Prologue

Six impossible things before breakfast

> Alice laughed. 'There's no use trying,' she said: 'one can't believe impossible things.'
> 'I daresay you haven't had much practice,' said the Queen. 'When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.'
>
> (*Through the Looking Glass*, Lewis Carroll, 1871)

7.20 am

The alarm buzzed. Already half awake, Alex reached over, pushed the mute button, and pulled the covers up over her head. She'd set her bedside alarm 10 minutes fast in the hope that this would help get her up more promptly. As a device to trick herself it was not really working. Knowing it was fast, she had long since adapted her behaviour to simply add an extra 10 minutes in bed from the time it went off. Throughout the night the clock's glowing display had been dutifully counting off the seconds, steadily consuming electricity. Elsewhere in her small apartment five other time-keeping devices had also been keeping track. There were displays on her microwave, television, sound system, washing machine, and air conditioner. None of these were telling the same time as any other – the air conditioner she had never even set as she could not see the point of it. That morning it was the washing machine display that was the most accurate. It was just 57 seconds slow. None of this troubled Alex. She always used her mobile phone to check the time. However, as the features were built into the units by their manufacturers, she could not turn them off and so simply ignored them. But, along with the standby power used by many of her devices, these electronic clocks contributed to a phantom energy drain that was close to 18 per cent of her electricity consumption.

7.30 am

Alex began to doze again, but then remembered she had set the alarm because her friend was coming over for breakfast. She dragged herself from bed and shuffled across the corridor to the bathroom. She spent almost a minute adjusting the hot and cold taps of the shower to achieve a comfortable temperature. During this time, 25 litres of potable water, collected and transported from river systems over 100 kilometres from her apartment, ran down the drain to be treated as effluent. The waste of water irritated her, but there was little she could do. The apartment was poorly designed, with the water heater placed too far from the shower. The consequent delay in delivery from the heater meant it was almost inevitable to overcorrect the

taps' setting. In the 10 minutes that she took to shower Alex successfully removed about a gram of dirt, body oil, and her own dead skin, using a quarter of a tonne of water. The water was heated by electricity generated by a power plant that, in the process, released some 7 kilograms of carbon dioxide into the atmosphere.

7.45 am

Shower over, Alex reached for her moisturizer. She used this glycerine-based product to replace the natural body oils that she had just washed down the drain. Without this, her skin would be left feeling dry. Palm oil was a basic ingredient in her moisturizer, as it was in the soap and shampoo that she had washed herself with in the first place. The palm oil in all the products she used had been grown in huge plantations across Southeast Asia. Many of these plantations had high environmental and social impacts, including habitat destruction that was endangering the orangutan. The plight of the orangutan was the subject of a television documentary that had upset Alex last night, leaving her angry at the selfishness and greed of the people responsible. However, she was also aware of the contribution her own choice of soap, shampoo, and moisturizers was making. Guilty though this made her feel she knew of no affordable and readily available alternative. She tried to mollify herself with the thought that the amounts she used were only very small.

7.50 am

Alex returned to her room to dress. From a choice of over 30 different T-shirts, Alex selected one with a mildly humorous slogan that she thought fitted the casualness of the day and was fairly sure she was not wearing last time she caught up with her friend. Not having thought about it, Alex would be hard-pressed to say why she needed so many. However, it would be unlikely that she thought her collection excessive – it was certainly no larger than that of most of her friends. The cotton for each of Alex's shirts was grown in large-scale cropping systems under intensive irrigation, with high fertilizer and pesticide inputs. Around 3,000 litres of water were required to grow the 250 grams of cotton lint that went into the manufacture of each one. After harvesting and local processing, the extracted lint was shipped overseas to be woven into cloth. The cloth was then bleached, dyed, and finished using a mixture of toxic chemicals, much of which ended up in local waterways. It was then made up into T-shirts by lowly paid workers in sweatshop factories. The finished garments were then exported to regional wholesale centres that in turn distributed them to local retailers, including the one where Alex had bought hers. Alex's preference was for cotton as she considered it to be a 'natural' product.

7.55 am

Although she knew that her friend was unlikely to forget their breakfast arrangement, Alex sent her a reminder – a text message from her mobile phone. Texting is an essential communication mechanism for Alex and her friends. More than just staying in touch, it forms a social 'glue' without which Alex simply could not participate in the group. Alex's mobile phone contained over 400 separate components manufactured by subcontractors across the globe and shipped to one huge factory for final assembly by hand. Her handset had been assembled in a city of some 14 million people, which had grown from nothing in just a few decades, powered almost entirely by the telecommunications industry. Over 30 kilograms of ore-bearing rock

had been clawed out of the earth to provide the base materials for Alex's phone – iron, aluminium, arsenic, gold, cobalt, lithium, chromium, silver – yet the phone itself weighed only 75 grams. Its lightness was due in part to the use of miniaturized tantalum capacitors. The tantalum in her phone was derived from a mineral nicknamed 'coltan', which had been mined in the Congo. Coltan fetched a high price in world markets, and illegal mining and sales were credited with supporting civil war in the region. As a consequence, the Congo was one of the most violent and dangerous war zones in the world. The coltan that went into the capacitors for Alex's phone had been dug by hand by child soldiers in the service of a local warlord.

8 am

Alex headed into the kitchen to prepare breakfast. The coffee that she used was made from beans shipped from Mexico. Coffee's international supply chain of importers, roasters, and retailers makes it the second-largest traded commodity in the world. However, the farmer who grew the coffee Alex was consuming was paid only a minute fraction of the price she paid at the shops. Some years back the farmer had switched from subsistence food production to coffee cash-cropping as part of an international aid 'modernization' programme. However, commodity prices had since tumbled and the farmer was now deeply in debt. In an effort to get ahead the farmer had increased production, but this required fertilizers he could scarcely afford. The demands of higher production were also starting to erode the productive capacity of his once-fertile soils. Furthermore, as thousands of other farmers were in a similar situation and also trying to increase yields, the collective outcome was simply to glut the coffee market and drive commodity prices lower still. Alex was aware of 'fair trade' and 'organic' coffee options, and was in principle prepared to buy them if the cost difference to conventional supplies was not too great. However, because demand for these more social and ecologically sound brands was low, the supermarket where Alex shops was not prepared to carry them. There was a specialty coffee shop in the next suburb that did sell these products, but Alex reasoned it was too inconvenient to make the trip that far just for coffee.

Alex remembered that today she was going to make omelettes for her friend. She reached into her refrigerator for some eggs. The carton displayed a logo certifying that the eggs were 'free range'. Alex insisted on buying only free-range eggs. It was one of the few ways she thought she could align her consumption choices with her concerns for the ethical consequences of her actions.

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Part I
The challenge

Robert Dyball

Humanity today is facing hugely complex challenges. The catalogue of problems can be overwhelming – over-population and over-consumption are driving climate change, loss of biodiversity, despair, illness, soil degradation, poverty, alienation, deforestation, pollution, inequality, and stress. At times it can seem that our every action has some impact, from the local to the global, that is environmentally unsustainable, or socially unjust, or both. Little wonder that many people close their eyes to the evidence that change is urgently needed, and simply try to get on with life as best they can.

However, giving in to this sense of disempowerment is a recipe for disaster. It is also premature. Across history, humans have shown that when they work collaboratively towards common goals they can achieve great things. The challenge for human ecology, as discussed in this book, is to help develop an idea of what a worthwhile, humane, and sustainable modern society might be like, and to see how we might get to that situation from where we are now. If our current collective demands on the environment exceed its capacity, then we will have to develop new social systems where demand is safely below environmental thresholds. This goal of more moderate consumption faces the additional challenge of redressing the fact that for many people in the world today, levels of consumption are so low they are unable to meet basic standards of living – a situation that is ethically intolerable. Ultimately, we need to consider the role of dominant knowledge and belief systems in legitimising our collective behaviour. If, as seems obvious, change is required, then we have to understand how social-learning processes adapt our culture so that we can value new social-environment systems – specifically ones that are more in tune with environmental reality and social justice.

1   Human ecology

An evolving discipline

For this knowledge of right living, we have sought a new name . . . As theology is the science of religious life, and biology the science of [physical] life . . . so let Oekology be henceforth the science of [our] normal lives . . . the worthiest of all the applied sciences which teaches the principles on which to found a healthy and happy life.

(Ellen Swallow Richards, 1892)

1.1 Introduction

Why 'six impossible things before breakfast'? Alex's story illustrates some of the central challenges facing human ecologists. She regards her morning routine as perfectly normal. She and her peers undertake activities such as these on a daily basis. Indeed, Alex may well feel that she has no choice in these matters. She can certainly choose one item of clothing over another, but she hardly has a genuine choice as to whether to wear clothes in public or not. Her friends would certainly pass comment if she wore the same T-shirt every day or refused to wash. But this mix of choice and social obligation results in Alex's everyday 'normal behaviour' consuming at levels far above what the vast majority of Earth's population can access or afford. It is not possible for Alex to justify her having access to a level of goods and services that others are denied on the arbitrary grounds of circumstances of birth. Nor is it possible for Earth's environments to provide the resources needed for everyone on the planet to consume at similar levels. In this sense Alex has done 'six impossible things before breakfast'. Her morning's activities would be impossible to sustain if 7 billion people could act as she does. Furthermore, it is ethically impossible for her to defend actions that allow her to satisfy her expectations, if these actions impose a heavy cost on others and the planet.

Alex is not a 'bad' or 'selfish' person, indifferent to the social and environmental problems of the world. Indeed, she is predisposed to caring for the environment and her fellow human beings. Unlike many of Earth's inhabitants she is not so constrained by poverty, and the daily struggle to stay alive, that she has little or no choice about her actions. Nor is she profoundly ignorant. She is literate, reasonably worldly wise, and has instant access to globally connected information systems. Yet, despite being well-intentioned, knowledgeable, and free to choose, her actions lead to a range of socially and environmentally harmful outcomes.

Human ecology aims to understand how such problems can be addressed. It has a practical interest in how systems of production, distribution, and consumption might be redesigned, so that the reasonable daily needs of people such as Alex might be

met, without causing harmful impacts. It is in Alex's own interest to face up to these practical concerns. The social and environmental systems that provide her with the things she needs might decline and eventually cease to function if they are too badly damaged by human activity. In the long run societies such as Alex's are at risk if the means by which they provision themselves cause such a collapse.

In addition to a pragmatic concern for self-interest, human ecology has an ethical concern for how that self-interest is satisfied. Human ecologists want to know how, in satisfying our own needs, we can make sure that we do not prevent others from adequately satisfying their needs. This is not merely to ensure that, when one community has taken the resources it believes it needs, some residual remains with which another community might satisfy what it believes are its needs. Human ecology extends to the idea that there is something fundamentally wrong if what one community regards as a reasonable expectation *can be met only* if other communities must settle for much lower levels of consumption. This imbalance is unethical, particularly where it imposes low levels of consumption that prevent individuals achieving even a basic level of health and wellbeing. The injustice of this situation cannot be addressed by attempting to raise levels of consumption in poorer communities, if continued profligate consumption by affluent communities means there are simply not enough resources to go around.

A central premise of this book is that sustainability issues are inseparable from issues of justice and fairness. How Alex, and people like her, might reconcile a reasonable level of desire and satisfaction, while avoiding excessive harm to others and to the environment, is one of the central questions of human ecology.

1.2 Human ecology: an evolving discipline

Over 100 years ago, Ellen Richards first proposed 'Human Ecology' as a form of enquiry seeking 'knowledge of right living' (Richards, quoted in Clarke 1973: 120. Figure 1.1). As Borden says, the subject matter of human ecology is fundamentally concerned with the age-old questions of the human condition, 'what makes life possible?' and 'what makes life worthwhile?' (Borden 2014: xvii). Since then, in one way or another, human ecologists have sought to better understand the answers to these questions and their implications. As human ecology has evolved, many different perspectives have come and gone, different concepts and methodologies have dominated, and different ways of thinking have been employed. Knowledge of human ecology has been generated both from within formal academic institutions and from outside academia among practitioners, communities, artists, and traditional peoples. Indeed, as a developing school of thought, the history of human ecology can be characterized as an ever-widening network of knowledge and ideas, as the inadequacy of any one perspective on its subject matter has become apparent (Tengström 1985, Boyden 1986, Dyball 2010, Borden 2014). Many human ecologists today would take issue with Ellen Richards' notion that their subject is a science at all – arguing that science, as a way of thinking, can provide only limited insights into the human condition (Steiner 1993). Many would label human ecology as *transdisciplinary*, spanning or integrating many disciplines, or even *adisciplinary* and not a discipline at all (Christensen 2014). In this book we explore the idea that human ecology can be a *disciplined* form of inquiry and practice, even if it is not regarded as a discipline (Young 1989, Dyball 2011).

Figure 1.1 Ellen Swallow Richards (second from right, front row). First woman graduate from the Massachusetts Institute of Technology (MIT), first woman member of MIT faculty, and first to use the term 'Human Ecology'. Shown here with MIT Chemistry staff, 1900.

Source: photo courtesy of MIT Museum.

If human ecology is to move towards the rigour and coherence of a discipline, while avoiding the rigidity and narrowness of thinking that disciplines can suffer, it needs an underlying conceptual framework. A conceptual framework for human ecology can be considered adequate only if it can accommodate and support the characteristic concerns of its practitioners. For human ecology, these concerns can be summarized under four themes – ethics, social–ecological systems, learning from experience, and dominant human-belief systems. These themes point to aspects of the subject matter studied by human ecologists. These include, for example, the interactions between social and biophysical elements; the intrinsically ethical concern for the health and wellbeing of humans (but arguably extending to other sentient beings) and the biosphere; processes of evolution and adaptation through time, with humans capable of experience-driven behaviour change; the overriding influence of dominant cultural paradigms (worldviews, beliefs, and values) on different human communities; and a community's expectations and judgements about 'sensible' behaviour. The challenge for human ecology is to comprehensively understand these aspects as inseparable parts of a unified whole.

1.3 The challenge of human ecology

We begin here by briefly characterizing the kinds of problems that human ecology deals with. Any minimally adequate conceptual framework for human ecology will have to aid understanding of these kinds of problems. The characteristic features of human ecological problems make them exceedingly difficult to tackle. They typically include some or all of the following features:[1]

- *Unclear definitions*. Stakeholders typically don't agree on what 'The Problem' actually is, even if they use similar words to describe it. If the nature of the problems is presupposed – for example, that it is an 'economic problem' – then the nature of 'the solution' is also presupposed. Economic problems are tackled using economic measures to achieve economic solutions. This may not be how others see things. And such a focus is likely to be too narrow to avoid unintended outcomes.
- *Scale issues*. There is no 'correct' level of abstraction across time and space. Interventions that solve problems at local scales may not solve them at national or global scales. For example, an effort to improve urban air quality by building a taller smokestack at a regional power station may simply result in sulphur poisoning of forests in another state or nation downwind. It can be very hard to see how actions taken in one place connect to outcomes far away in time and space.
- *Solution management*. Solutions can be better or worse than one another, but not right and wrong in an absolute sense. A conservationist might wish to see landscape-scale conservation measures implemented to protect the habitat of a large carnivore, such as a bear. However, a solution that includes local land-owners' rights to manage their properties within a landscape-scale plan of management might be a better outcome than either no measure at all or one that angers the landowners by locking them out. Social–ecological problems are not so much 'solved' as rendered manageable.
- *'Solutions' create new problems*. Intervening to 'fix' complex human–environment problems inevitably puts in train a range of outcomes. Some of these are desired and intended, but others are not. In time, these undesired and unintended outcomes emerge as new problems to be tackled. Often the urgency of the problem appears to warrant the intervention, but caution should be taken in thinking solutions are 'obvious'. In particular, solutions that are intended to 'make the problem go away' often make the problem worse over time. Building freeways to reduce commute times can work in the short term, but can lead to even longer commute times because it encourages more private vehicle use. Increasing the height of a flood-control levee is an obvious solution to rising flood levels. But the increased home building in flood-prone districts that follows from this intervention exposes settlers to even greater risk of flood damage.
- *No objective measure of success*. Which variable to monitor as an indicator of 'success' is often not obvious, but must be critically considered. A government department of roads might measure its success by reference to the total kilometres of road constructed within a set budget. A department of health might measure the success of its interventions by a reduction in the number of patients with respiratory tract ailments. The increased road use and consequent increases in

vehicle particulate emissions generated by the success of the former are directly at odds with the population health goals of the latter.

- *Intervention stresses.* Every intervention changes the situation and very often these changes cannot be easily reversed. Social–ecological systems can suffer 'regime shifts' following management interventions. People learn and adapt as a result of experience. A poorly presented proposal to install technology such as wind farms in a region can cause anger, distrust, and hostility in the community – causing rifts that take a very long time to repair. The proposer can certainly rework the proposal, but the second time around they will be dealing with a deeply sceptical community whose members will be predisposed to object. Adding sea water to rice paddies to farm shrimp yields greater profits to the farmer. However, the farmer cannot opt to go back to growing rice as the soil now carries a salt load in which rice cannot be grown. This becomes an even greater problem if the price of shrimp collapses.

- *Solutions must be collaborative.* Sustainability challenges are never 'owned' by one person or interest group. They always require a range of skills, perspectives, and understandings to be brought together in management collaborations. This is one reason why human ecology is necessarily transdisciplinary. Since 'disciplines' are ways of thinking that sit mostly within academia, human ecologists need to extend their conceptual reach to include knowledge held by all relevant stakeholders. Bringing these diverse and partial knowledge sources together is tricky, and how this might be done is a preoccupation of this book. However, it is only when we do successfully blend these various contributions that novel alternative pathways to just and sustainable futures can be found. An additional benefit is that a more lasting commitment to a particular innovation is generated when stakeholders have been included in the process of generating solutions to shared problems.

- *Moral, ethical, political, or professional dimensions.* Social–ecological problems are not only issues of environmental resource allocation. They are inextricably woven through issues of justice and fairness. It is not hard to imagine scenarios where a reduced human population lives in balance with the environment. Yet versions of balance that are achieved through death, destruction, and enforced misery cannot be ethically countenanced. Furthermore, people's moral stances are guided by their value and belief systems, including their sense of right and wrong, and thus influence what interventions they believe to be acceptable. These moral stances are grounded in cultural, religious, and peer-group allegiances, as well as in pragmatic political affiliations and professional codes of practice. Once taken up, such stances are not readily changed, and certainly not by scientific evidence. Yet their role in explaining a community's attitudes and actions is fundamental and cannot be overlooked.

- *Aesthetic motivations.* People do not tackle social–ecological problems in a purely 'rational' manner. When people are inspired to act it is for a suite of reasons that have judgemental, emotional, spiritual, aspirational, and aesthetic dimensions, in addition to any evidential knowledge base. Indeed, recalcitrance, ignorance, and irrationality all play their part. But that is part and parcel of human nature and it is, after all, human nature that human ecology has to deal with.

One of human ecology's major tasks is to contribute towards the re-imagination and rearrangement of social–ecological systems in order to bring into being the kind of humane, sustainable, and worthwhile futures that the broader community will willingly embrace.

1.4 Conclusion: a systems approach to sustainability

The four thematic areas of human ecology – ethical priority; social–ecological interactions; learning and behaviour change; and meeting, or changing, the expectations built into dominant belief systems – will be pursued throughout this book. The inquiry will, of necessity, be transdisciplinary (or comprehensive), due to its dependence on a wide range of knowledge and perceptions. In order to keep the discussion coherent we will develop a fifth theme as the book progresses. This is the 'systems approach' promised by the book's subtitle. A systems approach will help us, as human ecologists, to understand the interplay between the various aspects of the situations under investigation and how the parts of a social–ecological system drive change in each other. Where change is found to be unsustainable, a systems approach will help a community to identify leverage points for effective intervention and system redesign to develop more acceptable patterns of behaviour. Finally, the systems approach will point the way towards a theoretical structure that can help human ecology evolve as a comprehensive, disciplined form of inquiry and practice. The case study in Chapter 2 demonstrates the need for this comprehensive approach.

Note

1   This list is adapted from Rittel, H. J. and Webber, M. (1973). 'Dilemmas in a general theory of planning'. *Policy Sciences* 4(2): 155–169. A more up to date extension of these ideas can be found in Brown, V. A., Harris, J. A. and Russell, J. Y. (2010). *Tackling Wicked Problems Through the Transdisciplinary Imagination*. London; Washington, DC, Earthscan.

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