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AN ANALYTICAL FRAMEWORK FOR STUDYING GRASSROOTS INNOVATION MOVEMENTS

In this chapter we do two things. First, we elaborate our grounds for conceptualizing the field of study as consisting of grassroots innovation movements. Second, we develop a framework for analysing grassroots innovation movements in South America, India and Europe from historical and comparative perspectives. Drawing on a combination of ideas from research literatures on social movements, science and technology studies, and theories of innovation, including recent work on grassroots innovation, we develop a framework for understanding these particular movements' historical antecedents, motivations and strategies for innovation and development, as well as their engagements or disconnects with 'conventional' innovation approaches and mainstream development pathways, as set out in Chapter 1.

Our aim is to provide a framework for studying each case study consistently but flexibly – so that patterns may be identified, but space allowed for the specifics of each history. In our approach to analysing the cases, we alternately move between an 'outsider' and 'insider' (Smith and Stirling, 2007) ontology; in other words, recognizing our positions as analysts of the movements, we describe the movement's broader contexts as we understand them and in relation to the literature. On the other hand, we also carefully describe as faithfully as possible how the movements themselves see and describe their contexts, thus also employing an 'insider's' ontology. Ultimately, in attempting this method, we seek a way of exploring some of the diversity and context sensitivity of grassroots innovation. This also enables us to identify and explore any fundamental similarities or deep-seated features in movements, albeit playing out differently in the varied times and places we study, which will help us to develop understanding of why grassroots innovation movements' activities and influences take the forms they do (Flyvbjerg, 2006). We stress that this approach is not a comparative evaluation for best practices against some common, externally applied metric. Rather, we hope that an appreciation

of different movement experiences can be mutually informative and provide fresh ideas, insights and perspectives for thinking about more familiar initiatives closer to home. As such, our aims are to open up the field of grassroots innovation movements for wider appreciation and debate, rather than to close in around particular models and pathways.

As we pointed out in Chapter 1, our interest is as much in the networks between groups that practise or promote grassroots innovation as it is in the grassroots innovations *per se*. Moreover, we are interested in the ideas and identities that connect and motivate these groups and in the wider social consequences that their activities have. These are all themes prominent in the research literature on social movements, and so it seems reasonable for us to begin the development of our analytical framework there.

Grassroots innovation and social movements

While the grassroots innovation networks that we study in this book do not all self-identify as social movements, they nevertheless involve collective action in civil society and at times link to broader social movements. Social movements are often characterized as a historic form of collective action that is broadly composed of three elements: (a) a collective claim that challenges incumbent elites in society or institutions and opens a controversy about resources, rights or values; (b) forms of organization located primarily within civil society and with a set of strategies or repertoires of actions different from mainstream institutions; and (c) a sustained form of collective action over time that creates bonds of solidarity and identity (Tarrow, 2004; Tilly, 2008). An additional element underlying the formation of social movements that is particularly relevant for this book is knowledge production. As Eyerman and Jamison (1991) highlight, social movements are knowledge producers that can draw ideas from different sources (from science, history and the arts) and translate them into political action. In this process, social movements act as laboratories of experimentation for new ideas, forms of organization and knowledge. In this way, social movements can be regarded as reflexive social actors in two forms. First, social movements are social actors that learn by doing, particularly through reflection and debate concerning experience with movement practices, strategies and forms of organization (and modified accordingly). Second, social movements produce knowledge that 'might be inconvenient to and resisted from those above' and bring it to the public (Cox and Flesher Fominaya, 2009, p. 1), while movements' critique (of existing inequalities) enhances the reflexivity of society (Buechler, 2000). Movements thus also produce alternative ways of thinking about development and social change.

Much social movement literature examines questions around what motivates groups to mobilize, how they pull together, who is involved and what shapes the development of strategies. Earlier literature focused mainly on structural socio-economic factors, with particular attention to struggles for material resources and

access to political power. In the 1980s, a wave of literature on ‘new’ social movements (such as feminism, environmentalism, peace and lesbian, gay, bisexual and transgender rights, in contrast to the older movements based around labour or freedom from colonialism) highlighted additional motivations for collective action. Subsequent literature has highlighted the key roles of social movement organizations in shaping identities and the importance of local, national and transnational networks to help mobilize resources and open up political spaces (Thompson and Tapscott, 2010).

Relatively few studies have linked social movement literatures to studies of science, technology and innovation. Frickel and Gross (2005) have analysed the relationship between social movements and intellectual movements. In the same vein, Scott Frickel and Kelly Moore (Frickel, 2004; Frickel et al., 2010; Moore, 2006) have studied the role of social movements and collective action frames in the construction of alternative science, but also the undone science on issues neglected by conventional scientific institutions (Hess, 2007). Escobar (2004) and other decolonial scholars have highlighted different kinds of knowledge production by social movements. Regarding technology and innovation, others (for example, Hess, 2007; Jamison, 2001; Smith, 2005) have examined the role of social movements in developing alternative forms of technological change. Leach et al. (2010) have brought attention to the politics of knowledge involved in social movements.

Drawing upon the social movements literature, it is possible to suggest three features of grassroots innovation movements, and which further analysis must explore.

- 1 Grassroots innovation movements are primarily based in civil society forms of organization.

Grassroots innovation movements are informal phenomena that are mainly based in bottom-up initiatives that include different network architectures and a broad diversity of social actors, including non-governmental organisations (NGOs), social movements and cooperatives. Some are focused on social justice and sustainability, though others are not. Grassroots innovation movements are the result of collective action that requires constant collaboration, mobilization and self-recognition among a broad diversity of social actors. Collaboration and coordination between heterogeneous actors requires organizational strategies for mobilization of resources and spatial coordination, but also symbolic arrangements that differ from formal institutions. These forms of organization also require some flexibility and negotiation with mainstream institutions such as governments, development organizations, business and science and technology institutions. As a result, grassroots innovation movements create different spaces of experimentation and follow different strategies and forms of engagement with institutional actors, from extra-institutional forms of mobilization to collaboration to co-option.

- 2 Grassroots innovation movements use alternative strategies of knowledge production.

A central element of grassroots innovation movements is their focus on knowledge and technology production as a means to explore alternative scenarios of social change. An important component in this endeavour is the open character of knowledge production that the grassroots innovation movements usually try to foster. Grassroots innovation movements experiment with different forms of public participation in the knowledge production process. However, this is not simply participatory innovation towards the same aims as conventional innovation institutions, such as we see in some forms of citizen science. Rather, grassroots innovation movements identify and demand innovation in areas, on topics and directed towards issues neglected by conventional innovation institutions, and even towards a different social rationality and set of criteria. Strategies might include experiments with co-design, participatory research or popular education. These schemes are usually aimed at including a broader diversity of actors in the process of problem framing, knowledge creation and material solutions, which brings different forms of expertise and experience into play. In practice, this means that grassroots innovation movements create spaces where learning how to use and how to create technologies and alternative forms of knowledge is central. Furthermore, grassroots innovation movements prefer non-proprietary forms of innovation and common goods that differ from proprietary forms of intellectual property that dominate mainstream science and technology. As a result, grassroots innovation movements tinker with technology and knowledge and other resources in ways that are often very different from the formal institutions of science and technology. Unattached to the rules of disciplinary bodies, scientific evaluation and for-profit requirements, grassroots innovators are free to explore new directions of technological change.

3 Grassroots innovation movements are political actors.

The ability to experiment with new technologies and forms of organization is an important tool in the critique of incumbent forms of technological development. Grassroots innovation movements can be regarded as initiators or advocates of alternative pathways of socio-technical development. However, these roles are not exclusive, and hybrid arrangements can arise in pursuit of these aims that require engagements with science and technology institutions and development agencies. Pragmatic engagements can involve technical assistance, funding or other kinds of institutional support, but also include symbolic legitimacy, policy design and supportive regulatory structures (Ely et al., 2013). All these activities are ultimately aimed at opening up a discussion about the direction of development and the roles of scientific research and technological change. In this way, grassroots innovation movements raise questions about technological needs in societies, the appropriate directions of technological change and who is enabled to design, own and access a technology, and on what terms. Such questions involve a politics of knowledge that challenges the distribution of resources and power in knowledge production and technology development.

Taken together, these three features – mobilization through civil society, alternative forms of knowledge production and a political pursuit of different

rationalities and criteria – instil grassroots innovation with characteristics closer to those of social movements than of conventional innovation institutions. However, there are important differences between grassroots innovation movements and other, broader social movements regarding the forms of knowledge they produce and their means of mobilization. Conventional social movements (old or new) are generally based on claims about class, rights or identity, while grassroots innovation movements challenge specific directions and forms of knowledge production, technological change and development. This focal difference implies an important analytical distinction. Grassroots innovation movements are not reduced to contentious politics (Hess, 2007). While the repertoires of action that grassroots innovation movements might use include, only occasionally, public protest involving rallies and boycotts (Tilly, 2008), such displays of force and unity do not constitute the main means of expression and political mobilization. Instead, in similar fashion to scientific or intellectual movements (Frickel and Gross, 2005) grassroots innovation movements are centrally focused on strategies of knowledge creation and alternative pathways of innovation and development. Grassroots innovation movement repertoires and forms of mobilization are based more on the production of knowledge and technological solutions. As Hess notes, grassroots innovation movements are ‘analytically distinctive because the principal means of social change is the development of new or alternative forms of material culture, a means of change that is often associated with calls for significant institutional and policy changes as well’ (Hess, 2005, p. 517).

So, in analysing grassroots innovation movements we need to bring in concepts about learning, knowledge creation and technological innovation from innovation studies and science and technology studies, in combination with ideas about mobilization of resources and political strategies from social movement literatures. Such combinations are key to understanding how grassroots innovation movements develop alternative visions and practices of development. Informed by such a combination, over subsequent sections we develop our analytical framework. It will focus on the contexts in which each grassroots innovation movement arises, the framings they bring to questions of innovation and development, the spaces and strategies they create and pursue for turning their ideas and aims into material practice, and the development pathways that emerge from this activity (and that variously grow, disperse or disappear). The remainder of this chapter, and each case study chapter, is thus organized along the lines of an analysis of context, framings, spaces and strategies, and pathways. We draw on research in innovation studies, science and technology studies and social movements in order to elaborate each concept and bring into view some issues for consideration in advance of each case study.

Broader contexts

The importance of broader historical and political-economic *contexts* is a common theme both in evolutionary economic approaches to the study of innovation and

in social movement theory. Broader, dynamic contexts shape the opportunities for social movements to arise, flourish and diminish, as well as forming environments that select and shape technological developments and guide their trajectories over time. Contexts can condition grassroots innovation movements in three ways. First, predominant directions in innovation and development deemed problematic by activists can serve as motivation for the creation of alternative visions and directions. Second, dynamic contextual conditions can provide windows of opportunity for the development of grassroots alternatives. And third, dynamic contexts can present constraints to the development of grassroots alternatives.

Contexts may structure opportunities for grassroots innovation movement actions over time by enabling or blocking access to resources, changing dominant development discourses and opening up political opportunities. Mobilization processes often 'emerge from and are strongly shaped by political histories and cultures' (Leach and Scoones, 2007, p. 27). In social movements research, political opportunities might arise when institutions become newly sensitive to an issue that mobilizes grassroots innovators or undergo reforms that are rooted in broader national and international processes such as democratization, which may make state institutions more 'permeable' to action and influence by civil society groups (Thompson and Tapscott, 2010, p. 9). Historical context is also vital for understanding the relation between internal social movement dynamics and wider structures of political power and capital accumulation (Amin, 1993). More recently, neoliberalization – in its multiple and heterogeneous forms – has been a cause for social mobilization, including in the realm of science and technology (Moore et al., 2011).

There has also been increasing attention in the social movement literature to distinct characteristics of social movements in the global South (Escobar and Alvarez, 1992; Thompson and Tapscott, 2010). Despite apparent resource limitations, deemed a prerequisite for mobilization in some Northern social movement literature, there have been extensive movements across resource-constrained communities in Latin America and Asia, suggesting different forms of collective action and approaches to theories of social movements in such contexts (Escobar and Alvarez, 1992). In particular, Escobar and Alvarez argue that economic, political *and* cultural factors are crucial in Latin American social movements. So, in studying the generative contexts for grassroots innovation movements, as well as the opportunities that contexts provide, the lesson from the social movements literature is that this should be historically informed.

In research into technology and innovation, contexts are especially important when thinking about transitions to new 'regimes' of innovation, production and consumption. In the evolutionary economic approach of the multilevel perspective (Geels, 2002; Geels and Schot, 2007; Rip and Kemp, 1998), 'socio-technical landscapes' – including wider society concerns, political-economic crises and changing cultural or ideological discourses – are an exogenous source of change, which can provide windows of opportunity for destabilizing existing socio-technical regimes and opening up possibilities for innovation alternatives (Geels, 2010; Geels and Schot, 2007). Research in this field illustrates how 'sustainability' as a discourse

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can be interpreted as a landscape-level change that is destabilizing the contexts of operation of existing regimes and underpinning and effectively distributing services in energy, mobility, food, housing, water and so forth in a variety of geographical settings (Garud and Gehman, 2012; Grin et al., 2010; Smith et al., 2005; Voss et al., 2009). New social demands and structural contradictions cast hitherto robust regimes of provision and accumulation into doubt, opening up opportunities for social movements and other agents, including entrepreneurial business leaders and research institutions, to press for alternative social and technological configurations for meeting societal needs.

International or transnational networks can also help to open up windows of opportunity in national and local contexts. Movement actors can leverage influence from internationally based allies for local-level activity. This can be especially important when national contexts are otherwise unfavourable, the so-called boomerang effect (Keck and Sikkink, 1998). The appropriate technology (AT) movement, for instance, arose in the 1960s and 1970s in Europe and South Asia, gaining attention within the professional development community. AT activities were subsequently supported by development agencies at an international level. For instance, sections of the Organisation for Economic Co-operation and Development (OECD) and the International Labour Organization, as well as the World Bank, United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP), conducted activities around ‘appropriate technology’ into the 1980s. This mainstream interest helped to foster and open up opportunities for engagement among science and technology institutions and NGOs in other parts of the world, such as South America. However, national political-economic and ideological contexts regionally played an important role in the forms that the AT movement took in South America (see Chapter 4).

Within the current global economic crisis, renewed political focus on issues of inequality and social inclusion has drawn institutional attention at an international level once more to grassroots solutions and varied notions of inclusive innovation. Interest has been claimed within the OECD, the World Bank and the United Nations (Gradl and Knobloch, 2010; OECD, 2015; World Bank, 2012), among others. Such recognition brings with it both opportunities and challenges for grassroots innovation movements.

Thus, adopting our outsider’s ontology, we can describe how broader contexts – whether political, economic, social or cultural – shape opportunities for grassroots innovation movements. However, turning to an insider’s ontology, we need to examine how grassroots innovation movements themselves problematize the broader development contexts described above, and how they themselves frame opportunities and alternative possibilities.

Framings

In the social movement literature, the concept of framing is key to understanding how, beyond shared grievances, social movements are held together by a collective

production of ideas and meaning that creates bonds of solidarity between actors and informs their coordinated action. The concept of framing was taken from its origins in psychology and adapted by social movements research in order to understand the importance of interpretative orientations, values and interests in mobilization processes. According to Snow et al. (1986), framing involves a process of meaning production that enables movements to identify and organize their experience in forms that help them to connect to more powerful narratives. In this way, 'collective action frames are action-oriented sets of belief and meanings that inspire and legitimate the activities and campaigns of a social movement organization' (Benford and Snow, 2000, p. 614). Tarrow (2004) adds that framing processes are enacted by both social groups and states, and can serve to build boundaries of a constituency, develop a collective identity and define 'others'. Frames can be important in influencing how a situation and context is understood either descriptively or analytically, and what types of actions might be employed to address a problem.

The socially constructed character of frames means that their meanings and ideas can evolve and develop as part of a learning process that social movements undergo in relation to different periods of activity and mobilization. As such, the concept of framing allows understanding of how social movements not only act to claim and blame incumbent powers, but also develop a complex process of knowledge production. This aspect of framing is obviously important to understanding how grassroots innovation movements develop alternative forms of technological change.

Work in the sociology of technology and more political approaches in innovation studies emphasize the various 'framings' that social groups bring to innovation activities (Hess, 2005; Leach et al., 2005; Leach and Scoones, 2007; Smith, 2005). Bijker (1995) and others have studied how relevant social actors can draw from one or more technological frames in order to produce innovations. Technological frames consist of the shared problems, strategies, requirements, theories, knowledge, design criteria, exemplary artefacts, testing procedures and user practices that emerge through social interaction in groups. They help us to understand what social actors deem to be reasonable in choosing and developing a technology. Precisely for this reason, technological frames emphasize technical and cognitive aspects of innovation and tend to underplay explicitly political aspects involved in grassroots innovation struggles. Thus, by using technological frames there is some risk that we will regard technology as *the* central concern and output of grassroots innovation movements; whereas the way framings are invoked as a concept in social movement research points to a broader set of social, economic and political concerns within a frame. Including the social movement notion of framing helps us to combine the cognitive aspects of technological framings with symbolic, organizational and power aspects present in social movement framing activity.

In the case of grassroots innovation movements, following Jamison (2001), we argue that an important aspect of their framing involves critique of mainstream science, technology and innovation. In analysing our cases, we employ the concept of framings empirically to uncover what specifically motivated the movement's origins, how movements problematize mainstream models for innovation

and development, what alternative visions and aims they develop and promote and how these change over time – through negotiation, or due to changing opportunities and resources, for example.

A broad focus on *framings* helps us to appreciate the discursive and interpretative orientations of different grassroots innovation movements towards their contexts, which informs and shapes their engagements with technology development, innovation *and* values and ideas about social change. Where grassroots innovation comprises heterogeneity of actors and institutions, so the framings in play are likely to be plural also. And where a variety of framings underpin the movement, so we may anticipate tensions and debate about priorities and relations between them. This suggests a need for attention to the existence, operation and influence of different framings within grassroots innovation movements and to how different framings:

- prioritize different motivating factors;
- suggest different roles for grassroots groups;
- guide activity towards different opportunities and possibilities;
- emphasize different kinds of knowledge production and parts of the innovation processes or expected outcomes;
- identify and promote different exemplary artefacts and technologies; and
- point to contrasting strategies for engaging grassroots innovation groups with the state, business and wider civil society.

Plural framings may be an indication of contending normativities. Each frame can inform narratives about the movement and link to storylines about desired futures and goals, such as sustainability, social inclusion and participation (Leach et al., 2010). In this way, framing must be regarded as a key aspect of grassroots innovation movements and the process of building alternative development pathways (Leach et al., 2010).

We are interested in analysing how these different framings and interpretations of innovation, social inclusion and participation are negotiated and contested, and what modes of engagement grassroots innovation movements use in order to forge alternative pathways of innovation (Hess, 2007; Smith, 2007). However, even when frames inform alternative visions, action repertoires and pathways of innovation, they do not necessarily constitute a blueprint for mobilization and socio-technical experimentation. The plural frames held by social movements can be a source of contestation and debate, as well as flexibility and pragmatism in coalition building. Which frames become pre-eminent in strategies for grassroots innovation can depend upon their adequacy in negotiating spaces for doing and advancing grassroots innovation materially.

Spaces and strategies

Thinking about spaces and strategies helps us to identify, describe and understand the varied arenas where it is possible to do grassroots innovation, as well as the

repertoires of action employed by grassroots innovation movements to create or claim such spaces. These spaces need to be relatively sympathetic to grassroots innovation movement framings, as compared to conventional scientific, technological and innovation institutions. They are spaces where the norms and expectations for innovation are different (Kemp et al., 1998; Seyfang and Smith, 2007). These are spaces, for example, where social goals valued by the movement prevail over, say, the market pressure to rush into competitive commercialization and economic growth. In these spaces it is possible to develop the grassroots innovation by mobilizing resources for experimentation and enrolling receptive audiences, alliances and users for improving performance. Ultimately, however, if grassroots innovation is to open up alternative pathways for development, activity has to expand beyond these spaces, push back against the broader, problematic social context and influence the wider world.

Analytically, we want to understand the strategies by which grassroots innovation movements open up spaces for their activities, and how the characteristics of those spaces influence innovation processes and outcomes, including any development pathways that unfold. We use the terms *spaces and strategies* to bring together these different locations and activities that grassroots innovation movements leverage as they try to achieve their goals. Conceptually, we draw upon ideas of participation and repertoires of action (Tilly, 2008) and resource mobilization (McCarthy and Zald, 1977) from social movement literatures, and spaces of experimentation and niches from development studies and innovation studies (Cornwall and Coelho, 2007; Kemp et al., 1998). Ideas about resource mobilization in the social movements literature focus on strategy, agency and organizations for creating or claiming alternative spaces of engagement, which are seen as key to social movement mobilization. From this literature, we draw three key points in relation to the strategies available to grassroots innovation movements for opening up spaces; these are intermediaries and networks, mobilization structures and repertoires of action.

An ability to create *intermediaries and networks* is crucial to opening up spaces. Networks contribute through communicating, coordinating, representing and sharing grassroots innovation. Networks serve as both communicative structures and political actors, enabling flows of ideas, resources, claims and activities, including across transnational locations (Bebbington and Kothari, 2006; Keck and Sikkink, 1998). Intermediaries are key to sharing lessons arising from different grassroots innovation initiatives. Intermediaries network between specific grassroots initiatives and carry experiences, insight and lessons in order that it becomes easier to do the innovation in other settings (Hargreaves et al., 2013). The sharing of lessons and knowledge might be oriented instrumentally towards improving an innovation or oriented to identifying ways to speak to the agendas of policymakers and investors; or lessons might generate critical knowledge about limitations imposed on the innovation by broader social structures and which need to be addressed politically (Smith et al., 2015). Networks and intermediaries are able to operate above specific innovation situations and engage the wider context in opening up spaces for further activity.

Repertoires of action are the forms of organization and activism that movements develop and use to gain access to the spaces and challenge opponents. Grassroots innovation movements adopt specific strategies under certain conditions of opportunity in mobilizing access to resources. Knowledge, skills and capabilities for mobilizing in different ways are required. In social movements, this conventionally involves activities such as rallies and boycotts, linkages with other groups and organizations and cultivating a sense of shared identity, values and solidarity. In the case of grassroots innovation, the repertoires extend to activities such as prototyping, publicizing designs, arguing for inclusion, fund-raising campaigns and protesting against exclusions from science and technology agendas and institutions.

In *mobilization of resources* a group or network may mobilize many different types of resources and institutions in order to pursue its goals. In doing so, grassroots innovation movements must consider the costs and benefits, risks and rewards of different strategies, which are shaped by the conditions attached by resource holders to the deployment of those resources. Types of resources can include both material (such as financial, material goods and services) and non-material resources (for example, leadership, trust, skills, shared culture, historical tradition and ideology) (Oberschall, 1973). Shared identity, values and solidarity can also be mobilized to persuade other forms of commitment, particularly material resources (Jenkins, 1983). Other resources include outsider support or linkages with other groups and organizations, including investors and businesses, and even government strategies, all of which can selectively and conditionally furnish resources with a view to appropriating, co-opting or limiting social movements' aims, activities and accomplishments (McCarthy and Zald, 1977). Hess (2005) points out that science and technology can be one of the resources a movement may be interested in accessing but to which access is structured by the norms of scientific and technological institutions. The point is that structures of political, economic and social power, as well as geography, may render some resources more elusive than others for grassroots innovation groups.

Spaces may be physical, such as workshops, fields, buildings, factories, villages or neighbourhoods where groups can work on their innovations. Spaces may be social, in the sense that there are social groups, social networks and social activities able to provide support, lend resources and platforms for furthering grassroots innovation or become lead users of the grassroots innovation. Examples here might include social movements, such as peasants' movements, environmentalists, workers' groups and community activists. Spaces could be institutional, in the sense that an institution provides support and opportunity for grassroots innovation. Universities, for example, might open their doors and lend their research and education capacity to community initiatives and grassroots innovators, as has been the case with science shops. Political parties, trade unions or business associations might commit to grassroots innovations and bring attention, publicity, investment and advocacy. Consumers in niche markets might emerge who further help a grassroots innovation. So, spaces can range from cognitive spaces receptive to alternative ideas and methods (such as the development of new scientific ideas

in the margins of academia) to physical, political and institutional spaces where it is possible to develop and experiment with tools and forms of organization.

There is an important difference between spaces and strategies here and our earlier explanation of *contexts* described above. The difference turns on the agency of social actors. Contexts imply structural conditions that can restrict (or favour) the availability and locations of resources and opportunities for grassroots innovation activities; whereas the idea of spaces and strategies tries to understand how grassroots innovation movements can also be proactive in opening up new arenas or actively seizing and shaping platforms for alternative innovation activity.

Helpful here is research into niche spaces for alternative forms of innovation. Niches are spaces where the rules are different, or the conventional norms of innovation are suspended, perhaps partially. This allows social actors and institutions to build – sometimes only temporarily – protective spaces to tinker and experiment with innovative ideas and practices. Niches are the locus where it is possible to mobilize resources to nurture and test new technologies and new forms of organization. In this way, niches can be considered a source for path-breaking innovations (Smith and Raven, 2012). Grassroots innovation movements may be conceived as constructing temporary protective niche spaces where people can experiment with new technologies, knowledge practices and forms of organization (Seyfang and Smith, 2007). The act of constructing niche spaces encompasses both discursive practices and framing activities as well as material practices, including technological developments, funding strategies, infrastructure and network development. Importantly, processes and platforms for learning are vital to the development of these innovative spaces.

Niche spaces can be created by taking advantage of relatively ‘passive’ arenas, not generated or opened up by the grassroots innovators themselves but found to hand and actively exploited for their favourable possibilities. Conversely, niche spaces may be opened up much more deliberately and actively, in order to generate dedicated opportunities and situations, by pushing for support from other actors and institutions. In either case, it is important to understand that spaces of experimentation often involve negotiation and struggle with incumbent powers and entrenched practices that might otherwise close down such spaces.

Thus we ask how spaces – physical, social, discursive and institutional – are opened up by and for grassroots innovation movements in order that their alternative approaches can be put into practice; how framings and wider discourses are mobilized in each case, alongside other resources, in order to open and further these spaces; and how experiences in these spaces, and the success or otherwise of influencing the wider context, prompt reflection, reframing and some renegotiation of strategies.

Pathways

A final aspect to our understanding of grassroots innovation movements is to explain how they contribute to alternative developments over time. We do this

by using the concept of pathways. The STEPS Centre (Leach et al., 2010), where the research project leading to this book was based, makes the case for a plural approach to sustainable developments by arguing that plural development pathways are possible. In any given situation there is never one self-evidently best way to develop. STEPS research recommends that greater attention be paid to opening up and constructing ‘alternative’ pathways, either existing or imagined for the future. The Centre makes this case on the scientific grounds of recognizing diversity and difference and on normative grounds for environmentally sustainable and socially just developments.

So, how can the framing of contexts and innovation, and the active opening of spaces for doing grassroots innovation over time, contribute to alternative development pathways? How do grassroots innovation movements develop activities and respond to changes over time, and with what consequences for the pathways they build? Particularly interesting here is how encounters between grassroots innovation movements and mainstream institutions for science, technology and innovation can lead to the construction of alternative pathways of development (Fressoli et al., 2014; Hess, 2007; Smith, 2007): pathways with greater attention to issues of social inclusion, diversity and difference, and social justice.

The STEPS pathways approach emphasizes the multiple narratives that arise in sustainable development debates, shaped by a range of discursive framings (including scientific knowledge), and which in any given context can generate a plurality of possible development pathways. Different framings are more inclusive of some issues, criteria and knowledges than others, and framings can differ in their recognition and responses to the uncertainties inevitable in all social choices about the purposes and directions of development. Not all framings and associated narratives are equally influential, however; some may be linked to dominant pathways or directions, while other narratives may be side-lined or hidden, associated with more marginalized pathways (Leach et al., 2010). The STEPS approach calls for identifying the actors involved in different pathways, how each actor or group of actors frames their reality and their goals for change, and thus which features are prioritized and what strategies they choose to leverage development and change (Leach et al., 2010). This can extend to framings of the past and present, and visions for the future, all of which can have a function in the building of pathways, doing work to help construct them (Garud et al., 2010). Furthermore, pathways are not necessarily linear in time or space. There can be an element of ‘back and forth-ing’, truncation and renewal, in the durational journey along pathways (Garud and Gehman, 2012).

We draw on the STEPS pathways approach when considering the consequences of grassroots innovation movements. It involves us returning to an outsider ontology and attending to the intersections of power, politics and institutions that influence which pathways dominate (i.e. pathways that exhibit lock-in towards particular directions of development and lock out others), which pathways are marginalized or excluded and, hence, the associated successes and failures of contributions to alternative developments from our case study grassroots innovation movements. To do this, we examine the relations (e.g. supportive, antagonistic,

indifferent) that exist between grassroots innovation movements and mainstream innovation agendas and institutions: how do alternative movements, often situated on the margins in relation to prevailing political and economic structures, try to influence or respond to such asymmetric relations? What are the controversies, politics and power relations that challenge (or perhaps support as well as undermine) alternative pathways; what enduring influences or traces do these pathways leave? What are the lessons for grassroots innovation in future pathways?

However, we also seek to push the pathways framework beyond its emphasis on framing and narrative to include more explicit attention to the material aspects of pathways and the importance of interaction between the discursive and the material features in pathways. A significant body of work in science and technology studies more broadly calls for attention to the relations between the material and the discursive and the co-constitution of the social and the technical (Jasanoff, 2004; Latour, 1993). Whatever the values in play – be they the requirements of intended users, the ideas of grassroots innovators or the democratic ideals of activists – all have to confront the materiality of the technologies that feature in the solutions. Technologies themselves become agents in pathways: their material properties affect whether and how they are accessible to grassroots innovators, and thus how models, for example, of participatory design, can be applied to those technologies (Asaro, 2000). The materiality of the objects and concrete practices developed by grassroots innovation movements must therefore be considered a key component in the construction of alternative pathways.

An emphasis on the more material aspects of pathways is evident in the sustainability transitions literature (Schot and Geels, 2008; Smith et al., 2010). Some of this work emphasizes an iterative modulation between vision and practice, discursive and material components (Loorbach, 2007; Voss et al., 2009). This mix of adaptation or reorienting of goals through experience in material experimentation involves multiple actors, including intermediaries and outsiders, in ‘steering’ or shaping pathways (Kemp et al., 2007). For example, Kemp et al. (2007) recognize the sometimes conflicted encounters between actors at multiple levels and over multiple timescales that shape development pathways. Scholars developing the transitions framework point to various roles for intermediary actors – from government departments, local, regional and national-level NGOs, different kinds of research and development institutions, and the private sector, whether as firms, associations or investors – in steering, coordinating action and aggregating lessons arising in niches and for wider application (Geels and Deuten, 2006). Empirical work suggests that the realities of niches are complex and varied, and identifies the considerable work of intermediaries in helping to grow, consolidate and diffuse grassroots innovations (Hargreaves et al., 2013). Intermediary actors implement various methods to try to coordinate support and generate lessons for alternative pathways from very diverse, context-specific local projects, but drawing lessons across these varied circumstances and among a plurality of social actors with diverse interests is challenging (Hargreaves et al., 2013). Moreover, an emphasis on scaling up, growth and mainstreaming in niche management can

eclipse some of the more critical and oppositional motivations of the grassroots innovation movements. Easily co-opted elements of a grassroots innovation might be supported, especially those that align with dominant development pathways, to the detriment of grassroots elements criticizing and seeking alternatives to those dominant pathways (Smith et al., 2015).

Thus, for grassroots innovation movements, we need to trace the framings of pathways and the narratives for their development *as well as* the material objects and spaces they develop when trying to create alternative pathways. In other words, we want to attend to the actual material doing of projects and how these connect over time. We do this with the use of specific illustrative examples for each movement; projects that feed back and become resources (or cautionary lessons) for subsequent movement mobilization and help to shape or maintain movement identities. The strategies involved in working across projects or linking between broader aims and specific activities on the ground are part of what constitute innovation pathways over time. Grassroots innovation movements learn and develop their knowledge bases, skills and capabilities through the actual development of grassroots enterprises, case studies, pilots, experiments and technological objects, as well as through the lessons gained (and dilemmas raised) from taking advantage of public programmes or resources, addressing pressures to formalize or scale up, or seeing some practices co-opted or diffusing widely but in forms diverging from the original intent. All these experiences are also part of building pathways. Pathways may not go in the directions desired by some activists, or they may fail to incorporate some cherished values. How grassroots innovation movements perceive, reflect and respond to these pathway experiences becomes a focus of concern and the way that such reflections inform continued attempts to build alternative pathways.

Conclusions

In this chapter we have developed a framework for analysing grassroots innovation movements by introducing and discussing a number of interrelated concepts that are useful for thinking about the aspirations, activities and consequences of grassroots innovation movements. These concepts were as follows.

- *Context* covers the historical circumstances in which the grassroots movement arose, the issues and situations that were generative for the movement and the opportunities available to the movement within those contexts.
- *Framings* focuses on the shared meanings, interpretations and narratives for doing innovation differently that hold the movement together and orientate its activities.
- *Spaces and strategies* are the collection of sites and arenas – physical, institutional, organizational and cognitive – where grassroots innovation movements actively open up material activity and do innovation and get support for promoting further grassroots innovation.

- *Pathways* considers the development of the grassroots innovation movement over time, both in discursive terms (the fate and influence of its ideas and aims) and in material terms (the creation of new artefacts and new development trajectories).

In the next six chapters, we analyse our case studies of grassroots innovation movements in detail, including their encounters with mainstream institutions of science, technology and innovation. In each case, we carefully set out the context for the movement. We analyse how different framings and interpretations of innovation, social inclusion and participation are negotiated and contested, and what spaces are opened up through different strategies in order to realize their activities and forge alternative pathways (Hess, 2007; Smith, 2007).

Each of our case study chapters is structured so that it considers the above concepts in turn. Although this risks implying a linear process – framings inform spaces which enable pathways – the realities are movements whose contexts, framings, spaces and strategies are much more interactive, and whose dynamics carry implications for the kinds of grassroots innovation that get done, and the pathways involved.