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Chapter 1

Introducing Grassroots Innovation Movements

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In August 2015, while we were writing this book, a group of sustainability activists were gathering in the grounds of a borrowed chateau on the outskirts of Paris. They were intent upon ‘eco-hacking’ the future. What this meant was turning the chateau into a temporary innovation camp, equipped with the tools for developing a variety of technologies of practical and symbolic value for low-carbon living. These prototypes made use of open source designs and instructions in order that others can access, adapt and make use of these developments. The activity of the camp was publicized widely through social media and drew the attention of many commentators and even senior politicians (see www.poc21.cc for examples).

The camp was called POC21. Its location and timing were significant. Paris was gearing up to host in December 2015: the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21), and the latest meeting of governments and global elites figuring out how to address climate change. Meanwhile, POC21 stands for, and seeks, a ‘proof of concept’ for an alternative approach. POC21 brought together on site over a hundred makers, designers, engineers, scientists and geeks, drawn from various international activist networks, and many more that joined in

virtually over social media, or visited, and committed to prototyping for a fossil-free, zero-waste society. The designs and hacks they developed collaboratively ranged from low-cost wind turbines, to facilities for urban farming, to a 3D-printed bottle-top water filtration device; from easy-build cargo bikes, to open source energy monitors, to permaculture; and from low-consumption recirculating showers, to portable solar power packs. Their alternative approach is based on the premise that people at the grassroots level already have the ideas, knowledge, tools and capabilities required to create their own innovative solutions to climate change and sustainable development. Drawing upon practical initiatives connected to a variety of open source, collaborative peer production networks globally, the aim at POC21 is to mobilize a mainstreaming of these ready-made solutions. Immediately after their five-week camp, the organizers of POC21 set out the follow-up challenge as ‘how can we turn this momentum into a sustainable movement’ (email correspondence, 30 September 2015).

This book argues that a movement already exists. POC21 taps into increasing interest among growing groups and networks of people for directly hacking, making and modifying the world they find around them, and refashioning it towards more inclusive, fairer and sustainable goals. Furthermore, POC21 connects unconsciously to a longer tradition of subverting high-level summitry in order to raise awareness of grassroots solutions. These subversions go right back to the first United Nations (UN) Summit on the Human Environment in Stockholm in 1972. At the Stockholm summit, a group called Powwow convened activists who emphasized their argument, for radically different development alternatives to the political and economic interests of the industrialists and policymakers orchestrating the main summit, with the organization of a demonstration of alternative technologies emblematic of the futures Powwow wanted (Boyle and Harper, 1976; Faramelli, 1972). Although largely forgotten now, the legacy of Powwow, as with POC21, can be seen as one of a multitude of demonstrations of grassroots innovation arising around the world over decades, and whose associated social movements have bequeathed practices as varied as wind energy and participatory design, agroecology and eco-housing, as well as an insistent idea that alternative forms of innovation and

sustainable developments are necessary and possible. POC21 was another moment galvanizing grassroots innovation for sustainable developments.

Opening this book with examples such as POC21 and Powwow might give the impression that grassroots innovation for sustainable developments is predominantly a Northern environmentalist concern. Far from it! In the same year that Rachel Carson's *Silent Spring* (1962) highlighted alarming industrial contamination and environmental decline, and became catalytic for Northern environmentalism, activists in Kerala launched Kerala Sasthra Sahithya Parishad (KSSP, lit. Kerala Science Literature Forum), a programme for making science and technology work for the needs and priorities of local communities. Initially, KSSP involved a group of science writers and teachers that published textbooks in their local language, aiming to make science and technology more widely available and socially relevant to grassroots communities, rather than to the plans of elite industrial modernizers. Similar groups formed across India and joined together into the People's Science Movement. Their vision was to re-imagine and reorientate science and technology towards the lived experiences and knowledges of local communities. Over the years the movement has dedicated itself to grassroots activism and improvements in peoples' lives that work towards different kinds of sustainable developments compared both to the high modernist ambitions of the Indian state and to Gandhian village self-sufficiency.

High-level summitry provides arenas for grassroots innovators from the global South too (Letty et al, 2012). Examples in agroecology, housing, energy and recycling, developed through initiatives such as the Social Technology Network in Brazil, were displayed at the People's Summit in Flamengo Park at the Rio+20 Summit. Activists in these networks consciously draw upon lessons from experiences from appropriate technology in South America two decades earlier; and they connect with wider social movements today to press for a different kind of development. A thorough critique of industrialization models offered by elites was an important part of the Powwow agenda in Stockholm. Like POC21, the Social Technology Network and many others since,

Powwow recognized solutions had to work in diverse circumstances. But what all these grassroots innovation movements share is a commitment to helping people access tools for building alternatives.

The aim in this book is to make grassroots innovation movements more visible, and to learn from their experiences, in order that people can better understand, appreciate and engage with them in the pursuit of sustainable developments. We do this by analysing six case studies from different places and different times:

- The movement for socially useful production (UK, 1976–1986).
- The appropriate technology movement (South America, 1970s and 1980s).
- The People’s Science Movement (India, 1960s to present).
- Hackerspaces, fablabs and makerspaces (international, 2000s to present).
- The Social Technology Network (Brazil, 2000s to present).
- The Honey Bee Network (India, 1990s to present).

Across these cases, we attempt to identify within their diverse situations some common causes and deep-seated challenges that other grassroots innovation movements might recognize and connect with. Such possibilities will inevitably play out differently in different contexts, but perhaps with greater facility thanks to learning with others from elsewhere. We will explain the choice of these cases and our approach later in this chapter. For now, we wish to elaborate a little more upon what we mean by grassroots innovation movements and upon some of the challenges of studying their pathways to sustainable developments.

Radical roots and alternative routes

Throughout the history of social movements for both environmentalism and development, there has existed an associated undercurrent of practical grassroots innovation committed to values of social justice and environmentally sustainable developments (Hess, 2007; Rist, 2011; Schumacher, 1973; Smith, 2005a; Thackara, 2015). In North and South, in cities and rural settings, networks of activists, development workers, community groups and neighbours have been working with people to generate bottom-up solutions for sustainable developments; solutions that respond to the local situation and the interests and values of the communities involved; and where those communities have control over the processes involved and the outcomes. Initiatives have flourished, and struggled, in sectors as diverse as water and sanitation, housing and habitats, food and agriculture, energy, mobility, manufacturing, health, education, communications, and many other spheres of activity. Whether born of material and economic necessity, or motivated by social issues marginalized by the conventional innovation systems of states and markets, networks of people promote and coordinate alternative activity attentive to these needs and issues. They develop discourse and mobilize supportive resources among wider publics. It is this activity that constitutes what we mean by grassroots innovation movements and gives us our working definition (see also Gupta et al, 2003; Seyfang and Smith, 2007).

Grassroots innovation proceeds through groups and activities different from mainstream innovation processes in institutions such as universities, public research and development (R&D) labs and innovation departments at companies; and which have traditionally networked around formally organized research institutions. Innovation policy aims are generally expressed as an imperative to catch up with or keep up with an apparently universal techno-economic frontier, typically based in information technology, biotechnology and nanotechnology (Freeman, 1992; Perez, 1983). Furthermore, mainstream institutions for science, technology and innovation are generally aimed at nurturing partnerships between firms and science and technology institutes, fostering entrepreneurship and incentivizing returns on investment in innovation activities whose outputs boost competitiveness and economic growth.

In contrast, our interest in grassroots innovation movements involves studying how grassroots groups understand and mobilize around questions of local development. What is alluring about grassroots innovation movements are claims that they involve a base of local actors and therefore different forms of knowledge, including community-based and indigenous knowledge and the knowledge of the lay public in the process of innovation. Unconcerned and unconstrained by disciplinary boundaries or institutional constraints, movements can identify issues and questions that are not usually regarded by science, technology and innovation institutions, and they can search for solutions differently too. However, none of this is automatic or assured. Grassroots innovation is hard work; participation requires patience and stamina, and practical dilemmas challenge cherished values, as do structural disadvantages presented by prevailing political economies and institutions. The extent to which the grassroots innovation movements enable creativity, inclusion and the agency of local actors in the complexities of innovation is something that will be explored in this book.

Importantly, among the openings that grassroots innovation movements help cultivate are plural ideas about what constitutes sustainable developments. The global consultation process of the World Commission on Environment and Development in the mid-1980s brought together some of the issues at stake in sustainable developments, and which eventually reported with this widely cited definition in 1987:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- The concept of ‘needs’, in particularly the essential needs of the world’s poor, to which overriding priority should be given;

- The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.(World Commission on Environment and Development, 1987, p43)

There is much to debate in this definition. What are essential needs? What is meant by environmental limitations? What is a state of technology? What kinds of developments, and for whom, and why? Who gets to decide these things? Any application of these principles has to grapple with questions of development purposes, directions of innovation and issues of social justice. Looked at dynamically and constructively, calls for sustainable developments simply raise defining questions, without being definitive on the answers. Sustainable development is thus valuable as an essentially contested concept overflowing with normative content (Jacobs, 1999). It is a matter for principled debate and democratic action to figure out how to construct development pathways that express values of environmental integrity and social justice. The pathways to sustainable developments need to be plural (Leach et al, 2010).

To take one illustrative contrast, large solar electricity farms operated by multinational utility companies create quite a different sustainability compared to smaller community cooperatives installing panels in their neighbourhoods (Smith et al, 2015). Questions of distributive and procedural social justice look quite different under each arrangement: who benefits from a hitherto marginally interesting resource such as daylight, made newly valuable by shifting social priorities and technological advances? Why are the benefits of this widely-shared resource distributed in particular ways, and why should historically determined access to capital and markets privilege access to this local resource? Pluralist sustainable developments also involve questions of cognitive justice in terms of what kinds of knowledge and experience count in deliberating upon the relative prominence of different criteria for shaping and choosing between solutions. Knowledge about local histories and culture can affect the relative legitimacy and consequences of different developments, compared to, say, the more abstracted cost-benefit knowledge that may count as more legitimate for distant investors and with different interests.

In studying grassroots innovation movements, we are interested in how groups and networks address questions of development, how they seek to express their values in their innovation activities, and what shapes the pathways they build through that activity. We do not wish to impose our own definitions of sustainable development, and nor do we intend our comparative study to test who performs best to externally derived criteria. For us, questions of the broader social visions and implications of specific sustainable developments are made richer by attending to grassroots innovation movements working under different conditions and for various purposes in different places. Here are groups of people that are trying to create solutions to challenges as they see them, working to criteria that can differ from mainstream institutions and using novel forms for producing knowledge, appropriating technology and coordinating social organization. It is a matter for politics to arbitrate between whose solutions are ‘best’, for whom, or in what combination under the circumstances. It is a matter for analysis to understand how grassroots innovation movements provide a source of reflexivity in society, by pointing to the contention and plurality involved in sustainable developments and opening up more spaces for doing the politics of alternative sustainabilities. It is this analysis we attempt in this book.

Of course, hard-nosed summit negotiators and seasoned observers may well dismiss grassroots initiatives such as POC21 as politically naïve or idealistic. We think such dismissals are too hasty. It is our contention that it is important to recall the grassroots origins of many contemporary sustainability solutions and to take seriously initiatives in that tradition today. Global summitry, intergovernmental agreements, and the greening of capital involve institutional representatives locked within a development logic tied to conventional economic growth, deciding what to concede to principles for sustainable development. Frameworks and programmes are developed, and commitments made and funds released, as evident most recently in the Sustainable Development Goals launched in September 2015. But are these declarations and programmes really addressing root causes of problematic development pathways or ameliorating the consequences while

continuing along the same pathways? Meanwhile, coming from the grassroots, and evident around the fringes of these big events, are groups of people improvising practical possibilities for sustainable livelihoods as they see them, and informed by values and visions for social futures quite different from top-down measures of economic growth. Who really has the freedom to be innovative here? What happens if we look more widely and more carefully? Grassroots pathways will inevitably have their own drawbacks and shortcomings, but they nevertheless open up debate and ideas about innovation for sustainable developments.

Institutional encounters

Modern science, technology and innovation institutions have historically struggled to recognize other modes of knowledge production, including indigenous and community-based knowledge and non-codified forms of knowledge. Table 1.1 contrasts the worlds of grassroots innovation movements with conventional institutions for developing science, technology and innovation (adapted from Fressoli et al, 2014). We have to be careful here. It is not our intention to create a top-down/bottom-up dichotomy. Indeed moves to more open science and inclusive innovation are blurring the boundaries and making things more porous. As such, what becomes interesting are the encounters, relationships and possibilities that emerge when grassroots initiative opens up different possible pathways for developments, and how these might interact, challenge, and prompt responses in more conventional and institutionalized pathways of development. And, given our focus in grassroots innovation, how the practices developed among grassroots networks interact with more conventional institutions for science and technology. It is the encounters, intersections and hybrid arrangements between the two worlds in Table 1.1 that interest us as much as any resistance, contestation and countering.

<TABLE 1.1 NEAR HERE>

Table 1.1 The worlds of grassroots innovation movements and institutions for science, technology and innovation

	Grassroots innovation movements	Science, technology and innovation institutions
Protagonists	Local communities, grassroots activists, civil society organizations, social entrepreneurs, worker cooperatives, NGOs, social movements	Universities, research centres, venture capital, firms, science ministries, entrepreneurs
Priorities	Social values, convivial communities, livelihoods, sustainable developments	Codified knowledge, economic growth, competitiveness
Incentives and drivers	Social need, voluntarism, cooperation	Expert authority, reputation, market demand
Resources	Development assistance, social capital, public finance, grassroots ingenuity, local knowledge, activist organization	Public finance, corporate investment, venture capital, scientific expertise and training
Locations of activity	Villages, factories, neighbourhoods, community projects, social movements	Laboratories, R&D centres, boardrooms, ministries, markets
Typical knowledge forms	Situated knowledge, tacit	Scientific and technical knowledge
Appropriation	Knowledge commons, freely shared practices, activist guidebooks and media	Intellectual property, scientific journals, licensed technologies

Emblematic fields of activity	Agroecology, community health, small-scale renewable energy, housing	Biotechnology, medicine, nanotechnology, geo-engineering
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While a strict definition of grassroots innovation sees innovations coming from within local communities (see later), in practice it can also involve actions with and by people working in more conventional science, technology and innovation institutions. As we will see, public programmes can develop to connect the two. At times, grassroots initiatives benefit from the programmes and resources moved by global summits and agreements. Periodically, international programmes such as those for appropriate technology, Local Agenda 21 and inclusive innovation have lifted grassroots innovation up as an object of interest to policymakers (see, e.g. OECD, 2015). Policy and business is again taking notice of this bottom-up innovative activity. Agendas for inclusive innovation, open innovation and social innovation are drawing grassroots innovation to the attention of elite national and international agencies (OECD, 2015; World Bank, 2012). Most recently, 14 grassroots examples were highlighted by UN Headquarters on 27 September 2015 at its Solutions Summit to accompany the launch of the Sustainable Development Goals and as ‘part of a longer-term grassroots effort to lift-up exceptional innovators ... who are addressing one or more of the 17 sustainable development goals’ (www.solutions-summit.org).

However, precisely because grassroots innovation develops so often as an undercurrent in society, it is usually invisible to elite policymakers, business leaders, and professional non-governmental organizations (NGOs). Thus when support does arise, it can be an awkward encounter, orchestrated by elites’ assumptions and norms that miss the point motivating the original grassroots innovation movement. It is typical, for example, for policy initiatives to seek solutions from grassroots activity that can ‘scale up’ and be ‘rolled out’. Measures are taken, for example, to make it easier for grassroots innovators to access and work with research institutions and economic development agencies in the pursuit of new products, processes and business models.

Here the presumption is that grassroots innovation is simply the generation of ingenious products, requiring some professional design and marketing help and the protection of intellectual property; when in practice such ‘prototypes’ are actually the most visible aspects of much more complex and rooted local development activities. The isolation, bounding, enclosure and marketing of these visible objects of grassroots innovation activity, such as an agricultural technique, is much harder than imagined because it loses sight of the intangible features and local development gains motivating the original small-scale effort. Rather than figuring out how to scale up apparently innovative objects, policy might think about how to scale down its institutions for further cultivating grassroots innovative capabilities. In this book we want to draw attention to the possibilities and difficulties arising in such encounters between grassroots innovation and institutions for science and technology.

The reality on the ground is one of countless initiatives involving a shifting kaleidoscope of diverse groups working at grassroots level over decades, finding ways to manifest environmental integrity and social justice through practical activity, and sometimes engaging with policy, science and technology institutions in the hope of advancing their aims. Grassroots innovation might be diverse, messy and difficult to commercialize or support bureaucratically precisely because groups are drawing upon their distinct histories, cultures and priorities in their communities when addressing universal challenges of feeding, housing, water, sanitation, health, providing energy, livelihoods and having fun. Some initiatives might spread widely, but all ultimately need to be rooted locally.

Others have done remarkable jobs in documenting and illustrating grassroots activity in areas as varied as food, shelter, water and sanitation, energy, clothing, transport, manufacturing or recreation; whether Fritz Schumacher in *Small Is Beautiful* (1973), through most recently to John Thackara in *How to Thrive in the Next Economy* (2015); and in the continuing work of the Honey Bee Network founded by Anil Gupta (Gupta et

al, 2003). While we will come across examples in this book also, we do so in the pursuit of seeing how grassroots innovations connect as a *movement* that encounters institutions of science, technology and development, as these movements try collectively to advance broader visions of social change and build alternative pathways. As such, we look beyond specific grassroots initiatives in themselves, and examine the networks that try to promote, galvanize and support grassroots innovation as a generic activity for producing knowledge, technology and social organization in which community action is at the centre.

Grassroots innovation movements

In *Alternative Pathways in Science and Industry* (2007), David Hess takes as his point of departure the observation that social movement activities and consequences are not limited to protest and the securing of rights, but that social movements can also be generative of an alternative material culture. Andrew Jamison makes a similar point in relation to knowledge production in *The Making of Green Knowledge* (2003). Our work in this book follows their lead. It is important to avoid thinking about such innovations only as spin-offs of environmentalism, say, or freedom movements in (post-) colonial struggles. We need to think about grassroots innovation as a movement in itself; generating innovative activity that aims for practical expressions of core social values that contribute to alternative pathways, as David Hess puts it. As such, grassroots innovation is something worth promoting and supporting because it is an activity open to experimentation for social change. Grassroots innovation movements seek to prototype social change and act upon social change. We explain this further in Chapter 2.

There is always innovative activity at grassroots level operating beneath the radar of economic and scientific institutions. Those institutions conventionally set research and development agendas, and provide support and resources, and market and capitalize upon innovation in society. However, innovative grassroots activity only attains movement characteristics when motivated by an explicit normative desire for social change committed to values of social justice and environmental sustainability. Many people in

the maker movement, for example, voluntarily develop new devices and objects and share them online. There are thousands of designs freely available. Often these activities are motivated for purposes of fun, recreation, personal challenge and displaying virtuosity. Indeed, the maker movement may be committed to values of conviviality and sharing that appear quite striking, compared to the marketized innovation imperatives under dominant economic institutions. Yet when makers seek to develop a business from their crowd-sourced designs they tend to reproduce practices not so different from business as usual. They celebrate and follow Silicon Valley models for start-up entrepreneurship and disruptive innovation that is actually quite conformist in terms of economic development. And when the maker movement becomes a market for making, in which countless suppliers of materials and appropriators of designs find new sources of profit, coupled with little concern for who is included or excluded in this scene, nor with much concern for the social and economic structures being reproduced, then makers look less of a social movement (Ratto and Boler, 2014). Many in the maker movement accept as given the existing order of things and seek only to be innovative within it. When commitments to social change do come to the fore, and begin to direct the kind of innovation undertaken, then the activity becomes part of a grassroots innovation movement. We see this occurring in some of the hackerspaces, fablabs and makerspaces that are the focus of study in Chapter 6.

In practice, hard and fast distinctions can be difficult to pin down. For example, developing open hardware instructions for building a remote-controlled drone collaboratively through online social media networks is often motivated for reasons of fun and recreation in maker networks. But when drone instructions are adopted within networks that also build in sensors and link to data platforms to monitor environmental change remotely, do drone hobbyists become enrolled in a grassroots innovation movement? International networks such as Public Laboratory exist precisely for that reason. They develop and share cheap, open source monitoring technologies, drawing in knowledge and ideas from wide varieties of sources through their community of developers, in order to empower people who use the devices to demand healthier local

environments from public institutions. Here is grassroots innovation that helps people demonstrate more effectively.

Examples like this point to the increasingly proliferating intersections and hybrids between different forms of grassroots innovations and conventional institutions. Grassroots innovative activities can make use of technologies developed in industrial innovation systems and sold by global high-tech corporations; while global firms appropriate ideas and practices developed originally by alternative technologists and activists. Corporations now make use of ideas about open innovation pioneered among hackers in free software and free culture movements; while hackerspaces creatively appropriate laser cutters and other digital fabrication tools developed originally by industrial capital seeking to deskill labour and automate production (Noble, 1984; Söderberg, 2013). It is important to note and understand these flows and interdependencies between the grassroots and institutions; and to expect, as we follow grassroots innovation movements, that we are likely to confront considerable complexity in the relations between initiatives, tools, networks, movements and institutions.

But is taking science and technology to the grassroots really grassroots innovation? We think it is when these processes lead to new forms of producing knowledge and new ways of improving livelihoods, and with the grassroots having control over those processes and a stake in the outcomes. The Social Technology Network, for instance, involved groups from across South America collaborating in the generation, dissemination and reapplication of innovations for sustainable development. An important aspect of the networks was recognition of the need for local learning and empowering communities to make innovative adaptations when applying social technologies in different places (Miranda, Lopez and Couto Soares, 2011) – a focus on active grassroots empowerment, rather than simply diffusing ready-made solutions in which the communities in question remain relatively passive recipients.

Others adopt a more circumscribed notion of grassroots innovation movements. Under this view, grassroots innovation arises from the ingenuity and capability within local communities, or even of individual informal inventors (Gupta et al, 2003). Grassroots innovation is a purely indigenous phenomenon. Given the encounters noted above, however, and the global proliferation of knowledge, ideas, tools and practices, we see such tight definitional restriction as a limitation. We think grassroots innovators improvise and make use of whatever tools, resources and knowledge lie to hand and are less concerned about their provenance – the important point is that the innovators have power in the processes and a stake in the outcomes of the innovation (Smith et al, 2014).

It can be argued, and we recognize, that our more expansive view weakens the notion of grassroots innovation movements by opening it up to the kinds of consultancy-driven, participatory development already prevalent in the development industry and whose good intentions are confounded at times through unreflexive application of external ‘solutions’ that disempowers communities, or empowers them selectively in ways not welcomed by the recipients. Anil K. Gupta founded the Honey Bee Network precisely because he was frustrated with his experience in professional development consultancy that ended up extracting and undermining knowledge and innovation in local communities. Honey Bee’s development of scouting techniques, working in the languages of the communities concerned, and careful recognition of individual inventors by name (Gupta et al, 2003) reflect this concern to focus and build grassroots ingenuity, rather than expropriate it.

Certainly, the risks exist. Grassroots innovation can be co-opted as a term for continued local engagements that see communities as relatively passive sites for either appropriating ideas or inserting ready-made solutions, with little reflection on the grassroots as active subjects in innovations and making appropriations of their own. In our view, however, this is a criticism that calls for greater understanding and reflexivity towards grassroots innovation movements rather than circumscribed definitions. It is something we attempt with our case studies in chapters 3 to 8.

Furthermore, as we argued earlier, even tightly defined notions focusing on grassroots ingenuity have to be careful with the inevitable encounters beyond the communities concerned. When institutions engage with grassroots movements they risk decontextualizing innovation and turning it into an object removed from the originating grassroots processes. Well-intended assistance for scaling up or diffusing instances of grassroots ingenuity can transform it through, for example, the introduction of intellectual property for the purposes of protecting benefits, standardizing for purposes of scaling up, and commodification for purposes of attracting investment and marketing. These are institutionalized approaches from mainstream innovation management that imply commercial motivations, identities and values that may be distinct or counter to the motivations mobilizing many grassroots innovation movements. Or such commercial formalizations may be welcomed. But is it still grassroots innovation?

About this book

Our introduction has set out some of the issues and themes motivating this book. The majority of the research was undertaken through a project called Grassroots Innovation: Historical and Comparative Perspectives, which ran from 2012 to 2015. The project was funded by the Economic and Social Research Council's STEPS Centre at the University of Sussex. The STEPS acronym stands for research dedicated to Social, Technological and Environmental Pathways to Sustainability. The Centre's research investigates the social causes and consequences of developments in science and technology as they relate to principles of sustainable development. The research project aimed to contribute to the understanding, debate and appreciation of grassroots innovation movements. The questions we asked for each case study movement, and which we answer in chapters 3 to 8 are:

1. Why did this grassroots innovation movement emerge?
2. How did activists mobilize support and activities in grassroots innovation?
3. What dilemmas confronted the movement when constructing alternative pathways, and how did they negotiate those dilemmas?

Given the geographical spread of the team, with members in Buenos Aires, Brighton, Bogotá and Delhi, we were in a position to study grassroots innovation movements in South America, India and Europe. In this way we could extend study beyond the US and Europe (Hess, 2007; Jamison, 2003; Mathie and Gaventa, 2015; Smith, 2005), and combine it with studies in the so-called ‘global South’ (Gupta et al, 2003; Willoughby, 1990). The movements we chose to study were:

The movement for socially useful production (UK, 1976–1986) (Chapter 3)

The movement for socially useful production emerged in the context of economic decline and loss of manufacturing jobs in industrial communities in the UK. It involved an unusual mix of engineers, workers and activists, and arose out of a combination of diverse social movements, including grassroots trades unionism, peace, community activism, radical science and, to a lesser extent, environmentalism and feminism. Activists both provided a critique of the existing institutions for innovation in society and developed a set of practical initiatives that anticipated more directly democratic processes for socially shaping technologies.

The appropriate technology movement (South America, 1970s and 1980s) (Chapter 4)

During the 1970s and 1980s appropriate technology became a worldwide grassroots innovation movement that sought to redefine technology as a tool for development. In South America appropriate technology emerged in a context of social upheaval between the challenge of political repression and the influence of new forms of activism and participation. The movement was able to develop its own local networks, technologies and to reframe appropriate technology ideas in a more suitable way for the needs of the region, as well as pioneering activities that would outlast the movement in areas such as agroecology.

The People’s Science Movement (India, 1960s to present) (Chapter 5)

The People's Science Movement (PSM) in India emerged from various popular science movements appearing from the late 1960s onwards. The movement encompasses a range of grassroots networks, organizations and associations, each of which vary in size, history, focus and strategy. The PSM approach emerged from discussions between scientists, technologists and civil society organizations that centred on the potential for upgrading traditional techniques through the application of science. Particular attention was and is paid to the development of the 'social carriers' of innovations for inclusive local development.

Hackerspaces, fablabs and makerspaces (international, 2000s to present) (Chapter 6)

Hackerspaces, fablabs and makerspaces are community-based digital fabrication workshops providing innovative spaces where people come together to learn about and use versatile digital design and manufacturing technologies. Some spaces are run voluntarily, while others receive institutional support (e.g. from universities and libraries), but all share an ethos towards making skills and tools freely available to the wider public, so that they can participate directly in design and making activities. Nowadays, workshops constitute a global network and they can be found in many major cities around the world. Many of them network and share projects and knowledge through social media and meet physically at international events.

The Social Technology Network (Brazil, 2000s to 2012) (Chapter 7)

Originating in Brazil in the early 2000s and suspended in 2012, the Social Technology Network (STN) involved a range of participants, from academics to activists, unions, government representatives, funding agencies and, especially, NGOs and community groups. The STN fostered processes of social inclusion, public participation and income generation by putting community development activities at the centre of developing new, inclusive capabilities in science and technology development. The STN had as its main aim fostering a more democratic process of innovation for development by turning

isolated initiatives into broader public policies and application, with attention to income generation and social inclusion for the poorest among the population.

The Honey Bee Network (India, 1990s to present) (Chapter 8)

The Honey Bee Network (HBN) emerged in India in 1989 among a group of scientists, farmers, academics and others interested in documenting and disseminating traditional knowledge and local innovation in local languages. They focused on ensuring the individual innovators would receive benefits from their local ingenuity. The HBN views grassroots innovation as invention and innovation coming from the grassroots, often among people with little formal training and reliant on local, traditional or indigenous knowledge. The network's main activity is the scouting and documentation of innovations and traditional knowledge based on different actions such as visiting communities, interviews, awards and competitions. A second step is related to the exploration of the commercial potential of products and processes identified during scouting.

There were analytical and practical considerations affecting the selection of these grassroots innovation movements for study. Analytically, in all cases, we wanted to look at movements whose networks were dedicated to promoting grassroots innovation generally, rather than movements doing innovative things as part of mobilizations in particular sectors or on specific topics. So, for example, we chose not to look at movements specific to agroecology, health, housing or recycling. We chose movements whose core aims were to promote and expand the capacity of people at the grassroots to participate directly in innovation, and consistent with the definition given earlier. In fact, the grassroots innovation movements we looked at were active in areas such as housing or food, but they were also working in other areas and bridged these various mobilizations.

Another analytical choice was choosing diverse cases, not simply in terms of locations and therefore contexts, but also in terms of the approaches adopted. We chose different cases in order to recognize the particularities involved: how grassroots innovation looks different for these varied movements and the development challenges they confront. At the same time, however, any issues or patterns recurring amid the diversity could point to some fundamental and enduring features of relevance to grassroots innovation movements more generally (Flyvbjerg, 2006). Consequently, our comparison is not intended to isolate variables and explain why some movements perform ‘better’ than others according to some external measure of sustainability. Rather, we want to understand and appreciate these movements on their terms first: an ‘insider’ ontology (see Chapter 2). In all cases, we wanted to trace movement developments over time, including the rise of the movement, its ability to endure over time and its decline and dispersal where relevant.

Adopting an appreciative comparison requires a framework of analysis open enough to account for the diversity of movement-centred perspectives important to us, but nevertheless having sufficient structure that we can work consistently with each movement and identify common patterns. We developed our framework iteratively during the earlier phases of the project. It is explained in Chapter 2. Such appreciation is important when responding to the kinds of policy, business or NGO interest in grassroots innovation noted earlier. As we discuss in Chapter 9, issues emerge that institutions and movements need to think about carefully.

Practically, our choice of case study movements was affected by the need to access each movement, whether in terms of archive materials, interviews with participants, or our own observations as participants. Such considerations explain why we overlook movements in Africa, North America, Eastern Europe and South East Asia. In addition to the usual fieldwork activities of interviewing people, gathering documentation about initiatives, and searching for materials in archives, we were able to organize workshops in Buenos Aires, Delhi and London that brought together movement practitioners. Here

we could convene presentations, discussions and reflections on the experiences we were researching. These were fantastically rewarding engagements, especially for those research team members participating from outside the region. In the cases of movements still active, we also participated in their events and learnt much from the discussions. Our engagements continue. We hope that this book will be of use to them, and to other grassroots innovation movements with whom we did not have the benefit of working.