

A critique of the sustainable development concept – a statement¹

*Opinião: Crítica ao conceito de desenvolvimento
sustentável – um depoimento*

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ARTICLE-OPINION

Conservation is the fore-sighted utilisation, preservation and/or renewal of forests, waters, lands and minerals for the greatest good for the greatest numbers of people for the longest time. (Pinchot, 1910, 48)

1 INTRODUCTION

This paper contains a statement about (i) the path through which I entered the scientific-academic field of the study of socioenvironmental issues and (ii) my restrictions to the concept of sustainable development (SD) and the related field of sustainability. It also outlines the “socio-naturalist” approach I adopted to study these issues. The paper's first objective is to clarify why I adopted an approach distinct from the SD approach despite its predominance among most Brazilian social scientists that I know of who study environmental issues – and even among an expressive number of natural scientists. The second objective is to present an encompassing critique of the concept of SD and the field of sustainability.

I reiterate my reflections on SD since becoming acquainted with the concept in 1988. Initially, the text has an intentional tone of testimony combined with personal reflections. It does not draw on – nor mention – specific titles of the extensive critical literature on SD. However, thousands of authors criticise the concept and/or use modified versions. It is rare to find texts in which authors use the concept of SD without adding some criticism to it. Over the years, I have dealt with a small part of this literature. Because of its wide use, SD must be the most criticised concept at present. Consequently, my criticism of SD does not seek to be original or distinct from the numerous critiques in this literature.

2 SOCIAL SCIENCES OR NATURAL SCIENCES?

Despite graduating in social sciences in the 1970s, between 1986 and 1988, I studied in an interdisciplinary environmental sciences master's degree program. The program had a strong content of hard sciences (botany, zoology, geology, chemistry, soils etc.). This originated my initial “estrangement” with SD, as I did not hear about it during the program. I chose this program intuitively because I assumed I could only make a solid transition from social science to socioenvironmental science if I had a solid grasp on the fundamental theories, concepts, and findings of natural and life sciences – today, I know this assumption was correct.

¹ This article is an Essay and has not undergone a peer-review process and represents the author's opinions exclusively.

The program's strong natural and life sciences content caused me to wander away from the mainstream of the social sciences. Not by chance, it led to my “preventive” resistance to SD; that is, I moved away from SD before even hearing about it. I completed my master's degree in 1988 and soon returned to Brazil. I soon became aware of SD, as it was being adopted by the few social scientists studying environmental issues. However, I quickly identified SD as a sociological concept belonging to the field I was moving away from and consequently did not adhere to it.

For the purposes of this paper, the most relevant result of my master's course for my subsequent professional life was the following: I adopted a new scientific and analytical perspective that permanently moved me away from the social sciences and prepared me to study environmental or socio-environmental issues from an interdisciplinary perspective. I didn't foresee this departure, but it happened. Therefore, with this newly acquired background in the foundations of hard or biophysical sciences, I entered the still nascent Brazilian field of socio-environmental sciences.

The crucial point of this part of the text is this: my “entry” into studies on socioenvironmental matters was made mainly through the natural sciences and natural scientists. I did not abandon what I learned in social sciences, but my transition to socioenvironmental issues did not take place via essentially sociological concepts and fields such as social conflicts, social justice, government agencies, laws and regulations, poverty alleviation, public policies, governance, environmental justice or racism, gender, race, perceptions, inclusion, identity etc. Likewise, it did not pass through the still-nascent field of SD and sustainability. More than moving away from the social sciences, I abandoned its central paradigm regarding nature: the “human exemption paradigm”. This expression was coined in 1979 by two North American sociologists, Riley Dunlap and William Catton (Dunlap; Catton, 1979, p. 243-273), as the main reason they found for sociology being a latecomer in socioenvironmental studies. I came to understand natural variables as conditioning, explanatory, or even determinant of much of the behaviour, socioeconomic options, and environmental perceptions of human societies. This perspective makes natural variables necessary to study relationships between human beings and the natural biophysical environment. I emphasise again that my transition occurred in a context of complete ignorance about SD.

3 CONTACT WITH OUR COMMON FUTURE

Many social and human scientists currently studying the relationships between humans and nature in Brazil (and other countries) have entered this field through the concept of SD. It was proposed in an influential document published in 1987 (when I was in the middle of my master's degree course): Our Common Future (OCF), also known to Brazilians by the expression Brundtland Report (World Commission on the Environment and Development, 1987). Only in 1989 did I become aware of and read this book, as it was in the hands of almost all of my social scientist colleagues interested in environmental issues. Therefore, I was induced to read OCF by its reception by my immediate circles of fellow social scientists.

I was surprised when I read the long and tiresome OCF: I was intrigued by the contrast between (i) the blandness and lack of originality of its content and (ii) the frisson with which it was being discussed, praised and adopted. Like other publications on many subjects coming from the UN system, previously and subsequently, the WCED (World Commission on Environment and Development), the multinational and multidisciplinary team of OCF authors had gathered an enormous amount of facts, sometimes well analysed separately, although not necessarily in an original or integrated way. In the following years, my surprise turned into boredom, as rereading several excerpts from OCF made its content increasingly flat in my eyes.

However, I noticed the obvious: inside and outside Brazil, adherence to OCF and SD was growing in the scientific-academic world, in research funding institutions, in public policy justifications, in political party and NGO programs, in the media, in marketing messages of all types of companies, in multilateral

banks, in intergovernmental organisations, and in advertising agencies. However, the training I received in my master's degree did not interact with OCF and SD. I was bothered by this breach, but I didn't get upset. I remained mutely "faithful" to my still incipient socationaturalist synthesis, which will be discussed later.

4 CRITIQUES TO SD

I decided not to follow the SD. I held on to what I had learned in my master's course without engaging in controversy with SD. I taught classes, advised students, and published texts driven by my socationaturalist training. This decision implied a relative "isolation" of my output from the mainstream of Brazilian socioenvironmental studies.

I criticised moderately the concept of SD in a review published in 1999 (Drummond, 1999, p. 755-761). In this review of the annals of the first major academic event (entitled "Political Geography of Sustainable Development") on SD held in 1995 in Brazil, I exposed how I was negatively impressed with SD applications made by foreign and Brazilian participants. On the one hand, few texts showed any research results. On the other hand, I found it intriguing that almost all authors criticised SD – without necessarily breaking with it. Also disappointing was that most texts debated topics social scientists had engaged in for decades – income distribution, social justice, contrasts between rich and poor countries, combating poverty, etc. In 2006, I published an article criticising SD directly (Drummond, 2006, p. 5-25). I highlighted that natural and life scientists had built the global environmental agenda, followed by a belated entrance of human and social sciences.

Below, I reiterate some points made in these two texts and add others. I criticise the slippery concept of SD and the related field of sustainability for nine reasons.

- I. SD ignores or fails to emphasise that any development (or generalised socioeconomic improvement) of human societies, although desirable, necessarily increases the current level of consumption of biotic and abiotic natural resources, renewable or non-renewable. "More development" accelerates the consumption of non-renewable resources and puts negative pressure on the recovery cycles of renewable resources. In this respect, SD is business as usual. In the context of any type of development, including SD, people will have better standards of living, be healthier and more educated, live longer, consume more "old" resources, and start to consume "new" resources that may be discovered or invented, require more energy, generate more waste, etc. All of this points to a socially just, or more just, order but contradicts the expectation of durability/persistence/sustainability inscribed in the concept of SD because, at some point, this order will run into the dead end of the scarcity of resources.
- II. SD ignores or fails to emphasise that the stock of non-renewable resources is finite and exhaustible in the short term and that the stock of renewable resources is at least uncertain or potentially declining in the long term. Measurements show that each year humanity consumes the stock of new biomass produced by renewable resources more quickly than the previous year. SD incurs the same contradiction mentioned in the previous item. It addresses poetically the issue of the finiteness of non-renewable resources and ignores the increasingly accelerated consumption of renewable resources. This double omission is a conceptual absurdity. It strengthens my perception that the concept of SD was constructed in opposition to analytical perspectives that identify the inescapable constraints embedded in the notion of entropy, in the basic concepts of ecology, and in studies of the limits of growth, as popularised by the influential text by Donella Meadows and collaborators, published in 1972 (Meadows *et al.*, 1972).

- III. SD ignores or fails to emphasise that the unrestricted population growth of human societies and the related growth in their consumption of natural resources are incompatible (i) with the exhaustibility of natural resources and (ii) with the existence of the vital space necessary for the existence of other life forms on the planet. SD is afraid of being accused of being “neo-Malthusian” and anthropocentric. It is afraid to stress the axiom that the more numerous humans are, the more they consume nature, even if most humans are poor, even if the wealthy minority consumes proportionally much more resources than the poor majority.
- IV. These three critiques, which I consider hard, have a degree of mutual overlap. But they are enough to dilute SD's entire claim to denote a type of development that is a durable or permanent phenomenon.

I have six other critiques to present.

- V. SD hides the inconsistency in the three aforementioned omissions behind a strong ethical appeal – even if this appeal is vague and commonplace. It poetically calls for the celebration of a contract between human generations. It ignores the unfeasibility of this contract, proposed in the abundantly cited couplet (which has taken on the status of a mantra) that SD is that development that “meets the needs of the present without compromising the ability of future generations to meet their own needs”. This is the best-known verse – often the only cited excerpt– that SD proponents highlight from the huge and almost illegible “gospel according to OCF”. I am in favour of ethical appeals, but I maintain that they do not serve to support scientific concepts and studies.
- VI. This SD mantra, in addition to oscillating between prescriptive and utopian in its properly ethical dimension (which in itself is not proper for a supposed concept), is empirically impossible to happen. It borders on the absurd: future generations will never be present to sign this contract with current generations and give concreteness to the commitment it intends to engender. That’s why I consider it poetic. There is more: no current generation is capable of knowing with certainty whether what they do or fail to do will improve or worsen the lives of future generations. Additionally, no current generation can know for sure what future generations will need and want. The current generation can only guess what future generations will need and want. While this guesswork is in and of itself ethically laudable, it belies SD's claim to be a scientific concept. This SD appeal in favour of future generations is not at all original – it is redundant and trivial. Except for the harshest nihilism, I do not know of any minimally consistent set of social, political, philosophical etc. ideas (including Communist, Nazi, and Fascist totalitarianism) in which there is a lack of concern for the interests (supposed or proposed) of future generations. Proposing a better life for the people of the future is a common feature of liberalism, democracy, conservatism, democratic socialism, social democracy, Fascism, Nazism, Communism, populism of all colours, and other isms ad infinitum. The centuries-old words of the North American forester and politician Gifford Pinchot (1845-1946), which I included in the epigraph, contain a clear but pragmatic concern for future generations. Pinchot was a conservationist and a proponent of productivist management of US natural resources. In his way, he was a scientist and politician concerned with the lasting supply of natural resources to sustain the well-being of future generations. It would have been appropriate for the OCF to cite Pinchot as a predecessor of DS - but it did not. Pinchot dealt with the finiteness of resources (which DS does not recognise) and identified four basic resources (forests, water, land, and minerals) for which he proposed the same as SD, using other words: they should be used “for the greatest benefit, for the greatest number of people, for the longest possible period.”

Pinchot does not use the poetic subterfuge of ethical concern for future generations to ignore that resources are finite.

- VII. For many SD proponents, it seems like previous statements and concerns about future generations never existed. This SD mantra is nothing more than a catchphrase, supposedly universalist and inclusive. The mantra has an undeniable and healthy political/ideological/emotional effect, but it lacks originality in the ethical field and total inconsistency as a scientific concept.
- VIII. Another criticism of mine is related to the previously mentioned mantra. It ignores that every decision made now about natural resources to encourage present development may work, but it may also create limitations and close off options for future generations. This is true even if current development overcomes some deficits and opens new doors, even if it produces concrete benefits in the short term, even if it guarantees or seems to guarantee a rosy future for all humanity. In other words, today's decisions condition tomorrow's possibilities and decisions in unpredictable ways. This ironclad rule also affects many other dimensions of social life besides the socioenvironmental dimension.
- IX. There is an additional limitation in the intergenerational contract proposed by SD. It contrasts sharply with my socionaturalist view. This contract is (a) to be signed by current and future generations of human beings and (b) intended to benefit future generations of human beings. In other words, it involves exclusively human beings. This pact, which aims to include the natural world as a whole, does not hide its eminently anthropocentric character. SD does not even allegorically deal with the interactions between humans and biophysical nature because it privileges the relationships between today's humans with each other and the relationships between today's humans and the humans of tomorrow. There is nothing "sinful" about the social or anthropocentric character of this contract - it is, as I said, an altruistic and ethically commendable sociological statement, even though it lacks originality and substance. But, to study/understand the relationships between human beings and nature – and this was the intention of the SD formulators – this exclusive option for the human and the social is incomplete and distorted. The geological and evolutionary processes of hundreds of millions of years are cancelled by the wisdom and restricted interests of a single and recently emerged species, humanity. Although dressed as proclaimers of great news, SD proponents actually subscribe to regressive statements. They go back some 6,000 years and paraphrase Genesis (Old Testament). In Genesis, a god - single, anthropomorphic male who lives in an ill-defined location (heaven), punishing, wrathful, omnipresent, and omniscient - created everything (including nature) and gave nature to be used in an unrestricted and exclusive way by his favourite creature, made in his image – we, human beings. In other words, the intergenerational contract that supposedly saves nature repeats the substance of the Old Testament. SD, although presenting itself as innovative, has its mind, heart, and two feet rooted in the old field of anthropocentrism, which in turn is a child of Genesis. SD promotes anthropocentrism to the status of "anthropolatry" (idolatry of human beings).
- X. My ninth and final criticism of SD has a strictly scientific content. I argue that it results largely from an act of "conceptual smuggling." It does not matter whether this act is deliberate or innocent. I am referring to the use that SD and its original source (OCF) make of the concept of carrying capacity, created long before OCF by the emerging science of ecology and commonly used by ecologists of yesterday and today. In a nutshell, carrying capacity can be defined as "the maximum population of an organism that a particular natural environment or ecosystem

can support” without that environment or ecosystem deteriorating (Allaby, 1998, p. 73). The concept was born from meticulous field and lab activities seeking to measure energy and nutrient flows in simple, self-contained ecosystems, such as small lakes that spend part of the year frozen or lakes isolated from other bodies of water. In these ecosystems, the ecologist (a) measures the input of solar energy (origin of all the dynamics of life), (b) identifies the resident species that form the various trophic levels, (c) measures the losses that the initial input of solar energy suffers in the stages in which it transforms into plant and animal biomass of those resident species or in which it dissipates, and (d) predicts and measures quantitatively the possible production of biomass in the lake and its distribution among the plant and animal populations of these different levels. This is how the ecologist determines the carrying capacity, or, in the plural, the capacities that ecosystems have to "sustain" the populations of their various living components. This indicates the maximum species populations at different trophic levels that can subsist continuously in the studied ecosystem. Orthodoxly, these pioneering ecological studies did not consider possible human interferences capable of reducing or increasing “natural” carrying capacities. Humans can reduce the carrying capacity of one or another species, for example, through biomass export (via collection, fishing, hunting, cutting and removal of living and dead vegetation, introduction of new organisms, pollution, etc.); they can also increase the carrying capacity of one or another species through fertilisation, protection, or introduction of organisms. SD is guilty of conceptual smuggling by using the concept of carrying capacity in a biased way, focusing exclusively on the number of humans that ecosystems can support. The gravest issue is that SD practitioners generally do this in a merely textual or narrative way without making any measurements. They produce unfounded statements - if not mere guesses - about the capacity to support or the lack of capacity to support some ecosystem in the face of some human action affecting that ecosystem. They do not perform - and their readers who are convinced about SD do not demand that they perform - calculations on energy inputs, losses and transformations, and biomass formation. However, without these measurements, the supposedly sustainable character of any ecosystem, being or action becomes a matter of opinion. But in the context of SD, this entire approach, even if measurements occur, is fallacious, as it focuses only on the standing of humans. The problem with this is that no ecosystem exists to support just one species that is part of it, not even a trivial species that considers itself special, like ours. SD deepens this smuggling, as it can introduce “without warning” human intervention into the equations for calculating biomass and viable populations. On the one hand, it unduly records the effects of “additionality” created by human introductions and interventions in ecosystems – for example, the yields of introduced domesticated plants and animals or the inputs of matter, biomass, and energy transferred from other ecosystems. SD does not even record that the additional biomass resulting from an "anthropogenic" action - such as creating a field to grow a food plant on a plot of land – depends on the subtraction of biomass and abiotic components from other locations and implies the elimination of biomass from uncertain numbers of other native organisms that are simply suppressed to provide space and nutrients for crops. On the other hand, SD “forgives” ecosystem changes and losses caused by humans by attributing them to “non-human” factors (such as climate change, storms, floods, diseases, fires, erosion, lack or excess of water etc.) or “correctable” human factors (such as inadequate management, destructive technologies, inappropriate crops, etc.). In short, SD is blatantly fallacious in its intended scientific dimension because it cares primarily about the capacity of ecosystems to support a single species, the human species - even at the cost of displacing or eliminating as many native species as necessary, even at the cost of dismantling local and remote natural ecosystems, even at the cost of creating artificial ecosystems that only survive with the help of inputs transferred from other places and the care offered by humans themselves.

5 OTHER APPROACHES

Having presented my critiques of SD, I will dedicate the rest of the text to briefly explain “my” analytical synthesis, which I call socio-naturalist. First, I will just mention the names of some authors who influenced my transition to the study of socioenvironmental issues and made me refractory to SD.

I came across most of these authors during my master's (1986-1988) and doctoral (1991-1995) courses at US universities. I reached many others later through personal searches and recommendations from colleagues and friends. In both courses, I was permanently marked by a range of authors and approaches that work in diverse ways with natural variables that neutralise the supremacy of human action. Despite their many differences, I highlight their common denominator: they work on the premise that human societies are “anchored” in their natural contexts. This leads them to conduct their research by attributing balanced explanatory weights to social and natural variables or even giving greater explanatory weight to natural variables. These authors and these approaches have another point in common: they postulate that human societies do not have complete control or knowledge over their natural contexts despite trying to achieve this control and even claiming to have it. The broader analytical implication is that natural contexts contain variables beyond human control and are, therefore, candidates for the status of explanatory of human actions, options, and perceptions.

Foreign authors predominated among those who influenced me in this sense, mainly natural or life scientists dedicated to understanding the relationships between human societies and their natural environments in very varied contexts. The names of the most important of them follow, in no particular order: Paul and Anne Ehrlich, Donella Meadows (and coauthors), Paul Sears, Aldo Leopold, Edward O. Wilson, Robert MacArthur, James Lovelock, Lynn Margulis, Thomas Lovejoy, Norman Myers, Jared Diamond, Rachel Carson, Amory Lovins, Garrett Hardin, Peter Ward, Stephen J. Gould, Barry Commoner, George Evelyn Hutchinson, Lester Brown, Colin Tudge, Walter Alvarez, Richard Dawkins, Eugene Odum, Henry Chandler Cowles, Tim Flannery, Vaclav Smil and Michael Soulé. Among them are botanists, zoologists, ecologists, forestry engineers, palaeontologists, physicists, and geologists.

Below, I list social scientists, historians, geographers, and others who have also influenced me. Following different paths, they approached natural and life sciences and included them in their perspectives and research: Donald Worster, Frederick Cottrell, Riley Dunlap, William R. Catton, Frederic Buttel, Walter Prescott Webb, Roderick Nash, William Cronon, Stephen Pyne, Alfred Crosby, Warren Dean, Emílio Moran, John Hemming, Leslie White, Marvin Harris, Richard White, Carl Sauer, Julian Steward, William Denevan, Nigel Smith, Philip Fearnside, Patrick Vinton Kirch, Charles Wagley, I. G. Simmons and John Reader.

Several Brazilian authors or working in Brazil also influenced me in the same way. It is worth mentioning that I had contact with almost all the members of this third group only after completing my master's program, specifically during research I did for my dissertation in 1987-88, later published as a book (Drummond, 1997). The non-exhaustive list includes zoologists, botanists, agronomists and ecologists: Alceo Magnanini, Ibsen de Gusmão Câmara, Maria Teresa Jorge Pádua, Marc Dourojeani, Augusto Ruschi, Alberto José de Sampaio, Luiz Emygdio de Mello Filho, Aziz Ab'Saber, José Cândido de Mello Carvalho, Harold Edgard Strang, Paulo Nogueira Neto, Helmut Sick, Frederico Carlos Hoehne, Cândido de Mello Leitão, Wanderbilt Duarte de Barros and José Lutzemberger. Also Worth mentioning are Armando Magalhães Corrêa (artista), Caio Prado Jr., Sérgio Buarque de Holanda, Gilberto Freyre and Darcy Ribeiro (social scientists or similar), who I also read only after 1986 (except Freyre).

Although there are social scientists and historians on these lists, the change I experienced came more from my contact with the work of botanists, zoologists, ecologists, agronomists, palaeontologists, geologists and foresters. By abandoning the paradigm of human immunity to nature, I simultaneously moved away from the related sociological maxim of Durkheimian origin, consensual in classical and contemporary sociology, that “the social can only be explained by the social” (paraphrased). This

Durkheimian maxim was a founding postulate of the social sciences and continues to guide the vast majority of social scientists, including those dedicated to socioenvironmental studies based on the malleable concept of SD. This is not surprising, as SD is a sociological concept, easy for sociologists to use. SD is a bad concept, but not because it is sociological. Many authors of socioenvironmental studies carried out under the aegis of SD do not even realise that they remain in the conceptual and epistemological confines of classical Durkheim. This continues to be appropriate for studies focused exclusively on human societies. Even though DS wears a “naturalist”, “ecological”, or “interdisciplinary” facade (derived from its metaphorical use of the ecological concept of carrying capacity), I insist that it is an orthodox Durkheimian and viscerally sociological concept.

6 SYNTHESSES OF THE NATURAL WITH THE SOCIAL

Below, I briefly explain the analytical synthesis I adopt, which I call socio-naturalist. I reiterate that my approach departs from DS and sustainability, not as an argument in favour of the superiority of my approach. I mention it because it is relevant to complete the criticism I present in this text.

The author who most influences my analytical perspective is Donald Worster (1941), a North American environmental historian whose work I became aware of during my master's course. In 1979, he published a founding book of the naturalist perspective on environmental history, *Dust Bowl* (Worster, 1982). He studied the geological-ecological formation of the vast semiarid US region known as the Southern Plains and the agricultural technologies introduced by farmers of European descent from the 1890s onwards. He shows how just two generations of these farmers caused the disastrous dust storms (known as the Dust Bowl) of the 1930s. The cause was the hasty and thoughtless application of agricultural technologies appropriate to humid and super-humid regions of Europe and the Eastern USA. The literature includes these storms as the greatest environmental disasters caused by humans in modern times across the planet. Worster combined (i) the study of the biophysical context of the grassy plains of the semi-arid Southern Plains with (ii) the description of the inadequate agricultural technology adopted and with (iii) the cultural assessment of the disastrous wish of tens of thousands of family farmers to reproduce the commercial success of their fellow farmers from other regions of the US. Worster's own family, living in the state of Kansas, was displaced by the Dust Bowl and became part of the massive exodus of small, ruined farmers.

In 1989 Worster produced a short theoretical and methodological text on environmental history to provoke a debate with other historians. It was published as the centrepiece text of a round table that recorded the reactions of five other historians in the same issue of an important North American history journal (Worster, 1990, 1087-1147). The text caused lasting debates by proposing a naturalist approach to environmental history. Worster maintains that environmental history must study jointly (i) the ecology of natural systems, (ii) the productive technologies with which humans intervene in these systems, and (iii) the cultural values and aspirations of the social groups who adopt these technologies.

This is the text that most influenced my approach and that I look for in the works I choose to read, inside and outside the field of environmental history. I try to follow Worster's “formula”, a socationaturalist perspective that examines the relationships between humans and nature by considering three sets of processes and facts:

- the composition of natural biotic formations (biomes, ecosystems, communities, populations, species, individuals, and organisms) independently of human interventions and of abiotic natural components, such as geology, climate, atmosphere, soils, topography, hydrography, mineralogy, etc.) equally ignoring tactically human interventions;
- the extractive, agricultural, livestock, artisanal, and industrial interventions of human societies in these natural formations via productive technologies and infrastructure

facilities, and the effects of these interventions on the natural formations and on intervening societies;

- the subjective/cultural demands and valuations that different societies place on nature and natural resources to build and maintain their desired living standards.

I do not claim to have created this approach, as it is present also with nuances in other authors, some of which I mention below. Nor do I maintain that the natural and life scientists mentioned above systematically practice it. However, to my knowledge, few approaches in the social sciences consider jointly these three sets of phenomena in the study of socio-environmental issues.

In the following paragraphs, I briefly discuss five social science or human science authors whose syntheses are close to Worster's "formula" and who also influenced me (their names appeared in the lists of influential authors presented above).

Julian Steward (1902-1972), a North American anthropologist, called his approach "cultural ecology" (STEWARD, 1977, 1985). Long before Worster arrived at his formula, Steward, despite using other words, dealt with the three components or objects of study listed above. I learned about Steward through a Brazilian anthropologist (Darcy Ribeiro; see below). He studies human societies by systematically focusing on (i) the range of natural resources available to each people or social group, (ii) the technologies created or learned to exploit these resources, and (iii) the social relations and political structures engendered by the combination of the first two components.

Unfortunately, Steward is scarcely known, adopted, and taught by contemporary anthropologists, except for those who know the precious collection of books he organised in the 1940s on indigenous peoples of South America (Steward, 1940-1947). In this collection, he and his collaborators apply "cultural ecology" and study in detail the material cultures of these people, their agricultural technologies (mainly "tropical horticulture"), and their views of the world and nature.

It is worth adding that Steward's popularity among contemporary social scientists is weak because he identified himself as a member of a "multicultural evolutionary" school. The concept of evolution continues to bother current practitioners of the humanities and social sciences. This occurs even after these sciences harshly criticised and neutralised the concepts inadequately derived from the biological evolutionism of Charles Darwin (1809–1882) when applied by other scholars (mainly Herbert Spencer (1820–1903)) in studies of human societies, under the auspices of "social Darwinism". Steward's critics sometimes reveal that they have not read him when they place him in the ranks of social Darwinists – it is a blunder because Steward harshly criticised social Darwinism.

Steward's synthesis was applied in Brazil in the 1960s by the Brazilian anthropologist Darcy Ribeiro (1922-1997) in an ambitious book strongly influenced by Steward and virtually ignored by current Brazilian anthropologists and social scientists (Ribeiro, 1968). I read this book casually just before starting my transition to environmental themes; I returned to it several times after reading Steward. Ribeiro uses Steward's approach in a work that is more similar to that of the historians of civilisations. It deals with pre-colonial, colonial, imperial, and republican Brazil in the light of Steward's synthesis and in the context of brief studies on the ways of life, religions, technologies, and political structures of dozens of societies and cultures recorded around the world, from prehistory to contemporary history, paying attention to their biophysical contexts, their technologies and their values.

Another anthropologist, the North American Leslie White (1900-1975), also correlated cultural evolution with productive technologies and natural settings (White, 1949). The fact that he defined himself (somewhat like Steward) as a "neo-evolutionist" limited his ability to influence fellow anthropologists. However, White's synthesis—in particular, his view of the analytical centrality of energy efficiency—

achieved some notoriety among social scientists who later became interested in the interaction of culture and nature.

In the study of human societies, White attributes a leading role to technologies for capturing and using energy. For him, the capture and use of energy take different forms throughout the history of human societies, in a process of increasing quantity and quality, differentiating societies from one another. Energies are captured and applied through substances and instruments (devices), ranging from human muscular strength itself (somatic) to various extra-somatic forms, such as the traction and hauling force of domesticated animals, instruments and tools such as levers, pulleys, wheels, rails, ducts, hoes, saws, inclined planes (ramps), river and wind currents, the burning of firewood, peat, vegetable fibres, charcoal and fossil fuels, all the way to nuclear, wind and solar energy. White maintains that societies that create technologies capable of capturing more energy and applying it more efficiently have a competitive advantage and become stronger than other societies in terms of social organisation, productive capacity, infrastructure, and military power. The study of energy issues requires paying special attention to the available natural resources, to the culturally created or learned productive technologies, and to the cultural values and projects of each society.

Another North American anthropologist, Marvin Harris (1927-2001), openly incorporated natural variables into his approach. Significantly, he called it "cultural materialism" (Harris, 1968, 1979, 1980). He became remarkable for studying culture as the unfolding of the material conditions of each people, which includes the natural biophysical environment but also encompasses productive technologies and the goods that support different peoples, including pre-modern ones. He devoted special attention, for example, to hunting, plant collection, fishing, agriculture, and livestock as food providers that sustain pre-modern peoples. For him, thoughts, beliefs, and other cultural constructions must be focused but have strong roots in the means of production and in the natural environment that these means exploit. Some commentators consider Harris one of the many "neo-Marxist" authors of the second half of the 20th century, which gained him some popularity among social scientists sympathetic to Marxism and averse to the neo-evolutionism of Steward and White⁷. I consider that his classification as "neo-Marxist" impoverishes the appropriation of Harris as a scholar of relations between humans and nature.

Finally, I mention the also North American geographer Carl Ortwin Sauer (1889-1975), creator of a synthesis known as "cultural geography", "historical geography", or the "Berkeley geographic school" (Sauer, 1971, 1980). In these two books, he adopted an approach that unites, in a deceptively simple way, the description and analysis of nature and culture. He used published and unpublished accounts of the first Europeans to visit certain parts of the territories of present-day USA, Mexico, and Canada. He paid special attention to how travellers, adventurers, and "pioneer" colonisers described (i) geology, topography, soils, climate, fauna, flora, rivers, lakes, etc., and (ii) Indigenous uses (agriculture, hunting, fishing, fire, villages, etc.). He combined the analysis of these newcomers' narratives with the findings of contemporary studies of natural science (geology, hydrography, climate, fauna, flora, etc.) and ethnography (religion, customs, lifestyles, harvested and domesticated plants, animals hunted and fished, etc.) of the native peoples residing in each of the studied places. From this combination, he drew challenging conclusions about (i) how territories, which were "new" to Europeans, had been biophysically modified and transformed into "cultural landscapes" by former native residents and (ii) how they were modified again by European newcomers endowed with radically different technologies, demands and objectives. The result is an elegant combination of natural and cultural variables.

I mentioned and briefly described the approaches of Worster, Steward, White, Harris, Ribeiro, and Sauer to emphasise that my socionaturalist synthesis was influenced also by authors from the social sciences, my point of intellectual departure. Therefore, "my" synthesis was not due exclusively to reading the works of natural scientists.

7 CONCLUSION

In this text, I criticised the hegemonic approach of SD. I went beyond this: I tried to show that, despite the widespread adoption of SD, there are other approaches better connected with the scientific principles of ecology and capable of more faithfully portraying the complex web of relationships between human societies and nature. I don't foresee SD losing its hegemony in the coming years and decades, but I intended to highlight other approaches that can coexist with DS.

NOTES

2 | The only way to mitigate this would be a drastic redistribution of income and purchasing power from the richest consumers to the poorest consumers, as long as consumption by the ex-poor does not exceed consumption level by the ex-rich. However, this would be nothing short of revolutionary, way beyond SD's horizon of moderate reformism. Furthermore, this redistribution of consumption power between different social groups does not modify the limits dictated by the finiteness of natural resources, limits with which the SD does not deal seriously. From the point of view of Planet Earth, it doesn't matter whether a poor or a rich person consumes resources, whether renewable or not.

3 | This trend is systematically measured and reported by "Earth Overshoot Day", an international research project that determines the approximate day each year on which the world's population consumed the entire stock of renewed resources produced in the previous year. In 1971, this day occurred in December. In 2023 it occurred on August 2nd. See <<https://overshoot.footprintnetwork.org/>>

4 | This well-known excerpt from OCF appears on page 9 of the 1988 Brazilian edition. I rarely see any other excerpts from OCF cited even by the most diligent adherents and practitioners of SD. Significantly, this passage is almost never cited with information about the page on which it appears. It has become one of those strings of words freely cited without reference to authorship and source, something uncharacteristic of an authentic scientific concept.

5 | I allow myself to say something I cannot prove: I suspect that most of those who quote this short excerpt from OCF have not read the hundreds of soporific pages of the entire work. To date, I have personally met only seven people (besides myself) who claim to have read OCF from cover to cover, although today it is perhaps one of the ten most cited non-religious texts in the world.

6 | Genesis 1:28, paraphrased by me: "God blessed Noah and his sons and commanded, 'Be fruitful and multiply! Populate and subdue the whole earth; subdue every fish in the sea, every bird in the sky, and every beast that crawls on the earth!'"

7 | In recent decades, most anthropologists have become uninterested in studying the so-called "material culture", the common denominator in the syntheses of Steward, White, and Harris and present also in the approaches of other classical anthropologists. Current anthropologists prefer to study symbols, religions, myths, founding narratives, representations, identities, versions, resignifications, perceptions, cognitive constructions and deconstructions, cultural markers, "denaturalizations" etc., caring little to make connections between these fully cultural components and the material bases of the societies they study.

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