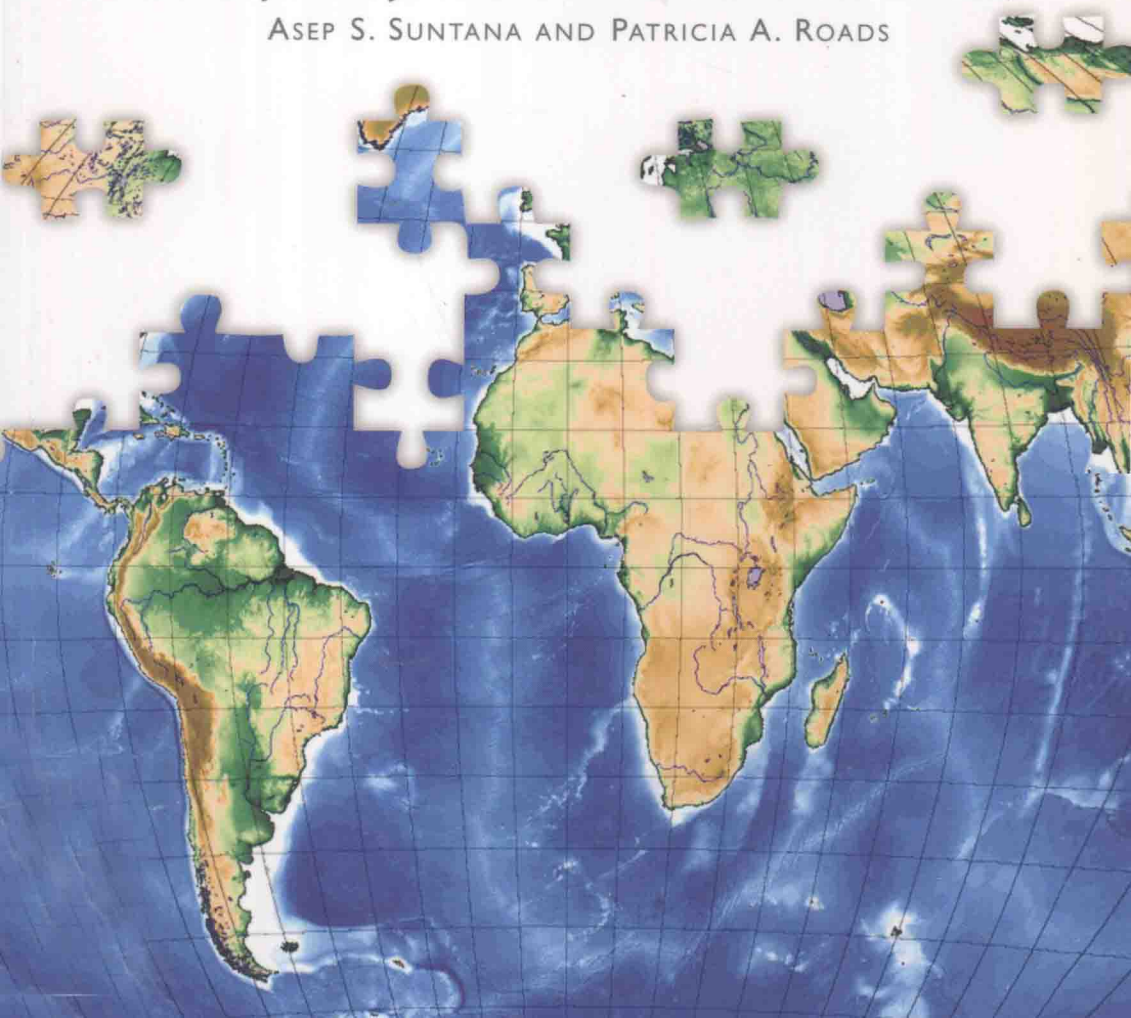


SUSTAINABILITY UNPACKED

FOOD, ENERGY AND WATER
FOR RESILIENT ENVIRONMENTS AND SOCIETIES

KRISTIINA A. VOGT, TORAL PATEL-WEYNAND, MAURA SHELTON,
DANIEL J. VOGT, JOHN C. GORDON, CALVIN T. MUKUMOTO,
ASEP S. SUNTANA AND PATRICIA A. ROADS



Sustainability Unpacked

Food, Energy and Water for Resilient
Environments and Societies

*Kristiina A. Vogt, Toral Patel-Weynand, Maura Shelton,
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Sustainability Unpacked

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Preface

Sustainability and adaptability are interdependent, essential traits of human history recorded on the Earth, which itself is dynamic. Sustainability, as a stand-alone trait or circumstance, may suggest a static condition, which, of course, is absolutely impossible in terms of the physical-chemical-biological processes that operate on and in the Earth.

Furthermore, sustainability is similar to hitting a moving target, in no small measure due to the ever-increasing population. The question must be raised: how many humans can the Earth sustain under the unavoidable constraints of climates and soils? These unavoidable constraints control the globe's productive capacity and set the boundaries for how much the human capital can be developed. It is not too early to do more than think about this pressing problem. It is time to formulate some proposals for serious consideration to achieve sustainability in practice. We hope this volume contributes towards the formulation of new proposals to sustainably produce and consume resources that also maintain societal adaptability in the face of dynamic environments and climates.

This volume addresses the survival necessities of life, in particular as they relate to humans – food, water and energy, with emphasis on their dependence on forests. It may be suggested that another necessity for survival is luck, as noted by Hsu (1986). Luck will not be discussed in our book but unpacking sustainable principles should help societies to make the necessary trade-offs to improve decision making.

When resources are considered, it is important to distinguish the two end-members – renewable, represented by biofuels and non-renewable, represented by fossil fuels. Products of both should be considered as creative wealth, as opposed to distributive wealth, represented by the monetary institutions, among others. Resource providers are producers, hopefully with responsible consideration of the ecosystems and they share that responsibility with those who are totally consumers of resources.

This book explores and decodes the interlinking and complex elements of sustainability so that resource use and human development strategies can maintain resilient environments and societies at a country level. Historical examples are used to provide insights into the characteristics of sustainability principles. These are followed by examining how 34 selected countries (advanced-, emerging- and growing-economy) have approached the sustainable

acquisition of energy, food, forest materials and water for their citizens, while being part of the global economy. We shall present and compare several indices developed by international organizations (such as population levels, percentage of people living in rural areas and dependence on fossil fuels), that are being used to rank countries as to their sustainability or vulnerability to environmental and societal changes, for these 34 countries. These climatic, environmental and resource use indices will be explored for their utility in explaining how a country's resource footprints contribute to its ranking in the environmental and climatic index groupings.

Country-level index data, supplemented by data on energy, food, forests and water uses are examined to demonstrate how the elements of sustainability vary among the countries. The country-level data include:

- climatic conditions;
- forest and agriculture productivity as well as their contribution to the GDP;
- the bio-resource productive capacities of the lands;
- fossil- and non-fossil energy consumption;
- carbon dioxide (CO₂) emissions during economic development;
- the importance of bio-resources in the economy;
- food consumption;
- renewable water availabilities and sources;
- soil quality and productive capacities;
- climate risk events.

These analyses are also used to demonstrate what makes a country resilient in its consumption of the four essential resources (food, forests, water and energy) and how appropriate it is to use higher human developed countries (such as Scandinavian countries) as models of sustainability. These data demonstrate that growing-economy countries should not necessarily follow the models developed in industrialized countries for the acquisition of the four essential resources. This is mainly due to the facts that we do not have new frontiers from which to acquire additional resources; our energy supplies are diminishing; and society has to adapt to changing climates. Therefore, for emerging-economies, their resource management and acquisition options should be geared towards efficient resource uses and the adoption of appropriate new technologies that may help them avoid the errors made previously by other countries. We also make a case that the sustainable use and management of forests will be important for those countries wanting to have resilient societies and environments.

By recognizing the links and feedbacks that exist within human landscapes, we hope to suggest how human behaviour can be modified and to emphasize the trade-offs that may have to be made in resource uses. It is important that we move beyond decisions that make us feel good or provide us significant short-term economic return, but have absolutely minimal ability to maintain long-term social and environmental resiliency. We need to move beyond special-interest group decisions, driven by their personal values or even greed, to make informed

decisions that allow for the human development potential to increase, without damaging the environment or human health. We hope this book will contribute to this goal.

We have developed here a comprehensive analysis that allows us to identify (1) the factors that can be managed and (2) when society needs to adapt if it wants to reach a higher human development potential. In addition, we also realize that the decoding of sustainability has to be grounded in scientific knowledge and to include the volumes of information that society has accumulated throughout its history. By simultaneously combining both a historical and a current perspective to explore resource and human development choices made by countries, it will be easier to begin to unpack the elements of what it means to be sustainable. This, we hope, is the value of a book like ours.

The authors really want to express our appreciation to Dr. John W. Shelton for his invaluable discussions, making us aware of pertinent literature, and for his editorial help that allowed us to maintain a balanced and credible discussion of fossil and renewable energy supplies for the countries included in our book. Dr. John W. Shelton is a Professor Emeritus of Geology from Oklahoma State University, and Founder and Editor of American Association of Petroleum Geologists Online Journal.

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List of Figures and Tables

Figures

1.1	The Sustainability Web: A conceptual figure representing some of the factors affecting human consumption of energy, food, forest materials and water	5
1.2	Orchestra analogy of global sustainability	10
2.1	Caricature of European countries harvesting trees in North America	38
3.1	HDI and EPI for 2005; $R^2 = 0.52$ [HDI & EPI rank of 1 is the highest rank]	63
4.1	Gross National Income and CO ₂ emissions per capita	82
4.2	CO ₂ emissions and energy consumption by HDI values during 2005	83
4.3	Total CO ₂ emissions from fossil fuels and cement production, gasoline consumption and from land-use for 2005	85
4.4	Natural gas, coal, oil, biomass and nuclear (in percentage ranges) as the primary energy supply in 2005	87
4.5	Wood biomass/wastes and fossil fuels as energy in 2005	88
5.1	Caricature representing the international community restricting who can access or live in an area identified to have conservation value	106
5.2	Caricature of using methanol, a wood alcohol, to power a computer to call for help after a car accident	114
5.3	Caricature of the link between deforestation in Siberia and the loss of corridors for woodpeckers to migrate to Finland's protected forests	124
7.1	The HDI values of countries plotted against the average annual minimum temperature and average annual maximum temperature	148
7.2	GNI/capita and rural population (%)	149
7.3	Caricature of competition for the same water supply by agriculture and for drinking	155
8.1	Caricature of how people do not know what problems a cook faces in producing the food that they eat	166
8.2	Country plots of the severity of soil degradation and desertification risk	177
8.3	Conceptual depiction of some human diseases resulting from nutrient deficiencies	181
8.4	Depiction of trees adapted to growing on parent material or rock and where there is no soil	189

10.1	Depiction of how human values complicate the development of solutions	213
10.2	HDI value plotted against population density (number of people/km ²)	221
10.3	Country agricultural indicators by HDI	226
10.4	Amount of energy consumed per capita plotted against the amount of family income spent on food purchases, $R^2 = 0.58$	228
10.5	Comparison of CO ₂ emissions per capita against electric power consumption and against biomass wastes as a % of total primary energy	231
11.1	Female children educated plotted against the proportion of the population in rural areas and their GNI	248
11.2	Relationships between female education, poverty and being undernourished	248
11.3	Percentage of girls not in school plotted against GNI per capita	249
11.4	Country labour statistics for 2008	259
12.1	Analogy of determining how many beds are in a house from looking through one window of the house	262
12.2	Conceptual fulcrum diagram of sustainability	272
12.3	Using the solar-centric view to determine what is sustainable at specific locations	281

Tables

1.1	Four categories used in our data analysis for ranking countries	18
2.1	Land area distribution types for the US and the world	23
2.2	Timeline for China to develop fossil carbon technology	32
2.3	Timeline of industrialization and building machines using fossil fuels	33
2.4	Timeline of oil use in industrialization	35
2.5	Timeline of major environmental impacts of oil consumption	36
2.6	Causes of water conflicts from 3000 BCE to 2008 CE	38
3.1	Comparison of nine indices for 34 countries	60
3.2	Statistical comparisons of nine indices for 34 countries	62
3.3	Ecological footprint groupings for 34 countries	64
3.4	Global Hunger Index rankings for emerging- and growing-economy countries	71
4.1	Correlations between CO ₂ emissions/capita and several country characteristics	82
4.2	Total CO ₂ emissions from fossil fuel and gasoline consumption by HDI groups	85
4.3	Water footprints of energy supplies	92
5.1	Groupings of countries by their total land area in forests and other wooded areas in 2005	99
5.2	Primary energy supplies from renewable resources in 2005	101
5.3	Correlations between energy and other resource indicators	102

5.4	Percentage of available forest area and of forest biomass consumed as the primary energy source	103
5.5	Grouping of countries into categories based on realistic uses of their forests	107
5.6	Total forest carbon budgets and CO ₂ emissions from land-use change and fossil-fuel combustion	110
5.7	Potential products produced from gasifying biomass to methanol	116
6.1	Country land area in agriculture in 2005	129
6.2	Grouping of countries into soil and climatic constraints to crop growth. A country may appear in more than one category	131
6.3	Percentage arable land irrigated (2003) and fertilized (2002)	132
6.4	Water dependency and drought risk rankings	135
6.5	Desertification risk by HDI country ranking groups	136
6.6	Percentage arable land irrigated by HDI country ranking groups	136
7.1	Climatic variables correlated to HDI and energy	147
7.2	Correlations between HDI and water indicators	154
7.3	Water information by HDI country ranking groups	155
7.4	Countries' drought risk rankings and electricity production by hydropower (2000)	159
8.1	Soil constraint characteristics by country (2000) by HDI	173
8.2	Arable lands without any soil constraints, by country for 2000	177
8.3	Arable land characteristics for countries grouped by HDI in 2000, unless given otherwise	178
8.4	Minerals in plants and human health	182
9.1	Total forest productivity and how much forests have been altered by humans	201
9.2	Forest area protected or lost each year due to disturbances by a country's HDI ranking	204
10.1	Climatic variables correlated to human development indicators	216
10.2	Energy use and climatic variables ranked by HDI value (from highest to lowest)	217
10.3	Population density (people/km ²) plotted to food indicators	222
10.4	Private ownership of forests by country	224
10.5	HDI ranking compared to labour and population statistics	225
10.6	Proportion of the population involved in agriculture plotted against human health indicators	226
11.1	Correlations between socioeconomic indicators and girls in education	247
11.2	HDI plotted against forest and agriculture imports	251
11.3	Countries grouped by whether they have net food imports or exports	253
11.4	Country HDI ranking groups and the percentage of GDP represented by import of goods and services	253
11.5	Energy use correlated to forest and agricultural imports	254
11.6	Energy characteristics of our 34 countries and how much needed to be imported, by HDI groups	255
11.7	HDI rankings correlated to development and labour variables	258

Contents

<i>Authors and Contributors</i>	<i>ix</i>
<i>Preface</i>	<i>xv</i>
<i>List of Figures and Tables</i>	<i>xix</i>

Part I: From the Beginning

1. Sustainability – Clues for Positive Societal and Ecosystem Change	3
Defining Sustainability	3
Why Sustainability Needs to be Unpacked	4
Decoding Our Current Perceptions of Sustainability and Is There a Right Model?	8
Large Datasets and Moving Beyond Irrational Human Choices	10
Using Human Development Ranking to Understand Large Datasets	17
2. Learning From the PAST: Why Societies Collapsed or Survived	21
Why People Live Where They Do	21
Where is it easier for humans to live within their footprints?	22
Where is it difficult for humans to live within their footprints?	24
Industrialization Fuelled by Carbon	28
A history of how society became dependent on ‘artificial’ products made from fossil carbon	29
Agrarian societies are dependent on renewable carbon	30
The ‘carbonization’ of society and the importance of coal	31
Oil made our ‘synthetic’ world possible	34
The Norm: Transboundary Consumption of Someone Else’s Resources	36
Human History: A Search for Food Security	39
Food and social status	42
Food preservation for food security	44
Restaurants and our perceptions of food security	46
A Long Human History of Poor Health	48
Accidental Reductions in Human Resource Uses	50