

SCOPE 58

# Sustainability Indicators: A Report on the Project on Indicators of Sustainable Development

*Edited by*

**BEDRICH MOLDAN**

*Charles University, Prague*

**SUZANNE BILLHARZ**

*Charles University, Prague*

**ROBYN MATRAVERS**

*Consultant, Prague*

*Cover and text designed by Julia Tennant*

*Published on behalf of the*

*Scientific Committee on Problems of the Environment (SCOPE)*

*of the International Council of Scientific Unions (ICSU)*

*United Nations Environment Programme (UNEP)*

*Commission of the European Communities, DGXI and DGXII*

*Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of Germany*



*by*

**JOHN WILEY & SONS**

Chichester • New York • Weinheim • Brisbane • Toronto • Singapore

---

# Contents

---

<b>List of Contributors</b>	xiii
<b>Introduction</b>	
<i>Bedřich Moldan and Suzanne Billharz</i>	1
Introductory Box:	6
The CSD Work Programme on Indicators of Sustainable Development <i>Monika Luxem and Birgitte Bryld</i>	
<b>1. Indicators and their Use: Information for Decision-making</b>	13
<b>PART ONE – INTRODUCTION</b>	
<i>Gilberto Carlos Gallopín</i>	
<b>PART TWO – BOXES</b>	28
<b>Box 1A:</b> Measurement and Indicators Program of the International Institute for Sustainable Development <i>Peter Hardi</i>	
<b>Box 1B:</b> The Spatial Dimension of Indicators of Sustainable Development: The Role of Geographic Information Systems (GIS) and Cartography <i>Sindre Langaas</i>	33
<b>Box 1C:</b> Environment and Sustainability Indicators for Latin America and the Caribbean: The Use of Geographical Information Systems <i>Manuel Winograd and Jeremy Eade</i>	40

<b>Box 1D:</b> The Driving Force-State-Response Framework used by CSD <i>Lars Fogh Mortensen</i>	47
<b>Box 1E:</b> Use of Models to Link Indicators of Sustainable Development <i>Ian D. Rutherford</i>	54
<b>Box 1F:</b> Decision-making Cycle <i>Bedrich Moldan</i>	59
<b>Box 1G:</b> Situational Indicators <i>Gilberto Carlos Gallopín</i>	63
<b>2. The Big Picture: Comprehensive Approaches</b>	69
<b>PART ONE – INTRODUCTION</b> <i>Arthur Lyon Dahl</i>	
<b>PART TWO – BOXES</b>	84
<b>Box 2A:</b> Current Approaches to Valuation <i>Jochen Jesinghaus</i>	
<b>Box 2B:</b> Vertical and Horizontal Linkages in the Context of Indicators of Sustainable Development <i>Manuel Winograd</i>	92
<b>Box 2C:</b> Syndromes of Global Change: An Information Structure for Sustainable Development <i>Matthias K. B. Lüdeke and Gerhard Petschel-Held</i>	96
<b>Box 2D:</b> Values, Services and Goods of the Geobiosphere <i>Bedřich Moldan</i>	99
<b>Box 2E:</b> Finding a Comprehensive Set of Indicators of Sustainable Development by Application of Orientation Theory <i>Hartmut Bossel</i>	101
<b>Box 2F:</b> Measuring Sustainability: Data Linkage and Integration <i>Peter Bartelmus</i>	110
<b>Box 2G:</b> Environmental Space-based Proactive Linkage Indicators: A Compass on the Road Towards Sustainability <i>Joachim H. Spangenberg</i>	119

<b>Box 2H: From Concept to Indicators: Dimensions Expressed as Vectors</b> <i>Arthur Lyon Dahl</i>	125
<b>Box 2I: From Static to Dynamic Indicators of Sustainable Development: Example of the Economy-Energy-Environment Link</b> <i>Walter J. Hecq</i>	128
<b>Box 2J: Barometer of Sustainability</b> <i>Robert Prescott-Allen</i>	133
<b>Box 2K: World Bank Perspectives on Sustainable Development</b> <i>Compiled by Bedřich Moldan</i>	138
<b>Box 2L: CSD Working List of Indicators of Sustainable Development</b> <i>Birgitte Bryld</i>	142
<b>3. Pieces of a Greater Picture</b>	149
<b>PART ONE – INTRODUCTION</b> <i>Ian D. Rutherford</i>	
<b>PART TWO – BOXES</b>	157
<b>Box 3A: OECD Environmental Indicators</b> <i>Myriam Linster</i>	
<b>Box 3B: Geobiosphere Load: A Tentative Proposal for a Comprehensive Set of Policy-relevant Indicators</b> <i>Bedřich Moldan</i>	164
<b>Box 3C: Accounting for the Physical Basis of National Economies: Material Flow Indicators</b> <i>Stefan Bringezu</i>	170
<b>Box 3D: Indicating Key Sectors for Dematerialization</b> <i>Stefan Bringezu, Ralf Behrensmeier and Helmut Schütz</i>	181
<b>Box 3E: Indicators of Biodiversity</b> <i>Ian D. Rutherford</i>	189
<b>Box 3F: Natural Environmental Change: A Challenge to the DSR Framework</b> <i>Antony R. Berger</i>	191

<b>Box 3G:</b> Greening the National Accounts <i>Peter Bartelmus</i>	198
<b>Box 3H:</b> Measuring Wealth and Genuine Saving <i>John C. O'Connor</i>	206
<b>Box 3I:</b> Small Island Developing States and their Economic Vulnerabilities <i>Lino Briguglio</i>	210
<b>Box 3J:</b> Sustainable Industry Indicators: The DSR Framework and Beyond <i>Helmut Forstner</i>	216
<b>Box 3K:</b> The Use of Indicators in Sustainable Agriculture and Rural Development: Considerations for Developing Countries <i>Jeffrey B. Tschirley</i>	221
<b>Box 3L:</b> Criteria and Indicators for Sustainable Management of Forests <i>Bernardo Zentilli</i>	230
<b>Box 3M:</b> OECD Indicators for the Integration of Environmental Concerns into Transport Policies <i>Myriam Linster</i>	237
<b>Box 3N:</b> The UNDP Human Development Index <i>Compiled by Bedřich Moldan</i>	242
<b>Box 3O:</b> Linking Sustainability to Human Deprivation <i>Terry McKinley</i>	253
<b>Box 3P:</b> Social Development Indicators <i>Alex MacGillivray</i>	256
<b>Box 3Q:</b> Rescue Mission – Planet Earth Indicators for Action: Using Indicators to Empower Young People to Implement Agenda 21 <i>Cecilia Weckstrom</i>	264
<b>Box 3R:</b> Towards Evaluating Social and Institutional Sustainability <i>W. Frederick Zimmerman</i>	266

CONTENTS	xi
Box 3S: Critical Loads in Europe <i>Compiled by Bedřich Moldan</i>	272
Box 3T: Health and Environment Indicators in Relation to Sustainable Development <i>Carlos Corvalán, Tord Kjellstom and David Briggs</i>	274
Box 3U: Environmental Indicators: City of Prague <i>Jaroslav Šolc</i>	283
Box 3V: The UNCHS (Habitat) Indicators Programme <i>Christine Auclair</i>	288
Box 3W: The Index of Sustainable Economic Welfare for the United Kingdom <i>Ed Mayo, Alex MacGillvray and Duncan McLaren</i>	293
4. National Level Indicators	299
PART ONE – INTRODUCTION <i>Bedřich Moldan</i>	
PART TWO – BOXES	302
Box 4A: The Development of Indicators of Sustainability in Canada <i>Anne Kerr</i>	
Box 4B: Indicators for the Environmental Programme in the Netherlands <i>Sebastiaan van Esch</i>	310
Box 4C: Indicators of Sustainable Development in the United Kingdom <i>Chris Morrey</i>	318
Box 4D: Costa Rican Experience with Sustainable Development Indicators <i>Edgar E. Gutiérrez-Espeleta</i>	328
Box 4E: Application of Indicators of Sustainable Development in China <i>Guo Xiaomin and Gao Li</i>	334

<b>Box 4F:</b> Environmental Policy and Sustainability Indicators: The Brazilian Environmental Monitoring Program <i>Fernando Vasconcelos de Araujo and Hidely Grassi Rizzo</i>	340
<b>Box 4G:</b> Sustainable Development Indicators: Philippine Government Initiatives <i>Candido A. Cabrido, Jr.</i>	344
<b>Box 4H:</b> The Sustainable Development Indicator Process in the United States <i>David Berry</i>	352
<b>Box 4I:</b> A Framework for Indicators of Sustainable Development: Finding Consensus (France) <i>Jacques Theys</i>	356
<b>Box 4J:</b> Austria: Indicators for Society's Metabolism and for the Intensity of 'Colonizing Nature' <i>Marina Fischer-Kowalski, Helmut Haberl and Harald Payer</i>	360
<b>Box 4K:</b> Approaches to Indicators of Sustainable Development in the European Commission <i>Isabelle Guinomet, Alessandra Sensi, Jochen Jesinghaus and Jonathan Parker</i>	369
<b>5. Research Needs</b>	379
<b>PART ONE – INTRODUCTION</b> <i>Jan Bakkes</i>	
<b>Box 5A:</b> Elements of a Research Agenda <i>Suzanne Billharz and Bedřich Moldan</i>	389
<b>PART TWO</b> <b>Conclusions</b> <i>Jan Bakkes</i>	396
Acknowledgements	399
Key List of Acronyms	401
Index	405