

Preface

The *World Scientists' Warning to Humanity*, signed by some 1,700 of the world's leading scientists (with 102 Nobel laureates, including the majority of Nobel laureates in the sciences), declares: "Human beings and the natural world are on a collision course", (UCS 1992). The information we now have regarding the process of that collision and its seriousness is overwhelming. This handbook ventures to explain the main elements of a Sustainable Economy, the development of which is an unavoidable endeavour if we are to retain our civilisation.

This handbook is an amended, updated and adapted translation of my original Spanish version (*Manual para una economía sostenible*). The adaptation consists of reductions or elimination of the original focus on aspects of Spain's specific situation. On the other hand, all of the references mentioned, which appear emphasized (in bold face), are taken from the original text.

The book is divided into 2 large blocks containing 20 chapters divided into 4 thematic sections. The first block is dedicated to a critical analysis of theoretical assumptions and appropriate tools that proponents of the conventional economy propose as the solution to the "environmental problem". The second block explains the main elements (concepts and tools) of an alternative approach through creation of a Sustainable Economy.

Part I contains five chapters that present a critical discussion of the main elements of orthodox economical thinking and tools: review of essential premises of the dominant paradigm (inspired by orthodox economic theory) (Chap. 1); analyses of the efficiency of a free market, the historical process through which the capitalist market emerged, the commodification of nature, its repercussions on the environment and the prevailing theories on the supply of natural resources (Chap. 2); theory and tools of Environmental Economics (a branch of orthodox economics) in order to deal with the task of commodification of nature (Chap. 3); analysis of the theoretical and practical contradictions which appear when attempts are made to combine environmental protection and free trade (Chap. 4); analysis of the concept of sustainable development premises which appears in the Brundtland Report, and its two main distortions (the theory of triple sustainability and the theory of dematerialization) (Chap. 5).

Part II contains four chapters that deal with principles and tools needed to build a sustainable economy. Chapter 6 begins with a brief description of the Complex Adaptive Systems (CAS), and it explains the main elements of nature's behaviour. Taking into account that human economy is a subsystem of the general economy of nature, we describe its functional principles in order to deduce the principles of a sustainable human economy. Chapter 7 has three sections. The first one explains the adaptive cycle of ecosystems; the second one analyses the validity of the concepts useful for studying SESs, and the third one explains the concept of transformability and the factors that determine it. Chapter 8 studies two issues: it broadly evaluates the capacity for transformation of National Sustainable Development Strategies (NSDS), and it analyzes the essential requirements of an ecological tax reform. Chapter 9 offers a critical vision of the dominant paradigm of science and technology, and defines the bases of the paradigm of their sustainability.

Part III deals with sustainable production and consumption; it has ten chapters, five related to energy, one dedicated to transport, three describe a circular economy of materials, and the last is dedicated to sustainable consumption. Chapter 10 analyses the factors that determine the limits of fossil fuels, the current and future development of their respective offers, focusing in particular on oil and to a lesser extent on natural gas. Chapter 11 analyses the geostrategic conflicts caused by the distribution of fossil fuels. Then it reviews the causes of the current crisis and analyses the economical repercussions of peak oil. Finally, it studies the peak oil structural effect and its sectoral impacts. Chapter 12 contains the following issues: an analysis of the current model of transport; a study of the economic impact of the construction of new infrastructures; an assessment of the impact of rising oil prices on the transport system; a critical review of the EU strategy on transport; and finally some basic elements of a transport strategy aimed at achieving sustainability. Chapter 13 defines master lines for a sustainable electric system, assessing the current development and foreseeable evolution of the three main technological systems, besides other general elements: efficiency, grids and storage. Chapter 14 deals with alternative fuels: biofuels, electricity and hydrogen. After discarding the initial two, only hydrogen associated to fuel cells is left as the sole broad alternative to oil. Chapter 15 studies the following issues: the origin, development and characteristics of societies in energy emergency (SEE); a comparative analysis of the two organisations that form the movement; a study of the process phases in the design and implementation of transformative strategies; and an evaluation of the SEE movement. Chapter 16 analyses the concepts and principles of a circular economy, critical metals, and non-metallic materials, the EU's policy on materials, and ultimately the basis for a circular economy. Chapter 17 is dedicated to analysing the concept of Industrial Ecology (IE), and its two main fields: Material Flow Accounting and Industrial Symbiosis (IS). Chapter 18 analyses the so-called Integrated Product Policy (IPP) and its limits, and proposes the basis of an Integrated Product Strategy (IPS). Chapter 19 studies, on the one hand, the structural causes of the current high-level consumption model through the lens of motivation, provision and access systems. On the other hand, it describes the policies that must be adopted as part of a sustainable consumption strategy.

Part IV contains the final chapter, which undertakes the task of analysing the capability of our societies to transform themselves to reach sustainability. To do so we broadly evaluate each factor, as a prior step to carrying out an overall evaluation. However, we have to emphasise that we accomplish this task based only on the information contained in this book, as a first approach. In order to carry out a broad and in-depth analysis, a multidisciplinary group is necessary.

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