Human Security Approach to Urban Resilience

Advancing the state of the art by positioning urban resilience within the human security paradigm

Preparedness and Resilience to Address Urban Vulnerabilities (PRUV)
Work Package 4

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Introduction

The research objective of this work package (WP4) is to advance the state of the art by positioning urban resilience within the human security paradigm. Several case-studies will contribute to this aim by addressing principles of complex systems theory which connect urban resilience and human security. In addition to these necessary elements, case-specific features (from all work packages) may assist in a more precise positioning of the urban resilience perspective within the human security paradigm (see table 1). Ahead of a more elaborate review paper, this research design offers a concise discussion of the contemporary literature on human security and urban resilience in which these commonalities are identified.

Table 1: Positioning urban resilience within the human security paradigm

	Human Security		**Urban Resilience**
Case-study necessities	*Non-linearity*		
	Adaptability		
	Chaotic appearance		
	…		
+ Case-specific features	*…*	*…*	*…*
	= Human security paradigm 2.0		

As delivery of research designs for the other work packages was required earlier, the University of Groningen (UG) has been working closely with its fellow work package leaders on the project's encompassing conceptual framework, ethical considerations, and preparation for baseline data collection. During two months of intensive theoretical researcher-practitioner engagement at Future Analytics (FAC) and University College Dublin (UCD) the involved consortium partners have looked at the PRUV theme through each other's legal, social cultural, political, and public health lenses. By exploring the linkages between the work packages, they have ensured the holistic approach needed for both field work in Africa, Asia, and Latin-America, and the development of evidence-based, lasting and sustainable solutions which are (cost-)effective, with a wide utility and transferability. Questions relating to a number of security dimensions at the individual and household levels of analysis have already been inserted into a common questionnaire to be dispersed, pending ethical approval, through Open Data Kit (ODK), in the selected test-bed sites. Once having added these findings to secondary data, simultaneously being compiled, its researchers will use other techniques

such as interviews and observation on site to complete, clarify, and triangulate the aggregate information, thus preparing it for analysis.

Central to the analysis in WP4 will be the Humanitarian Analysis and Intervention Design Framework (H-AID), a product of over a decade of interdisciplinary humanitarian action research and training at the UG and elsewhere.[1] Building on best practices of existing frameworks for humanitarian crisis analysis, H-AID offers an innovative combination of analytical tools for context, intervention, and stakeholder analysis. The specific case-study designs will be further developed in the upcoming months by Globalization Studies Groningen (GSG) and the involved researchers from different faculties at the UG. It is envisaged that they will include a broad spectrum including environmental security (food, soil, and water), political security (formal and informal governance), and transport security (infrastructure and mobility). Thus exploring urban resilience across complex human security contexts along systems-theoretical and other lines of thought, WP4 seeks to create an enriched and more practicable 'human security paradigm 2.0.' What follows here is first a discussion of human security, and more specifically humanitarian intelligence and the H-AID framework, followed by a chapter on urban resilience. In a third part on complex systems specifically, the commonalities between both interpretative frameworks are explicated.

1. Human security

As the international security system has grown more complex, a holistic approach is called for in International Relations and Security Studies.[2] The construct of human security answers to this call by broadening a long-established, but rather limited notion of security as the condition of territorial integrity upon which statehood depends. Through the process of 'securitization', any subject may nowadays come to be understood as a matter of security at any scale - from states to individuals. Human security is contingent on a dynamic balance of conditions relating to these overlapping context dimensions and levels of analysis as they can be mutually reinforcing as well as exclusive. It is therefore necessary to comprehensively assess any security threat by studying it through the

[1] Liesbeth Heyse et al, *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming* (Routhledge, 2014); Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Rowman & Littlefield, 2016); Pat Gibbons and Hans-Joachim Heintze, *The Humanitarian Challenge: 20 Years European Network on Humanitarian Action (NOHA)* (Cham: Springer, 2015).

[2] Luis Tomé, "Complex Systems Theories and Eclectic Approach in Analysing and Theorising the Contemporary International Security Complex," in *Handbook of Research on Chaos and Complexity Theory in the Social Sciences*, eds. Şefika Şule Erçetin and Hüseyin Bağcı (IGI Global, 2016), 19-32.

prisms of other dimensions and at multiple levels.[3] In that sense, speaking of interdependent human securities in its plural rather than singular form may be more apt.[4] Resilience, in conventional thinking about security, is the maintenance of stability through absorption of, or resistance to a distortion, while the more dynamic notion of human security depends on adaptive and transformative capacities.[5]

Whilst the list was originally expanded to include economic, food, health, environmental, social and cultural, political, and personal security, there seems to be no limit to the number of items which can be securitized.[6] In terms of human security, the context dimensions prevalent in the other work packages would be socio-economic (WP1), protective (WP2), legal (WP3), and health (WP5) security. This conceptualization allows for engagement with the other work packages, and building on the combined research findings regarding urban resilience to position it within the human security paradigm. The case-studies developed within work package 4 will do so specifically along the lines of the complex systems theoretical concepts present in both constructs, which may in turn contribute to the other work packages. A complete discussion of the re-conceptualization of security, and the process of securitization, goes beyond the purpose of this research design. As it pursues the identification of this system-theoretical thinking, however, it is interesting to note how the concept has been applied in humanitarian intelligence gathering.

1.1. Humanitarian intelligence

Humanitarian intelligence, as defined by Zwitter, is 'the use of investigative and analytical techniques in service of rapid and continuous assessment, project and program development, impact evaluation and learning.'[7] This humanitarian practice has many aspects in common with 'traditional' intelligence analysis, among which the intricate assessment of operational contexts and

[3] Andrej Zwitter and Joost Herman, "Context analysis and securitization," in *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming*, eds. Liesbeth Heyse et al. (Routhledge, 2014), 35-42.
[4] Victor T. King, "Of Risk, Uncertainty, Safety, and Trust:(Re) Locating Human Insecurities," in *Human Insecurities in Southeast Asia* (Springer Singapore, 2016), 7-19.
[5] Katrina Brown, "Social ecological resilience and human security," in *A Changing Environment for Human Security: Transformative Approaches to Research, Policy and Action,* eds. Karen O'Brien et al. (Routledge, 2013): 107-116.
[6] 1994 United Nations Human Development Report: http://hdr.undp.org/en/content/human-development-report-1994.
[7] Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Lanham: Rowman & Littlefield Publishers, 2016), p. 24.

probable impacts of interventions.[8] Citing Hall and Citrenbaum, Zwitter highlights three of the complexities involved: non-linearity – which is the disproportionality of effects to causes; chaotic appearance – because of which it is difficult to discern cause and effect; and adaptive systems – in which many stakeholders interact dynamically.[9] These can make the attachment of either qualitative or quantitative probabilities to such assessments a highly subjective exercise.[10] Informed by the comprehensive and multi-dimensional nature of human security, however, the H-Aid framework acknowledges and addresses these challenges.

1.2. The H-AID Framework

Dubbed the 'Groningen approach' to the further development of the human security paradigm for humanitarian analytical purpose,[11] H-AID is underpinned by social and political theory, but also by the aforementioned systems-resilience concepts.[12] For its context, intervention, and stakeholder analyses it uses a technique of absolute scaling.[13] With regard to the comprehensive context analysis (CCA), this method necessitates careful decomposition of the selected dimensions, the subsequent identification of a reliable number of valid indicators, and quantification of these on an ordinal scale.[14] Zwitter suggests analyzing the CCA by a subsequent capabilities and constraints analysis, and relational analysis.[15] Whilst ideally adapted for pre-post-incident analysis, the H-AID framework is also suited for theory-based ex ante evaluation of disaster impact and countermeasures. As both involve wide assumptions as to the ex post state of security however, in addition to the CCA a Context-Mechanism-Outcomes (CMO) approach is required to consciously specify in which context

[8] Ibid. p. 59.
[9] Ibid. p. 59-60.
[10] Alan Barnes, "Making Intelligence Analysis More Intelligent: Using Numeric Probabilities," *Intelligence and National Security* 31, no. 3 (April 15, 2016): 327–44.
[11] For a more recent discussion of the expressed need for evidence-based programming in this sector, see: https://www.odi.org/events/4457-evidence-informed-decision-making-complex-world; http://www.alnap.org/what-we-do/urban.
[12] Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Rowman & Littlefield, 2016): 59-84.

[13] Based on: Liesbeth Heyse et al, *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming* (Routhledge, 2014); Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Rowman & Littlefield, 2016); Pat Gibbons and Hans-Joachim Heintze, *The Humanitarian Challenge: 20 Years European Network on Humanitarian Action (NOHA)* (Cham: Springer, 2015).
[14] As an addendum to the H-Aid Framework, Zwitter offers a number of relevant questions pertaining to the classic human security dimensions: Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Rowman & Littlefield, 2016): 59-84.
[15] Andrej Zwitter, *Humanitarian Intelligence: A Practitioner's Guide to Crisis Analysis and Project Design* (Rowman & Littlefield, 2016); Pat Gibbons and Hans-Joachim Heintze, *The Humanitarian Challenge: 20 Years European Network on Humanitarian Action (NOHA)* (Cham: Springer, 2015): *91-95.*

which mechanisms set in motion lead to which outcomes, based on existing insights from previous experience in similar situations.[16] Subsequently, a stakeholder analysis – on agents, goals, interactions, resources, and institutions (AGIRI) – and social network analysis (SNA) are needed to map the relations of power and interest among decision makers.[17] As with the CCA and CMO, attaching comparable (numerical) values to these quantitative or qualitative facts involves subjective judgements, which call for careful interpretation and systematic, transparent, and explicit argumentation.[18]

At the highest aggregate level of analysis, the CCA could be informed by targets recently agreed through global deliberations such as the World Humanitarian Summit, Sendai framework for Disaster Risk Reduction; Paris Agreement on Climate Action, 2030 Agenda for Sustainable Development, New Urban Agenda, and agreements in more specific fields for which they set the stage. Indicators which enable measuring progress towards these goals in both absolute and relative terms are under development.[19] To the extent that they are underdeveloped, content analysis of the UN Global Sustainable and Human Development reports and their regional counterparts,[20] those of the World Bank[21] and regional development banks (notably ADB,[22] IADB,[23] AFDB[24]), reports of the

[16] Liesbet Heyse, "From context analysis to intervention design," in *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming*, eds. Liesbeth Heyse et al. (Routhledge, 2014): 132-148. (See also: Naomi Mihara et al, "A tale of two cities." *Devex* (20 March 2017): https://www.devex.com/news/a-tale-of-two-cities-89874; World Bank, *"City Partnership Program: Addressing Complex Development Challenges Together,"* 12 January 2017: http://www.worldbank.org/en/news/feature/2017/01/12/city-partnership-program-addressing-complex-development-challenges-together; Resilient Cities Connect (RCC): http://www.preventionweb.net/rcc/en/).

[17] For a more elaborate description of all main elements, see Rafael Wittek, "Stakeholder analysis: towards feasible interventions," in *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming*, eds. Liesbeth Heyse et al. (Routhledge, 2014): 149-170., and Andrej Zwitter, "Humanitarian Intelligence;" Gibbons and Heintze, *The Humanitarian Challenge,* 121-142.

[18] Rafael Wittek, "Stakeholder analysis: towards feasible interventions," in *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming*, eds. Liesbeth Heyse et al. (Routhledge, 2014): 149-170.

[19] See inter alia the World Council on City Data (WCCD): http://www.dataforcities.org/wccd/; ISO 37120:2014 Sustainable Development of Communities Indicators for City Services and Quality of Life: https://www.iso.org/standard/62436.html; Carey L. Biron, "How ISO Standards for City Data Are Starting to Make an Impact," *Cityscope* (March 6, 2017): http://citiscope.org/story/2017/how-iso-standards-city-data-are-starting-make-impact; and the World Development Indicators (WDI): http://data.worldbank.org/products/wdi.

[20] See inter alia the United Nations Sustainable Development Knowledge Platform: https://sustainabledevelopment.un.org/; the United Nations Development Programme (UNDP): http://www.undp.org/; and MacLennan, Michael, ed, "A new urban paradigm: pathways to sustainable development" *Policy in Focus* 13, no. 3 (2016): http://www.ipc-undp.org/pub/eng/PIF37_A_new_urban_paradigm_pathways_to_sustainable_development.pdf.

[21] World Bank Open Knowledge Repository: https://openknowledge.worldbank.org/.

[22] Asian Development Bank: https://www.adb.org/.

UN Office for Disaster Risk Reduction,[25] the UN Habitat regional reports and national urban policies,[26] and other research,[27] may serve to provide insight into the selected localities. Through combining this information with the deep insights gained from the fieldwork at different levels of analysis in Jakarta, Nairobi, and Bogotá, this research may assist both in the localization of these global goals and development of comparable indicators.[28] As these indicators may not be equally important, the H-AID framework suggests the attachment of different weights to them. Additionally, confidence intervals can be used to account for source and data reliability. In determining the relative gravity and credibility of indicators relating to accessibility (including affordability), it is crucial to address the gap between effective and nominal access.[29] Special regard for inclusive access is also warranted.[30] Table 2 provides tentative descriptors for different security levels and their

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[23] Inter-American Development Bank: http://www.iadb.org.

[24] African Development Bank: https://www.afdb.org/.

[25] United Nations Office for Disaster Risk Reduction (UNISDR): http://www.unisdr.org/, and its project website: http://www.preventionweb.net.

[26] UN-Habitat State of Cities Regional Reports: https://unhabitat.org/series/state-of-cities-regional-reports/.

[27] Most notably the Brookings Institution on Cities & Regions: https://www.brookings.edu/topic/cities-regions/ (e.g. https://www.brookings.edu/research/bolstering-urbanization-efforts/); the European Commission on European Civil Protection and Humanitarian Aid Operations and Disaster Risk Reduction: http://ec.europa.eu/echo/what/humanitarian-aid/risk-reduction_en; London School of Economics (LSE) Cities: http://www.lse.ac.uk/LSECities; and World Resources Institute (WRI) World Resources Report: http://www.wri.org/our-work/project/world-resources-report/cities (including its WRI Ross Center for Sustainable Cities: http://www.wrirosscities.org/).

[28] Gregory Scruggs, "Since Habitat III, an uptick in interest around national urban policies," 24 March 2017: http://citiscope.org/story/2017/habitat-iii-uptick-interest-around-national-urban-policies; On 'deep knowledge', see: Astrid Zweynert, "Philanthropy's Drive for 'Better Cities' Needs Data and Deep Urban Knowledge," *Foundation, Thomson Reuters*, 8 November 2016: http://news.trust.org/item/20161108160333-00wse/.

[29] Sumila Gulyani, "Are you being served? The gap between effective and nominal access to infrastructure services," 8 September 2016: http://blogs.worldbank.org/sustainablecities/are-you-being-served-gap-between-effective-and-nominal-access-infrastructure-services ; Tatiana Peralta Quiros and Camila Rodriguez, "To measure the real impact of transport services, affordability needs to be part of the equation," 15 December 2016: http://blogs.worldbank.org/transport/measure-real-impact-transport-services-affordability-needs-be-part-equation; Tatiana Peralta-Quiros and Shomik Mehndiratta, "Measuring and Exploring the Global Dimensions of Access," *Brookings*, February 15, 2017: https://www.brookings.edu/blog/the-avenue/2017/02/15/measuring-and-exploring-the-global-dimensions-of-access/; and the University of Minnesota Accessibility Observatory: http://ao.umn.edu/.

[30] Karla Dominguez Gonzalez et al, "When good transport alone doesn't bring jobs closer to women: insights from Mexico City, *Transport for Development*, 1 December 2016: http://blogs.worldbank.org/transport/when-good-transport-alone-doesn-t-bring-jobs-closer-women-insights-mexico-city; Annette Dixon and Joe Qian, "Women can play a greater role in realizing South Asia's potential," *End poverty in South Asia*, 8 March 2017: https://blogs.worldbank.org/endpovertyinsouthasia/women-can-play-greater-role-realizing-south-asia-s-potential; Charlotte McClain-Nhlapo, "What the New Urban Agenda Tells Us about Building Inclusive Cities," *Sustainable Cities*, December 6, 2016: http://blogs.worldbank.org/sustainablecities/what-new-urban-agenda-tells-us-about-building-inclusive-cities; Rafael H. M. Pereira, Tim Schwanen, and David Banister, "Distributive

corresponding values, which are then mapped onto radar graphs showing the security state of the different context dimensions, thus bringing evidence-based programming within closer reach of governments and non-governmental actors.[31]

Table 2: Contextual security levels and descriptors[32]

Type	Level	Descriptor	Value
Security	A	Ideal state of security as defined; or state close to ideal with no significant indication of threats to a security context.	6
Latent threat	B1	Average or just below average state of security; some vague indications of threats, which in total are no threat to an aspect of security; no indicators for negative trends.	5
	B2	Below average state of security; some indications of threats, which in total are no threat to an aspect of security in the long run; accompanied by indicators showing negative trends.	4
Manifest threat	C1	Single indicators or a combination of indicators, which in total threaten to cause damage to a population in the long run.	3
	C2	Single indicators or a combination of indicators, which in	2

Justice and Equity in Transportation," *Transport Reviews* 37, no. 2 (2017): 170–91; Anonymous, "Breaking the Link Between Extreme Weather and Extreme Poverty," *World Bank*, 14 November 2016: http://www.worldbank.org/en/news/feature/2016/11/14/breaking-the-link-between-extreme-weather-and-extreme-poverty; Jia Zheng, Judy, Jon Kher Kaw, Annie Bidgood, Sangmoo Kim, Marisa Garcia Lozano, and Rosanna Nitti, "The 'Human Scale' in Public Urban Areas," *Sustainable Cities*, December 6, 2016: https://blogs.worldbank.org/sustainablecities/human-scale-public-urban-areas; Ede Ijjasz-Vasquez and Joe Leitmann, "Investing in Resilient Cities Can Help the Urban Poor," *Sustainable Cities*, 25 October 2016: http://blogs.worldbank.org/sustainablecities/investing-resilient-cities-can-help-urban-poor; and Paul Daley, "Can Indigenous Culture Ever Coexist with Urban Planning?" *Guardian Sustainable Business*, April 15, 2017: https://www.theguardian.com/sustainable-business/2016/nov/22/can-indigenous-culture-ever-coexist-with-urban-planning. For contributions from the WRI Ross center, see: http://wrirosscities.org/news/release-wrr-towards-a-more-equal-city and http://www.wri.org/our-work/project/world-resources-report/cities.

[31] For a discussion of the benefits of visualization and interpretation of the CCA through the medium of radar graphs, see: Zwitter, "Conducting comprehensive context analysis," 53-62.

[32] Andrej Zwitter, "Conducting comprehensive context analysis," in *Humanitarian Crises, Intervention and Security: A framework for evidence-based programming*, eds. Liesbeth Heyse et al. (Routhledge, 2014): 53-62.

		total threaten to cause immediate damage to a population.	
Acute threat	D1	Single indicators or a combination of indicators, which already cause widespread damage to a population.	1
	D2	Single indicators or a combination of indicators, which already cause widespread damage to a population or result in a high number of victims.	0

2. Urban Resilience

Lack of resilience, as tentatively defined within the PRUV project proposal, is ultimately the extent to which unpreventable exogenous shocks and/ or stress cause a dire situation to escalate into humanitarian crisis. Such aggravation may be mitigated by the level of preparedness: the advance planning of disaster response, but also by favorable endogenous socio-economic, legal, public health, and other conditions. This broad understanding acknowledges the fact that resilience remains an essentially contested concept.[33] Whilst climate change, resource pressures, environmental degradation, and precarious livelihoods weigh in on both rural and urban resilience, the accompanying process of urbanization, causing rapid and unplanned urban change, poses distinct challenges. Urban complexities, including social, ecological and technical systems (SETs),[34] necessitate an adapted approach by aid actors - especially in the wake of rising frequency and severity of natural disasters. Such an approach to urban resilience requires, as with human security, a holistic understanding of its complex dynamics.[35]

Drawing on both urban and resilience theory, Meerow et al. propose a definition which explicitly addresses crucial conceptual tensions in existing characterizations of urban resilience.[36] With regard to the desirable adjustment of complex systems after disruptions, the literature distinguishes between two types of resilience, named after the fields in which they were first introduced: 'engineering resilience' is the idea that a system is able to return to its previous single-

[33] Cecile de Miliano et al, "Resilience: The Holy Grail or Yet Another Hype?" In: *The Humanitarian Challenge*, ed. Pat Gibbons et al. (Springer International Publishing, 2015) 17-30.

[34] Timon McPhearson et al, "Advancing understanding of the complex nature of urban systems," *Ecological Indicators* 70 (2016): 566-573.

[35] Sara Meerow and Joshua P. Newell, "Resilience and complexity: A bibliometric review and prospects for industrial ecology," *Journal of Industrial Ecology* 19.2 (2015): 236-251.

[36] Sara Meerow et al, "Defining urban resilience: A review," *Landscape and urban planning* 147 (2016): 38-49.

state, whilst 'ecological resilience' allows for multiple stable states by which it is able to absorb disturbance but nevertheless remains functioning and keeps its identity.[37] Engineering resilience works through the instrument of persistence, while the other conceptualization involves transition or transformation.[38] These mechanisms resemble the triptych of what Béné et al. paint as the active absorptive, adaptive, and transformative capacities to address passive vulnerabilities.[39] As for a working definition, the work packages propose to follow Meerow et al. in broadly defining urban resilience as 'the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.'

Such a comprehensive understanding does not yet make for practicable and communicable solutions, nor does it allow for easy quantification and comparison. It may therefore also be wise to link up with authoritative definitions and measurement efforts, even if they do not explicitly cover all the above mentioned aspects. Examples of these are offered by the United Nations General Assembly's (UNGA) open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction,[40] but also efforts undertaken by other international organizations, governments, and non-governmental organizations.[41]Also helpful in this regard may be Maruyama's taxonomy of resilience, categorized by type of shock, target system, and type of recovery, which may then inform numerous resilience strategies.[42] Suárez et al. suggest it should be possible to select salient resilience factors, e.g. diversity, for which indicators can be identified that allow for analysis of capacities to learn and change.[43] Neither theirs nor any other widely used method focuses on the dynamic interaction involved though.[44] Whilst resilience as such may defy measurement, heuristic devices from the study of complex systems can help formulate targeted research questions.

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[37] Meerow et al, "Defining urban resilience," 43-44.
[38] Meerow et al, "Defining urban resilience," 44.
[39] Christophe Béné et al, "Is resilience a useful concept?" 124-25.
[40] 2016 Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction to the United Nations General Assembly: http://www.preventionweb.net/files/50683_oiewgreportenglish.pdf.
[41] Anonymous, "Strengthening Global Collaboration to Support Urban Resilience," *World Bank*, April 15, 2014: http://www.worldbank.org/en/news/feature/2014/04/15/stengthening-global-collaboration-for-urban-resilience.
[42] Yoshiki Yamagata and Hiroshi Maruyama, eds. *Urban Resilience: A Transformative Approach* (Springer, 2016).

[43] Marta Suárez et al, "Towards an Urban Resilience Index: A Case Study in 50 Spanish Cities," *Sustainability* 8(8) (2016): 774.
[44] Leena Ilmona, "Approaches to measurement of urban resilience," in *Urban Resilience: A Transformative Approach*, ed. Yoshiki Yamagata and Hiroshi Maruyama (Springer International Publishing, 2016), 207-237.

3. Complex systems

The interpretative framework of urban resilience draws attention to interactions within and between urban systems and their constituent socio-ecological and socio-technical networks across temporal and spatial scales.[45] Like in the human security paradigm, these scales include multiple dimensions at different levels of aggregation.[46] Various tools have been developed to assess community resilience, but they largely ignore cross-scale relationships entirely.[47] The system theoretical concept of 'emergence', as applied in Complex Adaptive Systems theory (CASt), may be more helpful in their interpretation.[48] Whilst traditional approaches to disaster management suffered from linear thinking about causality, CASt sheds light on how complex adaptive behavior at macro-levels emerges from micro-levels interactions in seemingly chaotic open and shifting systems.[49] This emergent behavior is governed by, inter alia, feedback and thresholds, which may be studied as part of adaptive cycles (as shown in figure 1) within an interactive panarchy of complex, self-organizing systems.[50] In this model, the behavior of any system is characterized by a life cycle with a rise and a consequent fall – triggered by connected systems, after which it will need to reorganize, assisted by connected systems, in order to recover.[51]

[45] Meerow et al, "Defining urban resilience," 45.
[46] Christophe Béné et al, "Is resilience a useful concept?" 130-131.
[47] Ayyoob Sharifi, "A Critical Review of Selected Tools for Assessing Community Resilience," *Ecological Indicators* 69 (2016): 629-647.
[48] Christo Coetzee et al, "Disaster Resilience and Complex Adaptive Systems Theory," *Disaster Prevention and Management: An International Journal* 25(2) (2016): 196-211.
[49] Christo Coetzee et al, "Emergent system behaviour as a tool for understanding disaster resilience: The case of Southern African subsistence agriculture," *International Journal of Disaster Risk Reduction* 16 (2016): 115-122.
[50] Sjaak Swart (forthcoming); alternatively: Christo Coetzee et al, "Disaster Resilience and Complex Adaptive Systems Theory," 196-211.
[51] Lance Gunderson et al, "Resilience of large-scale systems," *Scope-scientific Committee on problems of the environment, International Council of Scientific Unions* 60 (2002): 3-20.

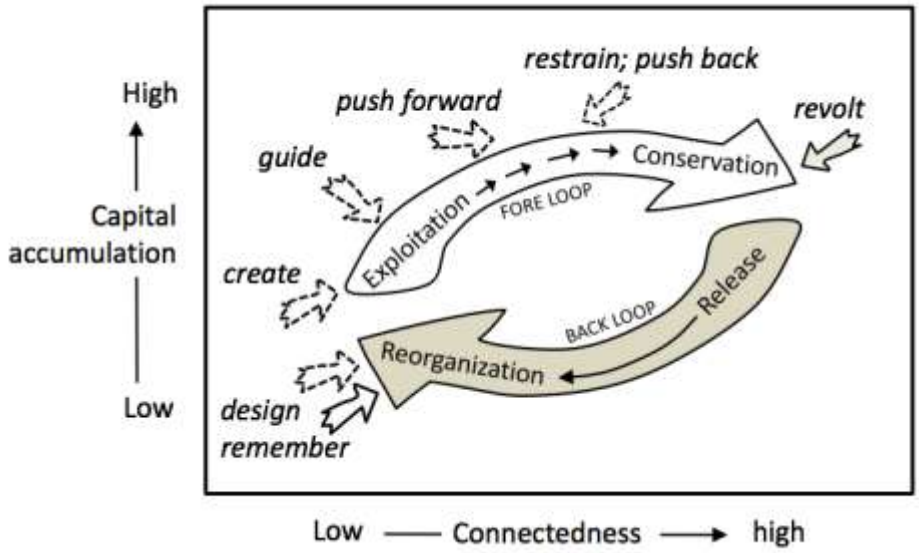

Figure 1: Stylized adaptive cycle. The adaptive cycle, after Walker and Salt (2006) in which 4 phases are distinguished: exploitation, conservation, release, and reorganization. The black arrows inside big arrows indicate the speed of the cycle, where shorter black arrows refer to a slower flow in the cycle. The arrows outside the cycle refer to linkages from other natural or social systems affecting the cycle. The term "remember" refers to a memory function of a connected larger system, which may help the systems to follow its way in the adaptive cycle system; "revolt" refers to a trigger by a another system, leading to a collapse of the conservation phase and the entering of the system into release phase. Remember and revolt are suggested by Holling and Gunderson (2002) in their original Panarchy model. The other linkages (dotted arrows) are hypothesized as additional interventions.[52]

For any specific research problem, questions implied by this interpretative framework may then be:

- Which systems and constituent networks can be distinguished?
- What are the connections between the different systems?
- On what spatial and temporal scales do they operate?
- Which spatial dimensions and levels of aggregation are salient?
- Which cross-scale/ emergent/ micro-macro patterns can be identified?

As the ultimate goal is to prevent or end humanitarian crisis (a system's collapse), the concept of thresholds warrants special attention. At what critical levels of aggravation triggered by shocks and/ or stress can a system only recover by transformation rather than mere adaptation (or even just absorption)? This question also informs the debate on when and how interventions are merited. One criterion could be the risk of a cascade in which failure of one subsystem by catalysis via critical

[52] Sjaak Swart, forthcoming. B.H. Walker and David Salt, *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. (Washington DC: Island Press, 2006); L.H. Gunderson et al, "Resilience of Large Scale Resource Systems," in *Resilience and the Behavior of Large-Scale Systems*, ed. Lance H. Gunderson and Lowell Pritchard (Island Press, 2002), 3-20.

nodes may lead to a collapse of the entire system, possibly setting in motion a further chain reaction with much wider impact on human security beyond the level at which it originated.[53] Further questions are then:

- What are the possible intervention points, feedbacks, and trade-offs?
- What are the realistic possibilities for intervention (costs, time and spatial scales)
- What type and level of resilience is at stake and how do we operate it?
- What is needed to perform such an intervention?

As systems-resilience theory itself has only recently emerged, however, generalizable empirical support for these and other models is still limited, as is their explanatory and predictive value.[54] With regard to the adaptive cycles model specifically, Duit and others have questioned the applicability of its ecological logic to social systems – which can occupy several phases simultaneously and also be driven by human agency and the distinct complexities of politics and policy-making.[55] The human security paradigm addresses these points of critique by combining elements of systems-resilience, such as non-linearity, adaptability, and chaotic appearance with social and political theory.

Conclusion

This research design offers global guidance to the researchers involved in work package 4, and several ways to engage with the other work packages. Seeking to advance the state of the art by positioning urban resilience within the human security paradigm, common underlying principles from the study of complex systems will inform all case-studies. While there are more, non-linearity, adaptability, and chaotic appearance stand out. Combined with case-specific elements feeding back into that synergy, they contribute to a better understanding of urban resilience, and enrichment of the human security paradigm.

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