

Jan J. Boersema • Lucas Reijnders  
Editors

SUB Hamburg



B/92240

---

# Principles of Environmental Sciences

With Editorial Assistance by  
Joeri Bertels and Henk Bezemer

# Contents

Preface .....	v
Acknowledgements .....	ix
Contributors .....	xv

## Part I Stating the Problem

1 Environmental Sciences, Sustainability, and Quality .....	3
Jan J. Boersema	
2 Biogeochemical Cycles .....	15
Lucas Reijnders	
3 Reconstructing Environmental Changes over the Last 3 Million Years .....	19
A. M. Mannion	
4 Environmental History: Object of Study and Methodology .....	25
Petra J. E. M. van Dam and S. Wybren Verstegen	
5 Human Environmental History Since the Origin of Agriculture .....	33
Clive Ponting	
6 Recent Developments and Trends .....	49
Lucas Reijnders, Jan Bakkes, and Klaas van Egmond	

## Part II Principles and Methods

7 General Principles .....	75
Craig Dilworth	
8 Specific Principles .....	85
Lucas Reijnders	
9 Social Science and Environmental Behaviour .....	97
Linda Steg and Charles Vlek	
10 The Natural Environment .....	143
Piet H. Nienhuis with contributions of Egbert Boeker (Sections 10.2 and 10.3)	

---

<b>11</b>	<b>Analytical Tools for the Environment-Economy Interaction . . . . .</b>	177
	Paul Ekins	
<b>12</b>	<b>Analysis of Physical Interactions Between the Economy and the Environment . . . . .</b>	207
	Helias A. Udo de Haes and Reinout Heijungs	
<b>13</b>	<b>Environmental Policy Instruments . . . . .</b>	239
	Gjalt Huppes and Udo E. Simonis	
<b>14</b>	<b>Environmental Institutions and Learning: Perspectives from the Policy Sciences . . . . .</b>	281
	Matthijs Hisschemöller, Jan Eberg, Anita Engels, and Konrad von Moltke <sup>†</sup>	
<b>15</b>	<b>Technology for Environmental Problems . . . . .</b>	305
	Karel Mulder	
<b>16</b>	<b>Integration . . . . .</b>	335
	Jan J. Boersema	
<b>17</b>	<b>Environmental Modelling . . . . .</b>	345
	H.J.M. (Bert) de Vries	
<b>17A</b>	<b>An Illustration of the LCA Technique . . . . .</b>	375
	Reinout Heijungs	
<b>18</b>	<b>Integrated Assessment . . . . .</b>	385
	Jean-Paul Hettelingh, Bert J. M. de Vries, and Leen Hordijk	

### **Part III Context and Perspectives**

<b>19</b>	<b>Environmental Policies in Their Cultural and Historical Contexts . . .</b>	423
	Maurie J. Cohen	
<b>20</b>	<b>National Policy Styles and Waste Management in The Netherlands and Bavaria . . . . .</b>	433
	Jan Eberg	
<b>21</b>	<b>Land Use in Zimbabwe and Neighbouring Southern African Countries . . . . .</b>	445
	Ignas M. A. Heitkönig and Herbert H. T. Prins	
<b>22</b>	<b>Climate Change Policy of Germany, UK and USA . . . . .</b>	459
	Richard van der Wurff	
<b>23</b>	<b>Technical Progress, Finite Resources and Intergenerational Justice . . . . .</b>	473
	Wilfred Beckerman	
<b>24</b>	<b>Sustainability Is an Objective Value . . . . .</b>	483
	Herman E. Daly	
<b>25</b>	<b>A Rejoinder to Wilfred Beckerman and Herman Daly . . . . .</b>	491
	Roefie Hueting	

---

<b>26</b>	<b>Transitions to Sustainability as Societal Innovations</b>	503
	Anna J. Wieczorek and Frans Berkhout	
<b>27</b>	<b>Agriculture and Food Problems</b>	513
	David Pimentel	
<b>28</b>	<b>Tracing the Sustainable Development of Nations with Integrated Indicators</b>	517
	Bastiaan Zoeteman	
	<b>Author Index</b>	529
	<b>Subject Index</b>	537