

APPLICATION WHITE PAPER

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Project Title: “Un”Resilience: Drawing Insights from Societal Collapse

Topic Number: 2

Topic Title: Considering Societal Resilience at Multiple Scales

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IDENTIFICATION OF THE RESEARCH AND ISSUES

Despite the extensive literature on resilience, the field often relies on generalized descriptions [1], making it challenging to operationalize and measure resilience [2]. This difficulty may arise from the inherent challenge of directly observing resilience. When a system efficiently absorbs specific shocks, its observable resilience may be obscured by its absorptive capacity. For instance, if someone contracts COVID-19 but remains asymptomatic, their resilience to the virus remains unobserved and unmeasured.

Resilience discourse, widely applied across domains [5], includes societal resilience defined by communities’ rebound capacity from crises [6], encompassing resistance, recovery, and creativity [7]. Scholars delineate social resilience into coping, adaptive, and transformative capacities [8]. Essential for navigating challenges like climate change and urban expansion, quality of life indicators are crucial for a society’s ability to navigate uncertainty and adapt to shocks [9]. However, resilience assumptions include linearity, distinct “stages” of absorption and recover, and “direct” system properties, with consensus on resilience definitions. While the core idea of resilience remains—bouncing back from stress or shock [6]—varied perspectives challenge the identification of new contributions, requiring reconciliation.

Amid debates on identifying new contributions, a shift toward studying collapse emerges as an alternative perspective to understand societal responses to shocks. The ability to observe “collapse” opens new doors to look at a diversity of shock types—including financial, ecological, natural disasters, human displacement, and other socio-ecological disasters—of varying degrees and intersecting with one another to measure the collapse of society (even low-levels of “collapse,” meaning certain subsystems but not others).

Peterson posits, “Collapse is the shadow of resilience, consequently studying collapse is indirectly the study of what makes a system resilient” [3]. In this project, we propose to study the collapse of a society, which is observable through criteria established by Cumming and Peterson [4], as a way to infer the typology of shocks that lead to collapse (observable) or resilience (potentially unobservable). While it might also be difficult to observe societal “collapse,” we rely on a proxy for identifying candidate global events by using *perceived* societal crises through news coverage.

For decades, scholars have focused on studying socio-ecological collapse, emphasizing that “collapse” doesn’t imply dark, apocalyptic events. Debates exist on “how much and what kind of change constitutes collapse,” but criteria have been developed to systematically observe it [4]. Cumming and Peterson explain, “Collapse and resilience are two sides of the same coin; collapse occurs when resilience is lost, and resilient systems are less likely to collapse” [4]. The four criteria to identify societal collapse are socio-ecological systems losing service or identity, rapid loss of system identity, significant capital loss, and enduring impacts [4].

Goal: Systematically measure the public perception of societal collapse using existing data sources. Employ Natural Language Processing (NLP) and Machine Learning (ML) techniques to extract insights from news articles contextualized by data collected in surveys and interviews. This multifaceted approach aims to characterize the interconnections of shock-types. The data will help to explain perceptions of and propensity for societal collapse. We purposefully avoid studying the system’s specific configuration during collapse, focusing instead on high-level failures (e.g., economic system broadly, food systems broadly—not each subsystems configuration) caused by shocks/stressors. Considering specific factors wouldn’t significantly enhance the state of the art using novel methodologies towards understanding resilience.

Research Questions: What shocks, including subsequent or co-occurring shocks, lead to social perceptions of crisis/disaster? How do we systematically identify societal collapse? What characterization of shock types and combinations leads to perceptions of societal collapse? How does the typology of shock types and combinations explain the propensity for societal collapse? What are the perceived mechanisms that fail?

PROPOSED METHODS

The research relies on the use of “inference from absence” or “negative inference” as an indirect/inverse way to measure the resilience of systems [10]. This approach has been used in various fields, including anthropology/paleontology, environmental sciences, and physics, where direct observation and/or measurement of a phenomenon is difficult or impossible. By focusing on societal collapse/crisis and characterizing interconnected shocks that led to collapse, we can provide insights about those societies experiencing shocks that did not collapse or fall into crisis.

Phase 1 – Identify Cases of Societal Collapse/ “Un”Resilience. Adapting existing crisis/disaster lexicons used to study social and news media, we will employ NLP and ML algorithms to identify candidate “events” related to societal collapse in global news databases. This frames our study as the social *perception* of crisis/collapse *as conveyed through media*. NLP/ML will also assist in identifying “shocks” that preceded the crisis/collapse event. Human coders will be used to verify that the NLP/ML is correctly identifying events and shocks. In this dataset, we will also track aspects of the shocks, including the length of time the shock remained in public conversations, volume/number of national or international news outlets covering the shock, tone and sentiment of coverage, and mentions of actors, institutions, systems, or services that ceased functioning.

Phase 2 – Statistical Analysis of Societal Indicator Data. The comparison between cases using indicators data from the World Bank and Statista (longitudinal) and survey data (Phase 4, cross-sectional) will allow for an understanding of the conditions before, during, and after the crisis/collapse in each context. The responses to the same event (e.g., Covid-19) in different countries can vary in intensity based on those conditions. The perceived “collapse” can occur at different times after the event, depending on contextual factors. Statistical analysis of changepoint analysis using available public and subscription data will allow for an understanding of how these conditions interact for incorporation into Phase 3.

Phase 3 – Specifying the System to Operationalize Collapse/Crisis. Based on the notion of system “identity” [4], which Cumming and Peterson argue is central to operationalizing the collapse of a system, we will use publicly available or subscription data to characterize the countries in which societal collapse/crisis occurred. Each of Cumming and Peterson’s “four criteria for defining collapse” will be mapped to available data. This includes loss of actors/institutions/services (unique events from Phase 1); speed of collapse (length of media coverage in Phase 1); substantial loss of social-ecological capital (statistical analysis from Phase 2); and lasting consequences (ongoing coverage and qualitative data in Phase 4). These four criteria will allow us to label the cases in the dataset as “collapse” or not. These will be verified by human coders and subject matter experts.

Phase 4 – Characterize “Shocks” Attributed to Collapse/Crisis. Conduct surveys and interviews in South America and Eastern Europe, led by our area-studies experts, to 1) validate the NLP/ML identification of shocks and collapse/crisis; 2) identify and explain the types of shocks related to local events selected from the dataset; 3) characterize the interconnectedness of identified shocks; and 4) identify/explain the societal long-term outcomes of those shocks. This

phase relies on a mixed-method (content and statistical analysis) approach to developing 1) a typology of shocks, 2) a network structure model of shock interconnectedness/heterarchies [11], and 3) network measurements to characterize network structures of interconnected shocks.

Phase 4 – Develop a Theory of Societal Structure that Precipitates Collapse/Crisis. Using the datasets generated in Phases 1-3, we will create a theory of societal collapse. The adverse inference [10] of societal collapse provides insights into societal resilience. In this case, we will connect the network typology of interconnected shocks (Phases 1 & 3) to the dataset of cases classified as “collapse/crisis” or not (Phases 1 & 2) to speak to commonalities and differences across those systems that collapsed and those that did not.

CASE STUDIES

The case study provides complementarity of geographical locations, cultures, and different types of intensity and co-occurring shocks/stressors. While we do not explicitly pick the specific countries here, as Phase 3 relies on identifying countries/communities experiencing collapse or crisis in Phases 1 and 2, we specify the regions where we have area expertise. For Phase 3, we will focus on South America and Eastern Europe. The specific country(s) will be determined based on the number of collapse/crisis events relative to other countries in the region, as determined in Phase 2. In South America, we expect that Venezuelan migration and Covid-19 will be common shocks across many countries. Likewise, the Russia-Ukraine war, displacement of millions of people, and COVID-19 are likely common shocks across Eastern Europe.

PROJECT OUTPUTS

The project will result in: 1) A dataset of *perceived* shocks conveyed in global news by a country that specifies the length of the conversation, identified shock types, tone and sentiment, and actors/factors/mechanisms attributed to the shock. 2) A dataset of each event and available public data about UN SDGs with a novel binary dependent variable characterizing the event as resulting in “collapse/crisis” or not. 3) A dataset corresponding to (1) and (2) that characterizes the interconnectedness of shocks using network structure and network metrics. 4) A theory of societal collapse that speaks to future ways to empirically measure societal resilience. 5) Publications: newspapers, scholarly journal articles, conference papers, policy articles.

PRELIMINARY RESEARCH

This research builds on a previously funded Minerva (N00014-19-1-2624) project focused on developing a framework for assessing the absorptive capacity of migrant-receiving host communities. All the proposed methods were developed and tested in that project, providing evidence of their scalability to global event analysis in this project.

CONTRIBUTIONS TO FUNDAMENTAL SOCIAL SCIENCE BASIC RESEARCH

Our research contributes to social science by proposing a theory that reframes societal resilience. The theory focuses on observable societal collapse to infer shock typologies, offering a framework for advancing the understanding of resilience and societal collapse. It embraces diverse perspectives, including indigenous and non-Western, considering culture in resilience. By observing collapse, this theory will explore various shock types, including financial, ecological, and socio-ecological disasters, and generate a theory of societal collapse in response to multiple, potentially interconnected shocks, thereby inferring characteristics of systems or countries that did not collapse and contributing to broader resilience theories.

POTENTIAL IMPLICATIONS FOR NATIONAL DEFENSE

The 2022 National Defense Strategy (NDS) prioritizes “building a resilient Joint force and defense ecosystem,” where resilience is defined as “the ability to withstand, fight through, and recover quickly from disruption [12]. The 2022 National Defense Strategy (NDS) prioritizes building a resilient defense ecosystem. Our project, aligning with this priority, aims to operationalize and measure collapse for insights into resilience. Like the NDS’s focus on studying crises and mitigating risks through prioritization, our contributions in analyzing shock types leading to collapse enhance planning and readiness. Resilience in military contexts, characterized by coping with stress and challenges, resonates with our research, even at the subnational and individual levels. Our project utilizes existing data for anticipating and explaining public perceptions of societal collapse, enhancing foresight through forensic-like analysis for better risk understanding and management.

TEAM MANAGEMENT PLAN

Jose J. Padilla (PI, VMASC, ODU), an expert in socio-technical systems and simulation modeling, with expertise in the topics of absorptive capacity and resilience mechanisms. will serve as the administrative and technical lead of the overall design and development project. Erika Frydenlund (VMASC, ODU), a computational social scientist, will lead the activities in Phase 2. Joshua Behr (VMASC, ODU), an expert in resilience, will co-lead Phase 1 with Faryaneh Poursardar (VMASC, ODU), a computer scientist specializing in social computing, NLP, and applied ML. We have two area studies experts, Katherine Palacio (Universidad del Norte, Colombia), with extensive experience studying South America and who specializes in survey design and analysis, and Eteri Tsinsadze-Maas (Hampton University), who is an expert in Eastern Europe and has methodological expertise in comparative politics and case study analysis. They will lead the activities in Phase 3. A software engineer, Anthony Baracco, will lead the development and maintenance of a dataset and its documentation across all participants. PI Padilla will lead Phase 4 to bring together all team insights to generate a societal collapse/crisis theory. Two PhD students (ODU) and two master’s students (Universidad del Norte) will be trained in interdisciplinary studies and contribute across all aspects of the project.

DATA MANAGEMENT PLAN

Data collected during the project will be managed in accordance with ODU’s Research and Scholarly Digital Management Policy. IRB approval will be obtained from ODU and the DOD sponsor (HRPO) identified by the Minerva Research Initiative. Research data that documents, supports, and validates findings will be made available after disassociation with personal identifiers and reviewed by the Minerva Research Initiative POC for educational, research, and non-profit purposes.

SUMMARY OF ESTIMATED COSTS

The total cost will be approximately \$1.56M over 3 years (8/1/2024-7/31/2027): Data collection and analysis (labor for 4 faculties, 1 software engineer, and 2 ODU graduate students): \$522,468; travel to data collection sites: \$39,600. Meeting & Conference travel: \$16,144. Student tuition: \$94,620. Data (newspaper and survey): \$106,000. Consultants: \$35,000. Subcontract: Universidad del Norte (\$90,000); Hampton University (\$60,000;) University indirect costs (77% IDC Rate): \$592,294.

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