Quantifying exposure: the influence of value estimation schemes

Veronika Röthlisberger[1,2], Andreas Zischg[1,2] and Margreth Keiler[1]

UNIVERSITÄT BERN | Mobiliar Lab for Natural Risks
OESCHGER CENTRE

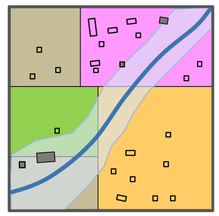
[1] Institute of Geography, Mobiliar Lab for Natural Risks, University of Bern, Bern, Switzerland
[2] Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland

This poster in a nutshell

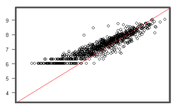
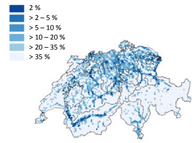
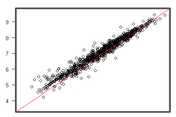
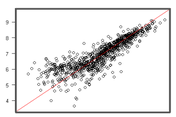
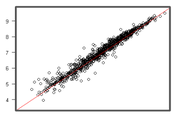
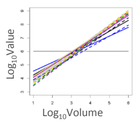
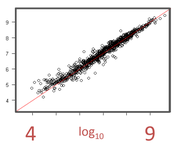
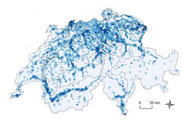
We investigate the relevance of building value estimation schemes within flood exposure analyses at supra-local scales. Our findings for Switzerland suggest that models based on individual buildings (M1, M2, M4, M5) produce more reliable results than models based on surface area (M3), but only if they consider the buildings' volume. Simple models (M1, M3) tend to underestimate the exposure, which results in suboptimal allocation of resources for protection measures in decision-making processes based on cost-efficiency.

Background

- Exposure analyses at the regional to national scale: monetary value of exposed assets (buildings in flood zones) have to be estimated.
- Common estimation method: average value per area, differentiated by land use (M3).
- New data at object level: Value estimation at building level feasible.



Model

			Requirements: data for model set up	Requirements: data for model application	Requirements: computational expenses	Parameter for CH: based on insured values of 290 000 - 390 000 buildings	Values [CHF] of exposed buildings per 10 km²: in 8 Cantons with insurance data: scatterplot	in 8 Cantons with insurance data: total	in 8 Cantons with insurance data: agreement	entire Switzerland: highest 35 %
M1	uniform average value per building	Σ / |||	👍	👍	👍	10^6 CHF / building		56 Bn — 67 Bn	👎	
M2	uniform average value per building volume	Σ / cube	👍	👎	👍	650 CHF / m³		74 Bn	👍	
M3	average building values per area, per land use type	Σ[CHF] Σ[CHF] Σ[CHF] Σ[CHF]	–	👍	👍	330 - 1 460 CHF / m²		48 Bn	👎	
M4	differentiated average values per building volume	Σ Σ Σ Σ	👎	👍	👍	380 - 950 CHF / m³		77 Bn	👍	
M5	value per building, based on multiple linear regression		👎	👎	👎	$\log_{10}(value) = ResPur \times \log_{10}(volume) + ResPur \times LaUse + \log_{10}(volume) \times LaUse$		68 Bn	👍	

Differences and similarities of models

With respect to absolute values, models that consider the building volume (M2, M4, M5) outperform the common approach based on surface area (M3).

Simple (M1, M3) models underestimate the value of exposed buildings; overall and in areas with extremely high exposure values.

All five models show comparable spatial distribution of areas with extremely high exposure values.

Implications for risk management

Models considering building volumes are preferable for decision-making based on cost-benefit criteria.

The use of simple value models in cost-benefit analyses may result in suboptimal allocation of resources for protection measures.

Spatial prioritization of flood protection measures can be based on simple models.

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Contact: veronika.roethlisberger@giub.unibe.ch // Institute of Geography // University of Bern

Reference: Röthlisberger, V., Zischg, A. P., and Keiler, M.: A comparison of building value models for flood risk analysis, Nat. Hazards Earth Syst. Sci., 18, 2431-2453, https://doi.org/10.5194/nhess-18-2431-2018, 2018.