



JOHN THACKARA

# HOW TO THRIVE IN THE NEXT ECONOMY



CHANGING



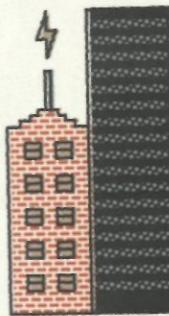
FEEDING

"JOHN THACKARA IS  
ONE OF THE GREAT VOICES  
ON SUSTAINABILITY"

BUSINESS WEEK



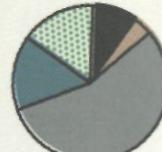
KNOWING



CLOTHING



GROUNDING



KNOWING



WATERKEEPING



COMMONING



DWELLING



MOVING



CARING

## CHANGING: FROM DO LESS HARM, TO LEAVE THINGS BETTER

At a dusty crossing on the long cross-country road from Kanpur to Lucknow, in Uttar Pradesh, India, we come across a huge video screen on the back of a flat-bed truck. Together with a dozen villagers, four people on bicycles, and a cow, we stare in a daze at the screen. On the left side of the screen the landscape on each side of the River Ganges, in whose vast fertile plain we are standing, is made to look hot, dusty, and wretched. On the right of the screen, a better future is portrayed: busy cities, robot assembly lines, and high-speed trains. This before-and-after sequence is followed by a full-screen video in which computer-generated apartment blocks sprout like so many mushrooms from bright green grass along the banks of the River Ganges. 'Welcome to Trans-Ganga HighTech City,' explains the voiceover.

'May the odds be ever in your favour!' mutters my young companion. 'This is pure *Hunger Games*,' she explains, and goes on to describe how, in a film that everyone in the world has seen except me, a young woman called Katniss lives in a dystopian, post-apocalyptic nation. Every year The Capitol, where the rich people live, asserts its power over the poor regions that surround it by staging the Hunger Games in which boys and girls, selected by lottery from the poor

areas, compete in a televised battle to the death. 'May the odds be ever in your favour!', I learn, is what the creepy ruler guy says when opening the Games – in which all but one competitor will die.

Trans-Ganga HighTech City resembles *The Hunger Games* all too well – a glossy, gated city surrounded by social hardship and degraded landscapes. Trans-Ganga is one of 100 Indian turn-key cities that developers want to build on green land swept clean of its small farmers and biodiversity. Investors are promised that special laws will be passed to ensure that millions of poor Indians are 'excluded from the privileges of such great infrastructure.'<sup>1</sup> These physical and social impacts are disturbing enough – but what really cranks up the anxiety level are the bright and perky voices, on screens everywhere, proclaiming these developments to be for the good of all. Whenever a voice is raised in protest at the negative impacts of these plans, the perky heads blame the losers for their own misfortune: Get a job! Try harder! May the odds be ever in your favour!

The words we choose are important as we try to make sense of these new times. One man's *energy descent* is another woman's *energy transition*. Talk of an *impending crisis* is scary; realizing that the crisis is already underway, less so. The *end of growth* sounds grim – but it is not the *end of life*. The *collapse of civilization* is a terrifying prospect; the *birth of a new one* puts things in a different light. 'What is civilizational collapse, after all,' quips the Italian physicist Ugo Bardi, a self-styled 'stoic scientist', 'other than a period in which things are changing faster than usual?'

The apocalyptic view is couched in the language of danger and collapse. Industrial civilization has started to crash, say the 'doomers'. For them, our best course of action is to head for the hills with a truckload of guns and peanut butter. At the other extreme, optimistic technology buffs are confident that man-made solutions will soon allow us to carry on as usual. And what about the rest of us? Most people I know are anxious about what's happening around them, but silently so; they think less about the collapse of civilizations than with finding work, or feeding their kids. But they – we – feel less and less secure. It doesn't help that the media are filled with fatuous advice

about what we should do: drive a Tesla? Change a light bulb? Give us a break.

This book is that break. It tells of a third social movement – much bigger than the rifle-packing doomers and the green-tech dreamers – that's emerging as the global crisis unfolds. This movement is below the radar of mainstream media, but it contains a million active groups – and rising. Quietly, for the most part, communities the world over are growing a replacement economy from the ground up. As you will read in the pages that follow, their number includes energy angels, wind wizards, and watershed managers. There are bioregional planners, ecological historians, and citizen foresters. Alongside dam removers, river restorers, and rain harvesters, there are urban farmers, seed bankers, and master conservers. You'll meet building dismantlers, office-block refurbishers, and barn raisers. There are natural painters, and green plumbers. There are trailer-park renewers, and land-share brokers. The movement involves computer recyclers, hardware re-mixers, and textile upcyclers. It extends to local currency designers. There are community doctors. And elder carers. And ecological teachers.

For most of the people I write about in this book, the changes they are making are driven by necessity; they are not a lifestyle choice. Few of them are fighting directly for political power, or standing for election. They cluster, instead, under the umbrella of a social and solidarity economy. Different groups and movements have names like Transition Towns, Shareable, Peer to Peer, Degrowth, or *Buen Vivir*. Their number includes FabLabs, hacker spaces, and the maker movement. Some have taken over neglected buildings – from castles and car parks, to ports, piers, hospitals, and former military sites. There are campaigning organizations, too – for slow food, the rights of nature, and seed saving – not to mention bioregionalism, and commoning. And our number is growing. Up to 12 per cent of economically active citizens in Sweden, Belgium, France, Holland, and Italy work in some kind of social enterprise – and that's in addition to the vast amounts of unpaid work already being done in the household and caring economy.

Although these projects are wondrously diverse they are all, for the Spanish writer Amador Fernández-Savater, 'message-bearers of a new story of the world'.<sup>3</sup> A green thread runs through this story: a growing recognition that our lives are codependent with the plants, animals, air, water, and soils that surround us. The philosopher Joanna Macy describes the appearance of this new story as the 'Great Turning' – a profound shift in our perception of who we are, and a reawakening to the fact that we are not separate from the Earth as a complex of living systems.<sup>4</sup> From sub-microscopic viruses, to the vast subsoil networks that support trees, this new story goes, the entire Earth is animated by complex interactions between its life forms, rocks, atmosphere, and water. Explained in this way – by science, as much as by philosophy – the Earth no longer looks like a repository of inert resources. On the contrary: healthy soils, living systems, and the ways we can help them regenerate supply the 'why' of economic activity that's missing from the mainstream story. The one kind of growth that makes sense, in this new story, is the regeneration of life on Earth.

The notion of a living economy can sound poetic, but vague. Where, you may ask, is its manifesto? Who is in charge? These are old-fashioned questions. The account given by Macy – of a quietly unfolding transformation – is consistent with the way scientists, too, explain how complex systems change. By their account, a variety of changes, interventions, and disruptions accumulate across time until the system reaches a tipping point: then, at a moment that cannot be predicted, a small release of energy triggers a much larger release, or phase shift, and the system as a whole transforms. Sustainability, in other words, is not something to be engineered, or demanded from politicians; it's a condition that emerges through incremental as well as abrupt change at many different scales. 'All the great transformations have been unthinkable until they actually came to pass,' confirms the French philosopher Edgar Morin. 'The fact that a belief system is deeply rooted does not mean it cannot change.'<sup>5</sup>

So this is an optimistic book – but not dreamily so. If I'm to convince you that the stories to come are the harbinger of the new

economy we so desperately need, I first need to explore the powerful but hidden reasons that a return to normal is just not going to happen.

## ENERGY

In 1971 a geologist called Earl Cook evaluated the amount of energy 'captured from the environment' in different economic systems.<sup>6</sup> Cook discovered that a modern city dweller needed about 230,000 kilocalories per day to keep body and soul together. This compared starkly to a hunter-gatherer, ten thousand years earlier, who needed about 5,000 kcal per day to get by. That gap, between simple and complex lives, has widened at an accelerating rate since 1971. Once all the systems, networks, and gadgets of modern life are factored in – the cars, planes, factories, buildings, infrastructure, heating, cooling, lighting, food, water, hospitals, information systems, and their attendant gadgets – well, a New Yorker or Londoner today 'needs' about *sixty times* more energy and resources per person than a hunter-gatherer. To put it another way: American citizens today use more energy and physical resources in a month than our great-grandparents used during their whole lifetime.

This upwards trajectory would be alarming if we thought about it clearly – but we don't. We simply ignore the fact that all these 'needs' depend on growing flows of cheap and intense energy. Belief is one thing; basic mathematics, and the laws of physics, suggest otherwise. The exponential growth of anything tangible, or energy consuming, cannot continue indefinitely in a finite universe. As Tom Murphy, an American physics professor, patiently explains, even if the future rate of compound energy growth in our economy declined to a lower level than today, we'd still see an increase by a factor of 10 every 100 years; in 275 years, we'd reach 600 times our current rates of use. Surely, you may counter, economic growth could be decoupled from energy growth and be freed to expand to infinity that way? Well, on the Earth. 'Energy is the capacity to do work; it's the lifeblood of activity,' explains Professor Murphy. 'Think it through: to keep GDP growing indefinitely on a fixed energy diet would mean that anything

requiring energy becomes an ever-smaller part of GDP, until it carries negligible value. But food, heat, and clothing will never be negligible needs. There is plenty of scope for economic activities that use *less* energy – but that is not the same as reducing energy intensity to zero.<sup>7</sup> Indefinite GDP growth is Not Going to Happen.

The world is not in danger of running completely out of energy – in the short or even medium term. Strictly speaking, we don't face an energy crisis so much as an *exergy* crisis – that is, a shortage of energy that is so highly concentrated, and easy to obtain, that it can easily be used to drive the economy. At its most dynamic, the thermo-industrial economy grew using oil that, if it did not literally gush out of the ground, was easily extracted using oil-powered machines. Since then, we've burned our way through the easy-to-access fuels and extracting energy gets harder and more expensive every year. To make matters worse, the man-made world has become so much more complicated – think of all those computer networks, aviation systems, and fancy hospitals – that it now takes far more energy just to keep 'the system' going than would have been needed, just a generation ago, to deliver a simple but effective product or service to you and me.

For an explanation of where these trends are taking us I went to the Houses of Parliament in London. An American ecology professor, Charles Hall, had been invited to give a lecture on Energy Return on Energy Invested (EROEI). The central principle of EROEI, he explained, is that it takes energy to obtain energy – and if that process takes too much effort, and therefore cost, then the needed investment probably won't be made – and the energy needed to run the system won't be available. Prof Hall showed us the change, through time, of the number of barrels of oil obtained for use in the economy for every barrel invested in extraction:

1930s 100 barrels for economic use

1970s 25 barrels

1990s 15 barrels

Most of the energy solutions being trumpeted today, Hall continued – from tar sands in Alberta to solar arrays in Spain – fall well below

the 15:1 threshold below which the investment never pays for itself. 'You can't have an economy without energy. Energy does the work!' Professor Hall concluded, echoing Tom Murphy's 'poor-quality fuels mean poor-quality growth'. I'll never forget the silence that followed his presentation. Eventually, a senior Member of Parliament stood up, thanked Professor Hall for his 'most interesting presentation', and added, 'but of course, for an elected politician, reduced affluence is an impossible sell'. He then sat down. Professor Hall, the scientist, said he was a numbers guy, not a policy guy – and he sat down, too. Then everybody went home.

Technology optimists believe that renewable energy, conjured into existence by innovation, will allow us to carry on as usual – but they are in for a disappointment. Nearly all plans for a transition to renewable energy suffer from an existential flaw: they take global energy 'needs' as a given, calculate the quantity of renewable energy sources needed to meet them, and then – well, things get vague. Green energy optimists have no answer for a logical inconvenience: it takes astronomical amounts of fossil-fuel energy, and money, to deploy 'green' energy systems – 200 km (125 miles) of copper in one wind turbine, to give just one example. There would be far fewer wind turbines, for example, if they had to be manufactured, installed, and maintained using wind energy. Retrofitting energy systems on a large enough scale to run today's industrial society would require vast investment of materials, money, and organizational effort that, in today's deflationary global crisis, will not be available. Gail Tverberg, an actuary and blogger, puts it bluntly: 'Quite apart from the math, or the thermodynamics, or the simple logic, a lack of cash flow for investment in infrastructure will eventually bring the system down.'

Measured against the laws of mathematics, physics, and common sense, our belief in an energy-intense economy – one that expands to infinity in a finite world – seems irrational. A better word would be *habitual*. Many smart people believe that growth will go on forever because that is all they have known in their lives. They believe in the inevitability of progress because, in their lives at least, things have always progressed. They believe that bold actions should be

taken without regard for consequences because there haven't been any negative consequences – or rather, none that they have experienced personally. They believe that man is special, and that progress is unstoppable, because no experience has given them reason to think otherwise. These foundation myths of the modern age – reason, progress, mastery over nature – are oil-powered narratives. In the 1950s, when Milton Friedman expounded the economic thinking that dominates political discourse to this day, you could buy a barrel of oil for US\$3.50.

## MONEY

The timing and severity of peak energy is a contested topic, but a growing number of people are happy to blame bankers for our economic woes. This blame is misdirected. The men and women in suits can be hard to love, it's true, but they are more the prisoners of a dysfunctional system than its masters – in their case, the money one. And the fate of the money system, it turns out, is tied intimately to the fate of the energy one. Money and energy are better thought of as one story.

Before writing this book, I had vaguely assumed that what banks do is collect deposits and savings from one lot of people, and lend those funds out to different people in the form of loans, mortgages, and credit on plastic cards. This is not the case at all. Although bankers describe their core business as 'lending' money, it should really be described as *creating* money. When you or I borrow money from a bank, and the bank tells you it is 'transferring' funds into your account, that money is not taken out of a vault, nor even sent down a wire from somewhere else. It is newly created, there and then. Only a small fraction of the money they create is backed up by assets – such as the deeds to a house, or a bar of gold – lodged safely in their vaults. For the most part, they just make the loan at will. And it gets curioser. Even though you and I now have new money to spend, these loans are recorded on the banks' balance sheets as assets. The rationale seems to be that the interest on the loan that you and I will pay to the bank represents a steady flow of profit

to them. And because many bankers are paid by commissions on new loans issued, there's a built-in incentive to lend as much as possible.

When an economy is growing, this peculiar dynamic does not much matter: as people buy more goods, often using credit from the bank, and as businesses take out loans to increase their production of goods, then interest on existing loans is repaid. But when economic growth stalls – for example, because there is less cheap energy to power growth – new money stops entering the system and a destructive feedback loop kicks in. Interest on existing loans is not paid; defaults multiply; jobs are lost; people spend less money; businesses take out fewer loans; less new money enters the economy – and the crisis of debt intensifies.

This through-the-looking-glass logic of the money system is made harder to grasp by the ineffable numbers used to describe it. At the time of writing, global debt is estimated to be about US\$200 trillion – but what does such a number mean? Well, think of it this way: imagine that a world government, burdened with this debt of \$200 trillion, decided to pay it all back at a rate of \$1 per second. To pay back \$1 million at such a rate would take 11.5 days; paying back \$1 billion would take 32 years; but to pay back the full \$200 trillion, at a rate of \$1 per second, would take 6.5 million years.<sup>8</sup> Taken together with the energy crunch this is why, however much we might wish things to carry on as before, they won't. They can't. As explained by Gail Tverberg, 'An infinite economic growth model has created the need to keep the hamster wheel turning faster and faster until the hamster dies.'<sup>9</sup> Blaming bankers for the hamster's imminent demise is therefore to miss the point; it's the money-energy system itself that is spinning the wheel.

#### GROWTH

If the manic striving for growth was just about numbers, we could write it off as deluded, but harmless, thinking. But money is not just an abstraction. As professors Murphy and Hall explained above, money gets work done in the real world. When a system must grow in order

to survive, but the work it enables is destructive, the consequences are catastrophic.

I experienced the grim consequence of growth for its own sake at a meeting of 200 sustainability managers at a famous home furnishing giant in Sweden. During twenty years of hard work on sustainability, this company has made thousands of rigorously tested improvements; these are recorded on a 'list without end'. The range of improvements is startling – even admirable – except for one fact: the one thing this huge company has *not* done is question whether it should grow. On the contrary: it is committed to double in size by 2020. By that date, the number of customers visiting its giant sheds will increase from 650 million a year at the time of writing to 1.5 billion a year. And why? The senior manager who briefed our meeting on this plan put this growth into context: 'Growth is needed', she explained, 'to finance the sustainability improvements we all want to make.'

A fatal flaw with this argument is best explained if I talk about wood. The company, as the third largest user of wood in the world, has promised that by 2017 half of all the wood it uses – up from 17 per cent now – will either be recycled or come from forests that are responsibly managed. Now 50 per cent is a vast improvement on 17, but it also begs the question: what about the *other* half of all that wood? As the company doubles in size, that second pile of wood – the *un*-certified half, the unreliably-sourced-at-best half – will soon be twice as big as *all* the wood it uses today. The impact on the world's forests, of this one company's hunger for resources, will be appalling. The committed and gifted people I met in Sweden – along with sustainability teams in hundreds of the world's major companies – are confronted by an awful dilemma: however hard they work, however many leaks they plug in production cycles, the net negative impact of their firm's activities on the world's living systems will be greater in the years ahead than it is today. And all because of compound growth. It doesn't matter how many brands proclaim that their products are verified, accredited, or certified as being sustainable; so long as growth remains a company's prime

directive, any promise to leave the world 'as unspoilt as possible' will remain an empty one.

If a lack of data were the main problem, help would be at hand. Following a large international effort, a set of accounting tools known as The Economics of Ecosystems and Biodiversity (TEEB) puts a price on the services provided to industry by nature; and many governments and companies have signed up to its framework.<sup>11</sup> Unfortunately, TEEB has only made things worse. The theory was that knowing the value of ecosystems would cause companies to look after them better – but TEEB's numbers, acting like blood in the water, have also attracted the attention of predatory investors. Living systems – watersheds, minerals, food, and land – are now being converted into 'financialized' assets which, having been rendered abstract, have become new tokens for speculation.<sup>12</sup> By design, these financial products contain powerful incentives for their owners to 'sweat' the underlying assets at an accelerating rate. This commodification of nature has spawned a related but no less baleful phenomenon called 'biodiversity offsetting'. This is the idea that the destruction of an ecosystem by mining, greenfield development, or a large infrastructure project can be 'offset' by the creation of a new patch of nature somewhere else.<sup>13</sup> This scheme is great for the companies digging the mines or pouring the concrete; it also creates new work for an army of intermediaries; but the result on the ground is an acceleration of environmental destruction. Nature is unique and complex. Some ecosystems take hundreds of years to reach their current state. The promise that the habitat can be recreated at will is another false one.<sup>14</sup>

## RISK

None of the grim trends I've described above is doomer speculation. Lloyds of London, the epicentre of global risk management, has warned that 'an oil supply crunch is likely in the short-to-medium term'. For another capitalist hotspot, the World Economic Forum (WEF), peak oil is just one item in a guide to possible futures called 'Seeds of Dystopia'. Highlights of this jolly survey include a killer

virus pandemic; unmanageable deflation; a geomagnetic storm that wipes out the internet; global food shortages; and 'unprecedented geophysical destruction'.<sup>15</sup> These top-trending risks, says the WEF, 'are a health warning regarding our most critical systems'. The WEF is not alone in its sombre outlook. What its *Global Risks* does for the economy, *Global Trends 2030* does for geopolitics and security.<sup>16</sup> The latter report, published by the US National Intelligence Council, warns that 'we are at a critical juncture in human history...natural disasters might cause governments to collapse'. Climate scientists and ecologists reinforce these warnings. The Stockholm Resilience Centre (SRC), for example, has delineated nine 'planetary boundaries' – the limits, for essential planetary living systems, beyond which we must not go.<sup>17</sup> The SRC's map is alarming enough – we are already beyond the red line on three of its nine systems – but it only plots the *known* risks. Even more alarming is the possibility of a so-called 'ecological surprise' – a transformational change, in one or more natural or man-made systems, that could be sudden, non-linear, and catastrophic. As complex systems researcher Noah Raford explains it, too much interconnectivity makes systems vulnerable to 'phase transition' – a word that sounds more benign than it probably is. When a system reaches a critical state, Raford explains, 'even a tiny change can lead to massive fluctuation and collapse'.<sup>18</sup> We know these events can happen, but we don't know when; they cannot be predicted.

All this is meat and drink to the doomer community – but not everyone agrees that we need to take these risks seriously. On the contrary: trends that signal 'risk' to you or me are embraced by others as opportunities. For some tech boosters, the increased interdependency of systems is good news; it signifies that our economy is in an 'evolutionary uplift' towards a 'post-productive' mode.<sup>19</sup> Boundaries and limits are also anathema to the WEF; risks are described in its doom-filled reports as 'transformational opportunities' that we should grab with relish to 'improve the state of the world' and to pursue the 'critical goal...of future growth'.<sup>20</sup> There is no acknowledgment – not a word – that compound economic growth could possibly be the cause of these biosphere-threatening trends.

As for the fact that exponential economic growth on a physical planet contravenes basic laws of physics and mathematics<sup>21</sup> – that, too, is simply ignored.

This is not to deny that resilience – ‘the capacity to bounce back’ as one book<sup>22</sup> so well explains it – is a desirable condition. The trouble is that a lot of people perceive resilience – dynamic or otherwise – to be a new variety of risk management that affords them the opportunity to carry on with business as usual. ‘We can’t avoid shocks in an increasingly complex world,’ said one commentator, ‘we can only build better shock absorbers.’ This metaphor would just about work if the world around us were indeed a tarmac road disfigured by potholes – but it’s not. Those ‘bumps’ we’re driving over are better understood as the bodies, metaphorical or otherwise, of living systems.

### METABOLIC RIFT

Why would anyone even consider driving over them? These powerful individuals are not stupid – so why do they believe so strongly in an ecocidal system? The explanation that works best for me is the existence of a ‘metabolic rift’ between man and the Earth. This is the idea that a combination of paved surfaces and pervasive media have rendered us cognitively blind to the health of the living systems of which we are a part.<sup>23</sup> As Timothy Morton so memorably puts it, a good way to think about the metabolic rift is that ‘the ecological catastrophe has already occurred’.<sup>24</sup>

Can the metabolic rift be healed? In his 1962 book *The Structure of Scientific Revolutions* Thomas Kuhn introduced the term ‘paradigm shift’ to describe the ways that scientific worldviews periodically undergo radical change in what appears at the time to be a sudden leap.<sup>25</sup> These ‘sudden’ paradigm shifts in worldview follow years, sometimes decades, in which scientists have encountered anomalies that don’t fit in with the dominant paradigm. Could a paradigm shift in our understanding of ‘progress’ and ‘the economy’ be imminent? Are there grounds for optimism that the modernist myth – that the biosphere is a repository of resources to fuel endless growth – will be supplanted by something new?

In the chapters that follow I propose that a new story is indeed emerging. This new story describes an economy based on social energy, using 5 per cent of today’s resources, that is not only feasible but will leave the world a better place. This story is not about an imagined future utopia; it’s based on actions being taken today that are enabling this new narrative to emerge. According to the German Advisory Council on Global Change (WGBU), the heavyweight scientific body that advises the German Federal Government on ‘Earth System Megatrends’, a ‘global transformation of values’ along these lines has already begun.<sup>26</sup> This post-materialist thinking is not limited to rich-world greens. In South Korea, Mexico, Brazil, India, and China, the WGBU found, a significant majority ‘supports ambitious climate protection measures’ and would ‘welcome a new economic system’ to achieve that.<sup>27</sup> Although the values described by the WGBU are ‘latent’ – and numerous laws, and institutional inertia, remain an obstacle – its conclusion is that political and social change on the ground is real, and growing.

This raises an interesting question: if profound paradigm shifts are possible in the worldviews of science; if ‘ecological surprises’ can transform natural systems, as scientists have shown; and if today’s monolithic states could be transformed by ‘multi-polarization’, as military think tanks predict; in that case, it is surely on the cards that a profound phase shift in cultural belief systems is un-paving the way for something entirely new. There’s a cheering consequence of this scenario. If, in an age of networks, even the smallest actions can contribute to transformation of the system as a whole, then our passionate but puny efforts so far may not have been in vain. It’s like the picture in a jigsaw puzzle that slowly emerges as we add each piece.

are to work with nature, and not against it, we, too, must subjugate machine time to organic, ecological, and even geological tempos. The natural systems that sustain us move at a slower rhythm than today's economy does; feedback loops in nature are slower than the lightning-fast synapses we've built into our machines.

Different ways of knowing, as I write about more in Chapter 10, are an important factor as we make this transition. For farmers in Bali, their music is a form of ecological knowing. As explained by the musicologist Judith Becker in 'Time and Tune in Java', Gamelan music helps people connect with the multiple cycles of nature.<sup>22</sup> Like nature, Gamelan music is composed of multiple interlocking cycles, subdivisions of cycles, and concentric cycles; these all rotate simultaneously within each other. The experience of order appears if the cycles are integrated well, Becker explains; if they are not well integrated, the result is unsettling. I have no idea what the equivalent of Gamelan music might be for the watershed where you live – so go find a composer and get started.

#### WATER WISDOM

I hope I have persuaded you, in the stories above, that even small actions can have big and positive outcomes for a watershed when enough people take them in concert.<sup>23</sup> The action can be to design a rain barrel, help clean up a creek, map the ecological resources of a watershed, plant water hyacinths, or compose the music score of an ecosystem. If we are to transform watersheds at an ecosystem scale, a variety of different actors and stakeholders – formal and informal, big and small – need to work together. This will seldom be easy, and because every city and its watershed is unique, there is no global blueprint to follow. These challenges are daunting – but bringing watersheds back to life is a vision with immense cultural power.<sup>24</sup>

## 4 DWELLING: FROM DEPAVE THE CITY, TO POLLINATOR PATHWAYS

It's early September. Any day now, the family of swallows that have spent the summer in the eaves outside my studio will head south for the winter. Most of them will follow the west coast of Africa to avoid the Sahara; a few may travel further east down the Nile Valley. They'll take it easy at first, stopping every few miles to build up their fat reserves, but then they'll speed up. In four months, as Christmas beckons here in the north, they'll reach their destination: Botswana, Namibia, or South Africa. After just two months gorging on insects, they'll begin the epic return journey. The strongest among them will make it back in just five weeks, travelling 320 km (200 miles) a day (they're keen to get back to their nesting site before some other bird nicks it). And I thought *my* air travel was profligate.

As an artefact, the swallows' nest is hardly the Taj Mahal; it's a ramshackle structure, made of mud pellets and straw, that's stuck crookedly to the wall. But it seems to suit them well – or rather, the surrounding *habitat* does. Their physical abode is a safe place to rear their young, but what brings the swallows back every year is the environment as a whole: open air for easy flight; fresh water from the river; flying insects to feed themselves and their offspring. As the swallows twitter excitedly overhead, I envy how lightly they manage

to live. I compare their external energy needs, which are tiny, to the prodigious energy flows and billions of tons of resources, gathered from faraway lands, that keep our cities going; the elevators in our skyscrapers; the huge pumps that supply our water and air, and keep our subways dry; the industrial food in our shops; the water in the taps.

Preoccupied by this contrast between our lifestyles and those of the swallows, I posed the following question to a meeting of housing association managers: do we really *need* to build more boxes? Is it beyond our creativity to provide our fellow humans with shelter and sustenance without covering more of the world in concrete? To be candid, I did not expect an easy ride from this group of experts. Their daily job is to manage 2.4 million housing units across the Nordic countries, and demand for more is unremitting. But I was surprised: many of these professionals shared my concern at the baleful influence of the Real Estate Industrial Complex. Manufacturing boxes may be good for GDP and construction firms, some agreed, but we can surely meet the social need for shelter in ways that improve the habitat, not wreck it.

#### TOP-DOWN NATURE

My surprisingly friendly reception in Reykjavik was symptomatic of a profound change in the ways we think about cities. The first signal of change that I noticed was in 2009 when Nicolas Sarkozy, then French president, asked ten architects to dream up 'the world's most sustainable post-Kyoto metropolis'.<sup>1</sup> The architects duly dreamed. One proposed to build economic 'buds' in an 'archipelago' around the capital. Another proposed to double the number of forests, and bring vegetable fields to the city's outskirts. A third proposed to cover up roads and railway lines with huge green canopies. Two Italian architects proposed to lay the city out as a 'porous sponge' in which waterways would be given pride of place. In this contest of the metaphors, 'sponge' struck this observer as the strongest one to emerge – but, at the time of writing, none of the competing plans has gained traction. The only project to be approved, in 2011, was a

US\$30 billion public-transport network called Le Grand Huit – and the word 'sponge' does not appear in its plan.

The failure of Paris to embrace its future as a sponge, in the short term at least, did not deter my adopted country's dreamers. In 2010 a vast exhibition called 'The Fertile City: Towards an Urban Nature' explored nature in the city from multiple perspectives: historical, social, cultural, botanical, and ecological.<sup>2</sup> A gigantic promenade led the visitor to sixteen projects from all over the world – from Beirut to Buenos Aires. 'The Fertile City' was an engaging spectacle, but most of its luscious images featured rich urbanites lolling around on green playgrounds. Life in the Fertile City seemed, literally, to be a picnic. It was like a still life fruit-bowl painting: decorative, but hardly nourishing. The show said nothing about the social and economic changes – not to mention the mud, and the work – that would be needed for our cities to become fertile sponges in real life.<sup>3</sup>

Another ideas project, this one for Chicago, is based on the concept of 'Eco-Boulevards'.<sup>4</sup> Shocked by the discovery that Chicagoans waste over 3.8 billion litres (1 billion US gallons) of the water they extract from the Great Lakes each day, Martin Felsen and Sarah Dunn proposed to transform existing roadways, sidewalks, and parks, which comprise more than a third of the city's land, into a holistic, distributed, bio-system for recycling water. Long strips of publicly owned land would be transformed from grey infrastructure – roadways and sidewalks – into an interconnected network of parks, wetlands, preserves, bio-conduits, and native landscapes. Natural bioremediation processes – the use of plants to clean up polluted soils – would remove contaminants from storm water and wastewater. Thus cleaned, the water would be returned to the Lakes, closing Chicago's water loop. If realized, Chicago's Eco-Boulevards will remake the city in the image of its own motto, '*Urbs in Horto* – City in a Garden'. They remain, at the time of writing, a concept but a resonant one.

Undaunted by the failure of these visionary projects to gain traction, the city of Bordeaux launched a live project called Bordeaux 55,000 to realize 'urban nature' in practice.<sup>5</sup> Five multidisciplinary teams were invited to explore how to transform 55,000 hectares

(136,000 acres) into natural areas. They were asked to 'restore natural and human capital', find ways to rehabilitate polluted soils, and use the design principles of permaculture in their proposals. To meet this brief, the teams assembled a small army of specialists: experts in architecture, geography, economics, agronomy, ecology, planning, development, landscape, sociology, tourism, hydrology, philosophy, history, philosophy, and storytelling. Although the French project is adventurous, Bordeaux 55,000 (which is ongoing) sits firmly within a resource-intensive development paradigm. The city's 'nature programme' accompanies a vast investment in high-speed rail infrastructure designed to transform Bordeaux into the 'crossroads of south-west Europe'. The plan is grand, but not yet grounded in the realities of resource constraints; it is likely to grind to a halt as energy descent kicks in. For a more representative picture of how energy-stressed cities may evolve, one has to look elsewhere.<sup>6</sup>

#### WILD CITY

In a project called Wild City, the Rotterdam-based research group Stealth set out to understand the seemingly chaotic and non-planned processes that transformed Belgrade during the turbulent 1990s.<sup>7</sup> They found that many functions and services previously provided by institutions were reinvented by an accumulation of individual initiatives in trade, housing, and other public services. The most radical reconfiguration of the city, Stealth found, happens when different kinds of street trade enter and reshape public space.

By 2020, according to the Organisation for Economic Co-operation and Development, two-thirds of all the workers of the world will be employed in the informal economy. In his book *Stealth of Nations*, the American writer Robert Neuwirth describes in vivid detail how this shadow economy is reshaping our cities as the formal economy stagnates.<sup>8</sup> The shadow system is most dramatically visible in places most of us never see: in the vast open markets underneath the Superhighway between Shenzhen and Guangzhou; in the tri-border area of Paraguay, Brazil, and Argentina; among the derelict remains of a once popular resort on the fringes of Buenos

Aires; in a former container depot outside Odessa; on no-man's-land along the former Iron Curtain. In each of these areas informal markets occupy a shifting mosaic of small locations. For Helge Mooshammer, who is also researching the phenomenon, these informal zones mark a radical shift in urban organization – 'from geographically fixed territories to a networked ecology of filters and channels'.<sup>9</sup>

#### INFORMAL FOOD

The lightweight hardware of these informal markets contrasts starkly with the heavyweight systems that supply our cities with food and water. As I will explore further in Chapter 5, the industrial system that keeps cities fed consumes ten times more energy running itself than it delivers as nutrition that you and I can eat. These food systems are only viable when fossil fuels are abundant. In a visceral response to this fragility, informal food and water systems are sprouting up everywhere, too. Five years ago, urban farming was a fad. Today, serious urban agriculture projects have taken root in dozens of northern cities. A powerful grassroots movement has given us community-supported agriculture and box-schemes, the 100-mile diet, and Slow Food. Sales of vegetable seeds have skyrocketed; backyard chickens are now commonplace; and schoolyard gardens, organic farms, and farmers' markets have proliferated. Together with thousands of grassroots projects to capture rainwater and depave hard surfaces, the informalization of food and water flows is transforming urban-rural relationships, and with them the metabolism of cities.

A few cities have already adapted their approach to planning to accommodate these developments. In the US, the city of Portland commissioned a report called *The Diggable City* to determine which of its properties might be suitable as community gardens or other kinds of agricultural uses.<sup>10</sup> Having identified 289 locations, the report yielded an action plan for the modification of land tenure, access to water, level grade, site security, and other considerations. Chicago set up a project called NeighborSpace to serve as a land management intermediary between the city and community groups seeking to

develop projects on vacant public land.<sup>11</sup> Social practices are a key part of this urban transformation. Urban farming is as much about the design of ways to share and collaborate, as it is about what to put in the beds. New services, policies, and infrastructures are needed to support food co-ops, collective kitchens and dining rooms, community gardens, cooperative distribution platforms, seed banks, hothouses, nurseries, and other enhancements of community food systems.

### SUBURBIA, TOO

The American writer James Kunstler described suburbia as 'the greatest misallocation of resources in the history of the world'.<sup>12</sup> Which may be true, but what's done is done – and besides, most of us have no alternative but to adapt to the places we live in now. On the positive side, although sprawl is frequently blamed for environmentally damaging transport intensity, the collapse of communities, and even obesity, suburbanites do also live on pockets of land in communities that have not been paved over with asphalt and concrete. Much of this land is subdivided into manageable parcels that could be productive once lawns are removed and the soils restored. For Bill Mollison, one of the founders of the permaculture movement, there's enormous potential to transform suburbia into a semi-agrarian patchwork of communities for localized food self-sufficiency. His vision is helped by the fact that some of the most widespread landownership in any mode of settlement is to be found in the world's suburbs.<sup>13</sup> A lot of land with potential for food growing will have to be depaved – but as car use declines, the potential areas available will be huge. Roads and parking facilities typically cover more than 50 per cent of urban land in most city centres and shopping malls; there are up to two billion parking spaces in US cities alone. These impervious surfaces prevent rainwater from entering the soil, instead diverting it to nearby waterways. This water carries pollutants such as oil, antifreeze, plastics, pesticides, and heavy metals from the roads into local streams and rivers.<sup>14</sup>

The liberation of soils from their imprisonment by parking spaces began as an illicit form of activist action. Small groups of guerrilla de-pavers, wielding pickaxes and wheelbarrows, would

remove hard surfaces to reveal the underlying soil bed. Their actions were followed in 2005 by a more mainstream art project called PARK(ing) Day in which citizens transform metered parking spaces into micro-gardens. What began as a two-hour installation in a single parking bay has now become a global movement; in 2012 the action involved more than a thousand parking bays on six continents.<sup>15</sup> Depaving went mainstream with the establishment in Portland of Depave, a non-profit organization that promotes the removal of unnecessary pavement from urban areas to create community green spaces and mitigate storm-water run-off. Many of suburbia's paved spaces and roadways could also be repurposed to gather the water we would need to grow food for ourselves.

Cost is a powerful incentive for depaving. It costs US\$215 per square m (10 square ft) to build a road, but just \$54 to open up the space for an urban farm. In some country districts, budgets cuts are doing more for the depave movement than activism. Because the cost of rebuilding an asphalt road has more than doubled over the past ten years (largely because asphalt cement is a petroleum-based material) some US counties are opting to pay about \$2,600 per 1.6 km (1 mile) annually to maintain depaved roads as against about \$75,000 per 1.6 km (1 mile) to reconstruct them using asphalt.<sup>16</sup>

### MAKE ROOM! MAKE ROOM!

Can depaving seriously free up enough land to feed a booming population? In the European Union alone, about 1,000 square km (385 square miles) of land, an area larger than Berlin, are being taken each year for housing, industry, roads, or recreational purposes.<sup>17</sup> Reversing that trend and restoring concrete-covered land to fertility is an enormous task – but not an impossible one. Ugo Bardi tells the story of a couple in Turin, Italy, who decided to give a patch of fertile land to their children as a gift.<sup>18</sup> They obtained it by demolishing a row of concrete garages they had inherited. It was a lot of work; the concrete had to be cut and broken to pieces, and the rubble carried away. Restoring the fertility of the soil took truckloads of dirt, charcoal, and other nutrients. The process was slow, messy, and expensive.

But it was also a subversive idea – an idea with the potential to spread. Until now, developing land has meant building on it; that's how you make money. Destroying property to restore fertile soil is something that nobody in her right mind would normally do, marvels Bardi, but someone did it. The end result was a patch of fertile soil where grass and flowers grow. Just a few tens of square metres, not much in comparison to the trillion remaining to be recovered. But it is a first step!

### OVERBUILT

Think back to the swallows I mentioned earlier. Many animals and birds meet their needs like early man used to do: they hunt, and they gather. Without pretending to mimic swallows or hunter-gatherers literally, we can surely take inspiration from their spatial intelligence and ask: how many buildings do we need anyway? For Frits van Dongen, state architect of The Netherlands, the answer is: none. Van Dongen stunned his colleagues and the construction world in 2013 when he called for an end to all new building. 'We have half a million square metres of office and industrial space, and 30,000 homes standing empty,' explained van Dongen, before proposing that soft green infrastructures, such as spaces for urban agriculture, were a better priority.<sup>21</sup>

The realization that rapid urbanization is a symptom of systemic problems, not a solution, is taking hold in newly industrializing countries, too. In 2014, when India's new government announced plans to build the 100 'smart cities' I mentioned in horror in Chapter 1, the 25 per cent of India's total primary energy demand was already being used to manufacture building materials and this building binge would exacerbate the country's already acute energy crisis.<sup>22</sup> Even potential clients for new buildings are asking hard questions about the need – or 'church-planting' movements, for example, are multiplying without the entrepreneurial pastor, 'massive building programs are often a waste of money; they're a barrier to exponential growth'. Warren reminds

his followers that the period of fastest growth for Christianity was during its first 300 years – when there were no church buildings at all.<sup>23</sup> A similar lesson is permeating the business world. For Bill Mayon-White, a professor at the London School of Economics, the physical assets owned by most corporate giants represent 'an albatross hanging around their necks'. Companies gain flexibility by not owning physical assets, by concentrating on ownership of intellectual property and moving that around.

The most valuable work in today's urban economies benefits from close proximity – and a city's streets, interspersed by shared workspaces, can support that kind of economic activity more cost effectively than buildings; simple technology platforms can render almost any urban location a potential worksite. In Mumbai, the urban research group Crit has developed a diagnostic tool to measure what it calls 'transactional capacity' of a city. Based on its findings, Crit deploys social innovation tools to enhance the complex landscape of services, relationships, and physical spaces that make a city truly smart.<sup>24</sup>

Even as we stop building unneeded new buildings, many empty ones will still remain – and what to do with them? In *The Economy of Cities* (1969), Jane Jacobs predicted that cities would become 'the mines of the future' – and not just metaphorically; the 'standing crop' of industrial metals already embodied in artefacts among the ten richest nations would require more than sixty years' production of these metals at 1970 rates.<sup>25</sup> Four decades after she made it, Jacobs's forecast is coming to life amid a proliferation of grassroots projects to dismantle buildings, reclaim tower blocks, and renew trailer parks. Disused buildings often contain valuable amounts of embodied energy, so the deconstruction or 'decon' trades are flourishing. A Deconstruction Curriculum in the US trains people to be 'green workforce ready'. Eight-week decon courses may be taken in Fort Dodge, Sioux City, Spirit Lake, and Cedar Rapids.<sup>26</sup> In Savannah, Georgia, building materials reclaimed from a public housing demolition project are being diverted to a Girl Scouts eco-camp, public school playgrounds, and community gardens.<sup>27</sup> In the UK, more than 60,000 people have joined a decon resource hub called Bricks and Bread that opened in 2009.

Its founder, Trudy Thompson, went on to create a social franchise model to replicate its systems and know-how; more than 300 franchisees are now using her innovative methods.<sup>28</sup> For its part, the UK's Asset Transfer Unit helps communities take over underused land or buildings – and do so legitimately.<sup>29</sup>

#### PATCHWORK CITY

The lesson of the decon boom is that rewilding cities is not much about the creation of wide open spaces; it's more about patchworks, mosaics, and archipelagos. When parks were built in past centuries they were called the 'green lungs' of towns. Decades of oil-fuelled overdevelopment has put an end to those expansive days – but a new generation of 'greening designers' have abundant man-made assets to work with. There are parks, cemeteries, watercourses, avenues, gardens, and yards to adapt. There are roadside verges, green roofs, and facades to plant. Sports fields, vacant lots, abandoned sites, and landfills can be repurposed. There are large and growing numbers of abandoned buildings and ruins, empty malls, and disused airports to modify – not to mention the abandoned aircraft that, before too long, will be parked there.

In Vienna, a design firm called Biotope City develops 'micro green spaces' to transform neighbourhoods. In the densely developed Haslingergrasse district, for example, the group covered the walls, balconies, and ledges of 150 social housing blocks with greenery.<sup>30</sup> for birds and insects were also added. A similar patchwork approach is emerging in the Jæren region of Norway whose landscape has been battered by the footprint of the oil economy. Undeterred, the architect Knut Erik Dahl teaches young designers to look for and appreciate and insects in among the people, goods, and buildings. Students make large-scale maps of each location on paper, by hand. It's low-cost, hands-on work. They call it 'dirty sustainability'.<sup>31</sup>

This new approach is all about nurturing patches, some of them tiny, and linking them together.<sup>32</sup> Think about 'my' swallows.

They thrive in open habitat, not in a closed-off property. Poor people, who live in tiny private homes compared to rich people, know this already. The average floor space per person in low-income countries is about 8 square m (80 square ft) compared to 60 square m (600 square ft) per person in the US – a nearly eight-fold difference.<sup>33</sup> But McMansions can be lonely places and the trick to thriving in small dwellings is access to shared spaces and services. The secret lies in the connections. When habitat patches in the landscape become fragmented, biodiversity suffers. The same goes for humans. Habitat fragmentation is an issue in cities, too. Ecologically minded landscape designers therefore try to ensure that valuable patches do not become too small or isolated to support species. In France, several cities are working to establish 'ecoquartiers', or eco-neighbourhoods, in otherwise gritty urban contexts. The idea is to 'seed' functions such as rainwater capture, or Sustainable Urban Drainage Systems (SUDS), in the hope that they will propagate and spread without ongoing support from city authorities – or budgets.

#### LEARNING FROM THE SOUTH

Many cities in sub-Saharan Africa are already 'green' in a bioregional context.<sup>34</sup> Cityscapes in which houses are surrounded by food growing are normal. The 'peasant economist' Teodor Shanin, who reckons that the informal economy supports three-quarters of the world's population, reminds us that 80 per cent of all farms in the world – 445 million of them – occupy 2 hectares (5 acres) or less – many in or near cities. From Lima in Peru, to Kinshasha in Zaire, a lot of expertise has accumulated on how to manage the complex social-ecological networks of urban and suburban agriculture. The main lesson: necessity, more than aesthetic reverie, is the mother of urban transformation.

Does city-grown food make a meaningful difference? A recent US study suggests that it does – or at least can. Researchers explored what it would take for Cleveland – a Rust Belt city with lots of potential green space – to feed itself. The results were startling: in one scenario, the use of 80 per cent of every vacant lot generated

22–48 per cent of the city's fruits and vegetables, 25 per cent of its poultry and eggs, and 100 per cent of its honey. If commercial and industrial roofs were added to the equation, the city could provide up to 100 per cent of its needed fresh produce, 94 per cent of its poultry and eggs – and 100 per cent of its honey.<sup>22</sup>

Growing food is one thing; storing it is another. Awareness of energy descent is reviving interest in the ways we preserved food in the past. For thousands of years, people in different cultures have preserved foods and vegetables using lacto-fermentation; in this fossil-fuel-free process, lactic acid acts as a natural preservative to inhibit putrefying bacteria. What began as a foodie fad is fast becoming mainstream as more people seek out practical ways to conserve food without resort to refrigeration or chemicals. Right next to City Hall in Seoul, in Korea, I visited a farmers' market in which fermented fish and vegetables were displayed in rows of tubs; these were interspersed with large mounds of bright red kimchi paste. Unlike canning and pasteurization, which kill all microorganisms in a food, fermentation takes the opposite approach: it promotes natural life in the form of bacteria and yeast in which microorganisms harmful to humans cannot live. In Korea, kimchi pickles are stored in *onggi*, or earthenware jars, which are shared and looked after by the community as a whole.<sup>23</sup> As similar tubs and jars crop up in northern cities, too – along with neighbourhood bakeries and breweries – a growing number of citizens have become unwitting experts in biological symbiosis.<sup>24</sup>

#### POLLINATOR PATHWAYS

Urban patchworks as a living infrastructure for bread and beer production are also friendly for pollinating insects. With bee and insect populations plummeting across the US and Europe, small gardens have enormous potential to act as archipelago-like nature reserves. England's 15 million urban backyard gardens, for example, occupy more ground than all of the country's official nature reserves combined.<sup>25</sup> To link these micro-sites together, and thereby to strengthen a city's natural food web, so-called pollinator pathways

are being developed. In Seattle, for example, the artist and ecological designer Sarah Bergmann established a mile-long series of planting strips along Seattle's Columbia Street to create a corridor between two green spaces at opposite ends of the city. Each planting strip – usually a band of grass between sidewalk and street – is transformed into a pollinator-friendly garden that offers viable food and habitat to vitally important insects.<sup>26</sup> In the UK, a nationwide project has started to establish 'Bee Roads' across the country; these will act as food-rich main routes for pollinators.<sup>27</sup>

Filling up cities with plants and trees has energy-related benefits, too. Cities, and not just rainforests, can provide ecosystem services. When researchers visited parks, golf courses, abandoned warehouses, and household gardens around the city of Leicester, they discovered that urban vegetation stores ten times more carbon dioxide than previously assumed.<sup>28</sup> Mature trees provide a canopy of shade to help cool buildings and streets; this reduces energy usage. Street plantings can also entail the removal of concrete, and mulched trees help rainwater soak into the soil underneath depaved surfaces. Trees also help prevent soil erosion; save water; shield children from ultraviolet rays; provide food; help sick people get well; reduce violence; and provide a canopy and habitat for wildlife. A recent Portland study suggests another surprising benefit: healthier newborns. Researchers found that pregnant women living in houses graced by more trees were significantly less likely to deliver undersized babies.<sup>29</sup> (Whether larger babies go on to consume more resources was not reported.)

A pioneer in urban forestry projects, and of novel forms of social organization to create them, is Andy Lipkis, founder of TreePeople in Los Angeles in 1973. TreePeople's Citizen Forester programme organizes volunteer tree plantings and tree care events along city streets and in neighbourhoods throughout Los Angeles County. TreePeople has also distributed thousands of fruit trees to low-income communities; these become functioning community forests – in backyards, on school campuses, and in community gardens. Planting trees is just one aspect of the group's work. For at least five years after a tree is planted, its progress is monitored by

Tree Care Coordinators who organize tree care events as needed; this dramatically increases the chance of the tree's survival to maturity.<sup>4</sup> Lipkis's pioneering work depaved the way for the creation, in 2005, of a Sustainable Urban Forests Coalition. This platform brings together city planners, educators, landscape architects, non-profit leaders, scientists, arborists, foresters, nurserymen and women, and many other professionals who care for, monitor, and advocate for trees and our urban forests as a whole.<sup>4</sup> The American Forestry Service then established an Urban and Community Forestry website whose pages are filled with happy-making stories. A manual filled with best-practice case studies has been distributed to more than a thousand planning agencies.<sup>4</sup> In Europe, a Forum on Urban Forestry collates discussions on how best to manage old urban forests, parks, and cemeteries. The island state of Singapore plans to transform itself from a 'garden city' to a 'city in a garden' by reforesting the entire city state. Tai Lee Siang, president of the Singapore Green Building Council, laments the fact that town planners, when they start drawing, almost inevitably draw the roads first. Siang plans to reverse that sequence. Quoting a NASA estimate that there are about 57 trees to each person on Earth, he announces a new target for Singapore: a ratio of 100:1.

#### REWILDING THE CITY

As people get reacquainted with real physical work in our cities, we are learning a special respect for solutions evolved by nature over the last 3.8 billion years. As Janine Benyus reminds us, other life forms than our own are able, expertly, to move water, capture the Sun's energy, provide shelter, store food, recycle nutrients, share resources, build communities, control population, and manage ecosystems – all without human intervention. We've exhausted ourselves trying to control our environment using fossil-fuel force – only to be reminded that ecosystems can manage this effortlessly on their own.

This prompts an interesting question: pull that weed out of its crack in the pavement – or let it grow? A growing number of people are inclined to welcome back the weeds and let nature take its course.

Seen through the lens of biodiversity as wealth, the city turns out to be richer than we thought. There is more biodiversity in many cities, for example, than outside them. In the 'country', industrial agriculture blankets large areas with monocultural single crops; among 20,000 species of edible plants in the world that we know about, fewer than 20 species now provide 90 per cent of our food. Some cityscapes, in contrast, are far more diverse. Urban biologist Claudia Biemans, a local naturalist and edible plants researcher in The Hague, has identified about 300 different species in 1 square km ( $\frac{1}{3}$  square mile) of her city; this compares to 50 different species found in the same area of managed countryside nearby. 'Bees know this very well, and are more to be found in cities these days,' she points out. On walks called 'Stalking the Wild', Biemans guides people to ecological niches in the city where plants don't just survive, but thrive.<sup>4</sup>

Much of this urban nature is edible. Herbal fruits, leaves, and edible flowers grow on walls and roadsides, between paving stones, and in other untended spaces. Lynn Shore in Amsterdam, trading as Urban Herbology, is among a growing band of urban foragers who help citizens find herbs, use them in cooking, and learn about medicinal preparations. Shore's activities include seed and plant swaps, urban herb walks, and 'gatherings for urban herbies'. In Los Angeles, a so-called 'rock star of foraging' called Pascal Baudar has turned his passion into a thriving business; Angelinos pay \$100 a session each to join his 'Gourmet Foraging Sunset Experiences' on which they learn about the culinary uses of weeds found in the local landscape. Baudar's wild food classes sell out weeks ahead.<sup>4</sup> Less prosperous foragers, the majority, are using a free mobile phone app called Boskoi to map the edible landscape; in an activity called 'augmented foraging' they share the location of wild food in public space. The word 'Boskoi', say its Dutch developers, is taken from Greek; it dates back to the tradition of desert hermits in the South Egyptian and Sudanese desert. This hardy band survived exclusively on wild herbs and rainwater, and were said to graze with wild herds of cattle. A splendid model for the post-peak city, then.<sup>4</sup>

Alerted by these innovative projects to the fact that cities support about 20 per cent of the world's bird species and 5 per cent of its

plants,<sup>4</sup> a growing number of city fathers now realize that their cities are dynamic nodes of biological activity in their own right, and that ecosystems in 'their' bioregions are a source of value.<sup>5</sup> In the UK, brownfield sites contain more rare insects than do ancient woodlands and chalk downlands.<sup>6</sup> And the US Forest Service, once sceptical that anything urban could be wild, now supports a growing urban forest programme.<sup>7</sup> In China, too, 600 million volunteers planted 64 billion trees in 2012.<sup>8</sup> Urban ecology and urban wildlife programmes are proliferating on university campuses.<sup>9</sup> Boasting that 'my city has more wildlife than yours' suddenly sounds so much better than banging on endlessly about its creative class.

Claudia Biemans, who I mentioned above, is among a growing community of researchers for whom the evolution of plants and animals in cities is an urban design opportunity. In New York, scientists have identified mutations in more than a thousand genes in the city's mice – far more than in mice from out of town. Extinctions, invasions, and adaptations have created a complex mixture of native and non-native life forms. Not all of this change has been positive; Manhattan was once home to twenty-one native species of orchids assumed to be extinct due to the replacement of woodland by open urban spaces.<sup>10</sup>

Or are they really extinct? Their seeds may still be there. The notion that older ecologies lie beneath our cities, waiting to self-resurrect, has long fascinated artists – and now scientists, too. Paleobotanists have discovered that 1 square m (10 square ft) of urban soil can contain tens of thousands of seeds that persist in slumber. In his essay 'City of Seeds', the writer Daniel Mason reflects that a two-and-a-half centuries old tradition of urban botany has yielded a startling insight: the flora of the city 'is essentially a flora of the city's destruction'.<sup>11</sup> Unlike the managed green of parks and wild plants of a city need 'the cracks, the pavement split, the palace abandoned'. Beyond the managed gardens and the wild invaders of our roads, Mason concludes, is 'a hidden, potential flora, an *idea* of

a forest, not in competition with the city but existing alongside it, patiently, waiting to become manifest'.

Although their activities are separate, these artists, writers and scientists agree that the city is part of nature, not outside it. 'Instead of manicuring sustainable gardens,' states *Urban Cannibalism*, 'we celebrate the spontaneous surplus of the city's life.' This group does not restrict itself to plants; it proclaims itself to be a conduit for 'the organic and inorganic voices of the city, of the liquid flows of minerals and invisible ecologies of microorganisms that constitutes the bodies of buildings and beings.' Buildings breathe and ferment, too, they explain – just very slowly; even the hardest wall is host to the invisible food chains of microbes and mould. The closer you look, the more blurred becomes the border between organic and inorganic life.<sup>12</sup>

### PLACE MAKING

I'm finishing this chapter outside the Portakabin control room of Shambala, a summer festival in England. On the wall is the street plan of what looks like a mid-sized town. Fifteen thousand people have indeed filled a vast field with tents, yurts, sound stages, composting toilets, drinking water tanks, hot tubs, food vans, charging stations, yoga enclosures, a barber shop, a meadow filled with aromatherapists, vending machines in a caravan, and pagan circles around wood-burning stoves. Surrounding Shambala's central core is a densely packed suburbia of tents; in these the sleeping area per person – a couple of square metres – is similar to the space available to billions of people in the world's other favelas.

Most of Shambala's prosperous urban tribe will return to a world of concrete and media when the festivities end – but, for two-thirds of the world's population, nomadism and contingency are now everyday conditions of life. Most of the world's 800 million urban farmers, for example, grow food because they need to eat it, not to be cool. In megacities across the Global South, informal settlements are also filled with the pop-up retail, food trucks, street traders, guerrilla gardening, and informal parks, that – at Shambala – are celebrated as fashionable novelties. In the world's refugee camps

and post-disaster settlements, too, a dynamic variety of social micro-economies enables people to share energy, materials, time, skill, software, space, or food. These activities depend more on social energy, and trust, than on fixed assets and real estate. There's an emphasis on collaboration and sharing, on person-to-person interactions, on the adaptation and reuse of materials and buildings.

These resource-light ways to meet daily life needs are usually described as poverty, or a lack of development. But in thirty-five years as a guest in what used to be called the 'developing' world, I've realized that people who are poor in material terms are highly accomplished at the creation of value in ways that do not destroy nature for people who cannot depend on the high-entropy support systems of the industrial world. This is not to trivialize the extreme challenges faced by poor people on a daily basis; but, to the extent that a regenerative economy is based on local production, human labour, and natural energy, the poor people of the world are further along the learning curve than the rest of us.

What the Earth needs, and what the Real Estate Industrial Complex needs, are two different things. The world is overbuilt. As our measure of economic progress shifts to health of the soils, and biodiversity, the practical focus of our efforts is shifting to a city's inhabitants – including non-human ones – and to ways of improving this 'reintegration of human endeavours into a larger ecological consciousness'. It's the right way to think about, and act, in our cities.

## 5 FEEDING: FROM SOCIAL FARMING, TO FOOD AS A COMMONS

Not long after my soil-making day in the Cévennes mountains, I found myself in the centre of the city of Carlisle, in the north-west of England, at 7 a.m. The railway station forecourt was empty except for a large truck whose driver was unloading packaged food into a cafe. An incredible, raw-edged roar of noise came from the refrigeration unit on top of his cab; it was so loud that I couldn't hear a word when someone called my mobile phone, so I retreated into the station cafeteria. It was little better inside: two refrigerated drinks machines were roaring so loudly that the sales assistant had to shout to tell me the price of a coffee. Getting off the train in London a few hours later and shopping for a snack in a branch of Marks & Spencer, I was aware of another, even louder, background roar. Curious about its source, I counted out 78 m (256 ft) of chiller cabinets in that one, not-so-big, urban food store. As I stepped out into the busy street, the noise of the chiller cabinets merged with the roar of the traffic – and in more ways than one. A lot of that traffic noise turns out to be food-related, too: agriculture and food now account for nearly 30 per cent of goods transported on Europe's roads; in the UK, 25 per cent of car journeys are to get food. We increasingly eat food while moving, too: 70 per cent of fast-food sales in the US are at the drive-through window.

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