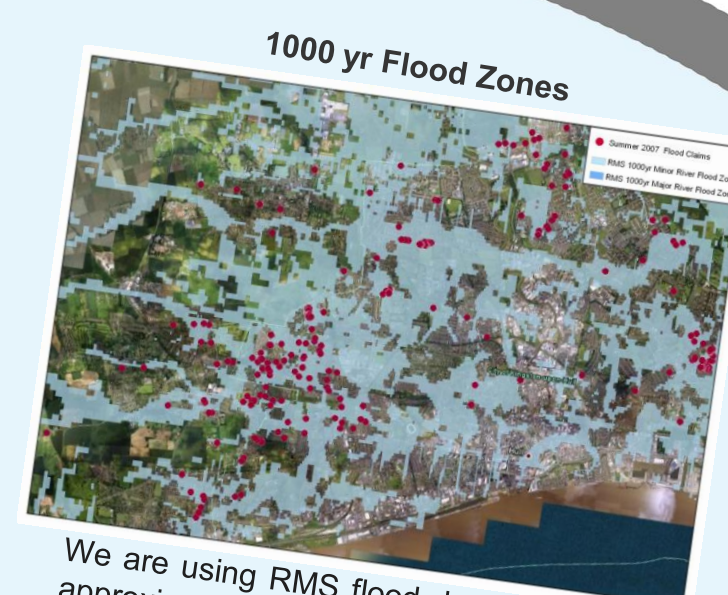
- In Switzerland, there is dual system of private and public insurance with monopoly character
- In UK, insurance compulsory for Mortgage properties
- In France, Mandatory Catastrophes Naturelles (CatNat) insurance system. As per AXCO, about 97% of 30mn homes in France (including second homes) carry insurance. Further, insurance normally covers domestic properties and contents thereof.

Germany 1000 yr Flood Depth



Flood Information and Location study

In some countries, such as Belgium flood maps form the basis of an obligatory flood insurance scheme, in which higher premiums have to be paid in certain zones or deciding penetration, for example, in Hungary high risk flood properties within 15km of river are generally excluded

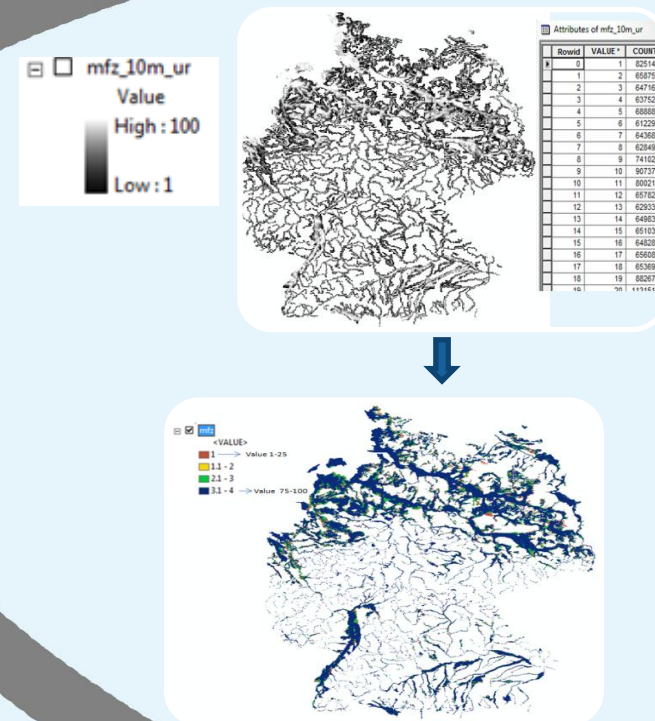


We are using RMS flood depth maps to approximate HORA and ZURS zones in Austria and Germany, respectively

Initial Components

- Country Specific Research:
 - Geographic and socio-economic study
 - Historical Losses
 - Type of flooding and Mitigation measures
 - Land Cover and Urbanization
- Insurance Information
 - Policy Conditions and Government Policies
 - Sums Insured
 - No. of policies
- Data search and information gathering from public and private sources as well as searching the literature.
- Flood Information and Location study
 - Hazard Zone and Return period Maps
 - DTM and resolution to suit location
 - Postcodes location.

Analysis and Development



Flood Extent map

Value 1 (low)-100 (high)

Very Low: No pixels
Low: 0-25 range
Medium: 25-50 range
High: 50-75 range
Very High: 75-100 range

Germany penetration rate

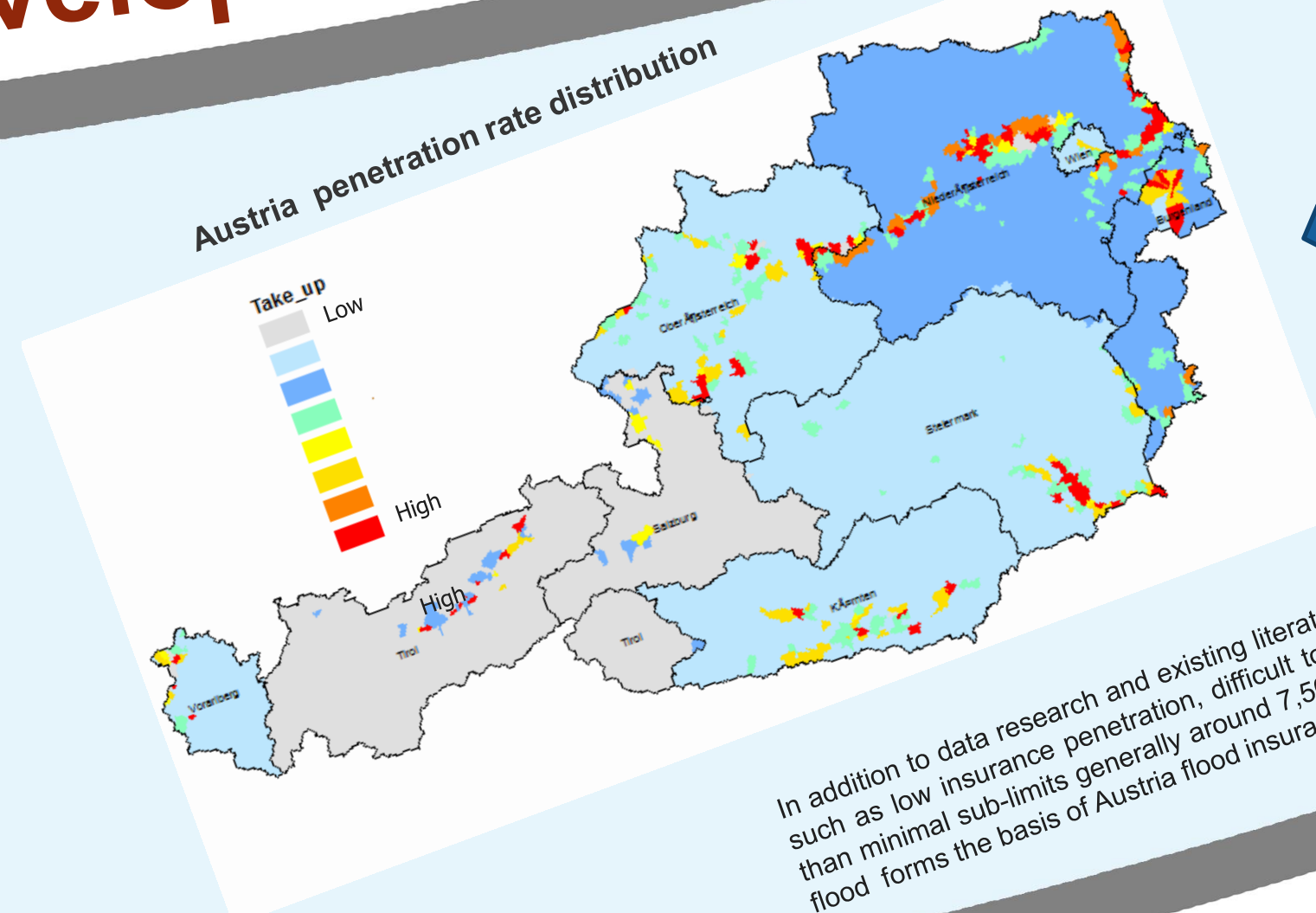
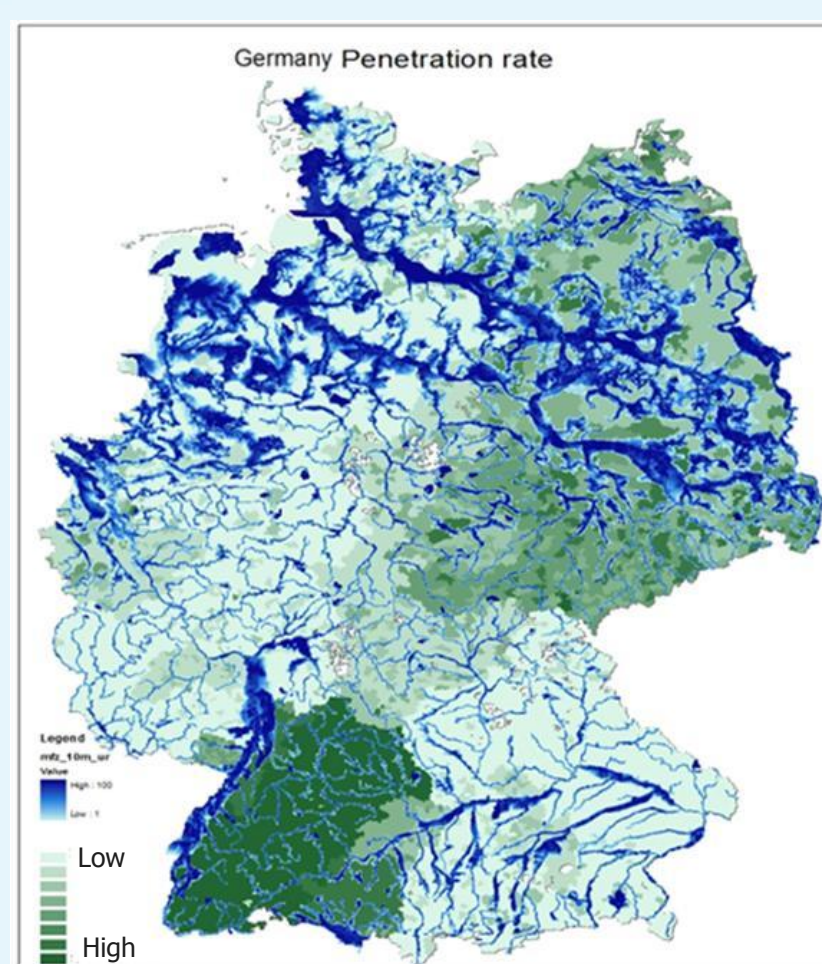
In addition to flood extent map study, client data information and additional data research from public and private sources like:

- Insurance cover generally not available for risks classified as risk 3 or 4 by the ZUERS system.

Flood cover is common under buildings policies in the state of Baden-Wuerttemberg, as the former monopoly insurer.

In former East Germany most policies have no flood exclusions and therefore include flood by default.

have also been used as an additional parameter for flood insurance modelling.



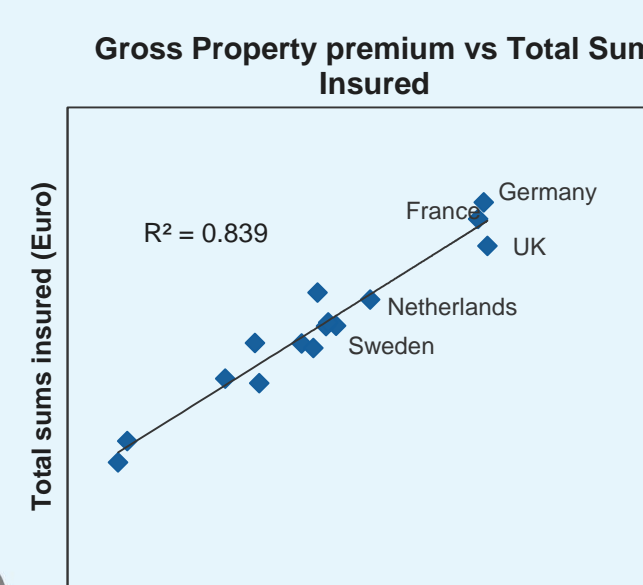
In addition to data research and existing literature related to insurance policy conditions such as low insurance penetration, difficult to obtain flood insurance for anything more than minimal sub-limits generally around 7,500 EUR per insured property, return period forms the basis of Austria flood insurance modelling.

Framework

- Different development methodologies using a mix of :
 - Return period and Hazard Zones study
 - Existing Policy condition and Government Policies
 - In Switzerland there is mandatory national coverage including flood
 - DTM and Flood depth study
 - Land use pattern and Inventory region classification (CBD/Urban/Sub-Urban/Rural)
 - Client data study and available information
 - In Austria, there is limited insurance in high flood risk areas.
- In addition to this other insurance assumptions including limits, deductibles, BI coverage are also formulated depending upon information available for each specific country.

Validation

In general, Premium/Rating = Exposure



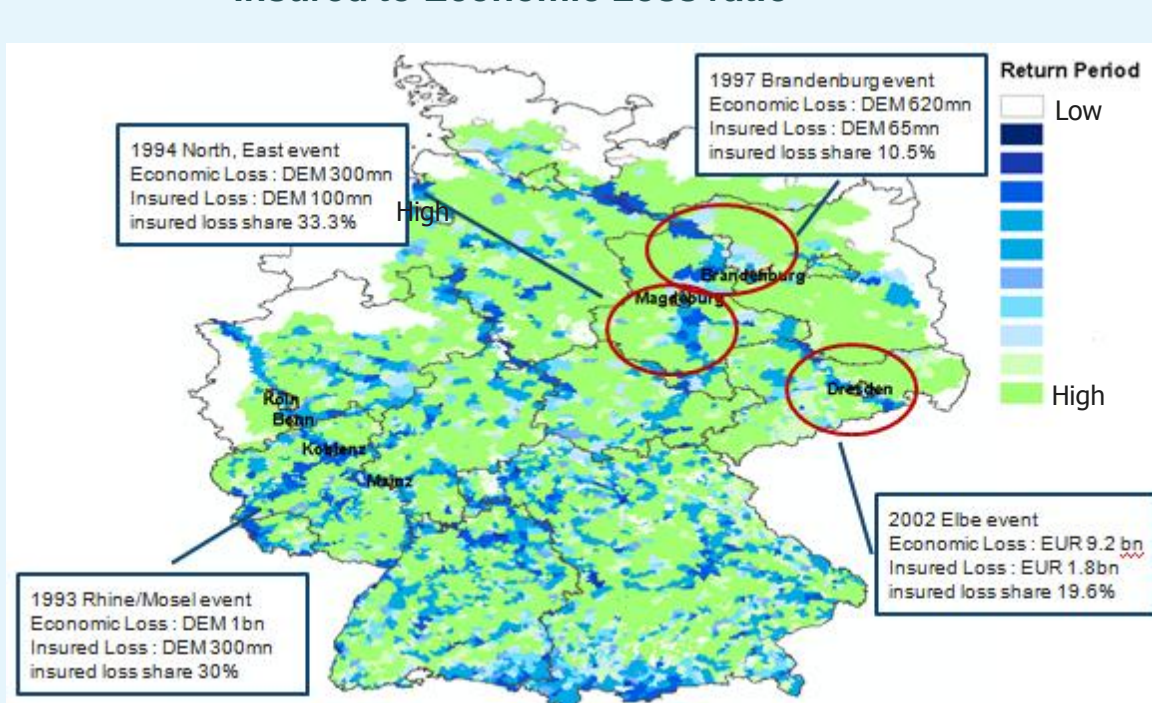
Historical Losses

Date	Area	Economic Loss	Insured Loss
Jun/Aug 2010	Saxony	EUR 940 mn	Unknown
2005	Bavaria	Eur 50mn	Unknown
Jul-02	Elbe	Eur 9.2bn	Eur 1.8bn
Jul-97	Brandenburg	DEM 620mn	DEM 65mn
Apr-94	North, East	DEM 300mn	DEM 100mn
Dec-93	Rhine/Mosel	DEM 1bn	DEM 300mn

Source: AXCO

- Correlation with gross written premium helps to validate how well correlated our modeled insurance exposure is and if there are any outliers.
- Insured to exposure ratio comparison act as an additional indicator check for validating insurance penetration rate.
- Country level penetration rate obtained are also validated against available data, example in Germany against GDV statistics.

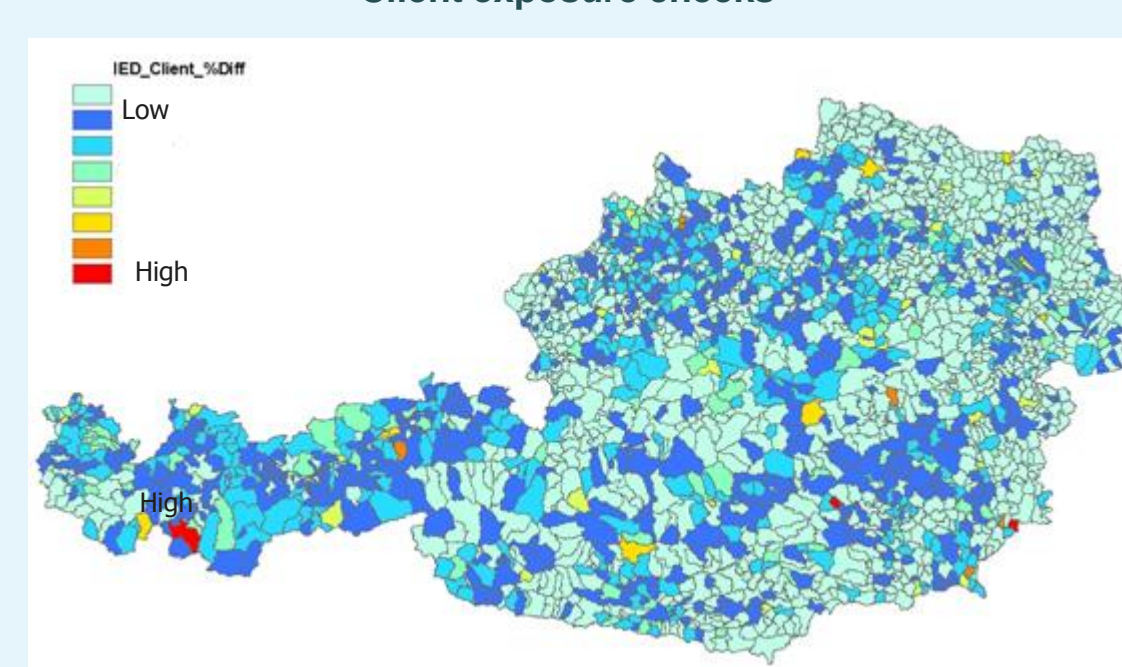
Insured to Economic Loss ratio



- Modeled vs Observed Losses from historical events check

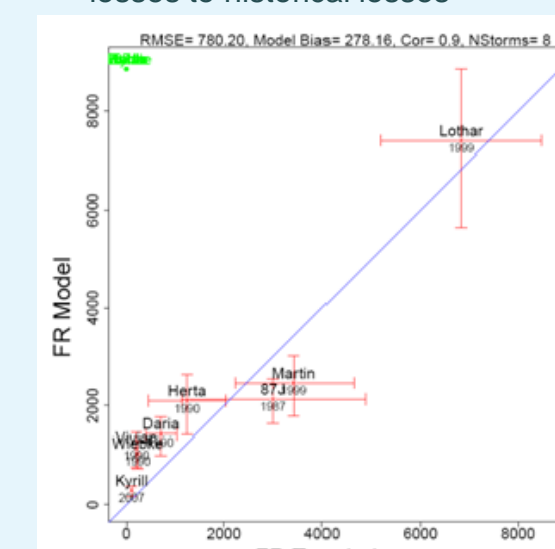
- Create EP per postcode
- Bin postcodes by RPs based on the target percentage PML
- Apply flood take up rates for RP bins

Client exposure checks

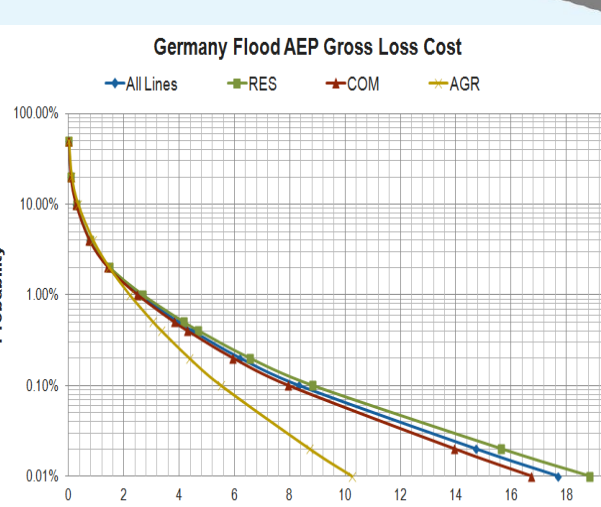


- Comparison of developed industry exposure with
 - Client data helps to check economic to insured exposure ratios
 - Claims data helps to check insured losses
 - In addition to this for example in Austria, HORA, a natural catastrophe risk model is available online. One can access flood or earthquake exposure for specific street address or postal code.

Calibration - AAL, EP results, modeled losses to historical losses



AEP Gross PML



- Loss Result Validation

- Compute losses for all stochastic events
- Create return period curve and benchmarks against available data
- Compare historical losses based on available event reconstructions.

* PML – Probable Maximum Loss; AAL – Average Annual Loss; AEP – Aggregate Exceeding Probability

Benchmarking

- Property Premium
 - Gross property premiums by class and geography
 - Insurance penetration and density.
- Comparison of results with different alternative methodologies and previous historical losses.
- Comparison of developed Industry economic exposure with :
 - Client data
 - Claims data
 - Catastrophe risk model available online, if any.
- Loss results validation
 - Calibration based on Historical event losses
 - AAL comparison by LOBs.

Importance

- Flood Hazard is intensifying
 - Land Movement
 - Land use changes
 - Sea – level rise
 - Changing rainfall regimes
- Exposure of insurers to flood is increasing
 - Growing Insurance market
 - Development on flood prone land
 - Increase in property value

Benefits

- Helps client better underwrite flood insurance
- Helps insurance companies to more accurately calculate premiums based on risk
- Help government and insurers with crucial information to guide risk management decisions in their respective regions and districts.
- Helps to get more comprehensive insight into natural hazards and their socio-economic consequence
- Helps to achieve better natural hazard risk management through:
 - Clearer understanding of geographical concentration of natural flood hazard risks, for various frequencies and severities.
 - Quantification of potential physical damage, business interruption and casualties.
 - Identification of exposure concentration.



Summary Process