

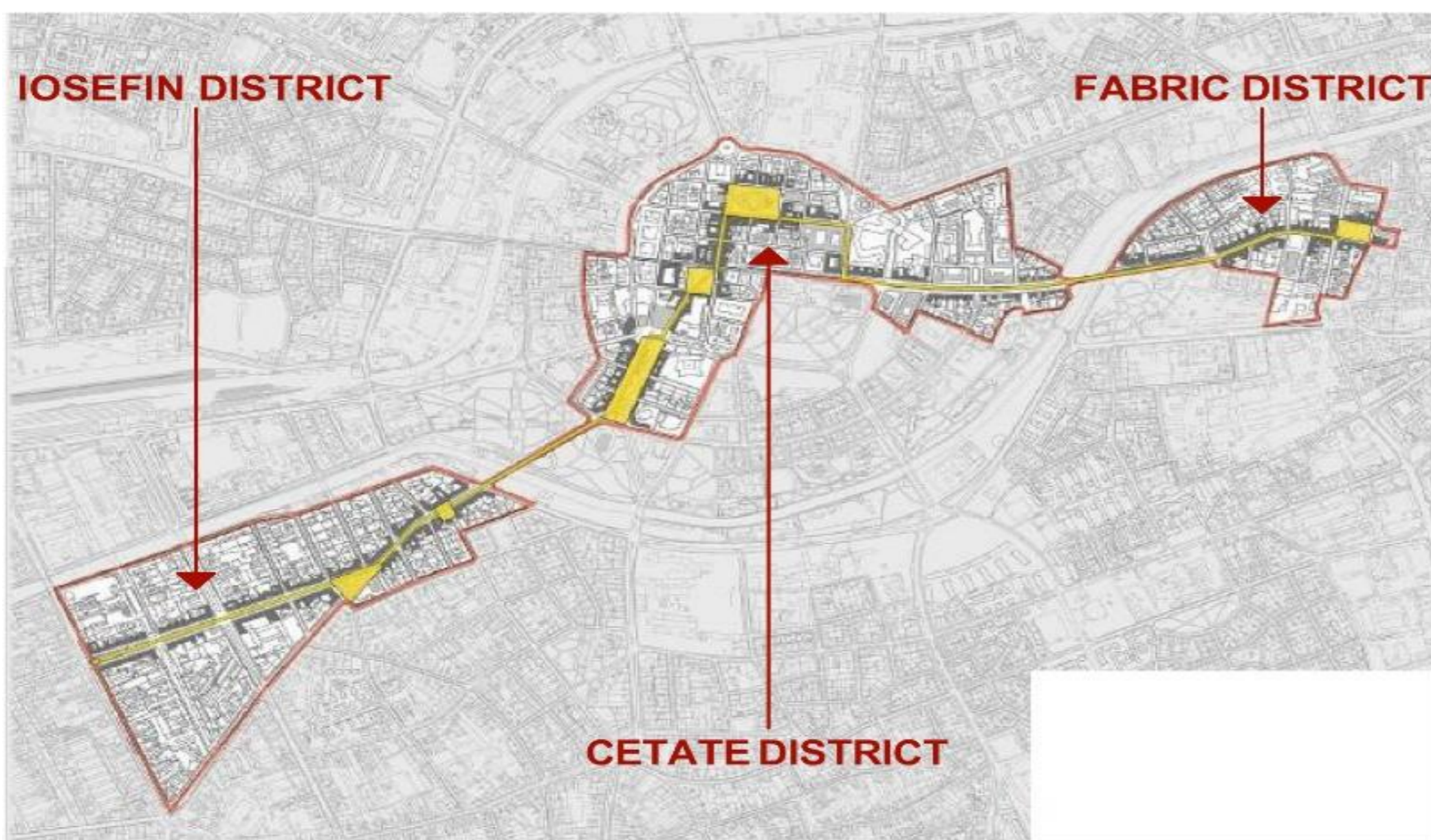
Multidisciplinary Seismic Vulnerability Assessment of Heritage Urban Centres: From Building Typologies to Urban Resilience

Iasmina Onescu

Faculty of Architecture, Politehnica University of Timisoara, Romania, iasmina.onescu@upt.ro

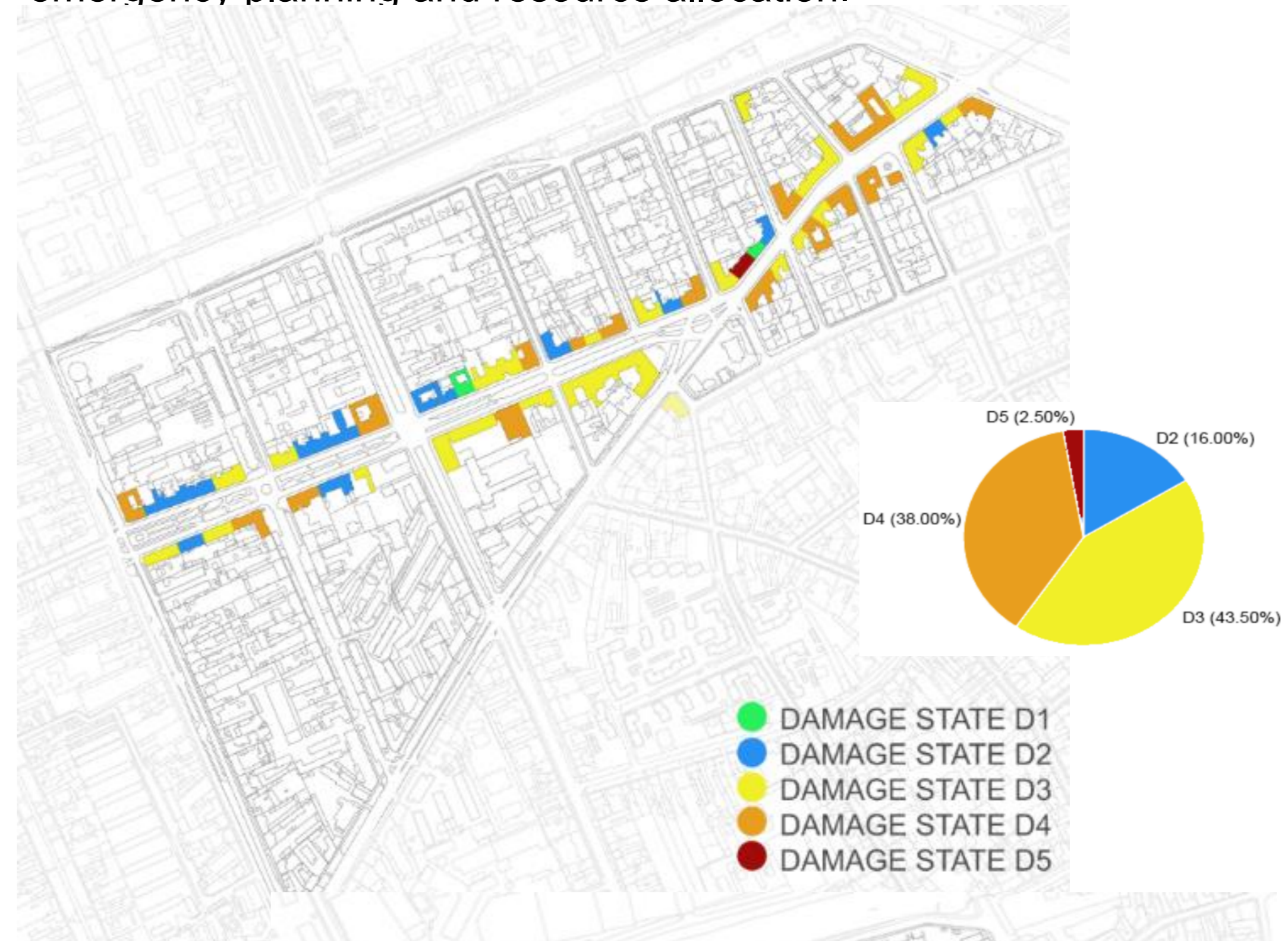
INTRODUCTION & AIM

Historic urban centres concentrate vulnerable building stocks, critical urban functions, and high cultural value within dense, morphologically complex fabrics. Yet, seismic risk assessment still focuses predominantly on single buildings or purely structural indicators, often underestimating systemic vulnerabilities and heritage significance.



RESULTS & DISCUSSION

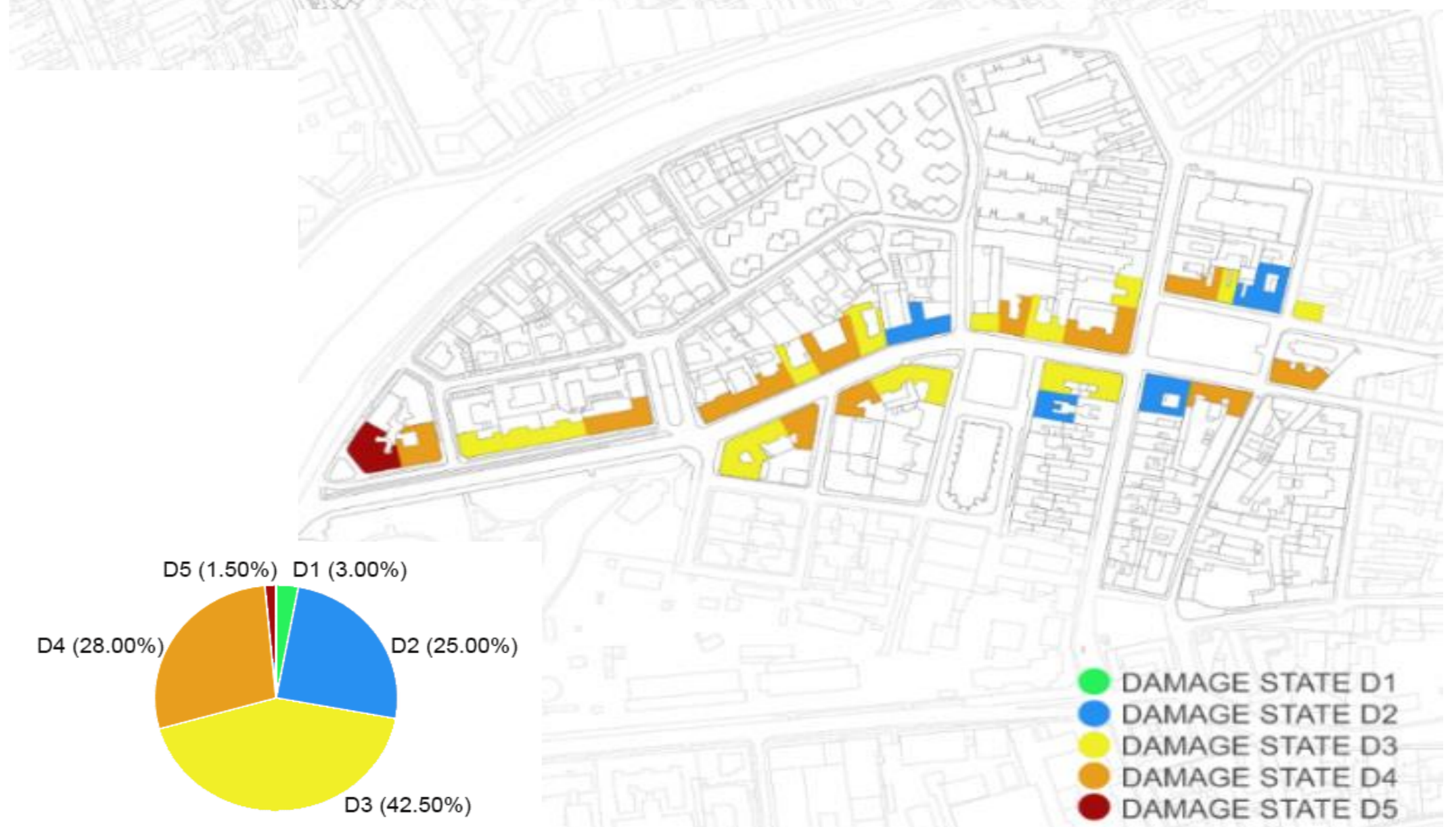
This contribution proposes a multidisciplinary framework for seismic vulnerability assessment at the scale of heritage urban centres, integrating structural fragility, urban morphology, exposure, and conservation value into a unified, map-based methodology. Results show that considering only structural aspects yields intervention priorities different from those when urban configuration and cultural importance are explicitly included, with direct implications for emergency planning and resource allocation.



METHOD

The approach combines: (i) building-by-building survey and typological classification, (ii) empirical vulnerability indices, (iii) urban-scale indicators such as street network configuration, parcel patterns, and (iv) weighting of cultural significance to support priority setting for risk-mitigation measures.

%	CRITERIA	No.	ELEMENT	CLASS				WEIGHT	VALUE
				A	B	C	D		
70%	STRUCTURAL	1	Organization of vertical structures	0	5	20	45	1	5
		2	Nature of vertical structures	0	5	25	45	0.25	6.25
		3	Location of the building and type of foundation	0	5	25	45	0.75	18.75
		4	Distribution of plan resisting elements	0	5	25	45	1.5	7.5
		5	Regularity in plan	0	5	25	45	0.5	2.5
		6	Regularity in elevation	0	5	25	45	1	25
		7	Type of floors	0	5	15	45	1	15
		8	Roofing	0	15	25	45	0.75	18.75
		9	Details	0	0	25	45	0.25	6.25
		10	Physical conditions	0	5	25	45	1	25
		11	Presence of adjacent buildings with different height	-20	0	15	45	1	0
		12	Position of the buildings in the aggregate	-45	-25	-15	0	1.5	-22.5
		13	Presence and number of staggered floors	0	15	25	45	0.5	7.5
		14	Effect of either structural or typological heterogeneity among adjacent structural unit	-15	-10	0	45	1.2	0
		15	Percentage difference of opening area among adjacent façade	-20	0	25	45	1	45
								Iv STRUCT-III	130
								Iv STRUCT-IV	160
15%	ARCHITECTURAL ARTISTIC	16	Representative architectural style for the area	0	10	15	25	1.5	37.5
		17	Age, importance of the build époque	0	10	15	25	1.2	12
		18	Original woodwork/joinery	0	10	15	25	1	15
		19	Original stucco, brick, floors or ceilings	0	10	15	25	1	15
		20	Original statues or bass-reliefs	0	10	15	25	1	15
		21	Original gable/fronton	0	10	15	25	1	15
		22	Original balconies and railings	0	10	15	25	1	15
		23	Original mosaics or stone work	0	10	15	25	1	10
		24	Original paintings or frescoes	0	10	15	25	1	10
		25	Conservation state of artistic assets	-5	10	15	25	1	15
		26	Authenticity/originality (global, elements)	0	10	15	25	1	15
		27	Official monument (national, regional, local, protected area) status	0	10	15	25	1.5	15
		28	Particular construction techniques/materials	0	10	15	25	0.5	0
		29	Conservation state of original materials	-5	10	15	25	0.5	7.5
		30	Representative historical events	0	10	15	25	0.5	5
		31	Archaeological site	0	10	15	25	1.5	0
		32	Representative original wooden framework	0	10	15	25	1	15
		33	Past restoration work	-5	10	15	25	1	10
								Iv ARCH-ART.	227
10%	URBANISTIC	34	Importance in contouring the street profile	-5	10	15	25	1.5	37.5
		35	Importance in contouring the urban silhouette	-5	10	15	25	1.5	37.5
		36	Annexes, relation with the urban pattern	0	10	15	25	1	10
		37	Location (central area, touristic area)	0	10	15	25	1.5	37.5
		38	Representative/particular shape of the roof	0	10	15	25	1	15
								Iv URBAN.	137.5
5%	SOCIAL ECONOMIC	39	Public/social functions	0	10	15	25	1.5	15
		40	Importance for the local community memory	-5	10	15	25	1	10
		41	Economic value	0	10	15	25	1.5	22.5
		42	Cultural functions	0	10	15	25	1.5	0
								Iv SOC-ECON.	47.5



CONCLUSION

The author argues for closer collaboration between earthquake engineering, architecture, urban planning, conservation, and social sciences, and outlines how such integrated assessments can inform urban policies aimed at enhancing both seismic resilience and quality of life in heritage cities.

FUTURE WORK / REFERENCES

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M. Mosoarca, I. Onescu, E. Onescu, A. Anastasiadis, ”Seismic vulnerability assessment methodology for historic masonry buildings in the near-field areas”, Engineering Failure Analysis, Vol. 115,, 2020