

Environmental History 3

Manuel González de Molina  
Víctor M. Toledo

# The Social Metabolism

A Socio-Ecological Theory of Historical  
Change

 Springer

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A Socio-Ecological Theory  
of Historical Change

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*To Esther and Manolo...*  
*To Patricia, Emanuel and Emilio, once*  
*again...*

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*It is not the unity of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, and hence their appropriation of nature, which require explanation or is the result of a historical process, but rather the separation between these inorganic conditions of human existence and this active existence, a separation which is completely posited only in the relation of wage labor and capital.*

Karl Marx, Grundrisse 1973, 489.

*Sustainability is of whom works on it.*

Leonardo Tyrtania

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# Chapter 1

## Introduction

### 1.1 Worrying About the Future

Today, when visiting into a bookstore, cautiousness must be exerted to avoid being burdened by the catastrophic book covers neatly displayed in stands. In the last years we moved from *Collapse* (Diamond 2005) to *The Sixth Extinction* (Johnson 2013), then to *Field Notes from a Catastrophe* (Kolbert 2007). These books were accompanied by a special issue in *Scientific American* about the end of the world (2010), and by two crucial books: *The Revenge of Gaia* by James Lovelock (2006), and *An Inconvenient Truth* by Al Gore (2007). Today, there is a proliferation of books, technical reports, and videos containing sophisticated analyses about the future scenarios focused on a new cabalistic date: 2050 (Smith 2012; WWF 2012). It is the day for worrying about the future, about the insecurity brought about by a modernity that is increasingly incapable of assuring us of a riskless future.

In other historical periods, such anxiety for the future was nurtured by certain religious beliefs and apocalyptic ideologies, or by the desperate expressions of fortunetellers, artists, and philosophers. In this instance, worries grow not because of the several catastrophist views, but at the same rate in which scientific research unveils new discoveries about human impacts in the equilibrium of the planet. This uneasiness is also adopting an unusual magnitude, because the disequilibria are at such scale that no region in the world or sector of society can be beyond their reach. Everything points to society being already immersed into a self-perpetrated "... a giant, uncontrolled experiment on earth (McNeill2000)," in which natural and social processes become entangled in an unprecedented way, generating novel, unpredictable and surprising dynamics and synergies that threaten human life, global equilibrium, and uncountable life forms. The human species, now transformed into a new *geologic force*, has given place to a never witnessed stage in Earth's history: The *Anthropocene* (Crutzen and Stoemer 2000).

## 1.2 Exploring the Past

Paradoxically, this concern about the future outcome of things prompts a renewed attraction for the past. It is as if the eyes anxiously turned to history in search of the keys allowing for understanding a future that looks uncertain. This searching in the elements of the past for the instruments needed for successfully navigating the seas of the future—a reaction which seems reasonable at the level of the individual—is today not only a challenge for the species and a generic task, but the most urgent of challenges for present day science. Will scientific thought generate the necessary knowledge for sorting the present crisis of civilization? For example, the perspective revealed by history continues to be limited, cryptic or biased, being limited to the tackling of secondary—or even insignificant—matters, or resulting either from empirically unsupported speculations, or from an unrestrained imagination. Even recent contributions aimed at discovering long-term historical patterns become limited, such as the alternation of growth mega-periods with stages of stagnation and reorganization (Modelski2007), or the expansion-contraction cycles (Chase-Dunn et al. 2007). The same applies to the frantic search for “collapses” in all time periods and regions of the world (Diamond2005).

If science as a whole is mandated to know the past in order to learn from it, i.e., to extract lessons, it becomes necessary to guide the efforts towards achieving two objectives, both appearing as having a high degree of difficulty and being urgently required: (a) To develop an integrating (interdisciplinary) socioecological conceptual framework capable of organizing research about the relations between society and nature; and (b) The application of such framework conceived as a functional, and above all, useful instrument for analyzing such reciprocal relations throughout history (temporal dimension), and across all scales (spatial dimension). Already available are some relevant contributions offering accounts of the succession along the history of the human species of increasingly complex constellations built by societies throughout the territories of the planet (McNeill and McNeill 2003). What follows, is to apply to all these descriptions the pertinent analyses allowing for interpreting the social and ecological processes through time, and in consequence, offering criteria for the positioning of the present and coming historical stages.

The book now being held by the reader belongs to the intellectual vortex that tenaciously, sometimes obsessively, and even desperately is seeking for a single goal: *to decipher the past for the sake of understanding the future*. This is thus not a conventional book about history, or about ecological and environmental sciences. Its scope places it at an uncommon field of interdisciplinary knowledge that may be called ecological and social, socio-ecological, or eco-social, given that it aims at interpreting natural and social processes within their complex and intertwined articulation, or synergy. Hence, what the present book offers, in essence, is a suite of theoretical and methodological tools based on a key concept: *social metabolism*. Grossly defined, the concept of social metabolism introduces the biophysical analysis of exchanges between society and nature; in other words, it

goes beyond the conventional sociological perspective, but distancing from many reductionist approaches, it recognizes that such material exchanges are reciprocally linked to exclusively social factors. As the reader will discover, the first dimension of the analysis is focused on the *flows of mater and energy*, while the second concentrates on *flows of information*. The exploration is ambitious and saturated with risks, but is most needed in times in which interdisciplinary approaches capable of understanding the complex present situation are urgently needed.

### 1.3 The book Contents

The book has been divided into four sections and fourteen chapters, including the present introductory chapter. Chapters 1 through 4 are essentially theoretical and epistemological, and are directed towards localizing, signifying and clarifying the contribution of the so-called *environmental history*, and providing a detailed definition of the concept of social metabolism. Thus, these chapters lay the theoretical foundations for the necessary reconciliation between the discourse and practice of social sciences and the sciences dedicated to studying the physical and biological world. History—as a field that encompasses all human action since our appearance on Earth—is particularly suited to this purpose when using innovative axiomatic, epistemology, theories of historical change and methodologies, which, among other things, break away from the traditional parceling up of scientific knowledge. Most hegemonic theories in social sciences are still tributaries of the *metaphysical illusion* seized by modernity, which separated the human being from nature, generating an anthropocentric fiction that still endures. Hence, accounts of our past are used more to legitimate the permanence of obsolete structures of industrial civilization than to adapt to new times, hindering awareness of change towards a *sustainable society*.

This conception of history as *environmental history* requires an applied approach in which knowledge “stored” in the past can be highly useful to move along the path to the future, towards a more sustainable world. Environmental history must, therefore, although not exclusively, perform the role of a *species memory*, in which are stored the useful experiences developed by humanity as a whole throughout the history of our relationship with the natural environment. Environmental history also emphasizes the importance of processes of historical change conceived as socio-ecological transformations.

Because during the last decade the concept of social metabolism has rapidly gained a growing notoriety, and because its use has explosively expanded, Chap. 3 is devoted to document the origins and history of the concept, give a brief analysis of publications about it, and outline its principles and schools or trends. The section ends with a chapter providing with sufficient detail the *basic model* acting as the conceptual framework, thus functioning as the backbone of the book. Among the offered innovations is the adoption of an approach not restricting the

use of the concept of metabolism to the purely material dimensions, be these energetic, economic, or cybernetic, but rather to what is understood as a complex integrated by material and immaterial, visible and invisible aspects. With that, it is recognized that all society is an assembly of phenomena pertaining to both dimensions: that of the *flows of mater and energy*, and that of the *flows of information* that organize, mold and give support to the latter in virtue of social conditionals such as institutions, legal rules and regimes, values, beliefs and knowledge.

The exchange between society and nature of energy, mater, and information takes place within a territorial or spatial matrix comprising several scales, which means that the studied processes are hierarchically linked. Therefore, metabolic analysis can be conducted at different scales, each one being determined by, and in turn, determining other scales. The scales on which the process of appropriation can be analyzed range from the local to the global. Between these two extremes, there is a plethora of situations defined by the breadth of the scale. Hence, *trans-scalar analysis* emerges, an approach that is gaining strength in different fields of knowledge.

Chapters 5–8 shows how social metabolism functions at the main geographic scales, providing examples from the literature about social metabolism and case studies developed by the authors. Specifically, four examples are given, each one at a different scale: the current situation of a rural community, a rural community from an historical perspective, a micro-region, and the nation state. Whereas the first three are based on field-gathered information—i.e., are derived from direct empiric research, the third is compiled through statistical data and national accounts, and the second is composed of information held in archives.

The above-mentioned chapters tests the *basic model* at the spatial dimension, for which it relies on the conceptual framework proposed and discussed in the first five chapters, deploying it at four spatial scales that are somewhat arbitrarily defined: local, regional, national, and global. At each scale level examples are provided and methodological aspects are briefly discussed.

Chapters 9–11 contain a similar analysis to that made in Chaps. 5–8, but analyzes the temporal dimension, i.e., it offers an account of social metabolism through history. In Chaps. 9–11 the material dimension of social change is examined through the description and study of different metabolic regimes that have existed throughout history. Each of them has encompassed a certain level of human appropriation of both, living or organic (capture of primary net productivity or biomass), and mineral (fossil fuels, metal and non-metallic rocks, and ore) resources, and a certain degree of human intervention in the physical and biological processes taking place in nature. The aim is to classify societies according to their material basis (flow of energy, mater and information), and to the limits this basis imposes on human practice—a practice that, at the same time, modifies and transforms metabolism itself until its total transformation. The temporal dimension of social metabolism compels a review of the principal states or “moments” in the connection between different societies with their respective natural surroundings, each one responding to historical configurations.



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