

Copyright © 1994 Rodney R. White

Published by John Wiley & Sons Ltd,  
Baffins Lane, Chichester,  
West Sussex PO19 1UD, England  
Telephone National Chichester (0243) 779777  
International +44 243 779777

All rights reserved.

No part of this book may be reproduced by any means,  
or transmitted, or translated into a machine language  
without the written permission of the publisher.

*Other Wiley Editorial Offices*

John Wiley & Sons, Inc., 605 Third Avenue,  
New York, NY 10158-0012, USA

Jacaranda Wiley Ltd, 33 Park Road, Milton,  
Queensland 4064, Australia

John Wiley & Sons (Canada) Ltd, 22 Worcester Road,  
Rexdale, Ontario M9W 1L1, Canada

John Wiley & Sons (SEA) Pte Ltd, 37 Jalan Pemimpin #05-04,  
Block B, Union Industrial Building, Singapore 2057

**Library of Congress Cataloging-in-Publication data**

White, Rodney R.  
Urban environmental management : environmental change and urban  
design/Rodney R. White.

p. cm.

Includes bibliographical references (p. ) and index.

ISBN 0-471-95001-7

1. City planning—Environmental aspects. 2. Urban ecology.

I. Title.

HT166.W513 1994

307.1'216—dc20

94-9553  
CIP

**British Library Cataloguing in Publication Data**

A catalogue record for this book is available from the British Library

ISBN 0-471-95001-7

Typeset in 11/13 Palatino from author's disks by  
Mathematical Composition Setters Ltd, Salisbury, Wiltshire  
Printed and bound in Great Britain by Biddles, Guildford, Surrey



---

## Contents

---

List of Figures	vii
List of Tables	x
Preface	xi
List of Acronyms	xvii
List of Other Abbreviations	xviii
A Note on Language	xix
1. The Urban Environment	1
2. Environmental Change	21
3. Urban Metabolism	41
4. Urban Pathology	65
5. Urban Impacts on the Air	85
6. Urban Impacts on Ground and Water	115
7. The Ecological City	137
8. Toronto Initiatives	167
9. Postscript	193
Glossary	201
References	217
Index	229

---

## Figures

---

1.1	The Ten Largest Cities in 1990	6
1.2	The Pollution Transition: from Poor-country Pollution to Rich-country Pollution	7
1.3	Impacts of Human Activities on the Atmosphere	11
2.1	The Growth of the Human Population	28
2.2	Stratospheric Ozone Depletion, Halley Bay, Antarctica	29
2.3	Carbon Dioxide Build-up, Mauna Loa, Hawaii	30
2.4	Carbon Dioxide Build-up from Polar Ice Cores	30
2.5	Relative Warming Impact of the Greenhouse Gases	31
2.6	Some Implications of Sea-level Rise for Urban Discharges to Ground and Water	36
3.1	(a) Wolman's Hypothetical American City; (b) The Metabolism of Hong Kong	45
3.2	Inputs and Outputs from Wolman's City and Hong Kong	50
3.3	Hong Kong Water Use	51
3.4	Energy Balance for Metro Toronto in 1988	55
3.5	Evolution of the Relationship between the City and the Environment	59
3.6	The Resources-Activities-Residuals Approach	60
4.1	UK Household Carbon Dioxide Emissions (1987) by End-use and Source of Fuel (in million tons CO <sub>2</sub> )	70
4.2	Carbon Dioxide Emissions and Energy from UK Households	71

viii Figures

4.3 Carbon Dioxide Emissions per Unit of Energy in UK Households	72
4.4 Cost of UK Household Energy	72
4.5 Grams of SO <sub>x</sub> and NO <sub>x</sub> per \$ of GNP 1988	76
4.6 Modal Split for Passenger Trips 1987	78
5.1 Sources and Impacts of Trace Gases in the Atmosphere	88
5.2 Annual Cost of Energy for Household Appliances	96
5.3 Typical Carbon Dioxide Emissions from Household Appliances	96
5.4 Carbon Dioxide Emissions from Energy Use	98
5.5 Total Sulphur Dioxide Emissions	99
5.6 Total Nitrogen Oxide Emissions	99
5.7 OECD Emissions by Economic Sector	100
5.8 Carbon Dioxide Emissions by Industry	101
5.9 Passenger Cars, 1970-1988	103
5.10 Emissions to the Air, Los Angeles, 1973	105
5.11 Energy Intensity of Transport Modes in the USA	106
5.12 Commuters' Contribution to Air Pollution	107
5.13 Car Use and Distance Travelled	108
5.14 Toronto: Population, Car Ownership, Carbon Dioxide Impact	109
6.1 Population Without Water Supply and Sanitation	119
6.2 Personal Water Use in Canada	122
6.3 Solid Waste Production by Country: Industrial, Municipal and Nuclear	126
6.4 Packaging Flows in Canada, 1990	128
7.1 Various Land-use Planning Situations	145
7.2 The Lower Don River before and after Channelling	147
7.3 The Poundbury Extension to the City of Dorchester	149
7.4 Transportation Patterns for Dorchester and Poundbury	150
7.5 Phases of the Masterplan for the Poundbury Extension	151
7.6 Ebenezer Howard's Garden City	154
7.7 Traffic Calming in a Residential Street	157
7.8 Domestic Water Used per Capita per Annum	159

Figures ix

7.9 A Linear City with a Combined Utility Trench	162
8.1 (a) The Greater Toronto Area; (b) Relative Population Size, 1986	172
8.2 House Prices in the Metro Toronto Area	178
8.3 The City of Toronto Proposal for the Reduction of Carbon Dioxide Emissions	183
9.1 Where Countries of the North and South are Today ... and where We Need to Be	197