CSS Lecture Series "After Sustainability“
University of Hamburg

Lecture by Prof. Christer Pursiainen

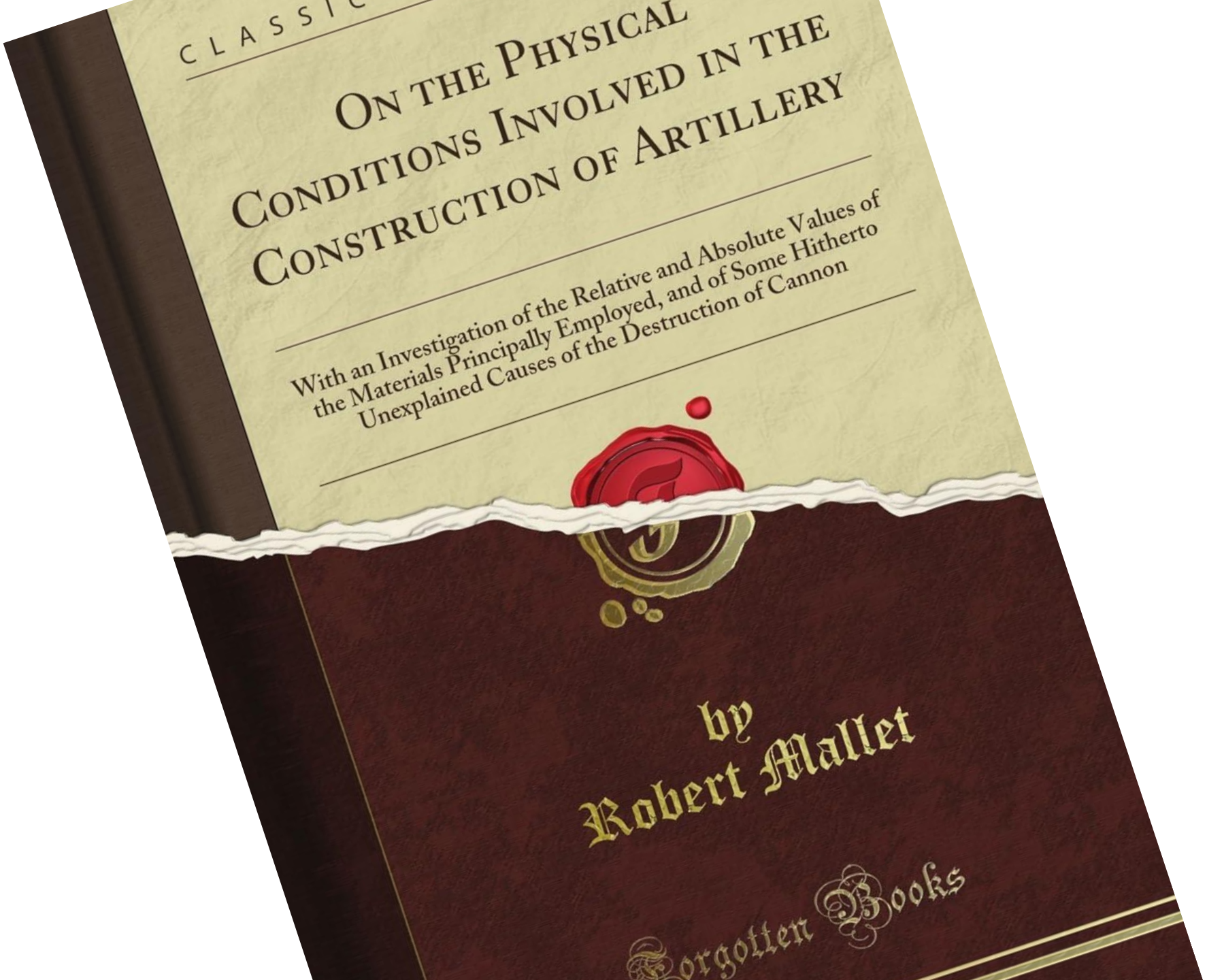
24th January, 6:00 PM

What is 'resilience' - and what could it be? Lessons from theory and practice

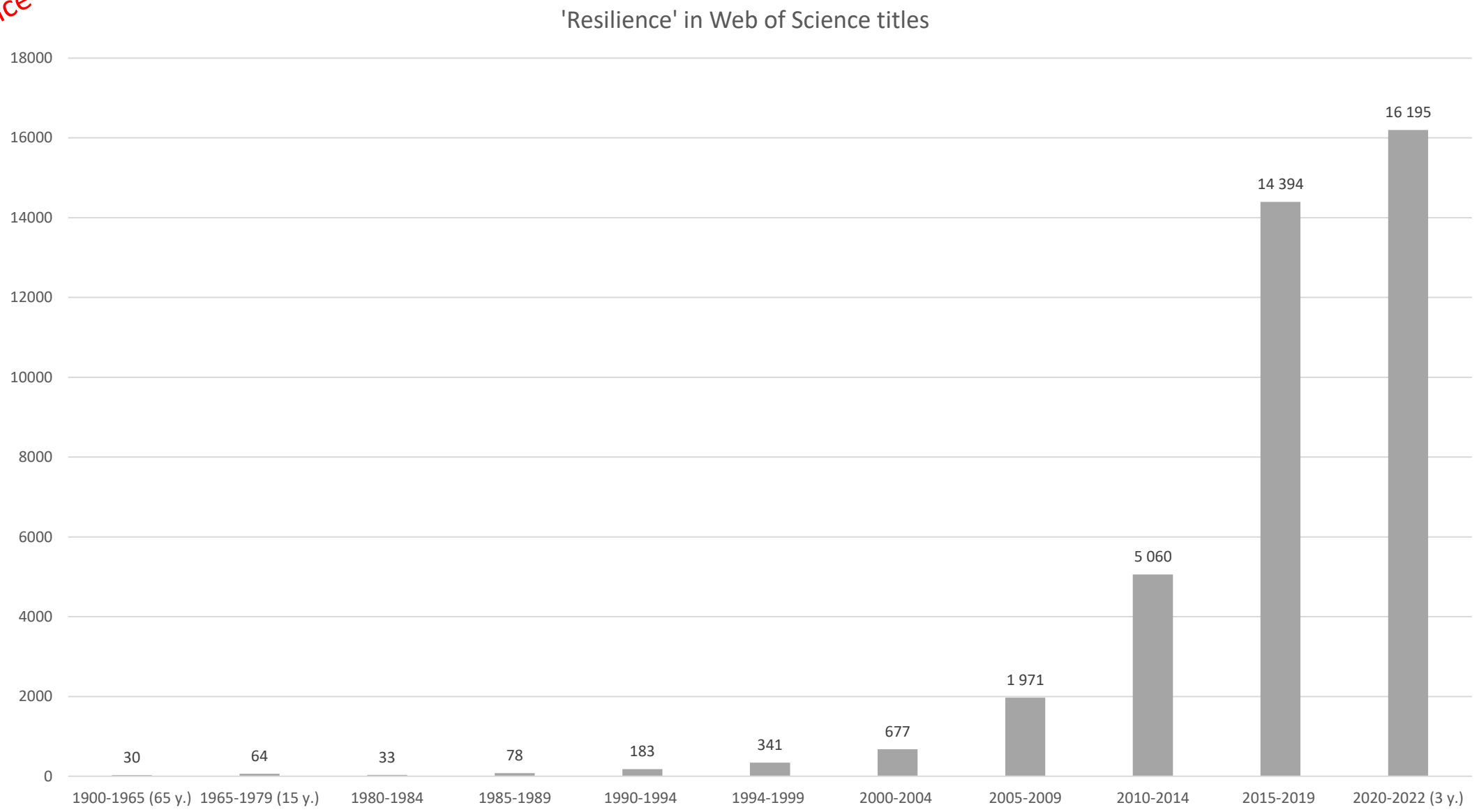
Some issues to be shortly discussed

- ✓Roots of resilience
- ✓Current popularity
- ✓Similarities to traditional risk management and crisis management – so, what's new?
- ✓Development trend: from models to indicator-based measurement
- ✓Some examples of resilience applications
- ✓Against resilience?
- ✓Some conclusions

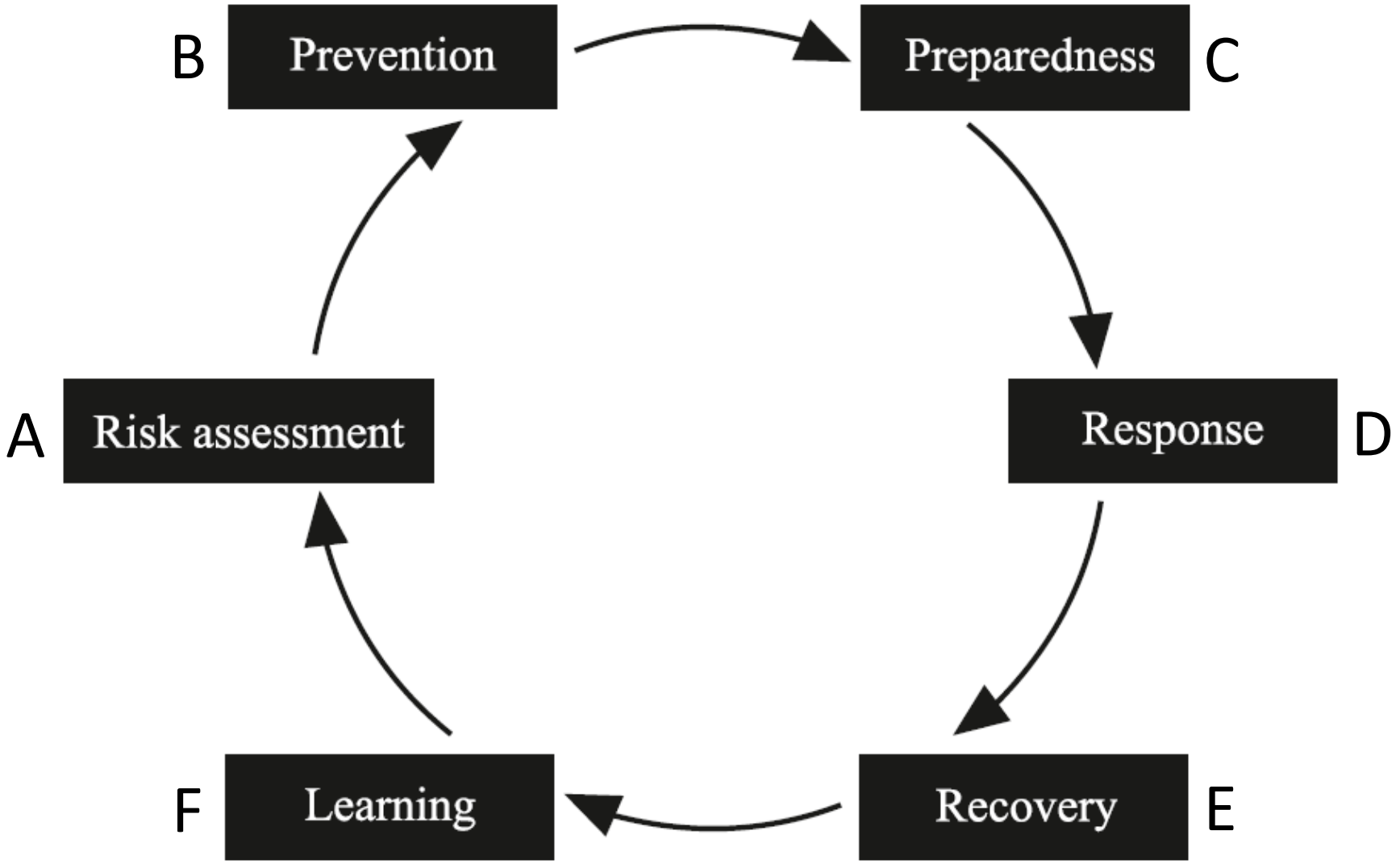
Resilience roots in material sciences from the early 1800 century



Current Popularity:
Resilience in WoS



Typical Crisis Management Cycle



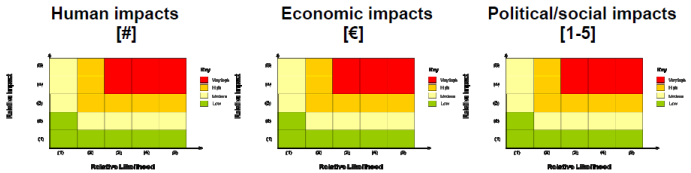
Pursiainen (2018)

Typical Risk Management Scheme

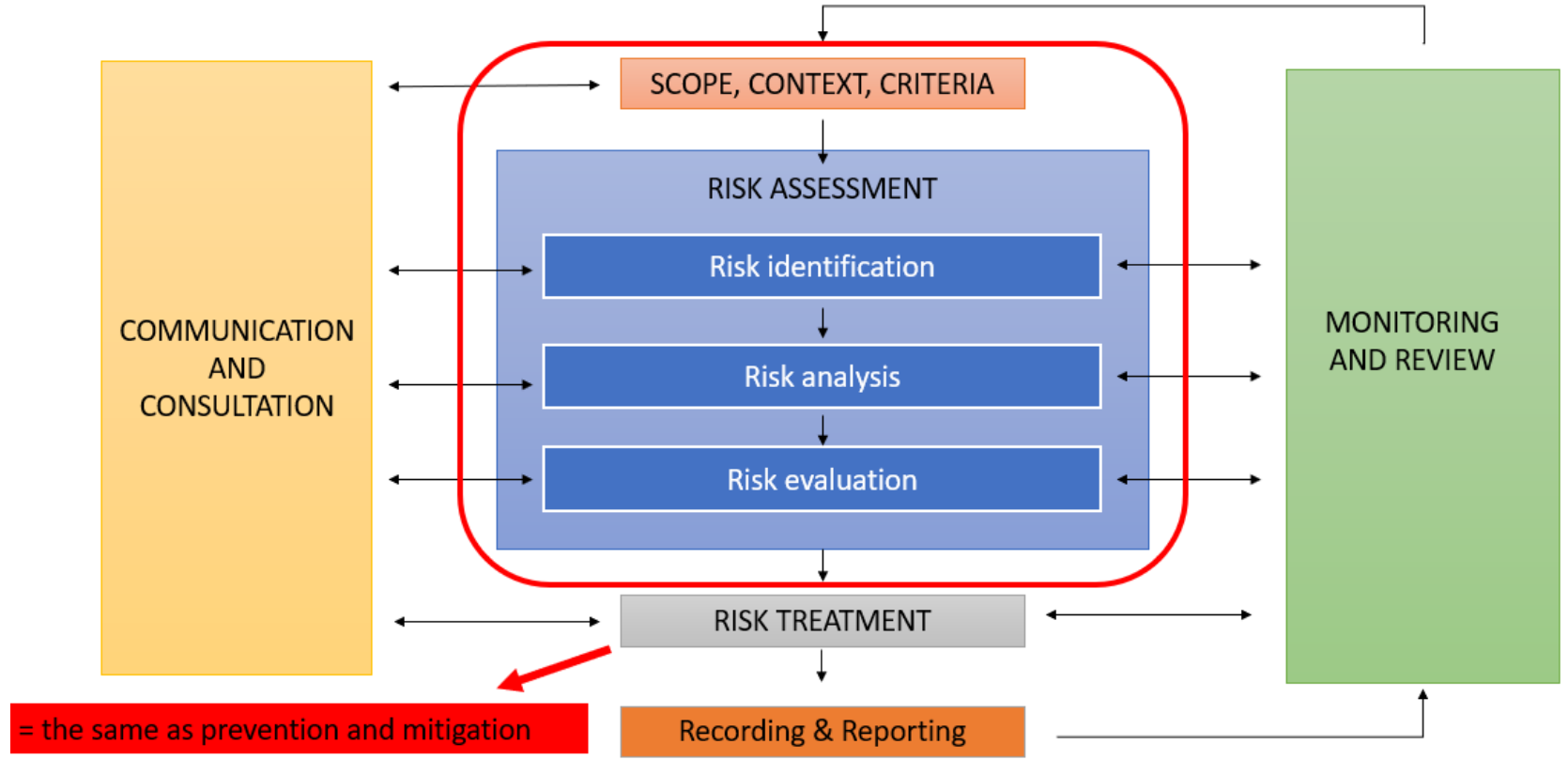
Basic risk matrix

Likelihood \ What is the chance it will happen?	Minor (How serious is the risk?)	Moderate	Major
Very likely	Acceptable risk Medium 2	Unacceptable risk High 3	Unacceptable risk Extreme 5
Likely	Acceptable risk Low 1	Acceptable risk Medium 2	Unacceptable risk High 3
Unlikely	Acceptable risk Low 1	Acceptable risk Low 1	Acceptable risk Medium 2

Impact
How serious is the risk?

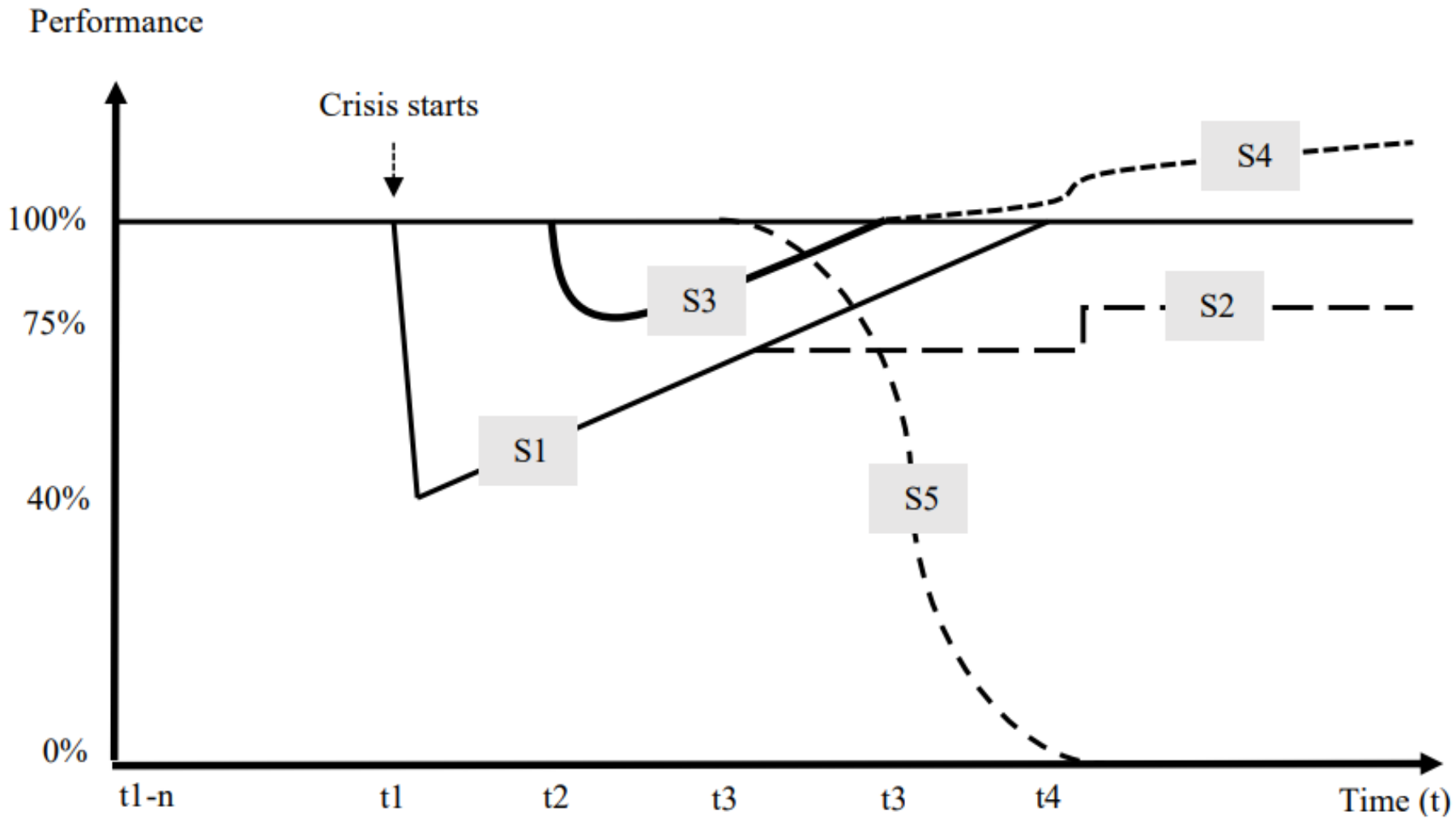


Risk Management (ISO 31000)



Adapted from ISO (2018) and ISO/IEC (2019)

Typical 'bouncing-back (engineering) resilience triangle' with variations



Adapted from Rød et al. (2020) and Pursiainen et al. (2016)

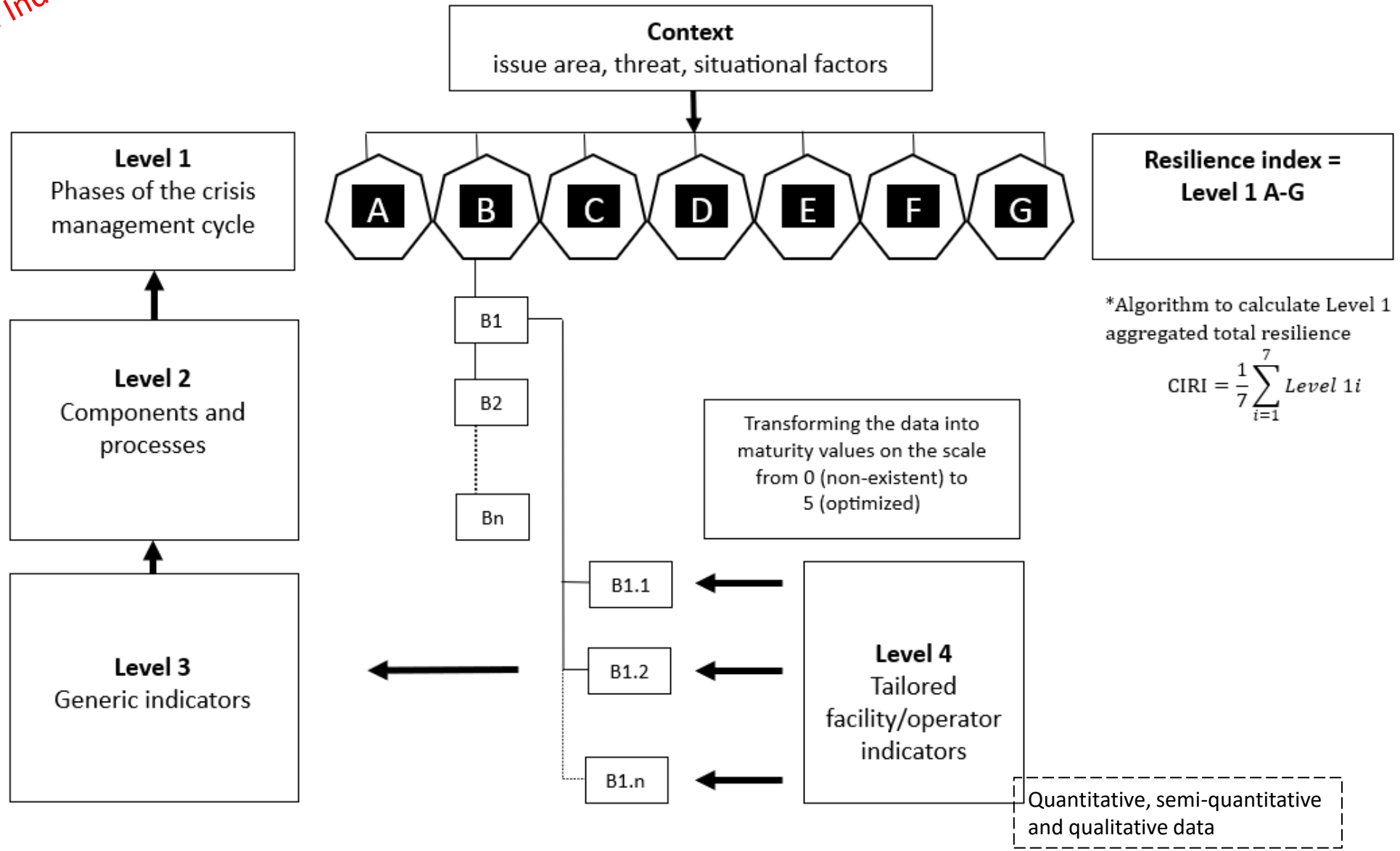
Examples of resilience applications

- ✓Technological/engineering
- ✓Societal/community
- ✓Organisational
- ✓Ecological
- ✓Macro-economic
- ✓…

Useful questions

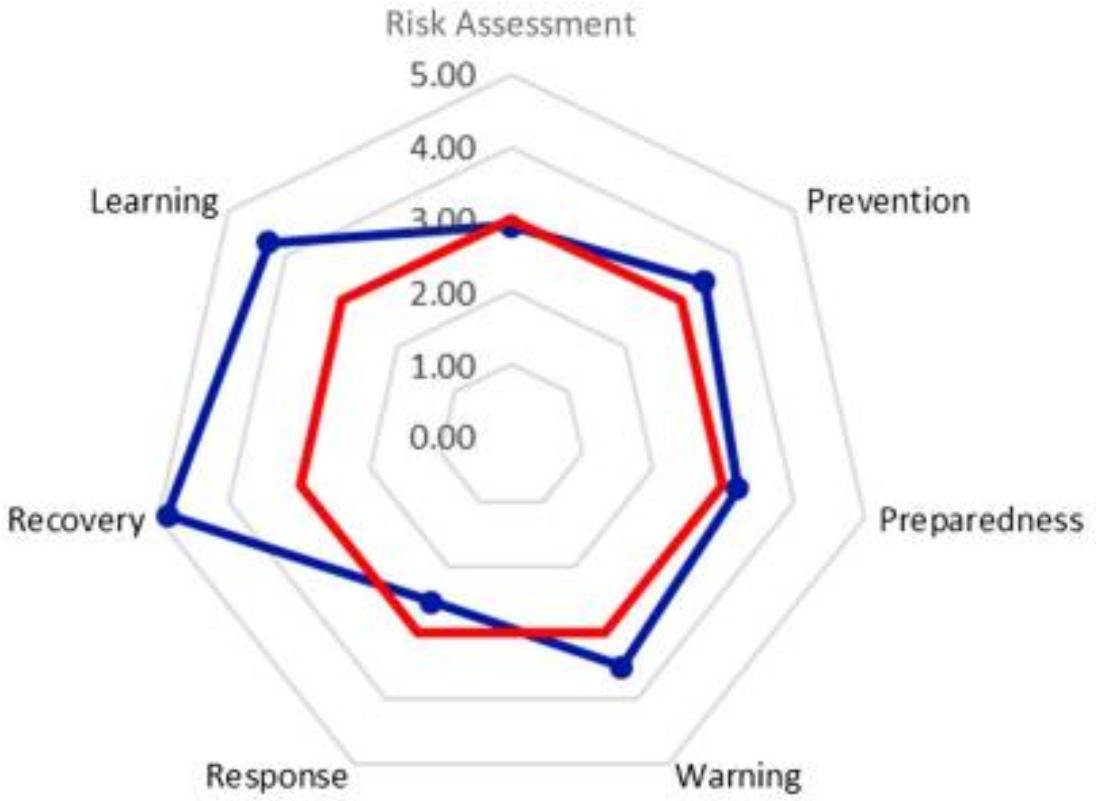
- ✓Resilient to what? By whom?
- ✓What are its components, elements, characteristics, dimensions, attributes...?
- ✓Can it be measured, evaluated, assessed...? What and how should be measured?
- ✓How can it be enhanced...?

Critical Infrastructure Resilience Index

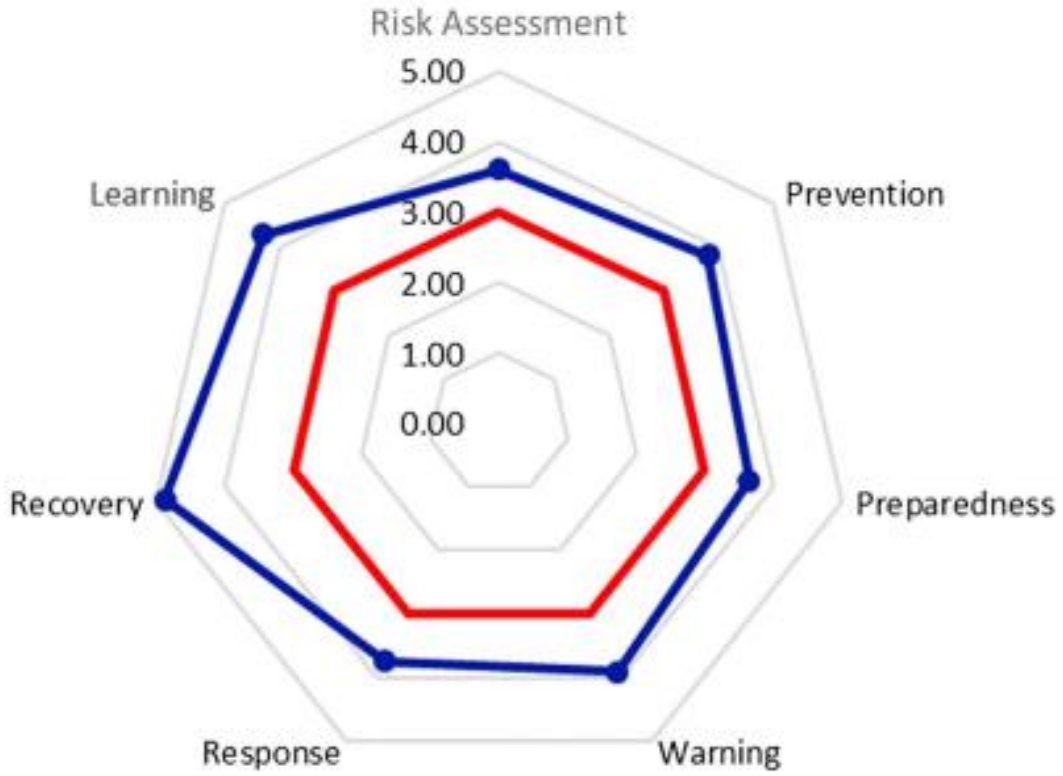


Adapted from Rød et al. (2020) and Pursiainen et al. (2016)

Enhancing Resilience



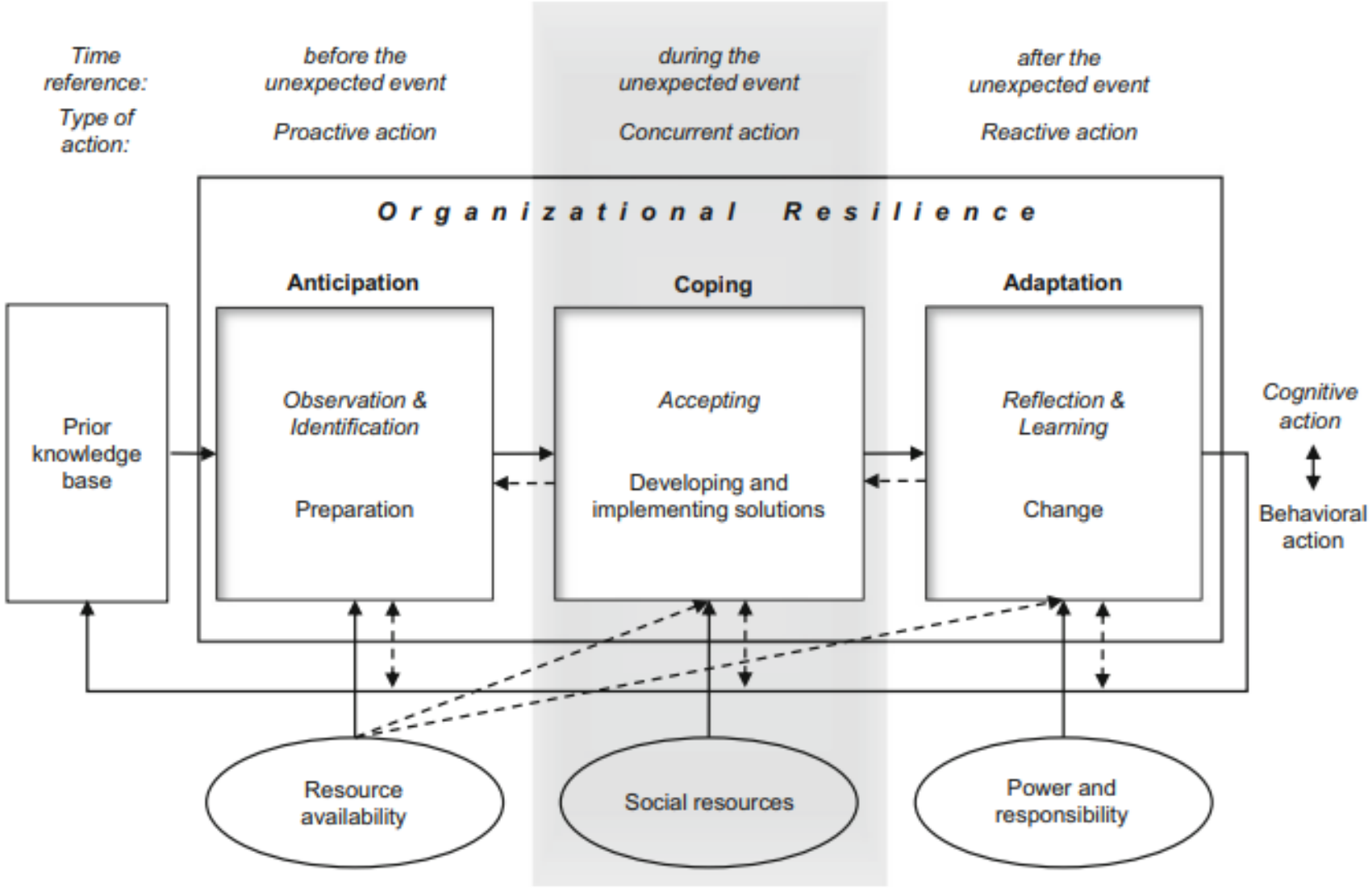
Blue = resilience measurement results
Red = the chosen minimum value



Blue = resilience measurement results after targeted enhancement
Red = the chosen minimum value

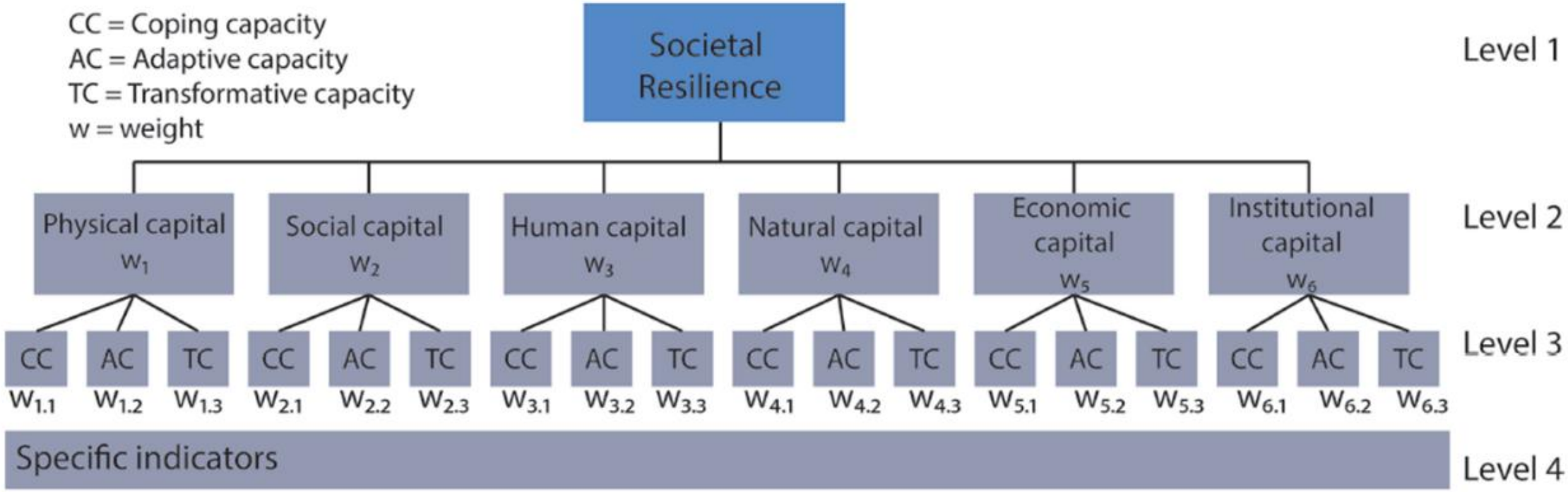
Rød et al. (2020) and Pursiainen et al. (2016)

Organisational Resilience model



Duchek (2020)

Societal Infrastructure Resilience Index



Rosenqvist et al. (2018)

Community Resilience Index application (Norway

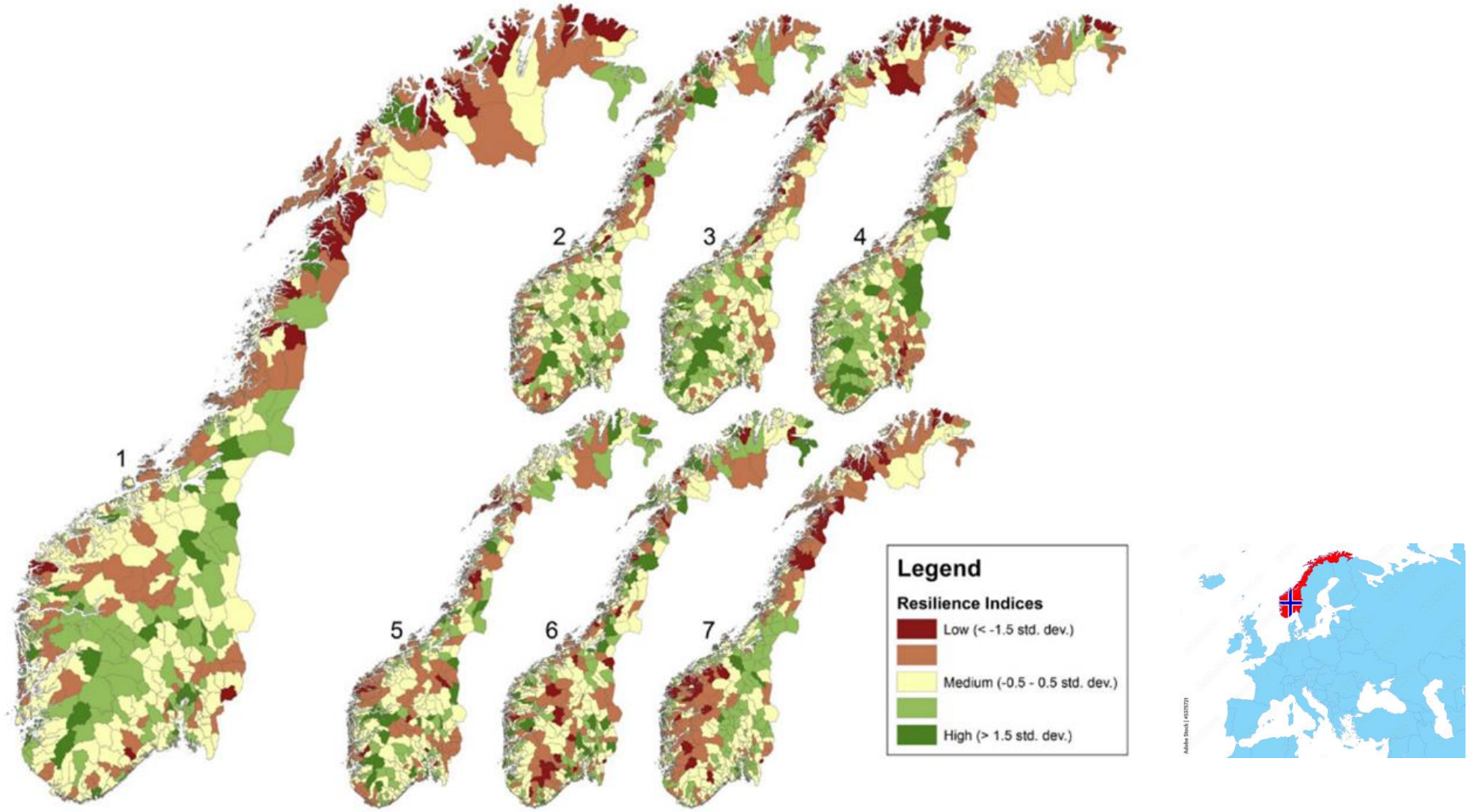


Fig. 2. Final community resilience index (1) and sub-indices; social (2), economic (3), community capital (4), institutional (5), infrastructure & housing (6) and environmental (7).

Scherzer et al. (2019)

Community Resilience Index application (Norway

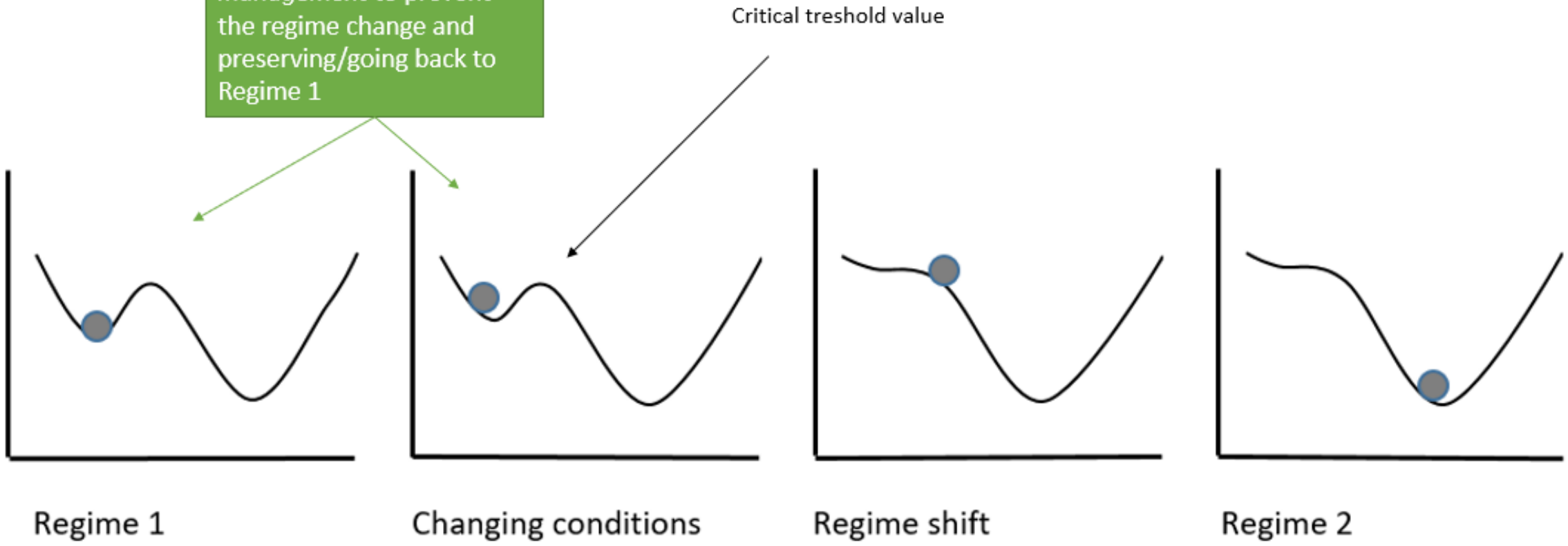
Table 1
Summary statistics for the indicators included in the community resilience index for Norway.

	Indicator	Mean	Std. dev.	Min	Max
Social	WORKING_AGE (% population)	64.64	2.07	58.46	71.62
	CARS (per 1,000 persons)	524.74	55.53	257.67	719.22
	INTERNET (subscriptions per 1,000 persons)	322.82	51.41	114.80	723.63
	NOT_SINGLE_PARENT (% households)	94.87	1.09	91.12	98.57
	NOT_ASSISTANCE (% population)	97.47	1.05	90.89	100
	PSYCHOLOGISTS (per 1,000 persons)	0.35	0.75	0.00	6.77
	DOCTORS (per 1,000 persons)	1.72	2.74	0.00	26.69
	GENDER_INDEX	0.67	0.04	0.56	0.79
Economic	EMPLOYED (% labor force)	97.51	1.01	92.88	99.55
	FEMALE_EMPLOYED (% labor force)	76.92	3.67	66.3	88.8
	EM_NOT_PRIMARY (% employed persons)	85.60	7.10	46.48	97.68
	RATIO_LS_BUSINESSES	0.01	0.01	0.00	0.11
	ENTERPRISES (per 1,000 persons)	73.98	18.12	36.37	172.98
	BANKS (per 1,000 persons)	1.62	1.35	0.00	11.79
	TURNOVER_RETAIL (per capita in NOK)	58464	28031	8027	208395
Inst.	FIRE_ACC_SPENDING (per capita in NOK)	976.57	617.12	307	8453
	NET_OP_SURPLUS (% gross op. revenues)	1.24	3.14	−9.00	18.20
	DIST_COUNTY_CAP (in meters)*	61897	44563	546	215381
	EM_MUN_PUBLIC (% employed persons)	29.19	8.63	13.16	86.78
Community Capital	EM_CREATIVE (% employed persons)	19.89	5.35	7.23	40.34
	RD_FIRMS (per 1,000 persons)	3.96	2.29	0.00	14.01
	MIGRATION (% population)*	10.43	2.96	4.46	20.60
	WORSHIP (per 1,000 persons)	2.72	1.98	0.19	10.83
	MUSEUMS (per 1,000 persons)	2.17	2.87	0.00	20.04
	SPORTS (per 1,000 persons)	2.62	2.33	0.00	15.69
	VOTER_TURNOUT (% voting age pop.)	76.98	3.75	65.10	91.10
	CLUBS (per 1,000 persons)	8.63	7.95	0.00	48.39
	CHILD_CARE (per 1,000 persons)	1.39	0.52	0.42	4.74
	BROADCAST (per 1,000 persons)	0.27	0.45	0.00	4.21
Infrastr. & Housing	RESPONSE (per 1,000 persons)	0.35	0.53	0.00	4.74
	DIST_FIRE_POLICE (in meters)*	8993	9749	1.00	68740
	DIST_HOSPITAL (in meters)*	35282	26283	1566	176594
	ACCIDENTS (per 1,000 persons)*	1.11	0.80	0.00	6.66
	RAILWAY_KM (in kilometers)	9.95	17.78	0.00	101.00
	ROAD_KM (in kilometers)	169.17	98.93	5.68	659.85
	DIST_AIRPORT (in meters)*	48165	33764	1369	152770
	EM_UTILITIES (% employed persons)	7.22	4.95	0.60	43.60
	URBAN_POP (% population)	53.34	27.24	0.00	99.14
Environmental	NOT_FLOOD_AREA (% land area)	96.36	3.02	79.73	100.00
	NOT_SLIDE_AREA (% land area)	95.66	5.86	69.64	100.00
	NOT_IMPERVIOUS (% land area)	77.06	22.57	9.72	100.00
	NOT_WATER (% land area)	94.58	3.53	69.86	99.93
	NAT_BUFFER (% land area)	18.14	13.79	0.00	60.05
	DEV_OPENSPACE (% land area)	0.45	1.56	0.00	21.15
	ARABLE_LAND (% land area)	11.59	13.71	0.00	83.27
	AG_HOLDINGS (per 1,000 persons)	21.93	18.85	0.00	93.93
	HAZARDS_FREQ (5-year average)*	32.33	41.87	0.40	403.80

Scherzer et al. (2019)

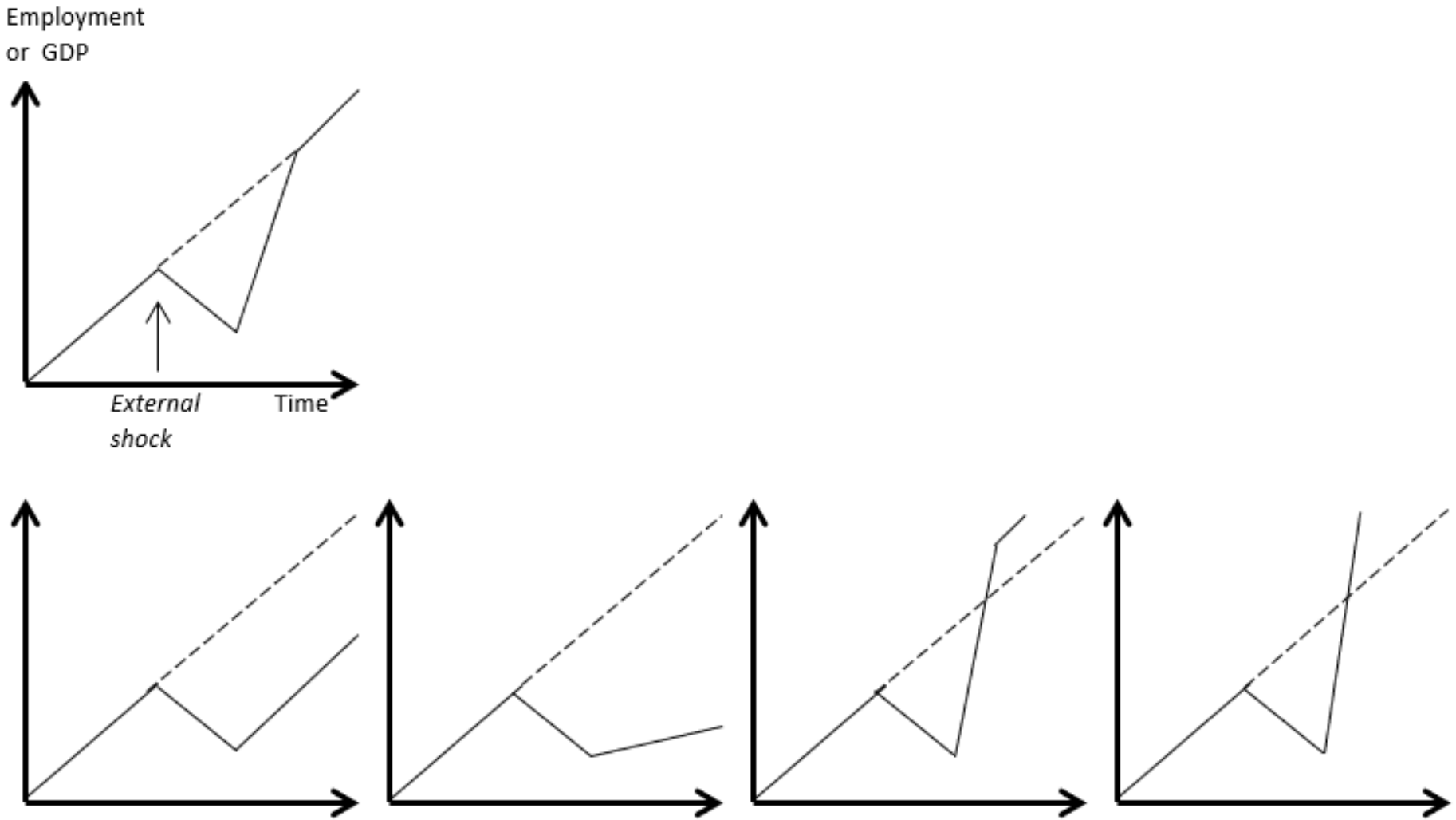
Ecological Resilience Index

Strategic leadership: *Environmental resilience management* to prevent the regime change and preserving/going back to Regime 1



Adapted from Folke et al. (2004)

Macro-economic
Resilience variations



Adapted from Martin (2012) and Martin & Sunley (2004)

Against resilience?

- ✓Resilience as an expression of neoliberalism
- ✓Withering of the capacity of governments to govern based on the idea of ‘cause and consequence’ in politics

E.g., Chandler (2014); Brasset et al. (2013); Walker & Cooper (2011)

Some conclusions

- ✓Adaptation, bouncing back, or both?
- ✓From modelling to measurement/assessment to targeted enhancement of resilience
- ✓From multidisciplinary to transdisciplinary learning

For discussion?

- ✓Q/A
- ✓Your own reading and use of ‘resilience’?
- ✓Is resilience a useful concept, particularly from the perspective of sustainability? How are they related?

- Brassett, James, Stuart Croft & Nick Vaughan-Williams (2013). Introduction: An agenda for resilience research in politics and international relations. *Politics*, 33(4), 221–228.
- Chandler, David (2014). Beyond neoliberalism: Resilience, the new art of governing complexity. *Resilience: International Policies, Practices and Discourses*, 2(1), 47–63.
- Duchek, S. (2020). Organizational resilience: a capability-based conceptualization. *Business Research*, 13, 215-246.
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L., & Holling, C.S. (2004). Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution and Systematics*, 35, 557-581.
- ISO (2018). *Risk management – Guidelines. ISO 31000:2018*. International Organization for Standardization. Geneva, Switzerland.
- ISO/IEC (2019).. Edition 2.0. IEC 31010. International Organization for Standardization. Geneva, Switzerland. *Risk management — Risk assessment techniques*
- Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography*, 12, 1-32.
- Martin, R. & Sunley, P. (2015). On the notion of regional economic resilience: conceptualization and explanation. *Journal of Economic Geography*, 15, 1-42.
- Pursiainen, C. (2018). *The crisis management cycle*. Abingdon, UK: Routledge.
- Pursiainen, C., B. Rød, G. Baker, D. Honfi, and D. Lange (2016). Critical infrastructure resilience index. In *Proc., Risk, Reliability and Safety: Innovating Theory and Practice*, 2183–2189. Boca Raton, FL: CRC Press.
- Rosenqvist, H. et al. (2018). ISRA: IMPROVER societal resilience analysis for critical infrastructure. In Haugen et al. (eds.). *Safety and Reliability – Safe Societies in a Changing World*. London: Taylor & Francis Group.
- Rød, B., Lange, D., Theocharidou, M., & Pursiainen, C. (2020). From Risk Management to Resilience Management in Critical Infrastructure. *Journal of Management in Engineering*, 36(4): 04020039.
- Scherzer, S., Lujala, P., & Rød, J.K. (2019). A community resilience index for Norway: An adaptation of the Baseline Resilience Indicators for Communities (BRIC). *International Journal of Disaster Risk Reduction*, 36, 101107.
- Walker, Jeremy & Melinda Cooper (2011). Genealogies of Resilience: From Systems Ecology to the Political Economy of Crisis Adaptation. *Security Dialogue*, 42(2): 143–160.

Thank you for your attention!

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