REGIONAL AND HOUSEHOLD ADAPTATION STRATEGIES TO CLIMATE EXTREMES: THE CASE STUDY OF THE BECVA RIVER BASIN, THE CZECH REPUBLIC

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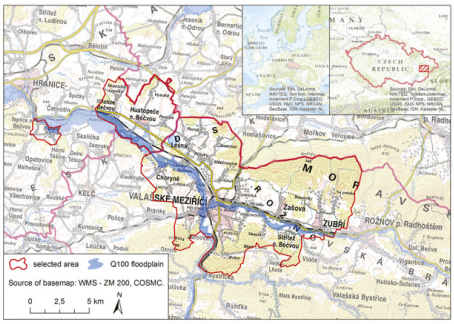
Introduction:

This research investigates regional and household adaptation strategies in the rural region affected by climate extremes within the past 15 year period. The target area is located along the upper and middle parts of the Becva river basin in the eastern part of the Czech Republic, in the foothill of the Beskids mountains. In the region, the main flood experienced in 1997, then 2009 and 2010. Besides, households are often affected by local floods caused by nearby small water streams.

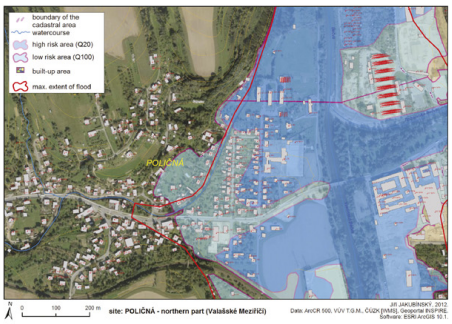


Households are stratified to risk areas according to quantified flood risk on Becva river and in reality, they correspond with different past experiences:

High risk (Q20) – households exposed to multiple flood (dark-blue shaded area)

Low risk (flood risk Q100) – household exposed to at least one flood (light-blue shaded area)

No risk - household not exposed to floods



Research Design:

Theoretical part

The main theoretical concepts draw from the differentiations between coping/adaptation strategies to climate extremes (focusing on floods) and are applied on a regional and household scale. The main research question relates to the state of adaptation measurements and analysing factors influencing them.

Empirical part:

In survey, we apply a mixed methodology and case study approach.

- qualitative research through problem-oriented, semi-structured interviews with relevant stakeholders (N=21)
- quantitative research by conducting face-to-face questionnaires with household residents (N=303) in high, low and no risk areas in relation to flood occurrence in 12 municipalities. Questionnaires were divided into main blocks serves as indicators: experiences with floods (frequency, level of impacts and damage), adaptation household measures (building material, height of the ground floor, repairs after floods, range of insurance, household interior and exterior adaptation measurements), flood preparedness (information, awareness and perception of risk) and socio-demographic characteristics.

Living by the small watercourse Juhyně, municipality Stritez nad Becvou.

Household exterior adaptation: increased groundfloor and technical basement, municipality Usti.

Regression on links between influencing factors and number and level of adaptation strategies:
(link between the intensity of adaptation strategies of a household and the level as well as frequency and severity of the actual exposure of that household to floods/ link between the amount of adaptation strategies of a household and its average socio-demographic characteristics. We adress two hypothesis: link between the intensity of adaptation strategies of a household and the frequency and severity of the actual exposure of that household to floods. Secondly, we investigate a link between the amount of adaptation strategies of a household and its average socio-demographic characteristics.

$$y_i = \beta_1 X_1^{'} + \beta_2 X_2^{'} + \beta_3 X_3^{'} + \beta_4 X_4^{'} + \varepsilon_i$$

y_i equals 1 if a household has undertaken at least any adaptation strategy in the exterior (specification one) or interior (specification two) of the house, and 0 otherwise.

$X_1^{'}$ is a vector that measures the level and intensity of the household exposure to floods

$X_2^{'}$ is a vector of dummy variables that describe characteristics and location of the house,

$X_3^{'}$ is a vector of variables that describe the socio-demographic specific characteristics

$X_4^{'}$ is a vector of region fixed effect and

ε_i is a stochastic error term that is assumed to be distributed normally, $\varepsilon_i \sim N(0, \sigma^2)$.

Estimates from two probit regressions are given in Table 1 below:

	adaptations to house exterior			adaptations to house interior		
	Coefficient	*Robust SE*		*Coefficient*	*Robust SE*	
total floods	0.066	0.092		0.033	0.151	
financial loss	0.072	0.096		0.383	0.098	***
cellar	-0.109	0.163		0.311	0.160	*
house flat	-0.207	0.273		-0.466	0.334	
house hill	-0.123	0.399		0.413	0.434	
avg_age	0.006	0.007		-0.001	0.010	
avg_income	0.006	0.014		0.022	0.011	**
avg_gender	0.758	0.303	**	-0.104	0.491	
avg_education	-0.004	0.117		0.349	0.111	***
avg_family status	0.479	0.181	***	-0.510	0.221	**
avg_occupation	0.033	0.066		-0.053	0.100	
Choryne	0.148	0.165		0.287	0.245	
Hrachovec	0.387	0.192		-0.159	0.270	
Hustopece	1.056	0.120	***	-0.161	0.136	
Jurinka	-1.099	0.141	***	-0.064	0.143	
Krhova	0.819	0.213	***	0.055	0.253	
Lhotka	0.268	0.265		-0.541	0.275	**
Policna	0.180	0.135		0.193	0.199	
Stritez	0.457	0.199		-0.107	0.279	
Usti	0.529	0.106	***	-0.409	0.239	*
Zasova	0.522	0.165	***	0.424	0.279	
Zubri	0.228	0.242		0.580	0.303	*
_cons	-2.475	0.768	***	-2.329	0.802	***
Log-likelihood	-119.17			-187.57		
Obs	303			303		

*** - significance at 1% ** - significance at 5% * - significance at 10%

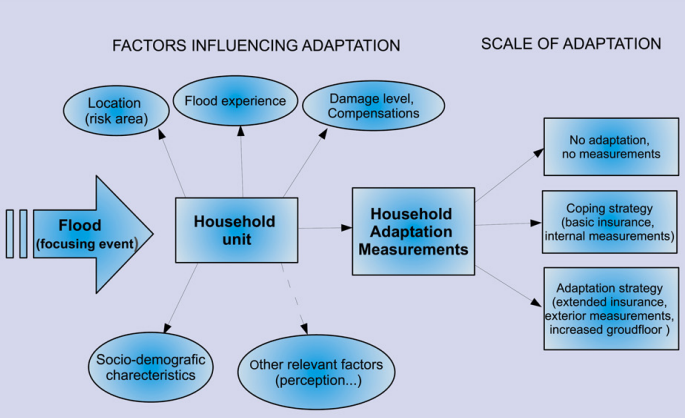


Figure 1.: Conceptual framework covering factors that influence levels of household adaptation strategies

Coping strategies include rather basic, low cost measurement applied within the short-term horizon (i.e. changes in interior, mobile barriers)

Adaptation strategies correspond with more complex measurements, include house and surroundings and are planned in advance within longer-term horizon (i.e. hydro-isolation, increased groundfloor, complex terrain and vegetation adjustments)

Results:

Relation between location in flood risk area and number of adaptation measurements:

Figure 2 shows that when we compare adaptation measurements and location in risk areas, we see that the more risky the area for households, the more adaptation households would take.

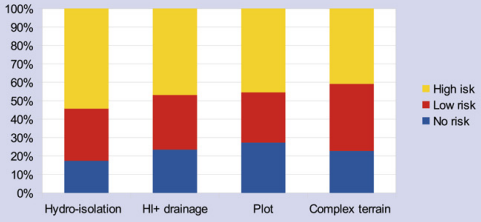


Figure 2: Proportion of applied adaptation measurements in no, low and high risk zone (total)

Conclusion

Field research and face to face interviews showed some significant changes and progress in regional preparedness for flood risk, even after the 1997 big flood. We also noted slow progress in setting up coping and adaptation household measurements, with the highest proportion in high and then in low risk areas. Regression revealed that level and intensity exposure of floods positively affect the exterior household adaptations. These adaptation vary regionally among individual municipalities and also location in risk areas. Then, we found positive links between gender composition, „family completeness", age, education and various adaptation measurements.

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