

## **Collapse, Environment, and Society**

Karl W. Butzer

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[https://en.wikipedia.org/wiki/Karl\\_Butzer](https://en.wikipedia.org/wiki/Karl_Butzer)

**Karl W. Butzer** (August 19, 1934 – May 4, 2016) was a German-born American geographer, ecologist, and archaeologist. He received two degrees at [McGill University](#), Montreal: the B.Sc. (hons) in Mathematics in 1954 and later his master's degree in Meteorology and Geography. Afterwards in the 1950s he returned to Germany to the University of Bonn to obtain a doctorate in physical geography. He obtained a master's degree in Meteorology and Geography from [McGill University](#) and a doctorate in physical geography from the [University of Bonn](#) in Germany.<sup>[1]</sup>

From 1959 through 1966 he taught at the [University of Wisconsin–Madison](#). This was followed by a stint at the ETH in Zurich, Switzerland. Next, he taught at the [University of Chicago](#) until 1984. After that, he went to the [Department of Geography and the Environment at University of Texas at Austin](#).

<https://sites.utexas.edu/butzer/home-page/>

Karl W. Butzer (August 19, 1934 – May 4, 2016) was a German-born American geographer. Butzer's research focused on the relationships between the environment and prehistoric people or more recent societies. In collaboration with a wide range of paleoanthropologists and archaeologists, he worked at both larger, regional scales and at the site-specific micro-level. Butzer engaged with an interdisciplinary environmental history, critical of the recent turn to a simplistic environmental determinism, and concerned about the prospects of global warming.

### **Abstract**

“Historical collapse of ancient states poses intriguing social-ecological questions, as well as potential applications to global change and contemporary strategies for sustainability. Five Old World case studies are developed to identify interactive inputs, triggers, and feedbacks in devolution. Collapse is multicausal and rarely abrupt. Political simplification undermines traditional structures of authority to favor militarization, whereas disintegration is preconditioned or triggered by acute stress (insecurity, environmental or economic crises, famine), with breakdown accompanied or followed by demographic decline. Undue attention to stressors risk underestimating the intricate interplay of environmental, political, and sociocultural resilience in limiting the damages of collapse or in facilitating reconstruction. The conceptual model emphasizes resilience, as well as the historical roles of leaders, elites, and ideology. However, a historical model cannot simply be applied to contemporary problems of sustainability without adjustment for cumulative information and increasing possibilities for popular participation. Between the 14th and 18th centuries, Western Europe responded to environmental crises by innovation and intensification; such modernization was decentralized, protracted, flexible, and

broadly based. Much of the current alarmist literature that claims to draw from historical experience is poorly focused, simplistic, and unhelpful. It fails to appreciate that resilience and readaptation depend on identified options, improved understanding, cultural solidarity, enlightened leadership, and opportunities for and fresh ideas.”

[NOTE: simplification/devolution/collapse appears multicausal and rarely abrupt; structures of authority breakdown, demographic decline, environmental and economic crises arise, famine occurs; in criticising ‘alarmist literature’ for being unhelpful and simplistic, Butzer swings in the opposite direction by emphasising those instances where resilience and adaptation due to ‘enlightened leadership’ and ‘cultural solidarity’ were successful in avoiding ‘collapse’]

### **Rise and Fall of Civilisations**

- the fascination with societal collapse, while appealing, has ambiguous meaning with sociopolitical institutions and environmental and demographic aspects being focused upon
- the change (growth followed by contraction) appears to be cyclical with failure in one systemic network impacting associated ones, with unanswered questions regarding timeframes, elements of failure, and whether the ‘collapse’ allows for adaptive restructuring
- historian Ibn Khaldun (1377 Common Era/CE) may be the first to have written about the phenomena, arguing that the fall of dynasties was due to rural rebellions and/or foreign invaders who challenged the ruling hierarchy that has lost its supporters
- his focus was upon the Roman Empire and Islamic societies, faulting “the greed and selfishness that came with power, at the expense of the common good” (p. 3632)
- the West took up interest with the issue when Edward Gibbon wrote his treatise on the Roman Empire and also attributed its imperial decline to moral decay of the elite and barbarian invasions
- Gibbon proposed that Rome’s ‘collapse’ was connected to a historical process that was shaped by context and worried about the future failure of modern states
- 19th century archaeology ‘uncovered’ recurrent examples of societal failure impacting sociohistorical models and discourse where Eastern societies regularly failed but Western ones (i.e., Rome) endured and showed durability (thus, modern states might last)
- theories were also influenced by the biological/evolutionary ideas of the time, with growth-maturity-decline interpretations common
- social Darwinists believed material culture demonstrated ‘progress’, with the West showing technology could ensure lasting economic growth by solving any issue encountered<sup>1</sup>
- Spengler’s *The Decline of the West* was composed post-WW1 and predicted the rise of authoritarianism as society ‘collapsed’; his work provided some insights towards sociopolitical resilience to avoid ‘collapse’
- the French Annales School gave rise to world-system history where economic systems competed and gave rise to warfare and pandemics
- “Notable is the increasing diversity of perspectives about collapse, ranging initially from ethical and social, to ideological or ethnocentric, and eventually to interdisciplinary and systemic... the challenge for a scientific study of historical collapse remains to develop comprehensive, integrated or coupled models,

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<sup>1</sup> This is an example of sociocultural influences affecting scientific paradigms and the interpretation of observable evidence

drawing upon the implications of qualitative narratives that go well beyond routine social science categories, to better incorporate the complexity of human societies.” (p. 3633)

- at the cost of considering cross-disciplinary integration, current collapse research focuses upon climate change and environmental degradation as the ultimate causal agents

- complexity of the interrelationships between multiple variables is being lost as a result<sup>2</sup>

- it's not that these aspects are not important, it's that we need to consider “a great tapestry of variables”

- using case studies to examine the interaction of variables, estimate timescales of change, and explore any processes of reconstitution, perhaps complex simulation models that include societal aspects can be formulated and hopefully validated

- this article hopes to draw on historical examples to show the spectrum of socioecological variables that are vital to system resilience

- current change models focus upon biophysical elements and their feedbacks, plugging in a few societal factors to explain outcomes

- this paper aims to “identify important qualitative variables and track their roles and interplay in systemic outcomes” (p. 3633)

### **Anatomy of a Collapse: Old Kingdom Egypt**

- following Pepi II (circa 2184 Before Common Era/BCE) succession issues arose with 20 powerless kinglets arising and lasting only about 20 years, after which a handful of feuding provincial powers arose controlled by warlords and old elite that were forcibly reunited after another 20 years

#### *Didactic Literature*

- written records and archaeology suggest a sociopolitical shift occurred over the next 120-200 years

- the elite began to bury their dead in rock tombs near their land holdings

- wealth flowed into new centres, disturbing entrenched interests (resulting in written lamentations/prophecies)

- some described famine, civil war, Nile failure, migration, cannibalism, elite dispossession, poverty, and anarchy

- social justice and the cosmic order were breaking down in the eyes of some

- the lack of a central government was evident

#### *Onset of Economic Decline*

- the 6th dynasty witnessed a dilution of central authority as increasing numbers of courtiers were granted privileges that drained the treasury of assets (e.g., prime land)

- foreign trade broke down abruptly, decimating elite revenue

#### *Environmental Trigger*

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<sup>2</sup> This seems reflected in the reductionist narratives that point towards singular or narrow causes of our predicaments and the associated notions that if only these could be addressed, all will be well again.

- changes in the behaviour of the Nile and its chemistry are noted from about 2800-2400 BCE, as well as increasingly poor/inadequate flooding around 2100 BCE; but then flooding increased for a couple of centuries (2000-1800 BCE) before subsiding again
- these changes may have triggered 'collapse'

### *Civil Wars*

- dynastic instability arose after Pepi II, including civil war
- reunification eventually occurred (2016 BCE) but was preceded by violence and interrupted by occasional uprisings
- “The collapse after Pepi II had evidently unleashed unwelcome feedbacks that repeatedly favored destructive military unrest, variously coupled with both elite contestation and resilience.” (p. 3634)

### *Concatenation*

- prosperity generally declined during the 6th dynasty yet the wealth/power of provincial governors grew
- over a 160 year period of economic stagnation, decentralisation of authority, and a loss of eastern Mediterranean trade set up Egypt for collapse
- failure of the Nile near the end of Pepi's reign likely led to a food production crisis and triggered economic decline
- royal legitimacy was undermined by provincial elites looking to gain power
- with institutional structures failing, social anarchy grew
- as contesting interests battled, political simplification ensued
- “A concatenation of triggering economic, subsistence, political, and social forces probably drove Egypt across a threshold of instability, setting in train a downward spiral of cascading feedbacks.” (p. 3634)
- eventually new elites restored the 'cosmic order' via military force
- initial decline was over several decades with the collapse process lasting a century or more (as did restoration)
- collapse is complex involving systemic interactions, encompassing people at cross purposes using incomplete information in their attempts to restore order

### **Autopsy of Another Collapse: New Kingdom Egypt**

- socioeconomic aspects are seen better during the 20th Dynasty due to detailed records (1187-1064 BCE)
- a powerful state became divided as a high priesthood usurped authority, controlling the military
- eventually foreign dynasties took over

### *When Did Decline Begin?*

- a major drought in Anatolia and the Aegean world may have prompted several attempted invasions of Egypt
- significant corruption and malfeasance surfaced (1157 BCE)
- domestic unrest grew as wages for artisans went unpaid and food shortages emerged (1156 BCE)

### *Process of Devolution*

- with the accession of Ramses IV workers were paid (food and silver) by the priesthood rather than via the royal treasury (implying institutional conflict)
- food shortages continued, however, accompanied by significant price inflation
- inflation stabilised (1110 BCE) then fell rapidly (1100-1070)
- food insecurity was worsened by marauders causing many to flee urban centres and productivity to drop
- monumental architecture commissioned by the royal family declined as that of the priesthood grew
- the looting of tombs increased
- eventually conflict between the royalty and priesthood became public with military battles, and a disenfranchising of royalty—labelled as mere figureheads by the priesthood

### *Evaluation*

- the 1170-1110 BCE food crisis was “preconditioned by (i) debilitating wars to repel invaders, (ii) the loss of Mediterranean commerce, (iii) official corruption, and (iv) a lack of support from the priesthood controlling the temple granaries.” (p. 3635)
- Nile failures are suggested by waves of significant price inflation
- in Nubia, agriculture was abandoned due to expanding sand dunes
- state division and growing fragmentation contributed to continuing economic decline even after the food crisis passed
- literature highlighted violence, arbitrary rule, hunger, excessive taxes, and increasing social discord
- the response to growing issues was not resilience but a military-priestly caste; a superstitious-driven theocracy<sup>3</sup>

### **Insights From Islamic Mesopotamia**

- an irrigation-based society in Lower Mesopotamia saw population peaking in the 226-637 CE period but then collapsed by about 95% over the next 700 years during which time two distinct collapses occurred
- during the 630s CE the Sasanid Empire was toppled by Arabs introducing new settlers and a new elite class
- Christianity and Zoroastrianism were replaced by Islam
- the Sasanids introduced innovative irrigation techniques (lattice of intersecting canals) distributing the Tigris and Euphrates waters widely—in the long run, this led to significant salinisation of the area
- massive flooding after 628 CE led to canal deterioration and increased salinisation
- this system was abandoned after the Arab Conquest and a new one was introduced but impacted less than half of the land that of previously worked
- Mesopotamia recovered rather quickly, becoming the centre of the Abbasid Empire after 750 CE

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<sup>3</sup> I can't help but think of the growing complexity and associated increase in fragility to solve arising issues/problems, and, thus, of Tainter's thesis regarding human societies being problem-solving organisations that address 'problems' in ways that increase complexity (and more 'problems') but eventually result in over-burdening 'costs' for most and the subsequent 'opting-out' of participants thus reducing support and 'investments' in the system as a whole...

- this rejuvenation peaked around 786-809 CE, with wasteful spending and significant tax increases<sup>4</sup> contributing to decline afterwards
- rebellions rose in frequency as the economy declined
- eventually a main canal ceased to function
- the two collapses occurred in the wake of the Arab Conquest (640 CE) and during the 10th century, concluding with the Mongol plundering of Baghdad (1258 CE)
- the first collapse took a century, while the second about three centuries and were common in their fallout: fiscal mismanagement, land use change, war, and irrigation difficulties
- Egypt's situation seems to have been more resilient and continued to function somewhat successfully
- the failure of Mesopotamia's irrigation system was ecologically tragic and resulted in an eventual wasteland

### Integration: A Didactic Model for Historical Collapse

- little comparative research has been carried out on historical collapse, with the discourse tending towards a generalised, macroscopic perspective
- the devolution of sociopolitical and socioeconomic markers have received little attention, as too has failed attempts to address such issues
- in particular, sociocultural factors have rarely been considered
- the heuristic model below in light of the case studies examined “suggest that the complexity of the social-ecological interface is as much about interrelationships as it is about the identification of stressors.” (p. 3635)
- caution is necessary in using this model for modern times

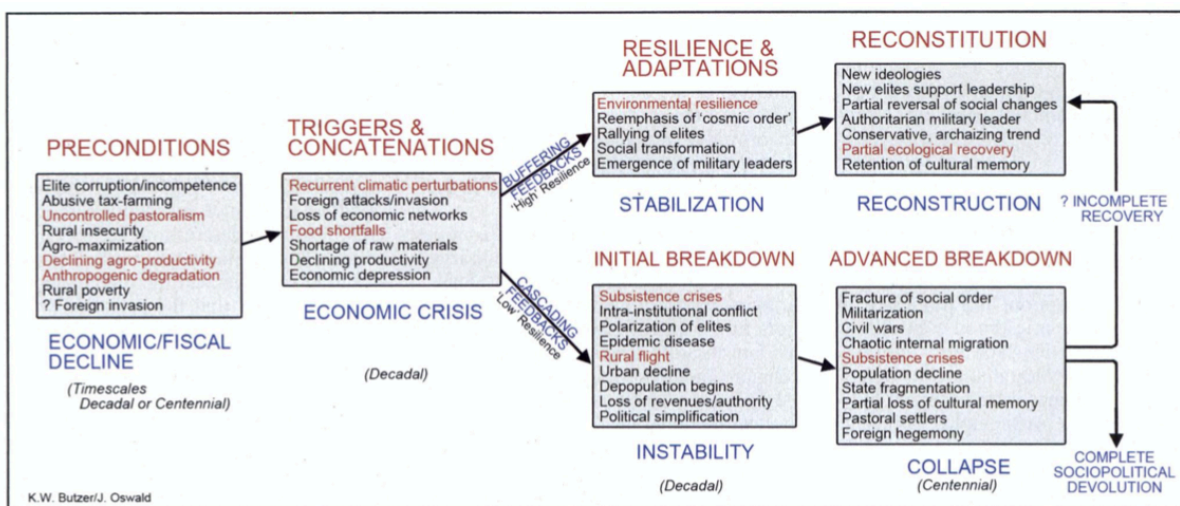


Fig. 1. A conceptual model for historical collapse, situating the variables and processes of stress and interaction discussed in the text. Timescales range from multidecadal to centennial. Alternate pathways point to important qualities of resilience. Red superscripts identify stages that are elaborated by blue subscripts. Environmental components (red within boxes) are secondary to sociopolitical factors.

<sup>4</sup> Significant tax increases are present in today's nations but are less obvious due to: increasing national debt levels (i.e., relative to ways in the past, spending can far exceed revenues), the way in which fiat currency can be devalued, and the narrative management over price inflation causes and the idea that 'low' inflation is beneficial.

### *Inputs, Triggers, and Interactive Variables*

- long-term economic decline may precondition a society for collapse, but it may also occur due to short-term, intense decline
- cascading feedbacks can enhance negative trends and create instability early on but may be slowed or stabilised by beneficial adaptations
- such adaptations may result in societal reconstruction or continuing decline and collapse
- degradation of biotic resources (e.g., soil, water, forests) can incrementally lower the threshold for eventual rapid change, especially in combination with destructive land use, incompetent governing, and rural flight
- an environmental subsystem can be preconditioned for failure due to the pressure of poor resource productivity<sup>5</sup>
- climate/weather factors (e.g., recurring rains/floods) may also serve as triggers as well as preconditioning via accelerating degradation
- population and/or socioeconomic decline may reinforce environmental feedbacks that impact food productivity and economic systems
- the case studies appear to “indicate that environmental inputs mainly played supporting roles in a train of events set in motion by institutional incompetence or corruption, civil strife and insecurity, invasion, or pandemics.” (p. 3636)
- governing institutions can also precondition a society for collapse with war being a trigger
- sociopolitical decline can lead to collapse or result from it
- conflict between groups of elite can reduce sociopolitical resilience

### *Time Frames*

- decline or recovery duration can help identify the processes involved
- preconditioning via economic decline can take decades to centuries
- initial stages may occur relatively quickly but the more complex collapse or reconstruction tends to take a century or more

### *Environmental Resilience*

- human ecosystem resilience is impacted by political, cultural, and environmental variables
- negative feedbacks can slow or reverse change and preconditioning factors can help stabilise
- European systems appear to have been less susceptible than arid near-Eastern societies, perhaps due to fragile, complex irrigation systems that required significant human inputs
- when these required inputs became over-demanding, it appears the peasants abandoned their villages returning to a nomadic semi-pastoralist lifestyle<sup>6</sup>

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<sup>5</sup> This appears to be classic diminishing returns on resource extraction whereby the easiest-to-extract resources are used first with relatively lower environmental impacts; as the more-difficult-to-extract are sought, environmental impacts increase.

<sup>6</sup> This seems very reflective of Joseph Tainter’s thesis, which is surprisingly not cited/referred to at all in this article.

- contrastingly, southern Europe experienced less specialised, mixed farming where temporary abandonments occurred in select bioregions; minimal investment was then required to resettle such areas
- it would seem that environmental resilience and not human-caused impairment is the main difference on a global scale
- on a regional scale, anthropogenic damage (e.g., deforestation, land use change) can complicate matters
- while deforestation is commonly held to be quite harmful, secondary vegetation can become more diverse as a result; and reforestation, if carried out with invasive/ornamental species, is not helpful<sup>7</sup>
- generalisations regarding arid-land irrigation are inappropriate as well—the Tigris-Euphrates radial canal system was problematic (breakdown of its complex networks led to complete abandonment of the food production system supporting large populations), but the Egyptian system that took advantage of the cyclical and natural flooding of the Nile was not and could support small, permanent settlements
- “Environmental elasticity may be critical in the mitigating of collapse, or in the ability of a society to carry on.” (p. 3637)

### *Political Resilience*

- the ruling elite tend to support the State out of self interest
- collapse can be reversed via a new dynasty composed of a new group of elite (typically with a different identity and political centre)
- the reassertion of such states occurred periodically in both Mesopotamia and Egypt
- Yoffee discusses such a cycle in Assyria (1800-1600 BCE) where greater centralisation tended to occur
- traditional noble councils gave way to military generals with civil servants
- incompetent rulers may fall and collapse ensue; some of the surviving elite may ally with new ones to support a different ruler providing a means of resilience and stabilisation<sup>8</sup>
- Butzer argues that a society’s elite can help with resilience and stabilisation, along with religious institutions
- if they can rally some elite and societal institutions, as well as perhaps ideology, they may not stop collapse but can move events towards reconstruction via reimposition of law and order and societal cohesion
- this may not be in terms of traditional values but through power consolidation (usually militarily) that often involves destructive violence
- it’s likely that the new elites work alongside new military leaders with a social contract arising that is more authoritarian, class based, and rigidly enforced

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<sup>7</sup> This perspective is rather narrow in that it only raises the issue of plant diversity and misses all of the other ecosystem disruptions/destruction that occurs, especially regarding the animal species, and further argues for the future possibility of using the deforested land for human purposes without consideration of the non-human species that have lost habitat. We are also learning about the impacts on other systems (e.g., climate/weather, hydrological cycle, etc.) as a result of deforestation/land system use change.

<sup>8</sup> It appears that societies experience ‘waves’ of complexity and simplification with ‘collapse’ being a somewhat arbitrary ‘classification’—think of punctuated equilibria with longish periods of stability (slowly increasing complexity) periodically experiencing rapid change (simplification)



-also probable that the political economy will be far more exploitive than conservative with respect to land use

### *Cultural Resilience*

- the most fragile aspect during collapse appears to be sociopolitical structures with its hierarchical order being simplified and authority often transferred
- the loss of religious and/or linguistic identity has often occurred to groups but societal collapse does not always accompany this
- sociocultural traits are fairly resistant to change and can remain relatively intact for millennia despite other shifts (e.g., language, ethnic identity, religion)
- collapse typically involved demographic change via a variety of avenues (e.g., war, disease, famine, migration, expulsion); while a decline may not lead to collapse, it can result in stressing important societal systems (e.g., agriculture)
- climatic perturbations or labour shortages (due to a pandemic) that impact food production can result in a breakdown of economic networks and simplification
- narratives regarding collapse are often affected by societal views and not cross-cultural (e.g., what is perceived as stressful or chaotic) which would impact a society's political economy<sup>9</sup>
- a top-down leadership structure may have suppressed community decision-making and resulted in a more repressive regime in the face of revolts
- cultural resilience is a difficult aspect to pin down; it may help to resist change but there may be cascading feedback that results in societal shifts

### *From Past to Present*

-these case studies suggest:

- 1) Every breakdown appears to experience institutional failure early on due to incompetence, corruption, and/or economic decline
- 2) As critical as climate forcing are civil war or invasion to breakdown
- 3) Climate perturbation is far more often experienced than environmental degradation
- 4) Depopulation appears during and/or after collapse (commonly pathogen-driven)
- 5) Overlapping with invasion and/or ethnic change is ideological change

-“In other words, poor leadership, administrative dysfunction, and ideological ambivalence appear to be endemic to the processes of collapse. War or climatic perturbations possibly served as triggering mechanisms, but environmental degradation does not appear as a universal variable. Demographic decline was either a coagency or a delayed result of change, except for the Black Death. Collapse was a consequence of multiple factors, reinforced by various feedbacks and partially balanced by resilience, with unpredictable outcomes. The comparative importance of societal versus environmental inputs seems to favor the social side.” (p. 3638)

-expanding this view by considering the case studies in this Special Feature only adds two additional collapse scenarios but four more where resilience avoided it

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<sup>9</sup> An important aspect to keep at the top of one's mind in considering 'collapse' narratives—stories often reflect societal norms, biases, etc. and variables may not have been as relevant to a pre/historical society

- Western Europe's subsistence crises (post-1200 CE) with riots, wars, and revolts did not lead to sociopolitical change until the French Revolution
- recent history also sees economic or ecological disaster being 'overcome' and not resulting in collapse
- environmental crises (e.g., Medieval Warm Period, Little Ice Age) resulted in food production and distribution strategies as opposed to collapse
- Western Europe's last millennium has witnessed a decentralisation of food production and seems to have resulted in greater resilience and novel solutions to stress
- the difference with earlier examples were structural in nature with Mesopotamia and Ancient Egypt being authoritarian where change was more difficult and the flexibility needed to deal with crises was frowned upon
- knowing the past helps us to situate the present but provides no simple and prescriptive insights regarding societal risks for collapse
- 'alarmist' literature that bases claims on the past tends to be simplistic and not helpful; instead, present societies should "turn their attention to information diffusion and socioeconomic integration<sup>10</sup>, across class lines and different spatial scales." (p. 3639)
- modern societies have a number of advantages over those of the past, particularly in the realm of available knowledge/information and engaged citizens
- it is also necessary for societal elites to set aside ideological differences and come to agreement on the socioeconomic implications of global challenges, particularly as they have to do with climatic changes

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<sup>10</sup> The suggestion of socioeconomic integration (i.e., the promotion of wealth equity) is an interesting one that requires some unpacking since it is often, if not always, used in a way that argues for raising the far more disadvantaged up to the level of the far more advantaged. This approach, however, flies in the face of our ecological overshoot predicament since it basically is a call-to-arms for increased consumption—and thus increased extraction and refining of resources. Raising the masses up to the level of the top 10-20% of wealth earners, would likely put the icing on the cake towards the complete destruction of our ecological systems. It would also tend to increase societal complexity in the face of diminishing returns, leading to even more fragile human systems.