

# The HANDY model of human and nature dynamics: A critical review

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A study made public this year, entitled “Human and Nature Dynamics (HANDY): Modeling Inequality and Use of Resources in the Collapse or Sustainability of Societies,” attempts to model the factors involved in societal collapse spanning the whole range of human societies, from simple, egalitarian groups to complex civilizations, including contemporary capitalism.

The study, published in the journal *Ecological Economics*, finds that civilizations characterized by great inequality are especially unstable and prone to catastrophic decline, but that “equilibrium” can be achieved if the proper, “rational” policies regarding social inequality and environmental exploitation are adopted.

The publication of the HANDY model has led to widespread comment among social scientists around the world, with claims that it predicts the inevitable collapse of modern society. The authors quickly responded that this was not necessarily the case and that “equilibrium” can be achieved if only “rational” policies are implemented. We will explore this claim later on.

Recorded history and archaeology demonstrate that many complex, state-level societies, also known as civilizations, including examples from all the inhabited continents, such as ancient Greece and Rome, Egypt, Mesopotamia, China, India, Southeast Asia and North and South America, have undergone repeated cycles of florescence and catastrophic collapse. In extreme cases, such collapses can be so thorough, involving dramatic population decline and/or devastating environmental degradation, as to require centuries before recovery could begin. Much research has gone into chronicling and analyzing the causes of these cycles. Earlier emphases on purely political or historically idiosyncratic explanations have, in more recent years, increasingly been supplanted by economic and environmental interpretations.

The recent study, including elements funded by a grant from the US National Aeronautics and Space Administration (NASA), though not endorsed by the agency, seeks to identify commonalities and predictive variables in societal collapse that may be applicable in understanding all such phenomena, regardless of specific historical context.

That disregard for history is a fatal—and uncorrectable—flaw, since the effort to find a simple, universal explanation for societal failure, one that can be expressed in a mathematical model that can be run on a computer simulation, inevitably oversimplifies the reality, particularly in the case of modern world capitalism, a society comprising more than seven billion people.

Known by the acronym “HANDY,” for Human And Nature DYnamics, the model was developed by three researchers: Safa Motesharrei of the School of Public Policy and Department of Mathematics, University of Maryland and National Socio-Environmental Synthesis Center (SESYNC); Jorge Rivas, Department of Political Science, University of Minnesota and Institute of Global Environment and Society (IGES); and Eugenia Kalnay, Department of Atmospheric and Oceanic Sciences, University of Maryland.

The HANDY model is an attempt to build on earlier efforts, which were based on simple predator-prey models, derived from ecology, and one based on two variables, population size and the natural environment, the latter having been developed to study the collapse of Polynesian society on Easter Island. HANDY is more complex, incorporating additional variables, principally the role of social inequality and of labor productivity in relation to the carrying capacity of the environment.

It builds complex equations designed to represent the “behavior” of three generic social formations: 1) Egalitarian (everyone works and gets an equal share of social wealth), 2) Equitable (containing working and non-working members of society, such as managers, students, and the elderly and infirm, but without elites who obtain a greater share of wealth per capita) and 3) Unequal, divided into two classes, “elite” and “commoners,” with differential access to wealth. The respective models are run repeatedly to observe how they react to changes in the values of the different variables over time.

In a followup statement, meant to clarify critical comments made prior to the report’s publication, the authors describe their work as a “thought experiment.” It consists of equations with symbols representing what are considered relevant variables, but the values inserted into the equations are artificial. No actual historical cases are tested.

The results of the model runs lead to a number of observations. While all three social formations may be subject to crises under certain circumstances, unequal (i.e., stratified or class) societies are the most unstable and prone to catastrophic collapse. Two principal causes are identified: over-exploitation of the commoners by the elite, in other words extreme inequality, and excessive exploitation of the natural environment, beyond its capacity to regenerate.

Nevertheless, the study’s authors conclude that unequal societies can achieve long-term stability, provided that they a) moderate the wealth differential between the elite and the commoners and b) maintain a level of exploitation of the natural environment below its maximum carrying capacity, in other words a sustainable rate of resource use which permits regeneration.

The HANDY model is notable in that it explicitly recognizes the central importance of class differentiation and inequality in social dynamics, and identifies growing inequality as a major destabilizing factor. Indeed, the model examines scenarios in which social inequality alone can lead to catastrophic societal collapse. Furthermore, the authors observe that the economic insulation of the elite, who tend to be buffered from the effects of a crisis for a period of time due to their differential access to social wealth, while the commoners are already suffering severe deprivation, leads the elite to ignore or downplay the seriousness of a crisis, despite the occasional warnings from the more enlightened members of the ruling class, until remedial action can no longer be effective. One need only think of the French and Russian aristocracies before the respective revolutions to recognize the validity of this observation.

These observations have naturally provoked criticism of a right-wing

character, by those who either deny the dangers of environmental degradation or regard giving any serious weight to social and class differentiation as illegitimate politically.

That being said, the HANDY model's attempt to represent all times and all places means that it obscures more than it elucidates, and leads to false and dangerous conclusions. The empiricist and ahistorical method employed to construct the model results in generalizations that represent social dynamics as mechanical and one-sided.

The HANDY model highlights some of the limitations of bourgeois social science. Despite the claims that it offers new insights into societal dynamics, the ultimate conclusions provide no more than gross generalizations which are intuitively obvious. The model tells us that if a society exploits its environment to the point where it causes degradation which impairs access to critical natural resources or that if it exploits its laboring classes to the point where they are suffering substantially increased mortality, that society will face a crisis and potentially a catastrophic collapse. Such outcomes are not especially surprising. Nor do they provide more than the most superficial understanding of societal dynamics.

The authors themselves and their supporters have proclaimed that the model's conclusion that societal crisis can result from extreme inequality (i.e., over-exploitation of the lower classes by the elite) alone is somehow a great revelation. This is news only to those who are so naïve about the existence of class interests that they have been blind this fundamental historical reality.

The fault in the empiricist method of the model's creators is not simply that they may or may not have selected the most relevant variables in modeling societal dynamics, but that they view these variables as self-contained, "independent variables", as things in themselves. Such entities may vary quantitatively, but do not affect each other qualitatively. There is no reciprocal interaction or co-determination. In other words, they relate mechanically, not dialectically.

This is completely unrealistic. Changes in the dynamics of economic interactions are likely to have substantial consequences in the political sphere and vice versa, for example. The model makes no acknowledgement of the class struggle. The fact that various segments of a society's population clash in support of their own conflicting interests within specific historical contexts, with outcomes that create ever greater complexity, potentially leading to a variety of possible outcomes, literally does not enter into the equations. This approach yields only superficial generalities.

One of the most serious problems with the HANDY model that it treats class relations based explicitly on a predator-prey model, which is totally inappropriate for understanding the dynamic of capitalist society. The predator-prey model implies that the elite (the predator) simply takes wealth from the prey (the "commoners" or workers) by force. As Marx so effectively demonstrated in *Capital*, the principal mode of appropriation of surplus value by the bourgeoisie from the working class under capitalism is not based on mere theft. Rather, it is part of a fundamental set of socially sanctioned relations in which each party appears to be participating in an equitable, rational transaction: the capitalist purchases labor-power, which is freely sold by the laborer, and then puts it to work.

Historically, each social formation, from egalitarian hunter-gatherers, to ancient states, to feudalism, to modern capitalism, has had such sets of social relations which govern economic interactions between different members of the group and, indeed, between different groups. At the rise of any new social formation, new sets of relations replace the previous ones and, necessarily provide some advantage, even if only relative, over the older forms. As the inherent contradictions of any given social formation play out over time, the transactions between the classes may become less and less equitable, but the evolution of a crisis in the social order cannot be understood merely as an intensification of the theft of wealth by the

ruling class, as the HANDY model would have it. Otherwise, the varied histories of different civilizations would be unexplainable.

Furthermore, if the differential accumulation of wealth by an elite is merely based on theft, then the acquiescence of the numerically superior "commoners" to such systematic pillage is inexplicable. Why would the majority tolerate continually being fleeced by a small minority? The HANDY model takes class stratification as a given, with no explanation as to why such an inherently more unstable social formation should have evolved out of relatively stable egalitarian societies.

The HANDY model's use of a biological analogy – the predator/prey relationship – is inappropriate for another reason. Humans are both biological and social beings. Their behavior cannot be explained by biology alone. Social and economic behavior depends on conscious human activity, involving thought and planning. This allows the creation of systems that are qualitatively different than those of any other species, with levels of complexity that are orders of magnitude greater than purely biological systems.

The HANDY model is reductionist, seeking to understand human behavior while ignoring what is fundamentally human. This is the same sort of error committed if one were to try to explain biological systems by chemistry alone. Chemistry is not superseded by biology, but it is subsumed dialectically within higher orders of complexity.

Another major flaw in the HANDY model involves its treatment of the exploitation of the natural environment (production) in relation to the environment's ability to regenerate—in other words, to what degree is a society's use of natural resources sustainable over time?

The model treats the exploitation of nature as a unitary phenomenon, which can vary in quantity, but not in quality. The model assumes that over-exploitation leads to environmental degradation, resulting in a decrease in overall societal wealth, which in turn will be compensated for by a restriction in consumption by commoners. If this drives the commoners' incomes below basic subsistence, famine will ensue, resulting in a decrease in the working population and a downward spiral in overall social production. If unchecked, this decline would eventually lead to societal collapse.

True enough. However, there is no accounting for the fact that in a class society the pattern of exploitation of nature is primarily dictated by the elite, for its own, immediate gain, regardless of whether this pattern may be detrimental to the society as a whole in the long run. The current runaway exploitation of fossil fuels is a prime example. The authors suggest that different, more "rational" decisions may be possible. However, because the model does not take into account the opposing interests of different social classes, the only prescription for the over-exploitation of nature that can be envisioned is to cut back on consumption and/or a reduction in the size of the population.

The authors dismiss technological innovation as a way to address the negative consequences of unsustainable exploitation of natural resources, saying that increased efficiency is always outpaced by rising consumption. This is the fallacy of Thomas Malthus, so ridiculed by Marx, and repeatedly disproven over the last two centuries.

The HANDY model misuses the ecological concept of "carrying capacity"—the ability of a given environment to sustain a particular species' population at a given size without degradation of the system. The model treats the carrying capacity of any given society as fixed, producing a limit to the exploitation of natural resources which, if exceeded, causes environmental and economic degradation. This is inappropriate for human society.

Being social creatures, humans are both part of nature and opposed to it. We have the ability to alter our environment to a qualitatively higher degree than any other species. Human beings have gone from a minimum population of perhaps a few tens of thousands (possibly even lower at the "genetic bottleneck") during the Pleistocene to the current billions of

individuals. It is obvious that “carrying capacity” is a highly dependent variable, subject to changes in the means of production (technology) and the social organization of production and distribution.

Particular societies with their given technologies and social organizations have certainly at times exceeded the carrying capacities of their local environments, leading to crisis, especially when stressed by climate change (e.g., precontact southwestern North American). Many societies have met such challenges by technological innovation (e.g., the shift from slash-and-burn to more intensive forms of agriculture, including the adoption of irrigation). Those that could not did indeed collapse (the Maya, perhaps). However, the inflexible application of this concept by the HANDY model will tend to distort the complexity of real-world examples and thus lead to incorrect interpretations.

The irrational pattern of the exploitation of natural resource and misallocation of productive capacity in contemporary society is characterized by over-consumption on the part of a tiny minority, and decreasing per capita consumption among a growing proportion of the population. While the model recognizes the negative consequences of this disconnect, it provides no insight into its causes or possible solutions, other than a general decrease in consumption. In reality, it is not a decline in total wealth that is driving the current capitalist crisis, but rather an extreme misallocation of that wealth.

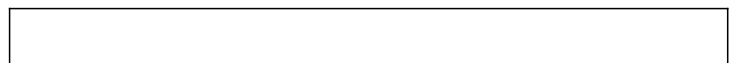
Despite its irreparable flaws, the HANDY model acknowledges the historical fact that class societies, including modern capitalist society, are manifestly unstable and likely to suffer repeated crises and potential collapse. It thus calls into question the narrative put forth by the ruling class and its apologists that capitalism is the ultimate and best (or only possible) form of human social organization.

The fact that such a model, with its explicit admission that inequality and class antagonisms are inherent in class societies, is proposed at the present time indicates that sections of the bourgeois intelligentsia in the social sciences recognize that a major social crisis is at hand. Indeed, even prior to its official publication, the article generated considerable criticism for implying that current society is headed for inevitable collapse. The authors responded that “equilibrium” can be achieved provided that “rational choices” are made. In other words, reform is possible.

The significance of the HANDY model is thus as much political as scientific. This classless, “thing in itself” view of societal variables allows the authors to propose the liberal reformist prescription that if only the proper “rational” policies are adopted, in other words, the isolated manipulation of “independent variables,” societal equilibrium can be achieved.

This view is based on the underlying assumption that the “rational choices” for one class are the same as those for another. However, as has been demonstrated by Marx and others for capitalist as well as pre-capitalist societies (e.g., feudalism, ancient slave-based societies), the conflicting interests of various classes are dictated by the social organization of production and distribution. Even when rationally pursued by each, these conflicting interests create contradictions that are integral to the respective systems. They are not “choices” which can be altered at will. These contradictions inevitably lead to stresses and conflicts, and behavior that is “irrational,” with respect to social, economic, or environmental survival of the system as a whole.

The reformist conclusions of the model have definite political implications. In the end, the prescription the authors propose to address the current world crisis, based on the lessons drawn from their model, is that, “. . .in order to reach a sustainable equilibrium in an unequal society, it is necessary to have policies that limit inequality and ensure birth rates remain below critical levels,” a perspective that a liberal democrat or even a fascist could feel comfortable with.





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