

Ian Bentley

Soham De

Sue McGlynn

Prachi Rampuria

# ECORESPONSIVE ENVIRONMENTS



A FRAMEWORK FOR  
SETTLEMENT DESIGN

ROUTLEDGE

# EcoResponsive Environments

*EcoResponsive Environments* integrates our current knowledge of designing for human needs, with a deeper understanding of natural systems. The book offers both a call to action and a comprehensive yet pragmatic framework for practising the art and science of settlement design, called EcoResponsive Design.

Bridging the gap between theory and generic policy on the one hand, and design for specific places and sites on the other, the book is aimed not only at the professionals involved in planning, designing and developing these places, but also the wider range of communities interested in creating better spaces for our everyday lives.

EcoResponsive Design encompasses all scales, ranging from the overall form of settlements and the landscapes in which they sit, to buildings and the detailed design of public spaces. Drawing from projects, places and best practices in many different countries and contexts across the world, it demonstrates how positive changes at the local scale can be achieved for every single site, large or small. The book urges a shift in focus from individual specialisms to collaborative actions, enabling development stakeholders to negotiate a balance between short-term financial viability and longer-term environmental and social values.



**Taylor & Francis**

Taylor & Francis Group

<http://taylorandfrancis.com>

# **EcoResponsive Environments**

**A FRAMEWORK FOR SETTLEMENT DESIGN**

**Ian Bentley**

**Soham De**

**Sue McGlynn**

**Prachi Rampuria**

 **Routledge**  
Taylor & Francis Group  
LONDON AND NEW YORK



Designed cover image: Soham De

First published 2024

by Routledge

4 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge

605 Third Avenue, New York, NY 10158

*Routledge is an imprint of the Taylor & Francis Group, an informa business*

© 2024 Ian Bentley, Soham De, Sue McGlynn, Prachi Rampuria

The right of Ian Bentley, Soham De, Sue McGlynn, Prachi Rampuria to be identified as authors of this work has been asserted in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

*Trademark notice:* Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

*British Library Cataloguing-in-Publication Data*

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

ISBN: 9781032506227 (hbk)

ISBN: 9780415818766 (pbk)

ISBN: 9781003399339 (ebk)

DOI: 10.4324/9781003399339

Typeset in Minion Pro

Book design by EcoResponsive Environments

This book has been prepared from camera-ready copy provided by the authors.

FOR IVA AND SEAN



IN MEMORY OF IAN BENTLEY



**Taylor & Francis**

Taylor & Francis Group

<http://taylorandfrancis.com>

---

# Contents

Foreword	viii
Acknowledgements	ix
About the authors	x
 NEW WAYS OF THINKING	 <b>1</b>
 <b>1</b> COUPLING WITH NATURAL INFRASTRUCTURE	 <b>15</b>
 <b>2</b> LINKING IN PUBLIC SPACE	 <b>57</b>
 <b>3</b> GENERATING THE PLOT SYSTEM	 <b>95</b>
 <b>4</b> INTEGRATING BUILDINGS	 <b>141</b>
 <b>5</b> TUNING FOR ATMOSPHERE	 <b>193</b>
 NEW WAYS OF PRACTISING	 <b>229</b>
 Bibliography	 232
Index	238

# FOREWORD

Published almost 40 years apart, the original *Responsive Environments: A manual for designers* (1985) and this new volume, *EcoResponsive Environments: A framework for settlement design* (2024) are very different in scope and intent. There are, however, some common threads that link the two books and this Foreword is an opportunity to put them both into the context of the periods in which they were written.

In Europe and the USA, the decades prior to the publication of *Responsive Environments* were marked by a growing popular rejection of the post-war reconstruction of town centres and inner-city clearances for roads and large housing estates. Initiated by politicians, planners, architects and highway engineers with the best of intentions, the physical results of these policies and design approaches were seen by many not as a positive rebuilding of cities but a further destruction of familiar places and neighbourhood communities.

The original *Responsive Environments* drew on the work of leading theorists and practitioners, such as Jane Jacobs, Christopher Alexander, Kevin Lynch, Bill Hillier and Jan Gehl, who were challenging these new urban environments during the 1960s, 70s and 80s and defining a ‘new’ discipline of urban design. Using these ideas in our own practice and teaching, we synthesised them into a set of seven qualities that could be used to design places that are more responsive to their users.

Whereas *Responsive Environments* focused primarily on human users, *EcoResponsive Environments* now proposes a new frame of reference in order to create places that are better not only for the people who use them but also the health of the natural systems on which we all rely. The solidity of the ground on which we stand, the air we breathe, the water we drink, the food we eat, the raw materials we use to construct the physical environment, the energy for powering transport, the trees, plants and flowers that afford sensory enjoyment – are all drawn ultimately from the wider ecosystem within which each site is embedded.

As we stand on the threshold of the Anthropocene, the world is facing an increasingly severe global environmental crisis, marked by rapidly increasing degradation of ecosystem services. Feedback to the wider ecosystem from current settlements, for example through resource and habitat depletion, water pollution, waste generation and atmospheric emissions, now damages the future capacity of the very services on which all settlements depend. As just one example, The European Commission has established that 80% of Europe’s habitats are in poor condition and more than 60% of soil is unhealthy. This sobering research has led directly to The Nature Restoration Act (European Union, 2023) which aims to restore these degraded ecosystems by 2050. Moreover, the crisis is not limited just to the depletion of habitats and other natural resources, but also to the international rise in issues of human wellbeing and life expectancy, including obesity, asthma, social isolation and mental health.

Our aim in writing this book is to address the overarching issues of the Anthropocene at the project scale, by developing a new design approach that is responsive to fundamental human needs and wellbeing whilst enabling ongoing support from ecosystem services. We call this approach *EcoResponsive Design*. As a starting position, we prefer to use the term ‘settlement design’ to break away from the connotations of ‘urban design’ for three main reasons.

First, the term ‘urban design’ has long been a source of confusion and is clearly a misnomer that perpetuates the somewhat false dichotomy between urban and rural places. For many people, urban design is concerned only with urban places. This belief is borne out in the urban design literature and the publications themselves, which are dominated by text about and images of big cities and densely urbanised settlements, with other settlement types and settings largely ignored. Clearly, denser and more compact settlements are a key part of the *EcoResponsive* approach, but this should not be at the expense of the natural systems that support all human life and wellbeing.

Secondly, the term also reflects the origins of urban design in the civic design movements of the late 19th and early 20th centuries. Perhaps unfairly, these movements have become associated more with architecture and aesthetics, the formal arrangement of buildings, axes and set-piece parks and open spaces than with the millennial understanding of a more dynamic and people-centred approach to urban design.

The final reason for adopting a new term is perhaps more contentious, at least in the UK. This is the alignment of urban design with what seems to us to have become a rather fixed practice and vocabulary that has been slow to integrate natural systems thinking with human needs and wellbeing in masterplanning and settlement design. Clearly, there are outstanding examples of new design in many places – but not enough bearing in mind how simple the essential urban design principles are and how long they have been incorporated within successive governments’ planning and design guidance and policies.

The practical guidance in the original *Responsive Environments* remains valid and relevant as a set of essential urban design principles. *EcoResponsive Environments* now aims to provide a more comprehensive framework within which these principles can be integrated with a new 21st century design agenda for achieving healthier human and natural habitats. From our own experience, we understand how difficult it is to challenge the current urban design pattern book, even though the same things seem to go wrong over and over again in masterplan after masterplan, project after project. Roles, responsibilities, legislation and professional practice are fragmented. Collaboration must replace compartmentalisation if we are to meet the challenges of climate change, habitat and species destruction and the impacts of car-based urbanism on human health and wellbeing.

This can only be achieved by a shift in focus from individual specialisms to collaborative actions, enabling development stakeholders to negotiate a balance between short-term financial viability and longer-term environmental and social values.

In this book, we have deliberately avoided repeating information that has been thoroughly explored elsewhere, such as the extensive technical literature on assessment and measurement of habitat health or performance of green and energy-efficient buildings. There is an almost overwhelming amount of literature on these issues yet much of it is not easy for planners or designers to synthesise, merge or assimilate with their practice. One of the motivations in writing *EcoResponsive Environments* has been to synthesise this diffuse theory and literature into a practical framework for making design decisions.

Our hope is that *EcoResponsive Environments* offers a springboard for continuous development through design practice, using our current knowledge of human needs and wellbeing but integrating and literally regrounding it in a deeper understanding of natural systems. This then forms the 'armature' for project design in different parts of the world, the open framework on which the settlement will be moulded and creatively designed.

## ACKNOWLEDGEMENTS

This book has taken a very long time to write and produce and its broad scope means that we have relied on the advice and knowledge of many colleagues in practice and in academia. It also means that we have probably missed out some people who have contributed and so apologise to them for that. We feel privileged to have worked with such creative and inspiring people, named and un-named, and thank them all for their time, generosity and expertise.

For their invaluable experience and deep knowledge of planning, development and design in practice, warmest thanks are due to: David Birkbeck, Design for Homes; Amy Burbidge, Homes England; Andrew Cameron, Andrew Cameron Associates; Garry Hall, Homes England; Shashank Jain, Studio 4215; Phil Jones, Phil Jones Associates; Stefan Kruczkowski, Urban Design Doctor; Todor Kuznetsov; Michelle Le Roux, Urban Collaborations, Cape Town; Richard Lewis, Active Planning; Kevin McGeough, Healthy New Towns Project Director, Ebbsfleet Garden City; Ed Moseley, London Structures Lab; Peter Neal, Peter Neal Consulting; Mark Pearson, Executive Director, Design Action Devon and Cornwall; Pedro Roos and Studio PDP; Tim Stonor, Managing Director, Space Syntax Ltd.

Over the years, we have all been both students and then lecturers at Oxford Brookes University. Colleagues and many generations of students have challenged, tested and

contributed to the ideas presented here. There are too many former students to acknowledge by name – many of them have gone on to become leaders of urban design practice in the UK and across the world – and we have the greatest admiration for the ways in which their own knowledge and expertise have pushed our thinking over the years. Amongst our former colleagues we would like to mention Ivor Samuels, Graham Smith, Alan Alcock, Paul Murrian, Richard Hayward, Regina Lim, Karl Kropf and Georgia Butina-Watson for their contributions to the development of urban design as a discipline at Oxford Brookes and to its international standing as a centre of excellence for urban design education and research.

We are grateful to Fran Ford of Taylor & Francis/Routledge who has been our editor since the very earliest proposal for the book and has provided us with unstinting support and advice throughout the process. Hannah Studd has also been involved in the later stages of the book's production and has helped to get us over the line!

Finally, we would like to express our gratitude to our partners, parents and families for their unending patience and unconditional love throughout the years.

# ABOUT THE AUTHORS

## IAN BENTLEY

Ian had a background in architecture and property development. In 1985, he co-authored, with Sue McGlynn and others, the publication *Responsive Environments*, which underlies much current UK urban design guidance, and has been translated into many languages. In 1999 he published *Urban Transformations*, exploring the financial and political reasons why today's development takes on its characteristic forms, and suggesting ideas for improvement. In 2007, with Georgia Butina Watson, he published *Identity by Design*.

From 1980s Ian was involved in the multi award-winning regeneration of Brixton's Angell Town estate. He has been invited as keynote speaker at conferences in the UK, China, Colombia, Australia, Iran, New Zealand, Russia, Canada, Brazil, Mexico and the Czech Republic. He was an emeritus professor at Oxford Brookes University's Joint Centre for Urban Design until 2011.

Since 2012, Ian with Soham De and Prachi Rampuria ran a series of urban design workshops around the latest EcoResponsive design concepts, in a range of countries that are experiencing rapid urban change. In recognition of his contribution to the field, he was awarded the Lifetime Achievement Award by the Urban Design Group in 2012.



## SOHAM DE

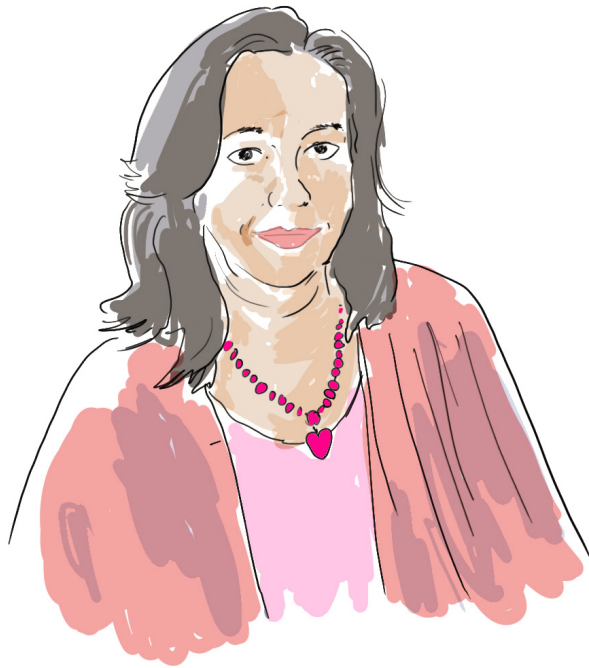
With a background in architecture and urban design, Soham is driven by solutions that underpin a circular economy and embrace a holistic approach to contextual design and place identity.

Since 2018, he is a co-founding director at EcoResponsive Environments, an award-winning urban design and architectural practice based in London with a singular mission: we design to support health and wellbeing, today and for future generations. Recent projects include a modern-day Garden City masterplan for a 45-ha expansion site to the north of Letchworth, UK for 900 new homes, amenities, and a primary school; a masterplan for regenerating the 60-acre Heath Business and Technical Park in Runcorn, UK as a mixed used zero-carbon neighbourhood; and public realm regeneration strategy for two council-owned housing estates in Tower Hamlets, London.

The Heath Park masterplan won the National Urban Design Award 2023 in 'Small/mid-scale masterplan' category; Pineapple Award 2022 in 'Future Place' category; and was recognised by the UK Government as one of 35 'Green Innovation' schemes in 2021. Since 2017, he has been teaching on the BA and MA Urban Design courses at Oxford Brookes University. He is also a visual artist and has undertaken several exhibitions and illustration of books.







### **SUE MCGLYNN**

Sue is an urban designer whose career has merged practice, teaching and research in settlement design.

Well-known as a presenter and author, Sue has taken a lead role in many national design training initiatives, such as the roll-out for Design Council Cabé's Design Codes pilot projects, DfT's Manual for Streets and Homes England/ Design for Homes' *Building for Life*. Since 2006 she has been an independent consultant, with much of her work involving design review and enquiry-by-design workshops for masterplans and design codes of major new settlements and garden villages.

Previously, Sue worked for many years at the Joint Centre for Urban Design at Oxford Brookes University. With Ian Bentley and colleagues at the Joint Centre, she co-authored the seminal urban design text *Responsive Environments: A manual for designers*. Sue was a founding co-editor of the journal *URBAN DESIGN International* and more recently has contributed to *Building for a Healthy Life*, a housing and neighbourhood assessment guide sponsored by Homes England, the NHS and Design for Homes. Sue's contribution to urban design has been recognised by the Urban Design Group with a Lifetime Achievement Award.



### **PRACHI RAMPURIA**

Prachi is passionate about places and place-making. She studied architecture in India, followed by a Masters in Urban Design at Oxford Brookes University. Early career influences include being trained at Sangath; studio of the Pritzker-prize and RIBA Royal Gold Medal winner architect B.V. Doshi.

As an urban designer, she has led multi-disciplinary teams on complex masterplanning and urban regeneration projects of diverse scales and typologies in the UK, the Middle-East and India. Her interest lies in developing a transdisciplinary multi-scalar design approach; from strategic master planning down to the sensory manifestation of materiality in contemporary yet locally-distinctive ways, optimally balancing the long-term environmental and social values with short-term financial value.

In 2018, with Soham De, she co-founded the award-winning London-based design practice EcoResponsive Environments, best known for innovation in sustainable urbanism, strategic masterplanning and architectural design.

She teaches at Oxford Brookes University's MA in Urban Design course as an Associate Lecturer. She also sits on the Design South East, Harlow and Gilston Garden Town and Taunton and Somerset West Quality Review Panels.





---

# New ways of thinking

DOI: 10.4324/9781003399339-1

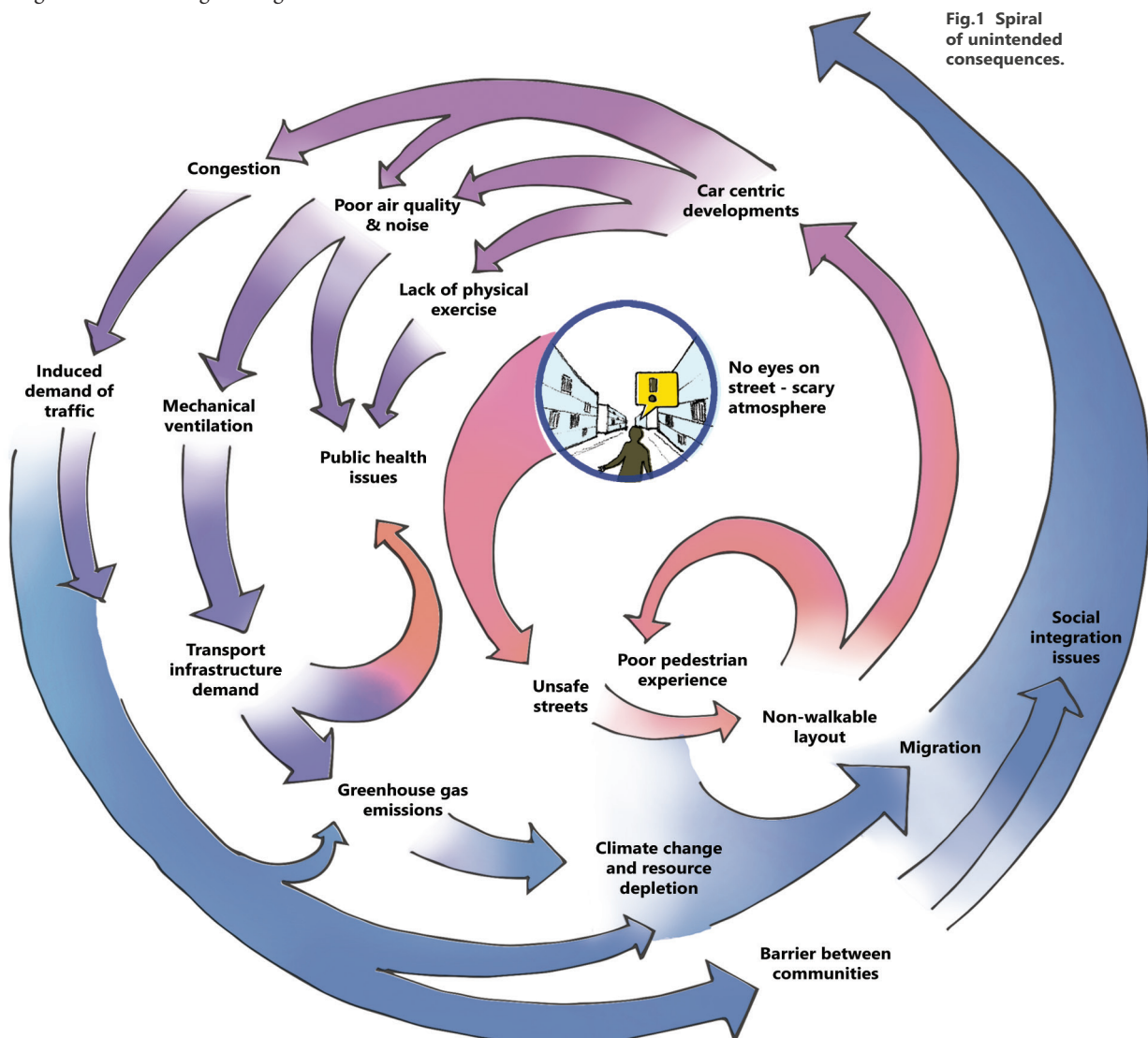
This is a practical book about designing the built environment, at all scales from buildings to the overall form of settlements.

## INTRODUCTION

This is a practical book about designing the built environment, at all scales from buildings to the overall form of settlements. We are addressing not only the various professionals involved in designing these places, but also the wider range of people who simply want better settings for their everyday lives. This book offers practical design ideas for empowering all these potential readers to collaborate in making better environments; either through building new places or by retrofitting or expanding existing ones. Since there is no point in explaining how to make the kinds of decisions that mostly work well already, we focus on things that most often go wrong.

## UNINTENDED CONSEQUENCES

Every design task, no matter how small, inevitably addresses some unique situation – that is why design is creative work. Because no design situation has an exact precedent, and because designers usually have to work within a complex web of others' interests, we can never predict the exact outcome of the multiple trade-offs that have to be made. This exposes all designers, at all scales, to the risk of making well-meant decisions that generate unintended consequences.

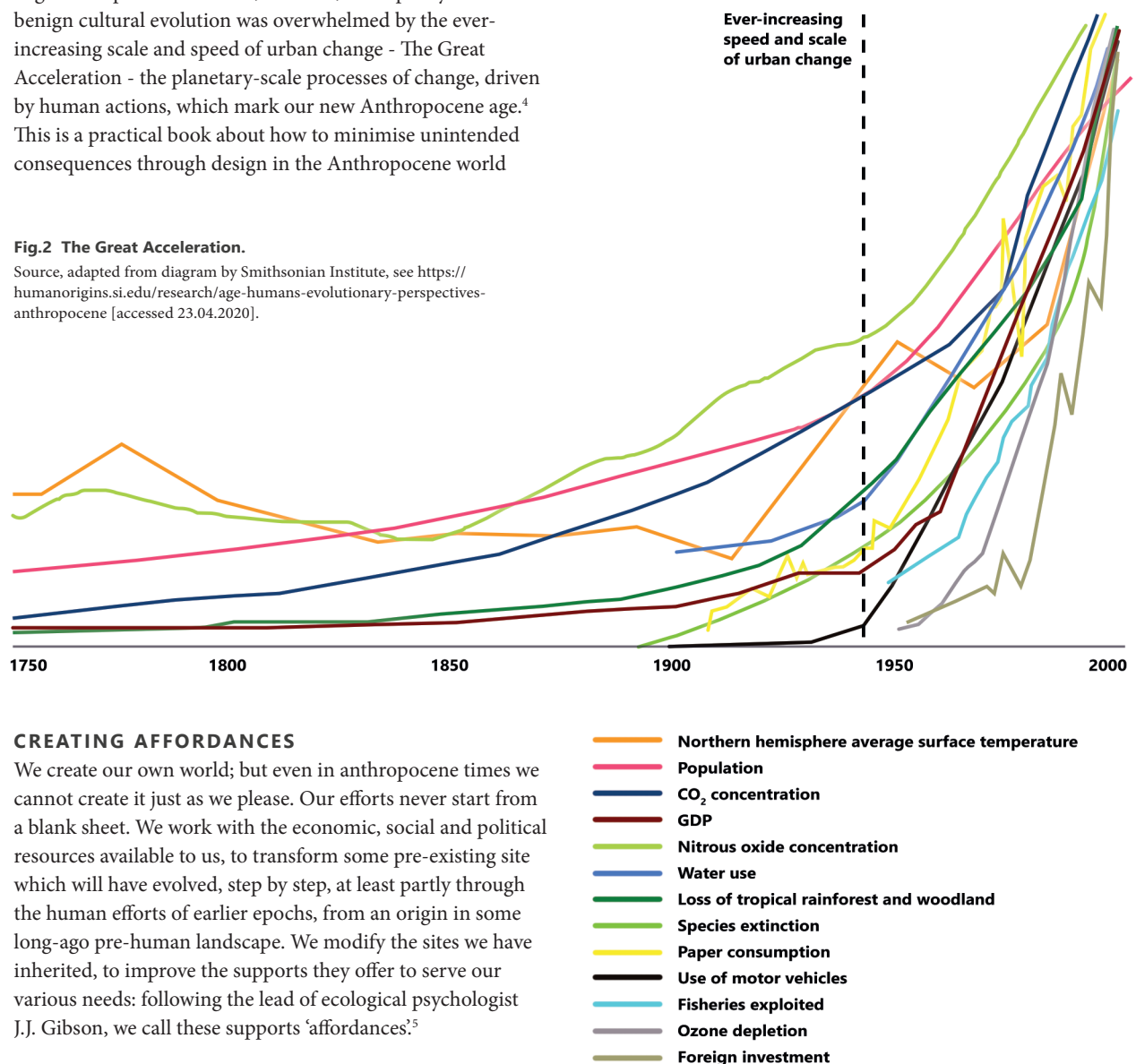


Some innovative internal layout within a single building, for example, may affect the building's interface with the adjoining street, which may affect people's perceptions of the street's own atmosphere. In turn, this may affect people's decisions about whether to walk, cycle or travel by car or public transport.<sup>1</sup> These decisions then have wider implications, ranging from the level of air pollution to the amount of exercise people take in their everyday lives. The consequences now range wider still, from climate change to the overall state of public health.<sup>2</sup> In turn, the consequences of climate change may trigger migration and even, in extreme circumstances, raise ethnic conflicts to the level of warfare.<sup>3</sup> And so on, in an infinitely-widening chain of unintended consequences.

Historically, the ideas within design cultures evolved through everyday experience to avoid repeating any unintended negative impacts. Over time, however, the capacity of this benign cultural evolution was overwhelmed by the ever-increasing scale and speed of urban change - The Great Acceleration - the planetary-scale processes of change, driven by human actions, which mark our new Anthropocene age.<sup>4</sup> This is a practical book about how to minimise unintended consequences through design in the Anthropocene world

**Fig.2 The Great Acceleration.**

Source, adapted from diagram by Smithsonian Institute, see <https://humanorigins.si.edu/research/age-humans-evolutionary-perspectives-anthropocene> [accessed 23.04.2020].



## CREATING AFFORDANCES

We create our own world; but even in anthropocene times we cannot create it just as we please. Our efforts never start from a blank sheet. We work with the economic, social and political resources available to us, to transform some pre-existing site which will have evolved, step by step, at least partly through the human efforts of earlier epochs, from an origin in some long-ago pre-human landscape. We modify the sites we have inherited, to improve the supports they offer to serve our various needs: following the lead of ecological psychologist J.J. Gibson, we call these supports 'affordances'.<sup>5</sup>

<sup>1</sup> Hass-Klau (2014), Chapter 15

<sup>2</sup> See, for example, National Institute for Health and Care Excellence (2012), and Booth et al (2013)

<sup>3</sup> For detailed discussion, see Schellnhuber (2009) and Parenti (2011)

<sup>4</sup> For discussion of the origins of the term Anthropocene, see Steffen et al (2011) and Vince (2011)

<sup>5</sup> Gibson (1979)

## ECOSYSTEM SERVICES

The affordances that any settlement can offer – the solidity of the ground on which we stand, the air we breathe, the water we drink, the food we eat, the raw materials we use to construct the physical environment, the energy for powering transport, the trees and flowers that afford sensory enjoyment – are all drawn ultimately from the wider ecosystem within which the site is embedded. Viewed from this wide ecosystem perspective, the affordances on offer are termed ‘ecosystem services’.<sup>6</sup>

We can distinguish a range of ecosystem services, each offering a particular set of affordances: provisioning services afford us staples such as food, water, raw materials and energy; regulating services control natural dynamics such as climate, flooding, waste decomposition, pests and diseases; and cultural services support cultural activities, ranging from recreation to scientific discovery. In turn, all three services –

and with them, ultimately, all affordances – depend on ‘natural capital’: the world’s stock of natural assets; encompassing geology, soil, air, water and living things. The Anthropocene’s threshold is marked by a rapidly-increasing degradation of ecosystem services. Feedback to the wider ecosystem from current settlements – for example through resource-depletion, water pollution, waste generation and atmospheric emissions – now damages the future capacity of the very services on which all settlements’ affordances depend.

According to the Millennium Ecosystem Assessment, initiated by the United Nations and published in 2005, ‘the changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of degradation of many ecosystem services... These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems’.<sup>7</sup>

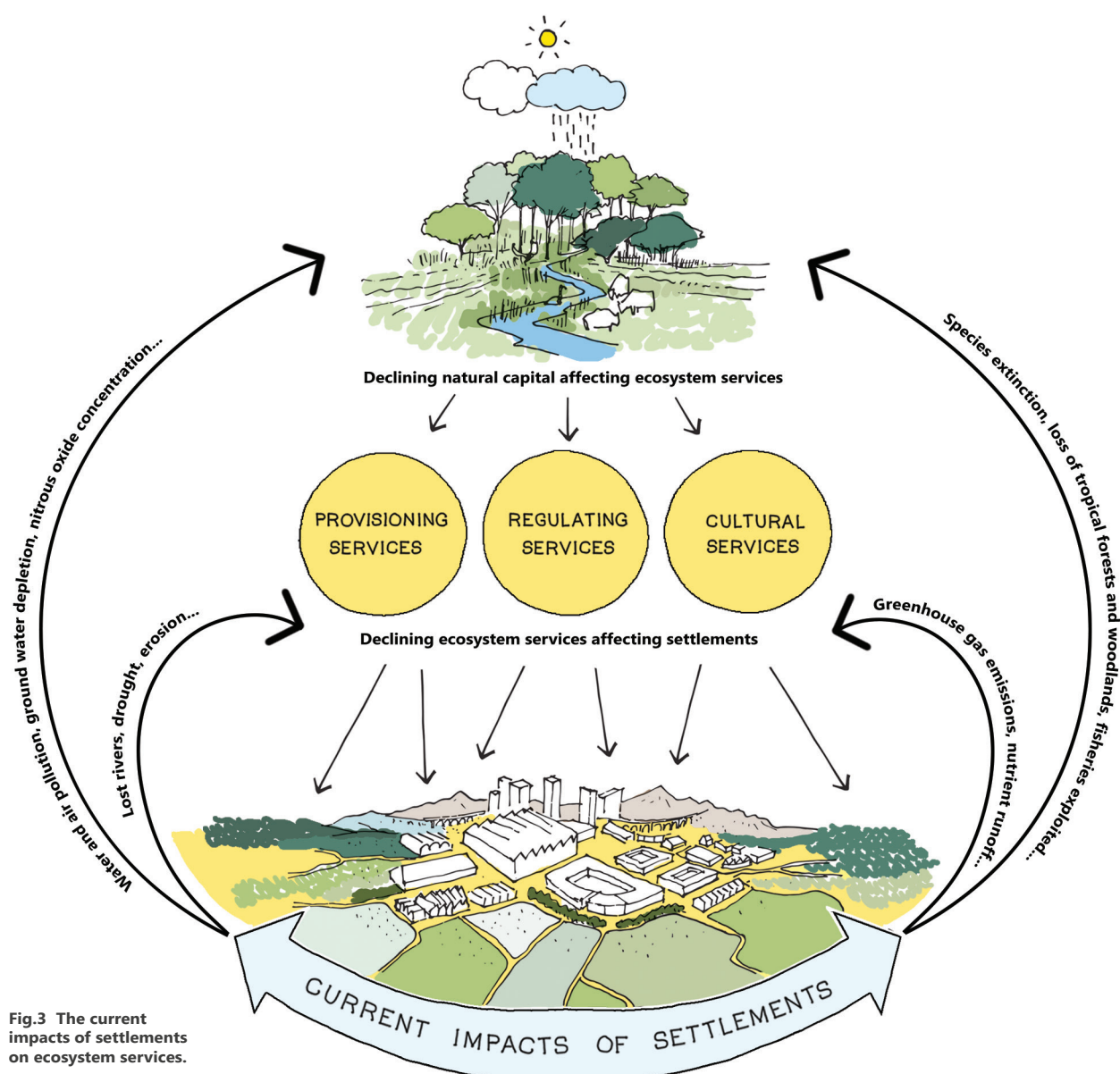


Fig.3 The current impacts of settlements on ecosystem services.

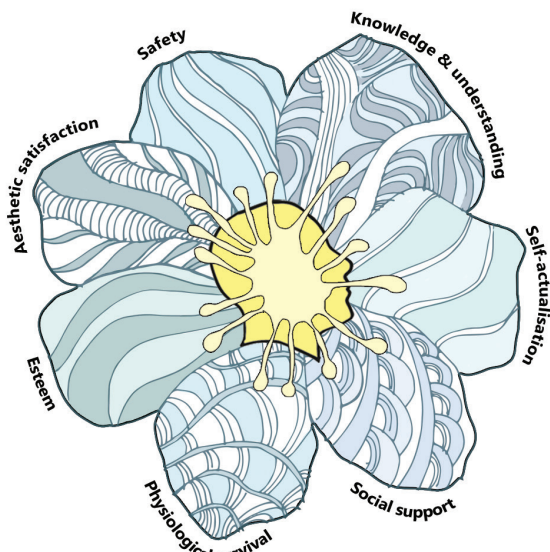
<sup>6</sup> For useful discussion of ecosystem services see Haines-Young and Potschin (2010)

<sup>7</sup> For extended discussion of current issues, see Millennium Ecosystem Assessment (2005)

## HUMAN NEEDS

To develop ideas that are relevant to our globalised anthropocene world, we need to understand human needs at an appropriate level of generality: not tied too closely to any particular culture, but not too abstract to inform complex design decisions. We find a useful balance between these extremes in the work of psychologist Abraham Maslow. First articulated during the 1940s,<sup>8</sup> Maslow's ideas gradually evolved to distinguish seven key, trans-cultural needs.<sup>9</sup>

Maslow's structure has stood the test of time, remaining widely-influential into the Anthropocene epoch. It has also been widely criticised; partly because it was originally based on limited and biased data.<sup>10</sup> The capacity of a very similar structure to explain people's sense of subjective wellbeing has, however, been empirically tested through a study involving more than 60,000 respondents, across a wide range of cultures, political-economic systems and stages of economic development relevant to the majority of the world's population. Since the findings support Maslow's ideas,<sup>11</sup> we use his understanding of needs throughout the chapters which follow.



- 1 A need for physiological survival: health and wellbeing: air, food, water, climatic control, supports for exercise and rest
- 2 A need for safety: security, order, freedom from fear
- 3 A need for social support, sense of social belonging and identity
- 4 A need for esteem: feeling of accomplishment
- 5 A need for aesthetic satisfaction: what is pleasureable to the senses
- 6 A need for knowledge and understanding: satisfaction of curiosity, we seek meanings in everything
- 7 A need for self-actualisation: sense of freedom to choose

**Fig.4 The 7 transcultural needs.**

Source, adapted from Tay and Diener (2011).

When he first developed these ideas, Maslow understood the pattern of needs as a hierarchy; in which it was necessary for the 'deeper' needs to be satisfied, at least to some extent, before others came into focus. This is fundamentally implausible. The histories of many societies, for example, tell of people who have proved willing to die for their beliefs. Less dramatically, we typically find 'higher' aesthetic concerns in even the most materially-poor societies; not only today, but from the earliest proto-human times.<sup>12</sup>

In his later work Maslow himself came to realise this, drawing an analogy between needs and vitamins: having enough of one vitamin does not negate the need for others.<sup>13</sup> This non-hierarchical understanding is reinforced by later thinkers such as economist Manfred Max-Neef, himself influenced by Maslow's ideas: 'Human needs must be understood as a system; that is, all human needs are interrelated and interactive with the sole exception of the need of subsistence, that is, to remain alive, no hierarchies exist within the system. On the contrary, simultaneities, complementarities and trade-offs are characteristics of the process of needs satisfaction'.<sup>14</sup> This means that there is almost never an obvious one-to-one correspondence between needs and affordances: any given affordance will potentially relate to several needs at once.

## THE EVOLUTION OF SETTLEMENTS

Throughout human history, people have modified their environments to suit their own needs. Any settlement is founded on the ecosystem services initially offered by its chosen site; which is then modified over time, to increase its affordances, as resources permit. We can therefore trace a history of increasingly radical place-transformations, as resource-availability changed over time.

Initially, restricted materials and techniques could enable only the production of simple individual shelters. The creation of increasingly permanent buildings called for greater investment of time, effort and materials: this would only be worthwhile in situations where the security of this investment was underpinned through the demarcation and control of building plots, with ownership secured by social agreements, eventually codified as laws. Because of this legal underpinning, plots are inherently more permanent than the buildings they support.

Where settlements grew in size, a need arose for spaces to give access between plots. These spaces had to provide access for a wide public, which could only be guaranteed through a legal system, formal or informal, defining them as public spaces which individuals could not alter. This meant that public spaces such as streets evolved as inherently more permanent than the plots to which they give access. Studies of the historical development of settlement form show that these same basic types of elements evolve within very different social, economic and cultural systems, across a

<sup>8</sup> Maslow (1943)

<sup>9</sup> Maslow (1954)

<sup>10</sup> Maslow's original data was drawn from analysis of the writings and biographies of only 18 gifted individuals, mostly white and male.

<sup>11</sup> Tay and Diener (2011)

<sup>12</sup> See, for example, Currie (2011)

<sup>13</sup> Maslow (1954): for discussion see Tay and Diener (2011)

<sup>14</sup> Max-Neef (1992). For related discussion, see Donovan (2018)



range of very different ecosystems. As urban morphologist Anne Vernez-Moudon puts it, ‘urban form is defined by three fundamental physical elements: buildings and their related open spaces, plots or lots, and streets.’<sup>15</sup> Through developing these fundamental elements of human construction, the original landscape itself is eventually transformed into a fourth element: the settlement’s ‘natural infrastructure’.

### IDENTIFYING KEY SUBSYSTEMS

Through this long-running process, settlements across the globe have evolved as complex systems made up of natural infrastructure, public spaces, plots and buildings; each composed from materials and small-scale components.<sup>16</sup> These subsystems are nested one within another; not only in space but also – because they inherently change at different rates – in time as well. The landform and water system of the natural infrastructure are the longest-lived of all. Public space systems come next: they may last for thousands of years. Land-ownership plots change faster through subdivision and amalgamation, but still typically last for centuries. Buildings, by comparison, are increasingly ephemeral: anthropocene buildings are often redeveloped after only a few decades.

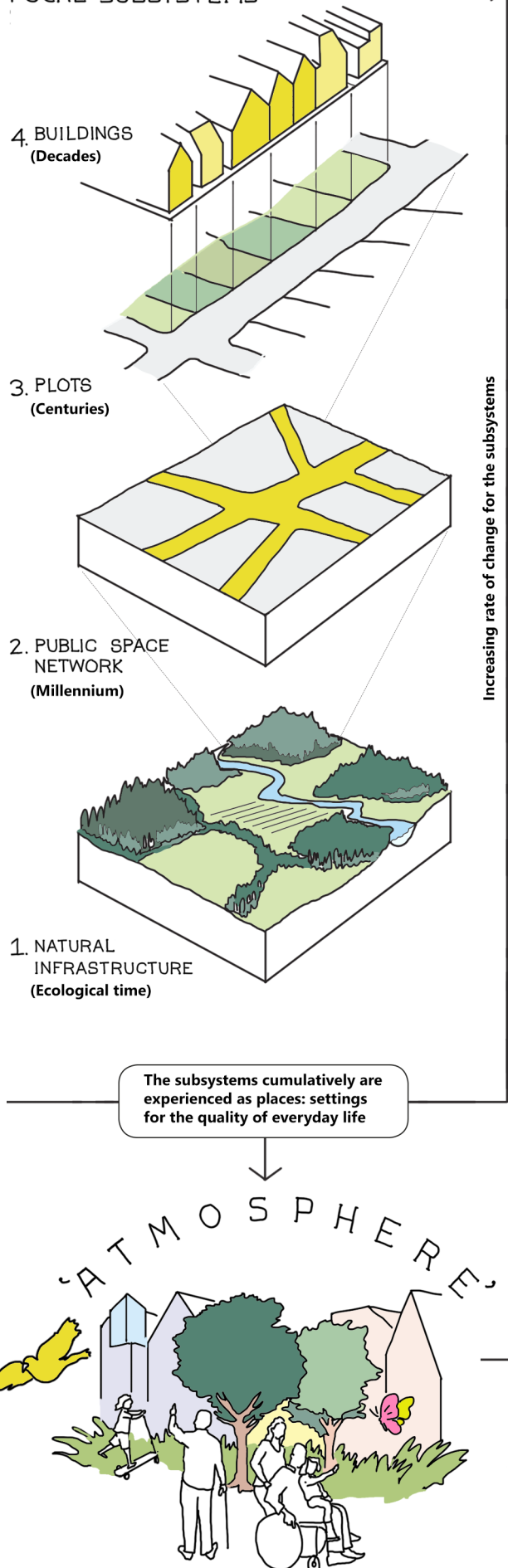
As technologies develop, new subsystems are woven in to link the underlying morphological systems of natural infrastructure, streets, plots and buildings together in new ways. First electricity, then the telephone, the internal combustion engine and, in the Anthropocene, information systems are taken up because they afford potentials to enhance human wellbeing. Information technology, in particular, is no longer just a tech add-on, but now influences everyday life at all scales: goods and services are accessed from great distances through the internet, and wi-fi converts every café and living room into a workspace. None of these systems, however, is immune from the law of unintended consequences,<sup>17</sup> so to maximise resilience we must never design in ways that make people dependent on them for their wellbeing.

### SYSTEMS WITHIN SYSTEMS

Changing at different rates, the underlying natural infrastructure, public space network, plots and buildings each have relative autonomy as systems in their own right. Settlements are therefore complex systems: systems made from other systems. Further, all these subsystems are themselves complex systems, made up from yet-smaller subsystems. The public space system, for example, contains a variety of streets and other spaces, each made up from yet-smaller components, from traffic lights to sidewalk surface materials. These smaller elements typically change faster than the larger systems they constitute. For example, the trees and plants of the natural infrastructure change much faster than the underlying landform; whilst the internal layouts of buildings typically change faster than their overall structures.<sup>18</sup>

Fig. 5 Identifying key subsystems.

### FOCAL SUBSYSTEMS



<sup>15</sup> Vernez-Moudon (1997)

<sup>16</sup> For a comprehensive discussion of complex systems and their multi-scale characteristics, without technical jargon and with some reference to cities, see West (2017)

<sup>17</sup> For discussion of these issues for cars, see Newman and Kenworthy (1989), for IT systems see Figueredo, Krishnamurthy and Schroeder (2019)

<sup>18</sup> Brand (1994)

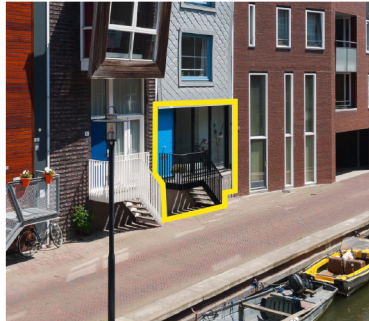
## EACH SUBSYSTEM IS MULTISCALAR

MACRO

MICRO



Large-scale structure - variety of plots with multiple buildings



Elements of individual buildings - entrances, windows, facade materials, subdivisions



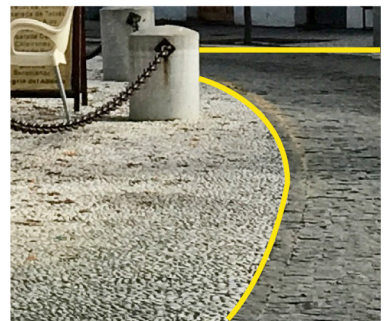
Smaller detail components - railing, door, letter-box, stairs



Large-scale structure - variety of streets and public open spaces



Elements of public open space - surfaces, trees, bollards, seating, lighting



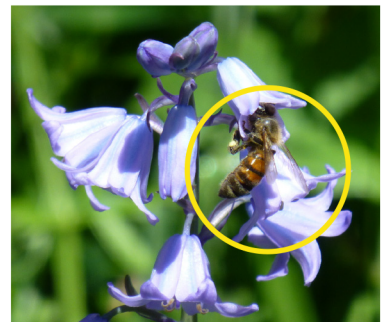
Smaller detail components - surface materiality and textures



Large-scale structure - variety of landscape structures

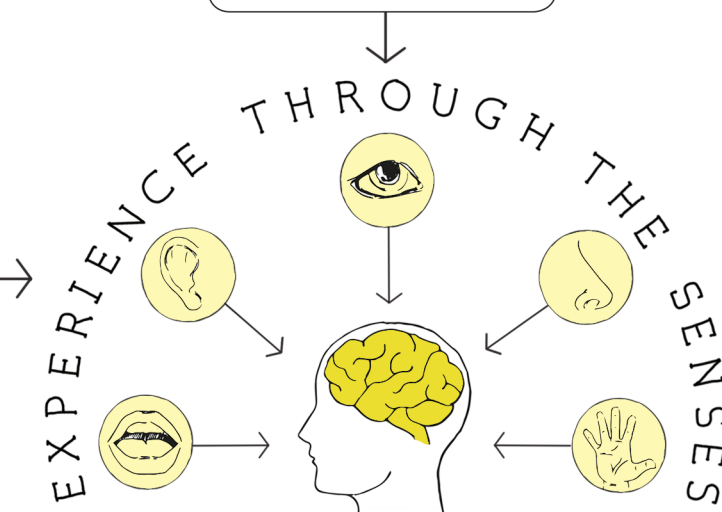


Elements of landscape - undergrowth, understory, canopy



Smaller detail components - plant and biodiversity species characteristics

Conscious design of the physical environments impact the experiential value of places





## SUBSYSTEMS AND DESIGN

The inherent complexity of settlement-design has increased over time, through the ever-increasing design possibilities afforded through successive agricultural, industrial and digital revolutions. These have faced designers with increasingly complex challenges which, in the context of globalisation, often have to be made in unfamiliar cultural and ecological settings. Overall, this ever-increasing complexity creates endemic problems of information overload. To cope with this, any particular designer is driven to take a specialised focus.

The relative autonomy of settlements' key subsystems – natural infrastructure, streets, plots and buildings – presents obvious opportunities for this necessary specialisation. The overall field of settlement design has therefore gradually evolved – particularly since industrialisation and globalisation – into a range of specialised professional disciplines; each focusing on one particular semi-autonomous subsystem: landscape architects for the natural infrastructure, architects for buildings, transport planners and traffic engineers for street layouts and so forth. Only users experience the whole built place; rather than abstractions such as professionals' drawings, computer-generated images or spreadsheets. The real-world experience of these 'local experts' offers valuable potential to incorporate in a more integrated design approach, but it is all-too-often excluded from current design processes.

## FIELDS OF EXTERNAL INFLUENCE

The cultures of all these specialised disciplines have evolved within fields of external influence that limit the designer's autonomy. Because designers themselves rarely have sufficient resources to build, they are usually dependent on funding from specialised development agencies, either public or private.

This always comes with strings attached: developers have their own aims; which design work must support if designers are to survive in the real-world market for their services. Developers too are subject to external factors: the cultures of both design and development disciplines evolve partly in response to structures of control (or at least influence) from municipal and national agencies, backed by political power and the prevailing legal framework.<sup>19</sup>

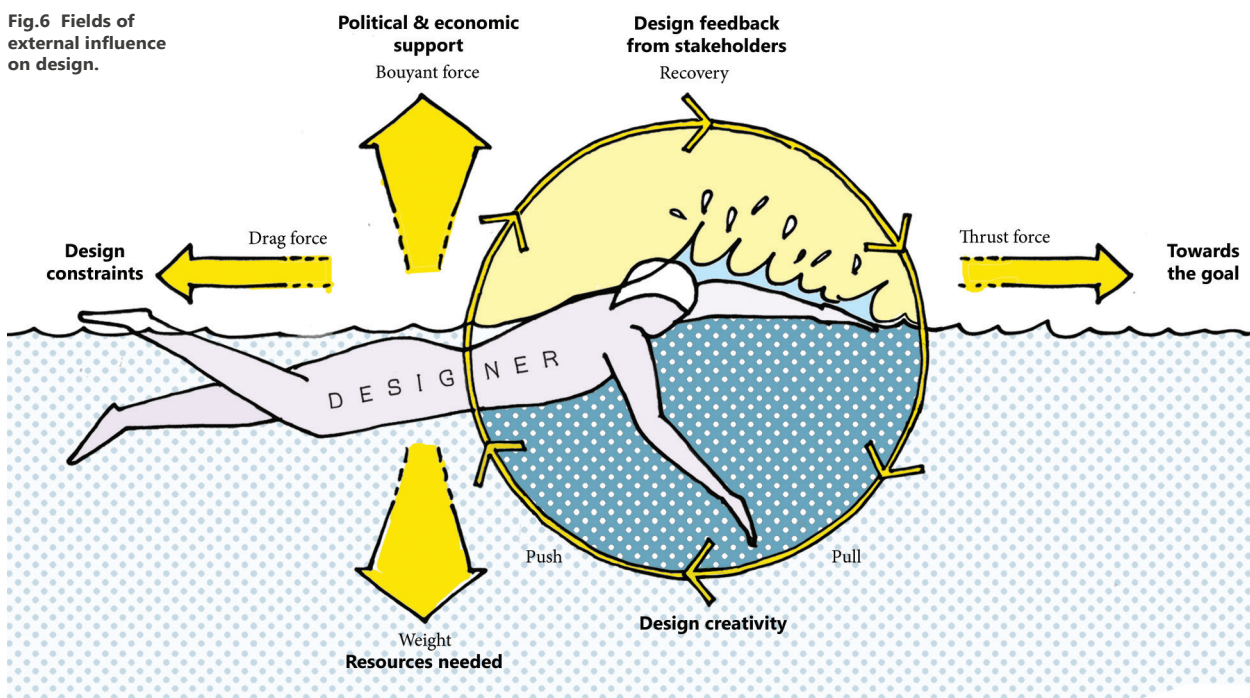
Designers often see these external factors merely as negative barriers that block creative work. Without them, however, we should find it impossible to realise our ideas in practice: these external factors of economic and political power are the very medium that enables design to take root in the real world. To get beyond mere rhetoric, to make a difference in people's lives, we must know how to swim in this medium without drowning.

## PROFESSIONAL BOUNDARIES

In an increasingly complex world, each specialised discipline of design, development and political control becomes increasingly challenged over time by ever-widening design possibilities; which impose ever-worsening levels of information overload.

The complexity of decision-making this requires, within each discipline, makes it increasingly difficult for designers, developers or municipal authorities to look outwards towards the settlement as a whole. Unintentionally, we all find our ways of thinking and working boxed-in by the boundaries of our professional cultures. In the nature of complex systems such as settlements, however, the whole is always more than the sum of its parts. This inevitably means that the effects of at least some of the decisions that are made within any given subsystem will probably spill over to affect other subsystems.

Fig.6 Fields of external influence on design.



<sup>19</sup> For discussion, see Bentley (1999), particularly Part 2

Professional boundaries, however, all-too-often blind us to these unintended spill-overs, which link our work inexorably with that of other designers working on other systems. From within each silo, crises in the overall situation always look like someone else's problem. Each silo's boundaries have evolved with current economic and political interests baked in, together with the problems these raise. Innovative design challenges, therefore, are inherently difficult to implement, because designers' only source of power is the creative use of knowledge.

To focus this knowledge effectively, we must not fritter it away through mutual misunderstandings. We must therefore minimise professional myopia, because it exposes all designers to the danger of making well-intended decisions in ways that affect other subsystems, and through them the settlement as a whole and eventually the wider ecosystem, in unintended ways. We need an innovative design approach that fosters cross-boundary working.

### SPECIALISTS WITH WIDER VISION

Despite their potential for triggering an avalanche of dangers, however, specialist design disciplines remain indispensable: without them, no designer could possibly address, in adequate detail, all the issues that stem from the unavoidable complexity of settlement-design. This has three practical implications for designers from all disciplines.

First, it means that we must all understand the key ways in which our own work spills over to affect the settlement's other subsystems. Second, it invites us to embrace a common vocabulary of design concepts that make these inevitable spill-overs generate positive affordances. Third, it encourages us - where possible - to involve the practical knowledge of end users, as local experts, in the design decisions we make.

### AN INCLUSIVE FRAMEWORK

Whatever their particular interests, all designers and all users share a common need for survival. From a shared perspective, as economist Kate Raworth points out,<sup>20</sup> this means that all ecoresponsive design decisions have to be focused between the limits of a 'social foundation' that affords immediate health and wellbeing, and an 'ecological ceiling' that affords the long-term survival of our species. Between these limits lies a space for design solutions that afford the conditions of safety and social justice within which humanity can thrive.

To work within these limits in practice, we have to support the social foundation through design decisions that promote a 'circular economy';<sup>21</sup> by drawing as few resources as possible from natural capital, and then using them with the minimum waste.

This is the space in which ecoresponsive design operates; seeking ways of strengthening both the social foundation and the ecological ceiling through the Anthropocene's ever-changing economic and environmental conditions.<sup>22</sup>



Fig.7 Professional myopia.

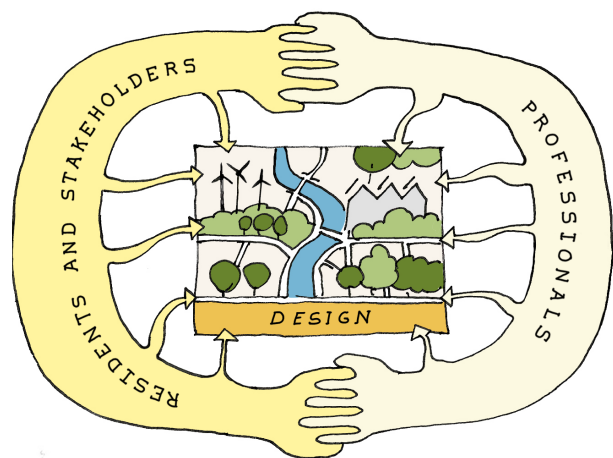


Fig.8 Specialists with wider vision for cross-boundary working.

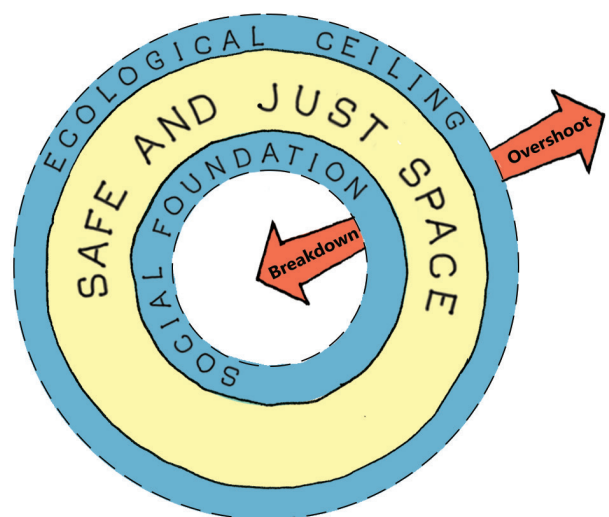


Fig.9 The Doughnut: A twenty-first century compass.

Source, adapted from Raworth (2017).

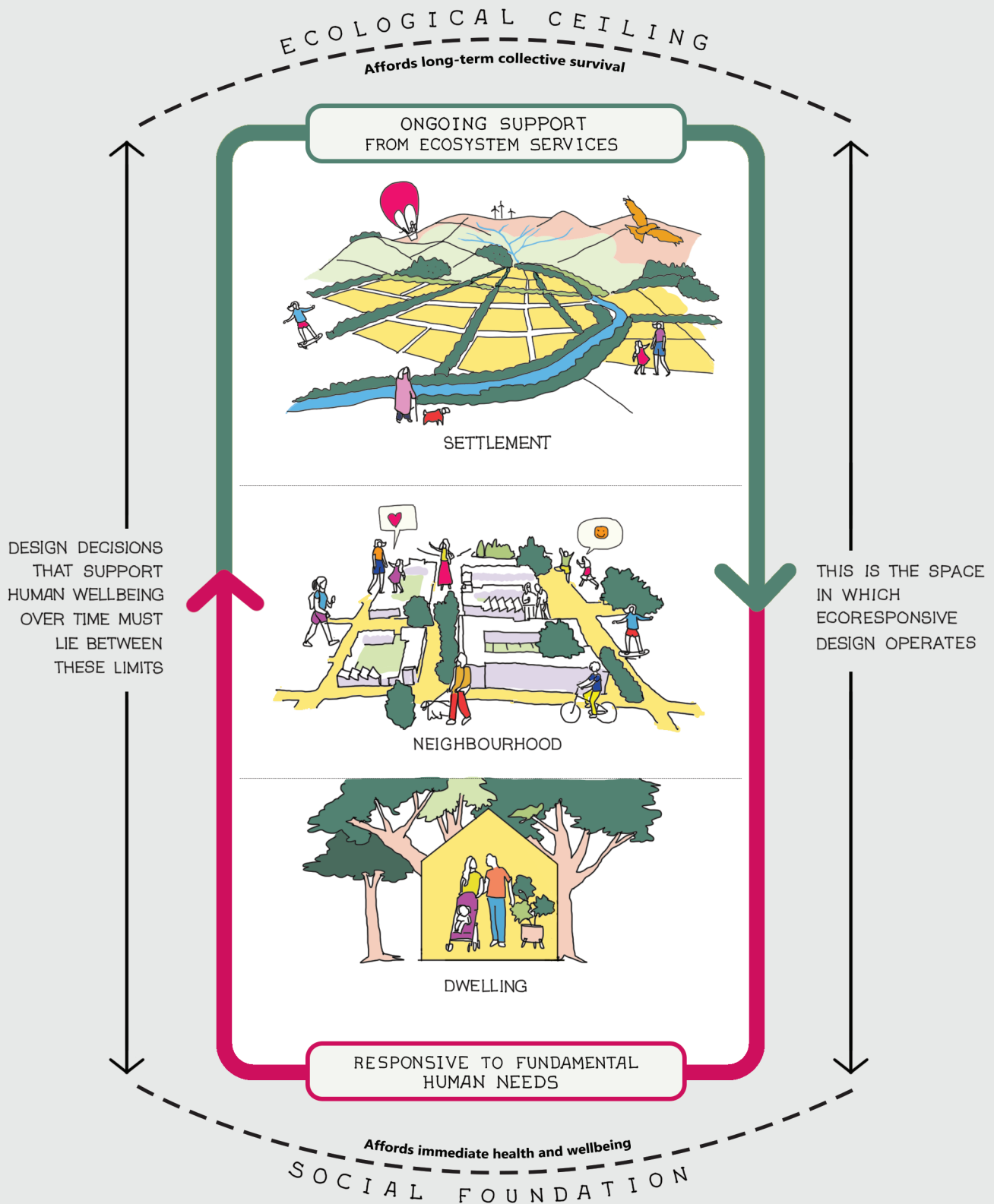
<sup>20</sup> For discussion, see Raworth (2017)

<sup>21</sup> For discussion, see Raworth (2017), Chapter 6

<sup>22</sup> See Barnett and Beasley (2015)

Fig.10

# WHAT IS ECORESPONSIVE DESIGN ?





Our aim is to address the overarching issue of the Anthropocene age at the project scale, by developing a design approach that is responsive to fundamental human needs whilst enabling ongoing support from ecosystem services. We call this approach EcoResponsive Design.

### AN INNOVATIVE APPROACH

We need a new trans-disciplinary design approach, but this must not stifle innovation within each particular discipline: the depth of the problems we face shows how urgently innovation is needed. We therefore need maximum design freedom with minimal unintended consequences. This calls for generic, open design parameters, enabling creative design decisions in varied local situations, and generating positive synergies across as many subsystems as possible. We call these 'synergic parameters': we develop them in detail through the chapters that follow.

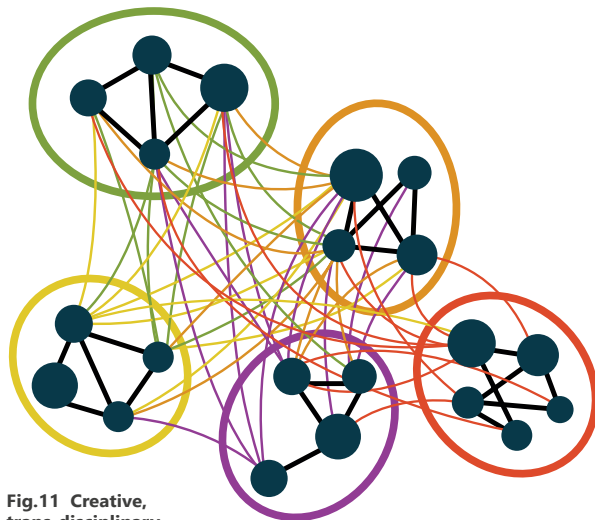


Fig.11 Creative, trans-disciplinary design approaches.

### CHAPTER STRUCTURE

Since the relative autonomy of the four basic subsystems and their related design disciplines is inherent to the settlement process, we organise the chapters around them. Chapter 1 starts at the largest scale; developing parameters for creating a natural infrastructure by drawing out maximum affordances from the site's natural capital. Chapters 2, 3 and 4 then weave in the public space network, link in the plot structure and integrate the buildings. The final section of each chapter uses RIBA competition-winning Heath Park, Runcorn as

a worked example from one of our 'live' projects. Having taken a strong, system-based approach to environmental and social sustainability, the Heath Park masterplan was selected as one of 35 'Green Innovation' Schemes featured in UK Government's new Global Investment Atlas and showcased as part of UK's Global Investment Summit (GIS) in 2021. It also won the 'Future Place' category of the Pineapple Awards 2022 and the National Urban Design Award 2023 in the category of 'Small/ Midscale Masterplans'.

Chapter 5 explores the final stage of our ecoresponsive design process by developing the further parameters that are needed to implement any project on the ground; focusing on tuning the atmosphere<sup>23</sup> - detailing physical components and their implications for sensory experience. Bridging between design and its perceptual implications, the parameters we need for tuning are subtly different in kind from those we developed in our earlier chapters. In this final chapter we are making adjustments to tune the perceptual experience of forms we have already designed. The parameters we need, therefore, are operations of adjustment rather than spatial types.

Between them, these five chapters develop key parameters for engaging all the experts involved in settlement-design – professionals and end-users alike – together with a process for using these ideas in design practice. Successful practice needs broad support from everyone involved in the design process. To achieve this support in practice, our design process has to be backed up by evidence; but evidence alone is not enough, as environmental communications specialist George Marshall explains: 'People may read information in the form of data and figures, but their beliefs about it are held entirely in the form of stories'. This is because 'stories perform a fundamental cognitive function: they are the means by which the Emotional Brain makes sense of the information collected by the Rational Brain'.<sup>24</sup> This means that we need a compelling story to help us replace existing design conventions with new ideas: 'Facts have no power to correct or dislodge a powerful story ... The only thing that can displace a story is a story'.<sup>25</sup>

Chapter by chapter, our story builds up a collaborative vision of EcoResponsive design: a vehicle for all fields of design expertise to work together in navigating the Anthropocene's currents of risk and opportunity.

### PIONEERING CROSS-BOUNDARY WORKING

Generic, open design parameters, enabling creative design decisions in varied local situations, and generating positive synergies across as many subsystems as possible. We call these 'synergic parameters'.

<sup>23</sup> 'Atmosphere': we use this term throughout the book. For discussion, see, Bohme (2018), McCarter and Pallasmaa (2013) and Perez-Gomez (2016)

<sup>24</sup> Marshall (2014), cited in Monbiot (2017)

<sup>25</sup> Ibid

The five chapters develop key 'synergic' parameters for engaging all the experts involved in settlement design – professionals and end-users alike – together with a process for using these ideas in design practice.

#### CHAPTER 1

Starts at the largest scale; developing parameters for creating a natural infrastructure by drawing out maximum affordances from the site's natural capital.

#### CHAPTER 2

Weaves a system of public spaces together with the natural infrastructure; to create conditions for healthy, enjoyable and energy-efficient movement through the urban system.

#### CHAPTER 3

Creates a system of plots within the movement-system to support diverse activities; generating lively streets that access the facilities for everyday life to thrive.

#### CHAPTER 4

Supports diversity through a circular economy of highly-adaptable buildings; minimising the resources needed in construction and use, and maximising the scope for component-recycling.

Fig.12

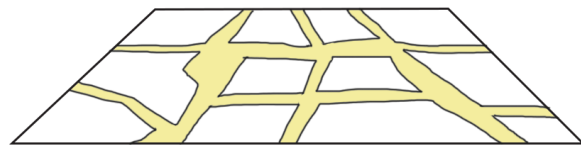
# DESIGNING ECORESPONSIVE ENVIRONMENTS

## CHAPTER 1



COUPLING WITH NATURAL INFRASTRUCTURE

## CHAPTER 2



LINKING IN PUBLIC SPACE

## CHAPTER 3



GENERATING THE PLOT STRUCTURE

## CHAPTER 4



INTEGRATING BUILDINGS

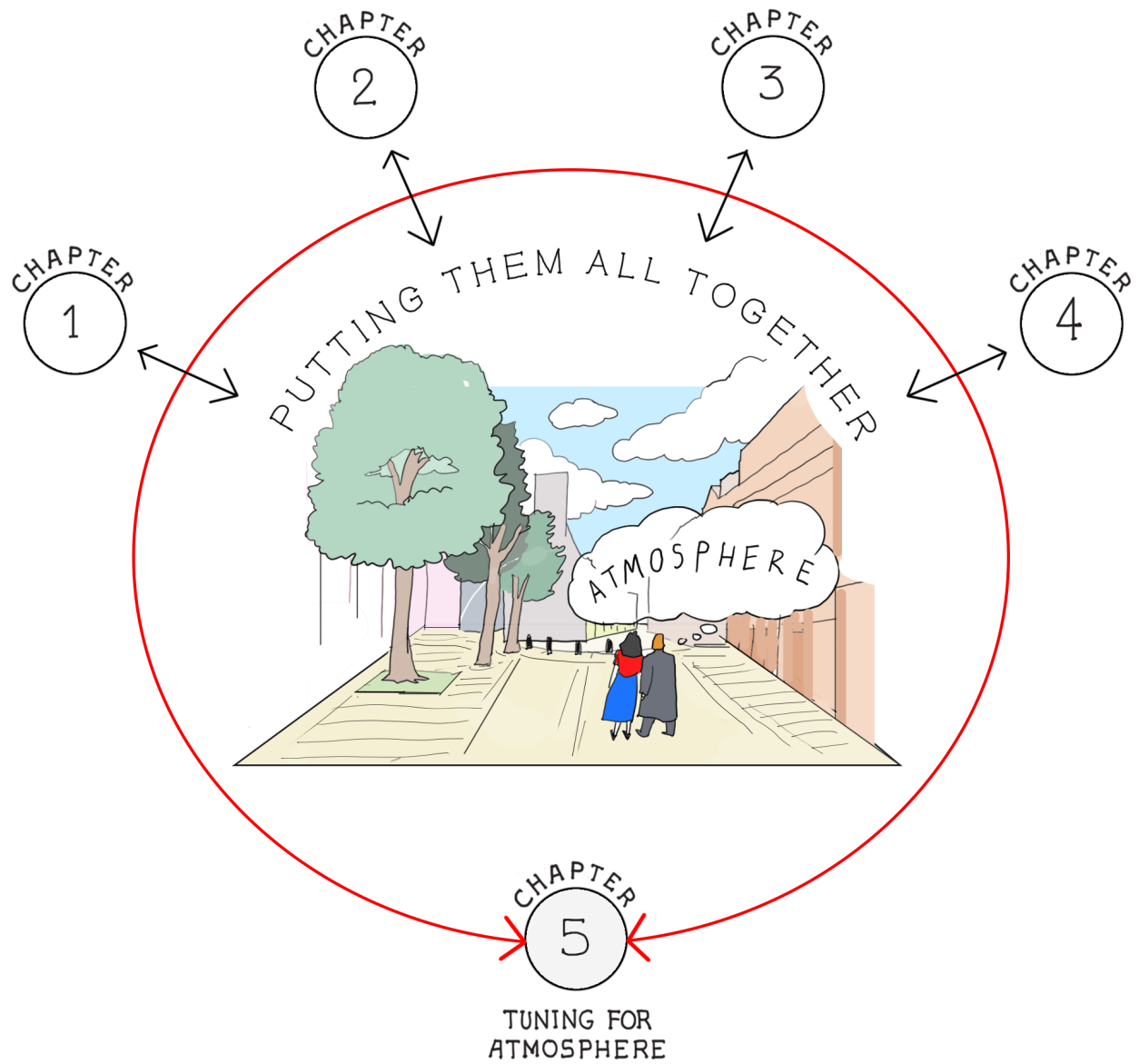


Fig.13

## CHAPTER 5

Bringing together the design parameters developed in earlier chapters, Chapter 5 makes the smallest-scale decisions needed to engender positive atmospheres; attuning the forms generated through earlier chapters with the fundamental characteristics of the human sensory system.

## NEW WAYS OF PRACTISING

Our conclusion, finally, is a call to action: a call to use the design parameters we propose as springboards for continuous development through creative practice.

A genuinely creative and collaborative practice engages all experts and stakeholders involved in settlement design, including existing communities, diverse professionals and specialists, landowners, developers and politicians. The book argues for a shift in focus from individual specialisms to collaborative actions enabling development stakeholders to negotiate a balance between short-term financial viability and longer-term environmental and social values.