



Vulnerability Check for Austrian cities: How to measure local vulnerability

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PS3: Housing: Vulnerability, commodification and de-commodification in the housing sector

The VESPA project: goals and expected results



- Expected results of the project
 - concept for a quick-check of local vulnerability for Austrian cities
 - evidence-based information platform for local administrations and stakeholders
 - applicable prototype for the city of Lienz

Tasks of the project

- definition of a comprehensive indicator catalogue
- overview of available data for Austrian cities
- design of a web-based tool ("dashboard") for Lienz
- competent support for solutions in the political action fields "mobility transition", "energy transition" and "circular economy"

The VESPA project: assumptions and questions



Basic assumptions

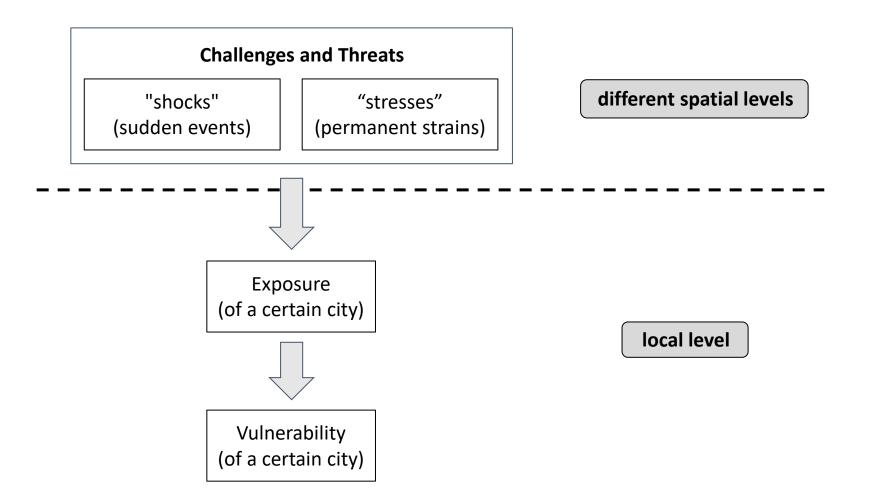
- Cities are increasingly threatened by climate change and other challenges
- Cities are affected differently depending on local conditions

Main questions

- What will be the most threatening challenges for Austrian cities in the near future?
- How and to which degree will these challenges affect a certain city?
- Which local characteristics determine the local effects of emerging shocks and stresses?
- How can these characteristics be measured?
- Which interventions can reduce the negative effects of these threats?

Basic terminology





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Challenges and Threats

→ What will be the most threatening challenges for Austrian cities in the near future?

Differentiation of challenges and threats by

- frequency of occurence
- spatial level
- topic / thematic area





- extinction of species / loss of biodiversity
- prevalence of new parasites
- emissions (pollution / noise)

"shocks" (sudden events)

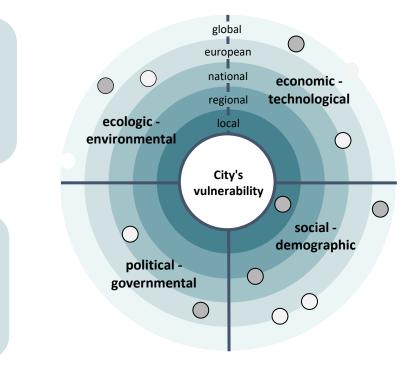
change of legal conditions

• bureaucratization

political or govermental upheavals

reduction of von subsidies and budgets

"stresses" (permanent strains)



"shocks" (sudden events)

"stresses" (permanent strains)

"shocks" (sudden events) economic crises / disruption of supply chains blackout "stresses" (permanent strains)

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increasing prices of ressorces or energy

- scarcity of ressorces or energy
- skills shortages / unemployment
- economic transition
- technological innovation / digitalisation

"shocks" (sudden events)

- wars / refugee movements
- pandemics

"stresses" (permanent strains)

- demographic change / aging of society
- emigration / brain drain
- inequality / poverty / social conflicts
- increasuing demand for land

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Local effects of challenges and threats



→ How and to which degree will these challenges and threats affect a certain city?

- Basic assumumption: The local effects of the same challenges and threats are highly different
- The exposure of a certain city is determined by basic local structures
 - Topography and natural environmental (mountains, rivers,...)
 - Economic structure (industries, foundational economy, trade relations,...)
 - Settlement structures (density, urban sprawl,...) and infrastructures (transport, energy, ICT networks,...)
 - Social and demographic structures (education, ageing,...)
 - \rightarrow can only be influenced by long-term structural interventions
- The vulnerability of a certain city is not only determined by its exposure, but can also be mitigated by local risk management
 - protection and safety systems (flood protection systems, shelters, avalanche barriers,...)
 - information and warning systems (dashboards, alarms,...)
 - co-operations and networks (firm networks, associations,...)
 - governance and social innovations (administrative bodies, stakeholders, NGOs,...)
 - \rightarrow can be steered by short-term adaptation measures

Criteria of local vulnerbility I



→ Which local characteristics determine the local effects of emerging shocks and stresses?

Approach: developing a matrix with

- challenges and threats considered (rows)
- definition of potential criteria of vulnerability (columns)
- hypotheses about relation between challenges and criteria
- Selection of criteria with relevant relations to challenges and threats considered

				CRITERIA OF VULNERABILITY													
				built environment				natural environment				economy					
				\$1	S2	S3	S4	S5	N1	N2	N3	N4	W1	W2	W3	W4	E1
				urban sprawl	ground sealing	areas danger zones	building stock / themal insulation	protection systems	topography	grenn and blue infrastrukcure	protected zones	biodiversity	economic diversification	Regionale regional economic cycles	co-operation of enrerprises and company networks	recycling of ressources	energy infrastructur
		EE1	heavy rain or hail / floods / storms		+		-		~	-	-						-
		EE2	water shortage / droughts / forest fires		+	+	-	-	~	-	-						
	ental	EE3	landslides / avalanches / earthquakes				-										
	gic - onme	EE4	Erdrutsche / Lawinen / Erdbeben	+	+	+		-	~		-						
hreats	ecologic - environmental	EE5	landslides / avalanches / earthquakes	+	+					-	-	-	-				
		EE6	prevalence of new parasites							-		-	-				
		EE7	emissions (pollution / noise)				-				-						
		ET1	Wirtschaftskrisen / Lieferprobleme										-	-	-	-	
		ET2	increasing prices of ressorces or energy	+										-	-	-	-
	a	ET3	scarcity of ressorces or energy	+										-	-	-	-
	economic - technological	ET4	skills shortages / unemployment														
dt	chno	ET5	Blackout														-
challenges and threats	te e	ET6	Cyber crime										-	-	-		-
		ET7	economic transition										-	-			
		ET8	technological innovation / digitalisation										-	-		-	
		SD1	wars / refugee movements										-	-			
	social - demographic	SD2	pandemics					-				-	-	-			
		SD3	demographic change / aging of society														
		SD4	emigration / brain drain										-		-		
	8 9	SD5	inequality / poverty / social conflicts														
		SD6	increasing demand for land	+							-						
	a l	PC1	political or govermental upheavals														
	political - governmental	PC2	reduction of von subsidies and budgets														
	vern	PC3	change of legal conditions														
	og og	PC4	bureaucratization														
												1		1			·

Vulnerability Check for Austrian cities

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Result: list of local criteria

- divided in 7 topics
- related to the 3 given action fields
- differentiated by temporal scope of action

				action fields		freedom of action			
topics	No.	criteria of vulnerability	mobility transition	energy transiion	circuklar economy	long-term structural interventions	short-term adaptation interventions		
built environment	B1	urban sprawl							
built environment	B2	ground sealing							
built environment	B3	areas danger zones		_					
built environment	B4	building stock / themal insulation							
built environment	B5	protection systems							
natural environment	N1	topography							
natural environment	N2	grenn and blue infrastrukcure							
natural environment	N3	protected zones							
natural environment	N4	biodiversity							
economy	C1	economic diversification							
economy	C2	Regionale regional economic cycles							
economy	C3	co-operation of enrerprises and company networks							
economy	C4	recycling of ressources							
energy	E1	energy infrastructure							
energy	E2	depency of fossile energy							
energy	E3	energy communities							
energy	E4	renewable energy production							
mobility & ICT	M1	mobility infastructure							
mobility & ICT	M2	mobility behaviour							
mobility & ICT	M3	ICT infrastructure							
population	P1	demographic strukture							
population	P2	education		_					
population	P3	diversity							
governance	G1	effectivity and flexibility of local administration							
governance	G2	municipal budgets and properties							
governance	G3	strategic planning concepts							
governance	G4	participation							
governance	G5	information offers							
governance	G6	social innovation							

Indicators of local vulnerbility



→ How can these local characteristics be measured?

Topic

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Definition of indicators of local vulnerbility

- One or more indicators for each criterion
- Potential data sources for Austrian cities
 - spatial level (regional / local / intra-communal?)
 - temporal dimension (one or more points of time?)
 - expected efforts for data exploitation (digitally available / own analysis / own inquiry?)

				DataSources									
					spatial level			temporal level		efforts for data exploitation			1
ic	No.	Criteria	No.	Indicators: Definition	regional (district or Nuts-3)	local (muni- cipality)	intra- kommunal (local ares, grids)	static (only one point of time)	dynamic (different points of time)	digitally available	own analysis	own inquiry	
ungsraum	K1	Zersiedelung	K1.1	Siedlungs- und Freiraumindex = (Siedlungsfläche / Gesamtfläche) * 100		x	x						Einfache Berechnung
ungsraum ungsraum	к1 К1	Zersiedelung Zersiedelung	к1.2	Sparsame Bodennutzung: Bebaute Fläche / Einwohner:in Baulandüberhang: Unbebautes Bauland / Einwohner:in Anteil der Brachfläche (schnell verfügbare Fläche) an Siedlungsfläche Versiegelungsgrad: Anteil der versiegelten Flächen		×	x		x				GIS-Analyse GIS-Analyse
ungsraum	К2	Versiegelung	K2.1	am Dauersiedlungsraum Gefährdete Wohngebäude: Anteil der Wohngebäude		×	×		×				GIS-Analyse
ungsraum	кз	Siedlungsgebiete in Gefahrenzonen	K2.2	in einer Gefahrenzone Heizenergiebedarf / Wohnnutzfläche Anteil der		×	×		×				GIS-Analyse: Überlagerung
ungsraum	к4	Bausubstanz / Wärmedämmung	K2.3	Wohnnutzfläche in wärmgedämmten Gebäuden Schutzinfrastukturindex		x	x		x				
ungsraum	К4	Bausubstanz / Wärmedämmung		Reliefindex Grün- und Wasserflächenanteil an Gesamtfläche (oder pro									
ungsraum	К5	Bauliche Schutzeinrichtungen		Einwohner:in) Populationsbiologischer Sensitivitäts-Index;		×	×						
raum	K21	Topographie		Naturschutzfachlicher Wert-Index Biodiversitätsindex; Shannon-Entropie		x							
rraum	К6	Grüne und blaue Infrastruktur		Anteil landwirtschaftlich bewirtschaftete Fläche an Gesamtfläche		x				x	x		GIS-Flächenanalyse mit sha
raum	к7	Schutzgebiete		Herfindahl-Hirschman-Index (HHI) ; Branchen-Diversitäts Index ;		×	×		×			×	· · · · · ·
raum	к8	Biodiversität	K8.1	Spezialisierungskoeffizient Anteil regionaler Produkte am Gesamtkonsum		x	x		×			×	
raum/Wirtschaf	ft?	Landwirtschaft		Anzahl der Firmenkooperationen und -netzwerke Recyclingquote: Menge des						×			
chaft	К11	Diversifizierung der Wirtschaft		recycelten Abfalls / Gesamtmenge Abfall Netzausbaugrad und Kapazität		×			×	×	×		Berechnung Spezialisierun
chaft	к10	Regionale Wirtschaftskreisläufe		Fernwärmeversorgung: Anteil der Haushalte mit Fernwärme/Fernkälte Fosssile		×			×				
chaft	K12	Unternehmenskooperationen und -netzwerke		Energieverbrauch: Anteil des Energieverbrauchs aus fossilen Quellen am		×	x		-* ×				
chaft	К13	Recycling		Gesamtenergieverbrauch Anzahl und Größe von Energiegemeinschaften		×			×				
ie	K17	Energieinfrastruktur (Netze, Speicher)		Fosssile Energieproduktion: Anteil der fossilien Energieproduktion an der		×	×						
ie	K17	Energieinfrastruktur (Netze, Speicher)		Gesamtenergieproduktion Qualität des ÖV-Angebots: ÖV-Güteklasse Angebot									
ie	K15	Abhängigkeit von fossilen Energien		Fahrradinfastruktur: Länge Radwegenetz Angebote Car-Sharing: Zahl der									
ie	K16	Energiegemeinschaften		verfügbaren PKW für Car-Sharing / EW Gefährdete Straßen: Anteil der		×			×				
ie	K14	Produktion erneuerbarer Energien		Straßenlängen in Gefahrenzonen Verkehrsmittelwahl: Modal-Split		×	×		×				
hr & Telekom	K18	Verkehrsinfrastruktur		Personenverkehr ÖV-Nutzung: Anteil der Besitzer:innen von ÖV-Zeitkarten			×		x	×			ÖROK: 100m-Rasterzellen f
hr & Telekom		Verkehrsinfrastruktur		Qualität der Telekom-Infrastruktur: Anteil der Haushalte mit					(×)				GIS-Analyse auf Grundlage
hr & Telekom	K18	Verkehrsinfrastruktur		Breitbandanschluss Überalterung: Alterungsindex = (Bevölkerung über 65 Jahre		(×)			(x)		×	x	Herold Firmendaten -> Anb
hr & Telekom	K18	Verkehrsinfrastruktur		/ Bevölkerung von 0-14 Jahre) * 100 Erwerbstätigkeit: Anteil der erwerbstätigen		(×)		(x)			×		GIS-Analyse: Verschneidun
hr & Telekom	К19	Mobilitätsverhalten		Bevölkerung Ausbildungsindex: Anteil der Bevölkerung mit abgeschlossener		(×)		,	(×)			×	kommunale Daten nur pun
hr & Telekom	K19	Mobilitätsverhalten		Berufsausbildung Bildungsbeteiligung: Anteil der Bevölkerung in Aus- und	(x)	((x)		×		Abfrage bei ÖBB (Klimatick
hr & Telekom	K20	Telekom-Infrastruktur		Weiterbildung im erwerbstätigen Alter Anteil der Männer >40 zu Frauen im	(-7		×		×	×			100m-Rasterzellen für ganz
kerung	K22	Demographische Struktur		Gemeinderat Divesitätsindex (Shannon, Simpson Index) ; oder: vereinfachter		×	×		×				Lienz: 146,43; Österreich we
kerung	K22	Demographische Struktur		GDI= Ausländeranteil x 1/ Durchschnittsalter Effizienzindex ??? Kommunaler									Lienz: 73,8 %
kerung	к9	Qualifikation und Ausbildung		Flächenbesitz: Anteil der im Gemeindebesitz befindlichen Flächen im DSR									· ·
kerung	кэ	Qualifikation und Ausbildung		Kommunale Budgetmittel: Frei verfügbare kommunale Budgetmittel /									46,9 Schlaiten Bezirk Lienz
kerung	K27	Politische Diversität		Einwohner:in Existenz strategischer Planungskonzepte: Zahl von sektoralen									
kerung	K27	Gesellschaftliche Diversität		und integrierten Entwicklungskonzepten Beteilgungsrate: Anteil		×	×		×				Wert liegt zwischen 0 und 1
mance	K28	Effektivität und Flexibilität der lokalen Verwaltung		Bürgerbeteiligungsverfahren an Gesamtverfahren? Vielfalt des politischen									Ŭ
nance	K29	Kommunale Budgetmittel / kommunales Eigentum		Angebots: Anzahl der Wahllisten bei der letzten Gemeindratswahl									
rnance	K29	Kommunale Budgetmittel / kommunales Eigentum		Wahlbeteiligung: Anteil der abgegenen Stimmen bei der letzten									
rnance	K25	Strategische Planungskonzepte		Gemeindratswahl		×	×		×				
rnance	K24	Beteiligung der Bürger:innen				×			x				
rnance	K24	Beteiligung der Bürger:innen		Social Innovation Index, Social Progress Index									
rnance	K24	Beteiligung der Bürger:innen											
rnance	K26	Informationsangebote											
nance	K22	Soziale Innovationen				~			×				

Applicability of results for pro-active planning



→ Which interventions can reduce the negative effects of these threats?

Well-defined indicators of local vulnerability can help to...

- give a well-founded evidence on specific local exposure and vulnerability against future challenges and threats
- point out potential ways to reduce or mitigate local exposure and vulnerability
- design effective interventions in planning and urban politics with regard to
 - expectable shocks and stresses
 - specific local conditions
 - highly relevant fields of action ("mobility transition", "energy transition", "circular economy")
- develop both long-term structural interventions and short-term adaptation measures
- evaluate the effectiveness of strategies and measures over a longer period of time

Conclusion: Recommendations for vulnerability indicators

Vulnerability indicators should...

- be derived from a comprehensive consideration of expected challenges and threats
- refer to relevant local conditions
 - local structures (built and natural environment, economy, society, infrastructure,...)
 - local risk management (governance, information, prevention systems, ...)
- be specified with regard to available data and information
- always be based on reliable empirical evidence (quantitative or qualitative)
- be defined in different spatial granularities
 - total level of municipality or region
 - spatial distribution within the municipality
- allow monitoring over time rather than benchmarking with other cities
- be defined transparently and broadly understandable
- easily be transferable to actual interventions (both long-term and short term)

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