1 Sustainability and Decisions

I went back to Ohio
But my pretty countryside
Had been paved down the middle
By a government that had no pride
The farms of Ohio had been replaced by shopping malls.
"My City Was Gone," The Pretenders

The song "My City Was Gone" laments sprawl development. Chrissie Hynde grew up in Cuyahoga Falls, Ohio, in the 1950s and 1960s.[1] My family often visited my Uncle Les, Aunt Mabel and cousins Jerry, Carl and Eileen there. In the 1950s, the drive from Kent took us past farm fields and scattered houses. Then things changed. Aunt Mabel got a job less than a mile from their suburban house at Montgomery Ward, a department store at the first large shopping center in the area. Long-standing family-owned businesses in downtown Kent and Cuyahoga Falls had trouble competing with the big-box and chain stores; many were gone by the late 1960s. By then, the drive from Kent to Cuyahoga Falls was mostly past housing and commercial developments rather than open land.

Paul McLaughlin captures Hynde's lament in the term "Genericville." You can drive around such a place (walking is difficult and dangerous) with only weather, vegetation and soil indicating if you are in New England, the Midwest, the South, California or elsewhere. This provides predictability – the same menu at every franchise restaurant in a chain no matter where it is located and whatever the season. When my family vacationed by car in the 1950s, finding a place to eat where the food was safe and tasty was a challenge. "Look for where the truckers eat" was the rule. The American Automobile Association gained the trust of American travelers from their rating system for restaurants and motels, as Michelin had in France. In Genericville, distant corporate headquarters enforce restaurant-quality standards and food safety. Often the soups, chopped salad greens and hamburger patties are shipped in from kitchens hundreds or thousands of miles away. Little or nothing is based on the local context. Any real sense of place, season and local identity is lost. Genericville minimizes diversity and local character in favor of efficiency, predictability and profitability.[2]

A conference in Fairfax County in the Northern Virginia suburbs of Washington, DC, asking "Are current patterns of land development sustainable?," prompted my thinking about the meaning of sustainability. These suburbs have been growing very rapidly for decades. From the year 2000 to 2010, Loudon County, about 35 miles from Washington, nearly doubled in population, adding about 170,000 people over that decade.[3] Developments were extending ever

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further into the farmland that surrounded them. A few small towns, with histories stretching back to before the Revolutionary War, were starting to thwart the plans of developers. When a community resisted sprawl, development would leapfrog, with the result that some old towns and small areas of farmland were surrounded by Genericville.

These suburbs have some of the worst traffic congestion in the United States. The DC Metro rapid transit system was designed in the 1960s to handle commuting between downtown Washington and the inner suburbs. By the 1990s, most commuting was from one suburban location to another – something hard to do on the Metro. Rapid growth was putting a strain on the water system even though this is a relatively wet part of the United States. I've been told by experts that some communities downstream from newer developments were drinking water that was "recycled." So much water was being taken by upstream users that, by the time a glass of water is drawn from a tap downstream, on average that water had already been processed through a municipal water treatment system – a sewage treatment plant.[4] Northern Virginia could be a poster child for the problems of sprawl. If sustainability involves thinking about economic development, the environment and quality of life, it made sense to discuss issues of sustainability in Northern Virginia. However, for most participants at the conference the key issue was that sprawl growth might not be able to continue. It might not be sustainable in the sense of continuing without change.[5] The discussions were almost the antithesis of what is normally meant by "sustainable development."

Ironically, Northern Virginia has a model of what a community might be. Reston, Virginia, was founded in 1964 by Robert E. Simon (hence RESton) and was perhaps the first planned community in the contemporary United States. The original development surrounded the artificial Lake Anne and was modeled after Portofino, Italy. Community design gave preference to walking over driving. Lake Anne Plaza was the hub of the development, with a plaza, restaurants and other businesses on the first floor and apartments on the second and third floors. My wife Linda and I and our golden retriever Darwin lived in a townhouse complex about a mile away. The kitchens were small by design to encourage dining in the community. Air-conditioning used cool water from the bottom of Lake Anne so there would be no noisy outside compressors that could discourage conversations and disrupt tranquility. The National Wildlife Federation had designated the community a "backyard wildlife habitat." Simon's ideal was that people could live, work and relax in the community and that one could live there comfortably from childhood to old age. The proximity of work, home, stores and schools could ease gendered divisions of labor. Reston was also intended to be a racially integrated community at a time when that was innovative. There is a fifteen-story high-rise apartment building on the plaza and apartments, townhouses and single-family dwellings are tastefully intermixed. All the businesses in the plaza were locally owned. Reston was a refuge from the sprawl of the rest of Fairfax County. It could have been a model for the development that dominated the rest of the region – clusters of high density with amazing amenities. But "old" Reston was a quaint anomaly. The typical pattern for Northern Virginia, and even Reston outside the original development, was a sprawl of single-family houses, apartment/condo complexes, big-box stores and strip malls. Unlike the historic district of Reston, cars, roads and parking lots dominate most of the Northern Virginia suburbs of Washington, DC, a pattern that now impacts communities fifty or more miles away. But it is not uniform. Thirty miles away, Hillsboro,

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Virginia, has found ways to preserve its small-town character in the face of pressure from sprawl and the commuting that dominate the area around it.[6] Unlike Reston, where Simon had the resources to plan the community from the start, in Hillsboro the changes have come from hard work by a broad coalition, engaging state and federal as well as local resources.

At the conference, the contrast between my expectations for a discussion of sustainability in Northern Virginia, perhaps invoking Reston, and the expectations of those promoting development was startling. It made me wonder if the term "sustainability" is useful in guiding our decisions. A few years later, I was at a meeting between agricultural researchers and the heads of organizations representing agribusinesses. One researcher emphasized that his group was moving to focus more on sustainable agriculture. The president of a powerful group responded, quite sharply, "Whose agriculture isn't sustainable?" It became clear that these organizations had a different view of organic farming, free range animal husbandry, local sourcing of food and similar moves that many of us would interpret as "more sustainable." In their minds, these forms of agriculture were economic anomalies and impractical. They strongly supported a "right to farm" law to keep agriculture "sustainable." "Right to farm" was usually promoted as a way of keeping new migrants to the countryside from objecting to traditional agricultural practices – a matter of sustainability for contemporary agriculture. We have lived in an area of Vermont with working farms as neighbors. It is certainly true that new residents from the suburbs are sometimes startled by the smell that comes from spreading cow manure on pasture. One can understand the desire to keep folks "from away," as native Vermonters put it, from blocking such farming practices.[7] But "right to farm" laws often have been used by large corporate agricultural operations, including huge concentrated animal feeding operations (CAFOs), to defend against lawsuits from neighbors and to supersede local zoning and other restrictions.[8] So, once again, I had encountered a group with strong views about sustainability as they defined it but with a perspective very different from mine.

1.1 Small Examples and Grand Challenges

We face huge and transformational challenges. Some of these are continuations of problems of coercion, discrimination and inequality that have been with us since humans first transformed ecosystems and were caught in hierarchical political and economic structures. They are still so prevalent around the globe and within the United States that they require urgent action, and in too many places they are getting worse.[9]

Global environmental change (GEC) – climate change, biodiversity loss, alteration of biogeochemical cycles, widespread dispersion of persistent toxics and plastics – began millennia ago. The pace of GEC greatly accelerated with European colonialism, capitalism and the industrial revolution and accelerated again after World War II with global markets, more powerful technologies and much larger human populations in most parts of the world. Some fear that we are exceeding planetary boundaries – putting so much stress on the environment that ecosystems are being overwhelmed, with catastrophic results for humans and other life on earth.[10]

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Problems are emerging that will be equally challenging. Novel technologies will transform the world and generate new issues by changing how we impact the environment and engage with other humans and other species. Among them:

(1) Nanotechnology: the ability to build tiny machines, the size of small insects or even as small as specks of dust;
(2) Biotechnology: directly intervening in the genetics of humans and other organisms;
(3) Information technology: artificial intelligences with far greater capacity than humans;
(4) Cognitive and neurotechnology: understanding of how our brains work but also unprecedented abilities to intervene in our brains and minds;
(5) Robotics: machines that can mimic and exceed human abilities.

They are not distinct technologies. As each develops, they draw on the others.

These technologies raise profound ethical and policy issues. They will make us confront what we mean by "human," creating new moral dilemmas. Debates about genetically modified organisms in the food supply, about privacy and access to personal information on the Internet and about robots (automation) displacing jobs have been going on for decades. Further debates are developing about whether we should:

- allow combat robots to make "kill" decisions without human intervention;
- permanently alter the genes of wild populations of plants and animals;
- alter the genes of a human to enhance their capabilities.

As with sustainability, good decisions about these emerging challenges will have to be made based on the best possible understanding of the available facts and by thoughtful engagement with our values. Lessons we learn about decision-making for problems of sustainability can teach us a great deal about how to proceed.

Given these huge challenges, why do I so often invoke small decisions, for example how we should manage land development at the local and regional level? As I emphasized in the Introduction, small decisions shape, and are shaped by, larger structures and give us a way to think about and ultimately influence them. As those local changes aggregate across the planet, the biosphere is changed.[11] My hope is that thinking about the small and sometimes the local can help make the issues involved in decisions more transparent and closer to most of our experiences.

Understanding land use also requires us to confront the historical interplay of land use with discrimination and inequality.[12] Northeastern Ohio, Northern Virginia and indeed all the land in the United States were once occupied and tended by Indigenous peoples. They were largely displaced by settler colonists from Europe. It is estimated that more than 50 million Indigenous people, 90 percent of the population of the Americas, died as a result of direct violence initiated by the colonists, by newly introduced diseases and by social and ecological disruption. The impacts on ecosystems were so large that they probably influenced the global climate. When areas formerly tended by Indigenous people went fallow it seems to have reduced greenhouse gases in the atmosphere enough to contribute to the "Little Ice Age" of about 1500–1850.[13] The Indigenous people who survived often were displaced from the ecosystems that had coevolved

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with their cultures. Whyte offers the striking argument that many Indigenous people have already lived through the dystopias usually described in science fiction.[14]

Kent, where I grew up, is located at the Great Divide that separates the Gulf of Mexico and North Atlantic watersheds. It had long been home to a sophisticated set of people who portaged between the Cuyahoga and the Tuscarawas rivers, and thus the two continental watersheds, in large networks of trade and cultural exchange – Kent is in Portage County. It seems likely that much of the Indigenous population there had been killed by the spread of European diseases before settler colonists arrived, but Ottawa, Ojibwa, Haudenosaunee (Iroquois) and Wyandot peoples were in the area. The word "Cuyahoga" probably comes from the Wyandot term for "crooked river." The political systems of the peoples of Northeastern North America were a major inspiration for Europeans who observed that many Indigenous societies were democratic and egalitarian, with broad decisions based on deliberation. It was a sharp contrast to the more hierarchical and authoritarian societies of Europe.[15]

While slavery was not prevalent in Kent, the site of John Brown's tannery on the Cuyahoga invoked the struggle for abolition. Soon after the first Europeans began to colonize the Americas, an economy based on slavery started to grow. About 2 percent of what would be the US population was in bondage by the time the Declaration of Independence and the Constitution were written. In what would become the Confederacy, the fraction was more than one-third and remained at that level until the Civil War. Many of the compromises enshrined in the Constitution came from demands to maintain the slave economy in the new nation.[16] When the Civil War ended slavery, racism and discrimination against African Americans evolved into new forms. Such discrimination has also damaged the lives of Latinx people, people of Asian ancestry, Native Americans and other Indigenous peoples. Indeed, at various points and places in US history nearly every ethnic group except those of English ancestry has been subject to discrimination. But discrimination based on the social construct of race has been and continues to be the most pervasive and pernicious form of prejudice. Land use reminds us of this history: The patterns we see today have been shaped by discrimination through laws, private policies and practices, and hostility and result in environmental injustice.

Reflection on the small examples like local land use can make clear how larger forces shape our lives and reveal how change initiated by individuals acting together can lead to larger structural changes that reshape society towards justice and sustainability. This interplay between individual action and larger structures is a key element of the evolutionary perspective discussed in the Introduction. Consider the abolition of slavery in the British Empire. In the late eighteenth and early nineteenth centuries, slavery and the sugar production it supported were big business, perhaps as powerful as the oil industry is now.[17] In 1787, a dozen British citizens formed what seems to be the first European organization to fight slavery. The movement that evolved used public education, lobbying, boycotts and other tactics common today. In 1807, the British involvement in the slave trade was abolished, followed by the outlawing of slavery in British colonies in 1833. Why did this happen? Part of the explanation is persistent and skillful action by those formerly in bondage and their allies in the abolition movement. Structural factors mattered too. This was a time when the rise of factories was changing the shape of the British capitalist economy and thus the profitability of slavery. In 1804, a slave revolt in Haiti

established an independent country, and there were many other acts of resistance throughout the Americas by those in bondage. Colombia, Peru, Chile, Argentina, Bolivia, Paraguay, Mexico and several European nations had abolished slavery before Britain did. Both individual action and larger structures mattered and were constantly shaping each other even as they do around sustainability and justice issues today.

The history of social change also demonstrates the importance of diversity. In the case of abolition, those still in bondage, those who had escaped from bondage and the European-ancestry abolitionists were constantly collaborating with and learning from each other. To understand a situation and to interpret our values in light of that understanding requires deliberation with others whose experiences and perspectives differ from our own. Such engagement is essential in finding ways forward. As we wrestle with the triplet of old problems, global environmental change and emerging technologies, we need the wisdom and understandings that come from having diverse voices in the discussions that shape our decisions; and we have much to learn from past struggles to transform society.

1.2 Does the Idea of Sustainability Help Us Make Decisions?

We all seem to favor sustainability, but do we have so many different understandings of sustainability that the idea has become meaningless? Is calling for sustainability just another way of saying we should "do good?" I am not alone in raising these questions – many have commented that sustainability may have come to mean so many different things that it now means little. If the concept of sustainability is deployed by nearly everyone, is seen by everyone as largely compatible with their present objectives and is viewed by thoughtful scholars as contested, is the term still useful? Are there ways of thinking about sustainability that are helpful? In the terms of the pragmatist John Dewey, I want to examine what work sustainability does for us as we try to make complex and difficult decisions. What approaches to sustainability can help us deal with the serious challenges we face as we move through the twenty-first century? And in turn, can thinking about how we make decisions and how we might do better at decision-making help us move towards sustainability?

Tom Burns offers an important insight when he notes that terms like "sustainability," and especially definitions of it, emerge from complicated deliberations.[18] Those deliberating will usually differ in their assessment of the facts, in values they hold and in the contexts in which they will experience the outcomes of decisions. So, it should not be surprising that, in trying to resolve conflicts and reach a consensus, contradictions and imprecision characterize the terms used. Chapter 2 will explore the evolution of the concept of sustainability. For now, we can say that sustainability means caring about both human well-being and the stress we place on the environment and on other species.[19] Improving human well-being while reducing environmental stress seems uncontroversial – nearly everyone agrees with these two goals. But moving from those very general goals to a specific decision raises many complications and conflicts.

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The decision of how to commute to work or school provides an example. Car travel has huge impacts globally. In the United States, cars are responsible for about 17 percent of total greenhouse gas emissions.[20] So, our transportation decisions matter. When I lived in Davis, California, many people commuted by bicycle. Recent estimates for bicycle commuting are 3 percent in Washington, DC, 1.4 percent in Lansing, Michigan, 2.5 percent in Sacramento, California, but 19 percent in Davis, California (data are only for the work commute and are for the period 2008–2012). Why the differences? The biophysical environment matters. Davis and Sacramento are pretty flat with mild winters – freezing weather is rare. The physical layout of the city impacts the time spent commuting. As was the case for Reston, land use policy decisions have made Davis compact. The longest commute within the city is only a few miles. Davis has also been an innovator in energy efficiency, including bicycle-friendly policies as well as a strong university/town bus system. There are bicycle lanes on all streets, physical barriers between bicycle and car lanes on many, an extensive network of bicycle-only paths, lots of bicycle parking and police that enforce bicycle traffic rules (including no bicycle riding on sidewalks, stop signs and even speed limits). Political decisions have shaped infrastructure to make bicycling safe and convenient.

What might I consider when making a decision about how to commute to work and, in particular, whether to bike, and how does that lead to more biking in Davis than other places? Most people would care about the monetary costs, safety, convenience, discomfort, exercise and time, and many of us care about the environmental impact. The monetary cost differences between bicycling and driving are probably the same across cities, although cars are probably more expensive to operate in larger cities. Safety will be higher in Davis because of policies and infrastructure that favor bikes. The unpleasantness of biking in winter will be less in Davis than in places with colder climates. The time cost of bicycling will usually be less in Davis because of its compact design and priority given to bikes. The environmental benefits and personal health benefits of bikes versus cars will be the same across cities for the same distance commuted. And, in Davis, because so many people travel by bike, the idea of bicycles as the typical way to get around – the norm – is much stronger than elsewhere. Different people will have different values and face different personal constraints and thus apply different weights to different criteria. Moreover, the decision may differ from day to day, depending on the weather and daily schedules. It's clear many things enter into a simple decision, with some of them shaped by the biophysical environment and many by long-standing policies.

In many ways, deciding whether or not to commute by bike is simple. I can roughly assess all the factors I've listed, including the chance of bad weather. When making choices about what food to buy, or where to live, or what candidates or policies to support, even more things have to be considered, and it can be hard to get the facts about the consequences of our choices in part because we have to predict the future and that always involves uncertainty. Individuals, households, communities, governments at all levels from the local to the global, private corporations, nongovernmental organizations, all make decisions that are consequential for the environment and for human well-being. These decisions will have impacts for years to come. Decisions that influence climate change will have impacts that persist for centuries. How does the idea of sustainability help? In the case of the bicycle commute, taking account of the

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environmental and human well-being might highlight the reduction in pollution and health benefits of biking and encourage me to think about how bicycling versus driving influences others in the community. So, sustainability encourages me to think about impacts beyond myself.

The *Oxford English Dictionary* tells us that the word "decision" comes to us from Latin via French. The origins are in the Latin term "decider," which means "to cut off" as well as to decide.[21] The idea of making a decision has been grounded in the idea of "cutting off" some options in favor of others. If actions result from habit, if there is no choice, if there are no options that are "cut off," then there is no decision.[22]

1.3 Kinds of Decisions

Most of us are aware that our choices as consumers have an impact on the environment. We can decide to buy organic, to save energy, to recycle, to bicycle. We may also be aware of the impacts of our consumer decisions on the well-being of other humans and other animals and look for products that are "fair trade," from companies that treat their workers well, opt for vegan food, or look for the animal welfare rating of animal-based foods. But how do my actions influence sprawl suburban development and large-scale agriculture? Consumer choices matter. I can favor local stores over the big chains and shop downtown. I might be able to choose to live in the city rather than the suburbs, depending on what I can afford and other constraints. But for these larger-scale impacts, it's clear that my political choices as a citizen matter too.

The six roles illustrated in Figure 1.1 can help us think about our sustainability decisions.[23] Each role involves decisions that can influencing the well-being of humans and other species and the stress we place on the biosphere. In thinking about how we can move towards sustainability, we should consider all five roles, not focus narrowly on only one.

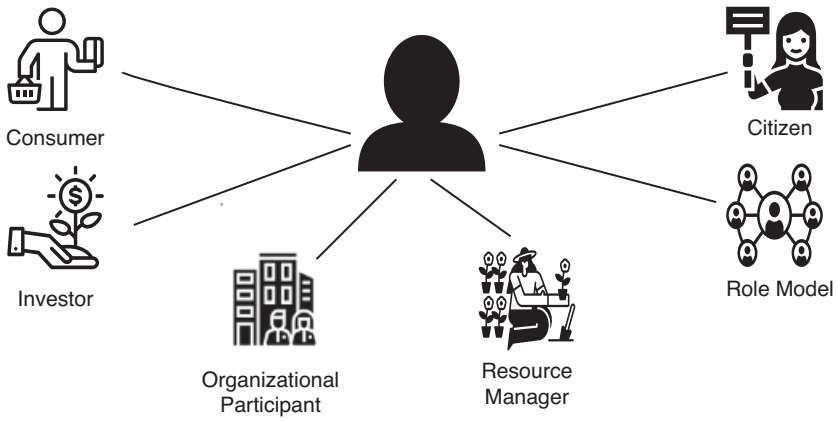

Figure 1.1 Decision-making roles
Adapted from Figure 1 in Nielsen et al. (2021).

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(1) Consumer. Decisions about how we use energy and water, what kinds of products we buy, whether we commute by bicycle, etc.

Most research on environmental decision-making has focused on the consumer role. Some criticize this focus on the grounds that we "cannot consume our way to sustainability." In Chapter 7, I will examine the links between reforms, like changes in consumption, and large-scale transformations. For now, I note that I know of no one who argues that changes in consumption alone will get us to a just and sustainable future. But our actions as consumers, as managers of the environmental inputs and outputs of our household, should be taken seriously for two reasons. First, they have substantial consequences. My colleagues and I have estimated that household-level decisions about direct energy consumption are responsible for 38 percent of US greenhouse gas emissions – emissions larger than those of any country except China and (of course) the United States itself.[24] We further estimate that effective programs to deploy on-the-shelf technology could reduce those emissions enough to reduce overall US emissions by 7.4 percent, more than the total emissions of France. This includes only direct energy consumption: electricity used in the house and the fuels used for heating and transportation. So, the total impact of household consumption, including impacts via decisions about food, clothing and other goods, is even larger and the potential for reductions greater.[25] Second, and perhaps more important, our decisions as consumers send signals to those who produce what we consume, and that has undoubtedly encouraged some corporations to offer more sustainable products. Such shifts can have effects throughout the supply chain for consumer products. For example, we have argued that a move towards labeling the greenhouse gas emission from products (carbon labeling) will strongly encourage companies to reduce those emissions so that their products appear more desirable.[26]

(2) Citizen. Decisions about voting, signing petitions, posting on social media, donating money to causes we support and otherwise engaging in politics.

Actions in this role range from the routine, such as voting or expressing opinions on social media, to the more committed, such as being active in social movements or political campaigns. Some who engage in activism are professionals employed by organizations to influence policy, so citizen action can overlap with organizational membership. But others are activists who are deeply committed even if they are not paid for their engagement.[27] In Chapter 9, I will discuss political engagement in democracies. I emphasize that some activists are not citizens in the legal sense; I'm using the term to cover political action no matter who engages.

(3) Role model. Making decisions visible to others.

Norms – what we think we should do, what we think others think we should do, what we think others are doing – are among the most powerful influences on our decisions (see Chapter 3). Whenever our decisions are visible to others, we are signaling what actions are appropriate. Being aware of how our actions may influence others may encourage us to make those decisions visible.

(4) Organizational participant. Engaging with an organization as a member, employee or other participant.

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Most of us are regularly engaged with a number of organizations. If you work for an organization or participate in voluntary organizations, you can have some influence on the decisions of those organizations, and organizational decisions can have huge impacts on the environment and human well-being.[28] For example, many students and faculty are pressing universities to be more sustainable. As noted in the Introduction, even if an organization has very formal decision-making rules, informal networks always have an influence.

(5) Investor. Owner of stocks or other investments in organizations.

In capitalist economies, private investors can have a tremendous influence on the behavior of private corporations, and many investors are pressing for more sustainable corporate actions.[29] Just a little more than half of US families own some stock, much of it in the form of retirement or other long-term savings. This ownership is not evenly distributed: The wealthiest 1 percent in the United States own about half of all those stocks. Large organizations, including investment firms, pension funds and universities, also own a substantial amount of stock, so organizations as well as individuals can pressure for more sustainable policies by corporations. Corporate action will be discussed further in Chapter 7.

(6) Resource manager. Managing large or small landscapes.

Many of us manage landscapes or directly extract resources from ecosystems on a small scale, such as when we make decisions about how to care for a yard or plant a garden. Each plot is small, but overall about 2 percent of the land area of the United States is in lawns, substantially more than the area of the next largest crop, corn. Some lawns are managed with more environmental impact per acre than many farmed crops, but others are managed to protect wildlife.[30] Some people, such as farmers and foresters, manage substantial resources either as individuals or as part of a community or workers in an organization.[31] Many people are installing solar photovoltaic arrays to generate electricity on their property, making them producers as well as consumers, "prosumers."[32]

Everyone can engage in some ways in most of these roles, but the most affluent have a special responsibility.[33] The richest 1 percent of people in the world (roughly those with incomes above US$109,000 per year; to be in the richest 1 percent within the United States you need an income of $546,000 a year) have huge impacts on the environment through each of the six roles. They have generated much of the current stress on the environment and thus have leverage for taking action to reduce that stress. "With great power must also come – great responsibility."[34]

Inequality, problematic in itself, degrades our ability to achieve sustainability.[35] Inequality also means that the less affluent and powerful have unique experiences and insights about the adverse consequences of the structures and constraints resulting from past and current decisions. The most effective strategies for change require diversity in understanding, ideas and actions – we have to mobilize the experience and creativity of the 99 percent as well as the resources of the 1 percent.

Organizations as well as individuals can have multiple roles. A corporation is a consumer of what it needs to produce its products and otherwise support its activities and can have tremendous effects through its supply chain.[36] It can also act as a role model for other similar corporations and as a resource manager. Many corporations engage in political actions, since in the United States corporations have rights similar to those of citizens. Government agencies,

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churches, nonprofit organizations and other organizations can also have substantial impact in multiple ways.

1.4 Context Matters

Gene Rosa used to say that the central finding of sociology is that "Context Matters."[37] When we think about how history and context shape our decisions, we are engaging the sociological imagination: "the awareness of the relationship between personal experience and the wider society."[38] Our personal lives, with their troubles and joys and individual decisions, are embedded in larger social processes and structures. We need a way of thinking about both our power and how structure creates opportunities for and constraints on our ability to act.

Deciding where to live is an example. Where you live influences how you will commute, how much time you will spend outdoors, what consumer choices you have, your health, who you will interact with in your neighborhood, your access to shopping, recreation and other opportunities, how much influence you can have on government, and much more. So, it's an important choice, but it's a choice that is shaped by the history of land use decisions.

In many US cities, minority neighborhoods have been "redlined" – marked too risky for mortgages and other funding.[39] As a result, less was invested in buildings, parks and green space and the neighborhoods were often the site for highways and industry. Redlined areas became less desirable, with lower housing prices. Those with enough income to avoid them will do so, while those who have to seek moderately priced housing will settle there. Over the long term, these cumulating decisions increased the amount of land covered by buildings and pavement and reduced the amount of green space, factors that contribute to heat islands. So, some of the urban health problems from climate change can be traced back to racist decisions made about investments nearly a century ago. So too can some of the impact of the COVID-19 pandemic on minority communities. Such neighborhoods are often "multiply deserted areas" with limited access to food, health care, green space and public services, and the industrial facilities located there have often been a source of toxic contamination.[40]

Why don't people living in these neighborhoods move? First, the financial cost of moving can be substantial and residents often can't afford to buy or rent in more expensive neighborhoods. Second, one strategy for dealing with poverty and economic uncertainty is to rely on a network of friends and family, and that can require being near those who can help. Third, we all become attached to where we live for any length of time, and neighborhoods with challenges are also familiar homes and communities to many who live there.[41]

In the face of these multiple challenges, redlined communities have responded in diverse ways. Informal mechanisms compensate for the lack of access to formal institutions. In many cases, despite the obstacles imposed by past and present discrimination, these communities have been able to develop important community infrastructure and local businesses that provide important lessons for innovation and resilience.[42]

The consequences of redlining show how constraints on today's choices have been shaped by decisions made in the past. The interplay between context and choice, between structure and power, is central to the rest of the book. So, it will be useful to see how this dynamic plays out in

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the way we assess facts through research, in how we understand social change and in how inequality can have pernicious effects.

1.4.1 Our Understandings Are Context-Dependent

For some kinds of facts, and some kinds of science, results are very context-dependent, while for others it is not. I will discuss this in some detail in Chapter 4. Some sciences, like physics and chemistry, have strong "invariance" principles. If the speed of light is measured accurately in Cleveland in 1887, given Einstein's insight that the speed of light is a constant, we can assume that the measurement applies throughout most of history across the universe.[43] Context doesn't matter all that much, so it is much easier to be cumulative and to reduce uncertainty. But for much of the science we need for sustainability, results are very context-dependent. Facts will vary across contexts – across ecosystems, across countries, across time periods, across subgroups within the human population. Science can still establish facts, but we have to be careful in applying findings made in one context to another.

Economic decisions are a good example. As we will see in Chapter 3, nearly everyone has trouble making decisions about the future. It's sometimes suggested that people are poor and disadvantaged because of bad decision-making. But something more subtle is at work: People are often making decisions that are well adapted to difficult circumstances.[44] How have African Americans and other people of color responded to limited access to and discrimination by mainstream financial organizations such as banks and credit unions?[45] The redlining discussed at the beginning of this section is part of this discrimination, but it also influences the ability to start a business, to get an education, to deal with emergencies, and much more. One response is to depend on social networks and community. When a family living in such a context has a windfall, or when it needs a loan, it makes far better sense to turn to trusted members of one's extended family and social network than to a distant and often discriminatory organization.[46] Sharing good fortune builds social resources that can be called upon in difficult times. Later reciprocity of kin and friends may be more accessible than a small savings account. If one ignores the context in which these financial decisions are made, they might seem irrational and inefficient. But in the context of limited access to financial organizations and discrimination, relying on social ties for reciprocity makes a great deal of sense.[47]

Low-income people and people facing discrimination have often evolved approaches that differ from those used by the more affluent and favored but that are well suited to adapting to the situations they face. There are many other examples of cultures evolving strategies that work well in that context but that seem "irrational" or "inefficient" if the context is ignored. For example, African peoples who depend on cattle seem to harvest those cattle at a slower rate than might seem economically optimal. But if we take account of the need to deal with periodic droughts, then what seem like inefficiencies can also be buffers against disaster.[48] In contrast, some seemingly "rational" strategies may be very vulnerable in the face of change. We have also seen how the seemingly efficient strategy of "just in time production," where factories depend on regular deliveries of supplies to continue manufacturing, quickly fell apart in the COVID-19 pandemic.[49]

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The challenge for research is trying to understand these effects of context and not overgeneralize from one circumstance to another. The challenge for policy is to design policies and programs that will work well in the contexts where they will play out. What works well in one place with a particular set of opportunities and constraints might be an abysmal failure somewhere else. As I will emphasize repeatedly, engaging with people who know the context in which decisions are made can be immensely helpful in getting it right.

While context dependency makes the science we do to inform sustainability decisions especially difficult, it is also an exciting part of our science. Acknowledging that context matters is only the first step. We want to go beyond documenting differences across contexts to understand how context affects what we observe at the individual level. Comparing economic strategies of disadvantaged communities to the mainstream reveals discrimination and lack of access but also resourcefulness in using social networks. By comparing across contexts, we gain insights into how social structure – the distribution of power, information, access to resources and so on – matters.

1.4.2 Context and Choice Are Two Views of the Same Process

As I argued in the Introduction, population thinking breaks down the dichotomy between structure and power.[50] As the housing example demonstrates, current choices are constrained by the history of previous decisions by others. Still other constraints are the result of the biophysical environment. But what is physically and biologically possible is shaped substantially by past decisions about technologies and resources. We develop new technologies to solve problems but also to make profits or gain power. New technologies may or may not have the consequences intended but usually have unintended and unanticipated consequences.[51] Fossil fuels became the major energy source of energy for industrial societies starting in the eighteenth century, but research on their potential to alter the climate didn't emerge until the second half of the nineteenth century and only became robust in the late twentieth century. Chlorofluorocarbons (CFCs) were introduced to make refrigeration and air-conditioning cheaper and safer. The discovery that they destroy stratospheric ozone and thus increase exposure to dangerous ultraviolet radiation on the earth's surface came later. Power plays a role in what we know about technology. There is a long history of industrial interests repressing and obfuscating science that demonstrates harm to public health and the environment.[52] And we have a tendency to invest far more in developing technologies and science useful for production than in science that helps us understand the impacts of our technologies and economic activities, a point I will revisit throughout the book.

Within a given context, we make decisions and engage in activities that have consequences for the future and thus reshape the context in which we live. Some responses to our actions are favorable to us, some are not. But the responses to our actions are not fixed. Many species, and especially humans, actively shape the responses to their actions – a socially constructed adaptive landscape.[53] This is the purpose of policy and law – to change what responses occur when an action is taken. Some responses are hard to change: lead is toxic whatever claims are made by the lead industry; the climate is changing even when government agencies are forbidden from using the term "climate change."[54] By choosing what technologies to develop and which lines of

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research to ignore, by investing in infrastructure for cars but not for bicycles or public transportation, by redlining some neighborhoods and investing in others, we shape the response from the biophysical environment to a substantial degree.[55] Our decisions are constrained by existing structures. But we can work to change those structures. From an evolutionary perspective, history is open-ended. What has happened and what will happen are the result of the interplay of the structures in place and the actions we take, and so our actions can shape the future but only if we address constraints and opportunities imposed by structure.[56] As Marx put it : "Men [*sic*] make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past."[57]

1.4.3 The Effects of Context Can Be Pernicious Because of Inequality

At least since 1970, we have been aware that the adverse effects of human stress on the environment are not evenly distributed.[58] Structural human ecology has examined how nations differ in the stress they place on the environment and their vulnerability to environmental change, especially climate change and the loss of ecosystem services.[59] These differences are driven in large part by the structure of the global political economy – by the public and private agreements that shape trade, other political and economic policies and much else – as well as constraints imposed by the biophysical environment.[60] There also are huge gaps within nations, with the poor and those facing discrimination disproportionately exposed to environmental threats.[61]

The forms these inequities take seem almost without end: exposure to toxics in the air, a lack of access to safe drinking water, living in dwellings with lead paint, cooking on stoves that pollute the microenvironment in which a family lives, holding jobs that are health risks, not having access to air-conditioning in times of dangerous heat waves, living in communities at risk from toxic dump sites, lacking access to resources to recover from natural disasters, and others. The term "risk" indicates that while the outcome for any individual cannot be predicted with certainty, we can assess the probability of bad outcomes for an individual and the proportion of the population who will have bad outcomes. The idea of risk has become central to sustainability decisions.[62] Stratification by risk seems to apply to every social category that reduces the power of individuals and communities to act. Differences in income, social class, race and ethnicity, gender identity, age, disability, geographic location within a nation and in which nation someone lives, and their intersections, often lead to power differences.[63] Power differences produce increased exposure to environmental health and safety risks and decreased ability to make choices as individuals or communities to respond to those risks.

The constraints people face have to be at the center of our thinking about sustainability. Many residents of Flint, Michigan, didn't have a choice that allowed them regular access to clean water.[64] Residents in some Native American communities cannot avoid exposure to radioactive tailings from uranium mines. Many workers throughout the world don't have a choice of earning a living without exposing themselves to health risks. Apartment dwellers usually don't have a choice about how efficient their furnace or hot water heater is. Income and discrimination limit the ability to choose where to live. Our theories and research strategies have to examine these constraints so we can understand them better. The constraints are also ethical

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issues that influence what actions we should take. Research on sustainability decision-making needs to provide a better understanding of what steps we can take to redress these wrongs.[65]

Focusing on decision-making can clarify the constraints and obstacles people face. It can also reveal how decisions by elites shape social structure and thus constraints. At present, there is often a division in how we approach these two aspects of the relationship between power and decision-making. The disadvantaged are most often studied using ethnography, survey and experimental methods, while the powerful are most often studied using historical accounts. This is understandable. Political and economic elites are not likely to respond to surveys, participate in experiments or allow an ethnographer routine access to their decision-making processes. But more could be done to better understand elite decision-making. Consider a comparison of the preferences of Yale Law School students (historically an elite group, many of whom come to occupy powerful positions in government and the private sector), University of California, Berkeley law students (a rather privileged group compared to the general population but not nearly as elite as Yale Law students) and a representative sample of the US population.[66] The Yale Law students overwhelmingly identified themselves as Democrats, but they differed from the public in having much stronger preferences for economic efficiency over equality and were much more likely to be self-interested rather than altruistic.[67]

As these elite students pursue their careers, they will differ from the average American by giving more weight to efficiency over equality and will be more inclined to favor their personal interests than the common good. We don't know the extent to which gaining admittance to Yale Law School selects for these values and the extent to which their training at Yale reenforces them. This is only one study, any single study can be flawed,and I am singling out Yale among all elite universities simply because that was the focus of the study. Still, it shows how individual characteristics can lead to elite decisions that differ substantially from the preferences of most Americans. And those decisions will in turn cumulate into policies, programs and social structures that affect nearly everyone.[68]

In thinking about sustainability, we have to remember that the decisions of some matter more than the decisions of others. The cumulative impact of thousands or millions of decisions by individual consumers can have immense consequences for sustainability.[69] But so too do the decisions of a small number of the most powerful in society; as noted, the global affluent have disproportional impact and disproportional opportunities to make changes.[70] While those opportunities can bring about positive change, there will also be those who fight to preserve an unequal status quo that they perceive benefits them.

1.5 Local Decisions and Global Change

The dynamics of land use in most places are the result of decisions by local landowners, businesspeople, families and governments. But the context of those decisions is shaped by the global political economy, national and state policies and many nonlocal interests – places across the globe are coupled.[71] Some of the consequences are local – the changes in the character of communities. Some of the most substantial impacts are on other species, who see their habitat altered, with species that have trouble with human-dominated landscapes displaced by

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commensal species – those who can deal with us as neighbors.[72] As local land use changes occur across the globe, those changes become a major driver of biodiversity loss and climate change.[73]

The idea of sustainability is intended to help us make better decisions about land use and other actions. The goal is to improve the well-being of humans and other species while reducing damage to the environment. Thinking about sustainability is the result of an evolution in our thinking about the problems we face and what constitutes an ethical way to make decisions. While much of the book examines our current understandings, Chapter 2 provides the background on how we came to those understandings.

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