INTRODUCTION

Several recent scientific assessments have offered persuasive evidence that the physical demands of contemporary patterns of energy and material consumption have begun to exceed critical biogeochemical thresholds and to jeopardize planetary systems (IPCC, 2007; Rockström et al., 2009; Aaronson, 2010). Current debates on appropriate policy responses evince skepticism about whether improvement in technological efficiency, including enhanced reliance on renewable energy sources, will alone be adequate to meet the demands of a global population projected to exceed nine billion by 2050. Although not impossible, in the words of Paul Raskin and his colleagues (2010, p. 2648) ‘the sustainability challenge presents, as well, the prospect of transcending technological solutions with a transformation in human values and restructuring of economic and governance institutions.’ Under these circumstances, a new conception of the future is gaining traction in the scientific community, one in which far-reaching innovations in both industrial production and societal consumption patterns are likely to be required.

Systemic changes in the prevailing social-technical-cultural-economic-political system are necessary to move in the direction of such a vision. This book will show that there are different dynamic forces that could help shape a comprehensive transition, which will imply a transformation of present arrangements for production and consumption. Some commentators argue that government policies should be the overriding force to help shape this transition, given the urgency of the problems and the need for swift, coordinated and effective actions. Others do not deny the important role of governments, but also contend that due to the complexity of the issues government policies alone will not suffice, and other actors and
Innovations in sustainable consumption dynamics need to play an important role. It is this latter perspective that this book takes.

An important set of approaches for moving forward on this front has been developed over the past two decades by social scientists, environmental scientists and engineers, and policy makers working within the interdisciplinary field of sustainable consumption. This work integrates across industrial ecology, ecological design, ecological economics, sociology, psychology, science and technology studies (STS) and consumer studies. Understanding what is meant by sustainable consumption, or how to study and advocate for it, varies widely within this community of scholars, practitioners and policy entrepreneurs. At one end of the spectrum, the emphasis is on the nature of the ‘stuff’ that we consume, with calls for more durable and less resource demanding consumer products and services. At the other end, priority is given to human behavior, with calls to reduce the volume of material goods and energy-intensive activities that people engage in while searching for a fulfilling life. A distinct and important line of thinking explicitly recognizes the social construction of technology (and the stuff we consume), as well as the mutual interaction and coevolution of technologies, human behaviors, societal institutions and economic arrangements. But even here, there are pronounced differences in perspectives, research approaches and related action alternatives.

This book comprises contributions by scholars from three domains of scholarship at the intersection of societal innovation and sustainable consumption: new economics, socio-technical transitions and social practices.

First, the new economics is a broad, emergent area of research that forges new understandings of the macroeconomics and political economy of consumption (Speth, 2008; Victor, 2008; Jackson, 2009; Seyfang, 2009; Cohen, 2010; Schor, 2011). Propelled by the financial crisis that began in 2008, new economists are formulating novel approaches with which to model production and consumption and how changes in social and economic policy might affect, for example, employment and economic growth. Absent to date from this work, however, has been much consideration of the role of technology as a driver of human behavior and societal change.

Second, work on socio-technical transitions is grounded in evolutionary economics, studies of the social construction of technologies and research on technological innovation and diffusion (Kemp et al., 1998; Schot, 1998; Rotmans et al., 2001; Geels, 2002; Vergragt, 2005, 2010; Loorbach, 2007). These investigations unambiguously recognize the importance of nonlinearity and the role of social context in large shifts of dominant technologies and focus on the coevolution of technologies, societal institutions and culture. However, to date this scholarship has been relatively silent on the
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political and economic context of the underlying changes and the nature of technology-human behavior interactions.

Finally, social practice theories focus on the mutual interactions between technology and ordinary daily human behavior and examine how more resource-intensive practices emerge and become stabilized in response to technological innovations (Shove, 2004; Hand et al., 2005; Røpke, 2009). This research though has not been concerned with the evolution of new technologies from a complex system perspective or issues pertaining to prevailing political and economic frameworks. Moreover, it has not actively considered how technological innovation could lead to more sustainable social practices.

This book seeks to forge intellectual bridges across these three perspectives with the aim of enriching each one through novel framings, new analytical lenses and development of a shared language of discourse. A second objective is to deepen the body of knowledge on how consumption patterns evolve in a technological society and the role of policy interventions, grassroots initiatives, small-scale experiments and market actors in affecting changes that are consistent with the requirements of the twenty-first century. We do not claim that these are the only, or necessarily the best, three perspectives for achieving a better understanding of sustainable consumption. Indeed, several of the contributors to this volume remind us that social movement theories may provide another fruitful and complementary perspective, and thus may help policy makers, civil society actors, progressive businesses and other innovators to sharpen their interventions.

THREE THEORETICAL PERSPECTIVES

The linkages across the new economics, socio-technical transitions and social practices have to date not received adequate attention. Each perspective has its respective strengths and weaknesses, but jointly there is potential that they might provide useful ways to formulate new intellectual framings, to deepen the pertinent body of knowledge and to inform policy processes. We explore more explicitly the capabilities of this interdisciplinary approach later in this chapter and use the case of passive houses to illustrate its utility in elucidating the complex technological, institutional, economic and behavioral dimensions of a shift in the socio-technical system for housing construction. We first though elaborate on the three theoretical perspectives that inform this chapter and the book as a whole.
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New Economics

The new economics, by drawing together insurgent ideas from ecological macroeconomics and environmental political economy, effectively demonstrates that intensifying environmental stress, growing economic volatility and widening social inequality are interlinked trends. Furthermore, the dominant economic model, predicated on growth in gross domestic product (GDP) and improvements in resource efficiency, is being increasingly challenged because of its inability to maintain full employment, to ensure financial and political stability and to facilitate ecological sustainability (Speth 2008; Victor, 2008; Boyle and Simms, 2009; Jackson, 2009, 2012). Moreover, social surveys have shown that over the past few decades, despite multifold increases in material consumption, most affluent countries have experienced little improvement in subjective well-being (Layard, 2006; Engelbrecht, 2009; Hanlon et al., 2010). This work suggests that beyond a relatively modest level of average annual per capita income – generally understood to be approximately US$15 000 – consumer economies become relatively inefficient in converting resource throughput into gains in personal lifestyle fulfillment. Other studies of objective indicators of well-being have shown similar leveling off in such variables as infant mortality, life expectancy and educational achievement (see, for example, Wilkinson and Pickett, 2009).

Drawing on these insights, an alternative paradigm has begun to emerge, one that seeks to improve individual and societal prosperity under conditions of ecological constraint. This so-called ‘new economics’ draws attention to the drivers (overproduction, relentless marketing and illusory fixation on growth through consumer spending) and the side-effects (premature product obsolescence, chronic indebtedness and unsustainable exploitation of planetary life-support systems) of current modes of consumption. A key point of awareness is how consumerism creates and perpetuates a culture of ‘working and spending,’ a development that has become especially prominent in the United States over the past several decades (Schor, 1998; Whybrow, 2005). Such observations have led new economists to consider models based on decreased throughput of energy and materials, as well as low or no growth of GDP (or even degrowth).

New economics is still emerging as a societal vision, an economic theory and a research area. Nonetheless, over the past few years, a growing number of authors and working groups have made progress defining its contours (see especially Boyle and Simms, 2009). This innovative way of considering social progress includes an emphasis on equitable distribution of paid employment, a reduction of economic inequalities, a shift from individual consumption to public investment, a distinction between
benign forms of growth (for example, renewable energy, cultural activities, education, healthcare) and environmentally damaging modes such as nonrenewable resource extraction, and a restructuring of major societal institutions that influence government policies (especially the financial markets that over the last few decades have come to overwhelm the real economy).

Some prominent sustainability proponents – and indeed some socially responsible companies – are calling now for a complete restructuring of the economic system toward one that is both more conscientious and green, while simultaneously predicated on new understandings of ownership, growth and the role of a corporation (Korten, 2009; Alperovitz, 2011; see also WEF, 2012). Other commentators stress the need to expand our understanding of technology as more than simply a means with which to enhance labor productivity and to move toward multidimensional analyses of how the actual functioning of dominant technological systems – agrofood, transportation, housing, energy and others – affect the overall economy.

From a quality-of-life perspective, the economy envisioned by some new economists will translate future increases in labor productivity into large-scale investments in education and other public goods, shorter working hours with living wages and improved balance between work and leisure. From that perspective, un- and under-employment created by improvements in labor productivity are offset not by consumption-driven GDP growth, but through greater reliance on an informal economy and self-provisioning that strengthens communal linkages and by more equal distribution of working hours and income. In addition, consumers are likely to begin under such circumstances to develop more expansive societal roles as ‘prosumers’ (producer-consumers) on a community scale.

Examples of these novel forms of communal interdependency include sharing networks, time banks, complementary currencies, urban farming, vocational reskilling and community-based energy generation (see, for example, Seyfang, 2009; see also Crawford, 2009). Popular interest in these activities has been catalyzed by new social networking tools that make it relatively straightforward and inexpensive to acquire instructional materials, to develop skills and to seek out collaborators. While the emergence of these practices may be viewed by some readers as the perpetuation of deeply rooted (but socially marginal) traditions of utopian communalism or as simply the result of constrained economic circumstances, the prominent (and in some cases pervasive) role of technology in many of these societal innovations is a notable development.

These lifestyle experiments are also of interest because of their potential to engender new (or new kinds of) social movements. However, the
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durability of these innovative provisioning routines, as well as the extent to which they are likely to diffuse spatially and in scale – and in what form – remain open questions. It is presently unclear how these nascent practices fit into existing socio-technical regimes, economic structures and social practices and how they might contribute to change. Finally, it is indeterminate what role, if any, public policy might play in encouraging the uptake of these new consumer routines.

Socio-technical Transitions

Scholars conceptualize socio-technical systems (or regimes) as configurations comprising technologies, infrastructures, policies, cultures, institutions, actors and networks (Geels, 2002; Geels and Schot, 2007). For example, the agrofood system, the transportation system and the electric power system all constitute socio-technical systems. These systems are complex, operate on a relatively efficient and optimized basis and, despite prominent flaws, are highly stable. However, insurgent alternatives can emerge to challenge them as a result of internal tensions and external pressures. When successful, such changes are called socio-technical transitions and are driven by processes that can dramatically alter the structure, culture and practices of relevant societal systems of provision.

The socio-technical transitions perspective is deeply rooted in evolutionary economics (Nelson and Winter, 1977; Dosi, 1982; Rip, 1995). Evolutionary economists tend to view technological innovation as a process guided by variation (through, for example, laboratory experiments and research and development) and societal selection (primarily through market competition and government regulation). On the macro level, these dynamics give rise to technological trajectories that are relatively durable and further develop in path-dependent directions, leading to a high degree of entrenchment and lock-in (Unruh, 2000).

Historians of technology have explored the temporal and geographical evolution of numerous socio-technical transitions (see, for example, Schot, 1998; Geels and Schot, 2007). The most notable case studies include transitions from the horse-drawn carriage to the automobile, from sailing ships to steam ships, from cesspools to sanitary sewers, from traditional factories to mass production and from chemically cultivated food to organically grown produce. Key insights from these studies are the significance of niche-level processes (such as experimentation and higher-order learning); the coevolution of technologies, institutions, cultures and infrastructures; and the importance of interactions and timing of these different processes.

Socio-technical transitions are commonly understood to evolve slowly and, in accordance with what is referred to as the multi-level perspective
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(MLP), to occur across three levels: niche, regime and landscape (Geels, 2002). First, landscape developments occur at the scale of macroeconomics, cultural patterns and political relationships. Prevalent understandings of the linkages among global climate change and greenhouse gas emissions, future resource availability and human-environment interactions more generally constitute landscape-level considerations. Second, these evolutionary changes at the landscape level put pressure on incumbent regimes, but such stress is generally not sufficient to destabilize regime-scale actors who tend to have considerable capacity for resilience. Finally, socio-technical experiments and more expansive innovations gestate in niches as alternatives to the incumbent system of provision. These nascent technologies and practices could – if the incubated innovations were to be adopted on a sufficiently wide scale – mature to a point where they might eventually transform an existing socio-technical regime.

A transition to a new socio-technical regime becomes feasible if pressure from and opportunities within the landscape, along with internal fissures in the incumbent regime and new developments in niches, align so that the insurgent technologies and practices come to be regarded as more attractive than the prevailing alternatives (Geels and Schot, 2007). This process though is rarely rapid and numerous factors can intervene to refortify extant relationships and circumstances. Historical case analyses suggest that transitions evolve over a long period of time – one or two generations – and include the concomitant transformation of societal institutions, technologies and practices. It is however not clear if this protracted timeframe is generalizable over different sectors and for ongoing and future transitions.

Transition management is an applied variant of this more conceptual work on socio-technical transitions that actively aims to orient or steer ongoing processes of transformation toward socially desirable goals (including sustainability) (Rotmans et al., 2001; Loorbach, 2007). Proponents of this approach argue in favor of policy interventions to promote niche activities, where experimentation and learning can take place (Brown et al., 2003; Brown and Vergragt, 2008), by way of ‘strategic niche management’ (Kemp et al., 1998; Schot, 1998; Hoogma et al., 2002; Raven, 2005). Methods for improving the efficacy of niches have been described as ‘transition arenas.’ Related approaches are captured by the notion of ‘reflexive governance’ that entails conscious attempts to align landscape pressures on socio-technical regimes and niches to accelerate regime-level change (Voß et al., 2006; Murphy, 2007; Kemp and van Lente, 2011).

Much of the socio-technical transitions research – both historical and contemporary – has been conducted from the perspective of technological
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innovation and diffusion, emphasizing the coevolution of technologies, cultures, institutions and infrastructures in the emergence of new regimes. Although socio-technical transitions also implicate the demand side – predicated on consumer behaviors and consumption patterns – scholars and policy practitioners have not to date explored these dimensions in detail. In particular, research on socio-technical transitions, especially within the context of the MLP, has been mostly silent on the specific roles of consumers and their regularized daily practices. The economic and political dimensions of socio-technical transitions, both on the landscape and regime levels, have also received limited attention. Outstanding research questions include: What roles could consumers play in transition processes (for instance, by participating in transition arenas and socio-technical experiments)? How does demand for new products and services develop in niches and then upscale to the mainstream? What roles do civil society, economic considerations and deeply embedded cultural attitudes and practices have in fostering and facilitating transitions? Social practice theories, the third perspective taken up in this book, usefully engages with these issues.

Social Practice Theories

Social practice theories complement research on new economics and socio-technical transitions because this perspective focuses on the coevolution of technology and human behavior. The unit of analysis is on individual practices, as constituted in a social context (Shove, 2004; Hand et al., 2005; Kennedy and Krogman, 2008; Røpke, 2009). Social practice scholarship views consumers of goods and services (and the attendant use of resources) as practitioners immersed in the affairs of everyday life. Practices are the ways that people constitute the ordinary tasks of working, cooking, washing, socializing and relaxing. Moreover, most individuals typically regard themselves as practitioners engaged in the business of living, rather than as consumers of scarce commodities.

Technology can be an important driver in the rise and change of social practices. Research by Shove (2004) on evolving practices over the past few decades with respect to personal cleanliness and home cooking effectively illustrates this point. For instance, as technology made it easier to shower at home, people abandoned the less convenient custom of weekly bathing and also began to cleanse themselves more often. This change transformed collective ideas about personal hygiene and expected norms of cleanliness. The social practice of daily showering, in turn, had the effect of creating ‘bottlenecks’ in access to bathrooms among family members for which a commercially mediated answer has been the construction of
larger homes with a greater number of bathrooms (see also Quitzau and Røpke, 2008).

Developments in the kitchen offer other examples relevant to considering the growing demand for energy, water and materials by ordinary ‘consumers.’ During the past few decades, the prototypical kitchen has been transformed from a production center, with free-standing labor-saving appliances, to a large and comfortably appointed ‘living’ space where appliances are built in accordance with the latest fashions in interior design. An analogous story can be told about the evolving idea of indoor comfort. With technological developments in central heating and cooling, and based on scientific studies of what constitutes a comfortable ambient temperature, came the idea that indoor temperature should be fixed within a particular narrow range (69–72 °F, 20–22 °C) regardless of climate and season. Social practices for dressing and choosing various activities developed around this notion of comfort, and so have various institutional rules such as those mandated in many cities regarding minimum winter-time temperature in rental apartments, as well as expectations of building performance.

These illustrations highlight the strengths of looking at consumption from the perspective of social practice theories. First, they reveal that there is strong path-dependence in the emergence of ordinary social practices and that technology and social practices coevolve such that current practices appear normal and inevitable. Second, this work stresses the importance of attributing cultural meanings to everyday technologies in the evolution and stability of social practices. Shove (2012) notes, for example, that showering is now associated with freshness and cleanliness while bathing is part of a set of practices connected to relaxation. Third, social practice theories make it clear that education, outreach and incentives will have limited effect on people’s behaviors if they are determined by routine patterns of everyday life. Finally, this perspective shows that the coevolution of technology and social practices includes not only individual behaviors in a cultural context, but also the larger elements of socio-technical systems such as infrastructure and institutional rules. These insights were clearly presaged by the landmark study by Hughes (1983) showing how utility companies created demand for electricity by appealing to cultural attitudes, needs and expectations, and how growing demand, in turn, facilitated emergence of the infrastructure and the institutional rules governing it.

This latter observation is a promising point of departure for conceptually bridging the other perspectives highlighted in this book with social practice theories. This integration is still in its infancy. In particular, markets, economics and technological innovation and diffusion are not well incorporated into social practices approaches. Furthermore, social
practice theories have to date been less helpful in explaining how technology can influence the emergence of social practices that lead to reduced usage of constrained resources. Importantly, they have not to date provided ways out of current circumstances of ‘lock-in’ or shed light on the roles of markets or economic contexts in changing practices. If consumers are fixed in their habitual behavior, which is determined by the incumbent socio-technical regime, how does change occur? Studying the relationships spanning everyday practices, socio-technical systems, and the macroeconomics and political economy of consumption may offer a way out of this conundrum.

PASSIVE HOUSES AS AN INTEGRATIVE CASE STUDY

To illustrate the complementary analytical powers of our three theoretical perspectives – new economics, socio-technical transitions and social practices – we consider the case of an incipient shift from the current building-construction regime to one based on passive house technology. A passive house is a building that requires minimal external energy input, largely owing to holistic design that includes an extremely well-insulated building envelope, an innovative system of air circulation based on heat-exchange technologies, an appreciation of the importance of careful positioning with regard to the external environment and an emphasis on high-quality materials and construction techniques (see Klingenberg et al., 2009).

The reason for focusing on passive houses is that a putative transition in the types of structures presently being built in the United States and elsewhere touches in many interconnected ways on the main foci of the three perspectives: a change in the prevailing economic system, a transition of a dominant socio-technical system and a shift in routine social practices. Furthermore, buildings account for approximately one-third of the greenhouse gas emissions produced in most affluent countries and have other huge direct and indirect environmental impacts in terms of timber, plastics and minerals, and through their implications for transportation and mobility. The construction sector has moreover been during the post-World War II era one of the most reliable engines for generating employment and growing GDP in these countries (though the situation is obviously quite different in the aftermath of the Great Recession). And a home is a central anchor in people’s lives: an expression of their values, aspirations and social position; a determinant of access to education and public services; a lifetime financial investment of considerable consequence; and, at least until recently, a crucial source of financial security in old age.
The concept of the passive house was first introduced in Germany during the early 1990s and defined by the Passivhaus Institut as a residential structure that uses less than 15 kilowatt hours of energy per square meter (kWh/sq m) for heating (compared with approximately 220 kWh/sq m in customary construction). To achieve this stringent performance standard, passive houses entail different architectural, material and engineering strategies than conventional buildings, and may place new demands on occupants in terms of how they relate to the house as a technological artifact. Proponents of passive houses also encourage – for technical reasons as well as a matter of principle – a size not exceeding 500 square feet per person (sq ft pp) (compared with an average of 800 sq ft pp for the current middle-class ‘dream house’ in the United States (Wilson and Boehland, 2005), as well as site locations that promote higher density land development than is common in most contemporary suburban communities and alternatives to personal mobility based on the automobile.

It is reasonable to ask at this point how relevant this case is at a time when the housing sector in the United States and parts of Europe is in shambles, few new houses are being built, and more and more people are expected to forgo the prospect of home ownership. Doherty and Leinberger (2011) address this question with respect to the American context by noting that the baby-boom generation and its children (the so-called millennials or members of ‘Generation Y’ born between approximately 1977 and 1994) together comprise half of the American population. These two age cohorts are redefining their housing needs and will, over the next two decades, become a powerful driver for the ‘next real estate boom’ in the country. For different reasons – boomers are downsizing while Generation Y-ers are confronting rising energy and material costs, traffic congestion and personal costs of long commutes – these two demographic groups are looking for smaller homes located in walkable, transit-friendly, economically dynamic and job-rich areas (Glaeser, 2011; Cohen, 2012). According to recent surveys, 77 percent of millennials plan to live in city centers (Doherty and Leinberger, 2011), but housing in such places is at present unaffordable for most people. Over time, though, this demand will lead to new construction in cities and their proximate suburbs and to restructuring of more distant exurbs into more spatially compact and economically viable and culturally vibrant places (Dunham-Jones and Williamson, 2008).

Examples of the changing priorities for housing in the United States abound, and are not related to political ideology. In Denver, the values of homes in the car-dependent suburb of Highland Ranch dropped by half while those in the Lower Downtown Historic District (dubbed LoDo) have increased. In Maryland, suburban McMansions with vaulted ceilings and granite countertops are being converted into small apartments.
for the needy; locally financed public transit is emerging in improbable cities such as St Louis and Salt Lake City (Doherty and Leinberger, 2011). Foremost perhaps, a recently inspired cooperative movement in Cleveland is resulting in a remarkable – if long awaited – process of urban renewal (Alperovitz et al., 2009; Bond, 2012).

These changes will, of course, necessitate significant investments in new or retrofitted infrastructure – especially transportation – and require a radical shift in current policies that privilege the automobile as the primary means of personal mobility, but such changes are already in evidence. To be sure, numerous other policy adjustments will be needed over an extended period of time to bring this change to full fruition. But more to the point, the anticipated ‘next real estate boom’ will lead to new construction and create opportunities to replace current building technologies with drastically different ones. The shift from the presently dominant model for a single- or multi-family dwelling to this fundamentally different one is neither going to be easy nor assured because housing construction is a socio-technical system that fiercely resists change.

The remaining discussion on the passive house case is explored from the standpoint of each of the three perspectives pursued in this book (though in the interests of coherence in a slightly different order from the sequence above): socio-technical systems, social practices and new economics.

Socio-technical Transitions Perspective

There has been considerable progress over the past two decades in the design and implementation of passive houses. In 2011, 32 000 passive houses were reported worldwide, mostly in Germany and Austria, and the numbers have been increasing exponentially (Rosenthal, 2008; Zeller, 2010; Gregor, 2011). Advocates of passive houses – a minority among architects, building and materials scientists, engineers and homebuilders – regard such structures as a technical innovation that deserves wide adoption. Ornetzeder and Rohracher (2009) analyzed the adoption of passive houses in Austria as a socio-technical transition, and found that starting in the 1990s the number of passive houses in the country had been increasing at a rate of more than 40 percent per year. By 2010, about 25 percent of new houses in the leading Vorarlberg province met the passive house performance standard, making Austria the world leader in the per-capita number of structures of this type.

The two-decade process in Austria has gone through four distinct phases. During the first phase, the technical concept was defined and developed, championed (mostly in a bottom-up fashion) by innovators from the architectural and engineering professions.
The second phase was marked by the emergence of a community of practice in the country’s westernmost province of Vorarlberg. This process was driven and nurtured by Energieinstitut Vorarlberg, a local education and outreach organization with a mission to foster technological innovation and to disseminate knowledge. From a socio-technical transitions perspective, these developments can be seen as institutionalization of a bottom-up process and the emergence of a thriving niche. The community of practice grew over time to encompass not only technical innovators but also mainstream actors such as builders, developers, planners, building materials manufacturers and others. Moreover, because the emphasis was on building practical, high-quality houses for ordinary occupants, feedback from users was incorporated into evolving practices, sowing the seeds for eventual emergence of a market for passive houses.

The third phase entailed the diffusion of passive houses in Austria from niche toward mainstream through the nationally funded scaling up (in terms of magnitude, geographic reach and diversity of actors) of provincially based efforts. This process of transmission and dissemination of formal knowledge and accumulated experience contributed to improvements of the technology, the circulation of knowledge and the expansion of the community of practice.

Finally, in the fourth stage, the new socio-technical system started to stabilize as a result of government policies aimed at nurturing the niche-to-mainstream transition, including direct regulations, financial incentives, subsidies and other regulatory instruments (Krapmeier, 2012). For example, in Vorarlberg, all so-called social housing (similar to low-income housing in the United States) must meet the passive house standard while in Vienna, where developers compete fiercely for expensive permits to build on mostly municipally owned land, priority is given to low-energy buildings. All of these activities were fostered by landscape pressures: the threat of climate change, the quest for energy security and the advent of concern about peak oil. The emergence of an influential national interest group to disseminate the passive house concept through lobbying and outreach campaigns was a sign of maturation of the new socio-technical regime. And the increasing number of these structures, diffusion of knowledge and growing availability of materials have lowered the cost differential between a passive and conventional large occupancy building from about 15 percent only a few years ago to 5–8 percent at the time of this writing (Krapmeier, 2012).

The Austrian passive house case, analyzed through the lens of the MLP, highlights the complexity of the system, the spatial clustering of pre-niche activities and actors, the harmonization of bottom-up and top-down initiatives at different stages, the importance of government support...
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for small-scale experiments and learning, and the institutionalization of the innovation by strategic government policies and emerging interest groups. It also demonstrates the centrality of champions and the role that they can play in framing the issue at various stages and for different actors – for example, as cutting-edge innovation for early professional movers, as an expression of progress and environmental action for initial adopters and as a statement of progress for later adopters – and the relevance of user feedback in optimizing the technology and creating a market.

The Austrian example also contributes to our understanding of why the passive house niche in the United States is developing much more slowly (as of 2010 there were just 13 passive houses completed in the country, with approximately 130 more either under review or underway (Klingenberg et al., 2009). Some of the factors holding back construction of these homes are: the lack of market demand; the greater technical complexity (owing to the presence of eight different climatic zones); the sheer size of the country (which slows down the emergence of geographically clustered communities of practice); the absence of government support for research and development and small-scale experimentation (that inhibits the aggregation of proximate experts); the absence of supportive public policies; and the inability thus far to resolve conflicts with existing building codes.

The socio-technical transitions perspective concomitantly draws attention to important indicators of niche-level developments such as the institutionalization of various practices with respect to construction and performance and dissemination of knowledge. Accordingly, it merits observing that public subsidy programs are beginning to emerge in the United States on local and regional levels with Baltimore County (Maryland) providing but one illustrative example (Hindle, 2010; Weber, 2011).

More conceptually, using the socio-technical transitions perspective to understand the status of a putative new housing construction system in the United States elucidates the progress (and its absence) on the three levels: the niche in the country, as explained above, is still quite weak; the tensions in the incumbent system – such as questioning of the prevalent model of a ‘good life’ in the form of a large single-family suburban home requiring heavy energy inputs – has emerged only in the past few years; and the landscape pressures (such as demographic shifts or high energy prices) are only now beginning to garner attention in the housing market.

The analysis of the Austrian experience from a socio-technical transitions perspective also has limitations. For example, it does not enable us to understand why market demand developed earlier in Austria than elsewhere. Or, why the market for passive houses is so undeveloped in the United States, despite a very active community of practice. One might be
prone to ask whether there are opportunities to frame the passive house more appropriately and how it might be made more consistent with prevalent (and changing) conceptions of a ‘dream home’: one that is smaller, differently designed, less energy intensive, connected to an economically vibrant locale and within reach of vital services and amenities. These limitations stem from an emphasis in the socio-technical transitions perspective on the supply side of new regimes and from limited consideration of demand-side factors such as lifestyles, social practices and coevolutionary formulations of normal consumption, as well as a tendency to underplay the role of civil society and cultural trends.

Social Practice Theories Perspective

In the United States, nearly all passive houses built to date are free-standing, single-family suburban constructions. This mode of development is in marked contrast to Europe where most passive houses thus far built have been multi-family houses and institutional buildings. This distinction has implications for the lifestyles of the occupants. Inhabitants of apartments in a large passive house building are barely aware in their daily lives of the uniqueness of the building’s design. The situation is quite different in the case of a free-standing, single-family passive house. For one thing, in the absence of artificial heating and cooling, the interior temperature is not constant but rather varies with the external temperature and occupant behavior. Because interior thermal conditions are very sensitive to the level of physical activity undertaken by occupants, residents need to be more deliberate about their daily practices of cooking and entertaining. In addition, a passive house requires replacement of a gas-burning stove with an electric one to avoid air pollution in the tightly insulated structure. And simple acts such as making a pot of tea, using a hair dryer or taking a shower or a bath influence the indoor temperature, as does the presence of many people. Indoor cooking on hot summer days (which in a conventional house can be easily remedied by turning on an air conditioner) needs to be minimized. In short, when living in a passive house the social practices related to cooking, socializing and personal hygiene require recalibration. And the notion of a house inhabitant as a passive consumer of its technologies and amenities needs to be recast in favor of a more active producer-consumer (similar to the vision of a prosumer in the new economy).

The relationship with the outdoors also differs in a passive house from a conventional structure. Since the building is designed to maximize the use of natural light, occupants tend to be more aware of weather and lighting conditions. They open and close windows and shades more often to
adapt to external conditions. The large southern exposure windows that are typical in a passive house also encourage more connection with the outdoors. Some residents of passive houses note that they spend more time gazing out the windows into their backyards, watching nature and changing lights, and enjoying the experience of merging interior and exterior space. Under such circumstances, common notions of relaxation are likely to change.

There is also a push among passive house advocates to make the structure smaller than a customary home, both for technical reasons and as a matter of principle. This idea challenges the long-standing trend in the United States (but also prevalent elsewhere), one that has persisted for more than a half-century, toward larger suburban houses (from approximately 900 sq ft in 1950 to 2400 sq ft in 2010 (USCB, 2011; see also Diamond and Moezzi, 2004). On the one hand, a passive house may be viewed as unacceptable by many householders because of the tight relationship that customarily pertains among perceived levels of comfort, social status and home size. On the other hand, the ongoing post-2008 housing crisis has led to an apparent trend reversal. Between just 2009 and 2010 the average square footage of a new house actually declined by 100 sq ft and, in some communities, outsized homes with high cathedral ceilings are losing their appeal (Hurst, 2010).

Other emerging social practices may presently be influencing our notion of privacy and house design toward smaller spaces. New electronic personal devices give members of a household the capacity to share the same room while being in their own ‘private space’ and lessen the need for large, personally customized rooms outfitted with entertainment and communication equipment. Passive house design can respond to these new practices in ways that are perceived as gains rather than losses, which may increase the relative attractiveness of these homes. Further developments along these lines would have an effect on the home-furnishings industry, reversing the decades-long trend toward larger household accoutrements. In doing so, new furnishing designs and novel conceptions of comfort and elegance in suburban and urban interiors would converge.

In short, the development of a market for passive houses would likely be accompanied by changes in the ideals that have since World War II dominated conceptions of what constitutes a ‘dream house,’ and that process of evolution may be consistent with an already changing set of practices and sensibilities, including the demographically driven interest in urban lifestyle.
New Economics Perspective

Conventional wisdom places the cost of building a single-family suburban passive home at about 15 percent above traditional construction. However, these approximations do not include the extra time required by highly trained professionals who must work as a team with the homeowner to develop the design, to secure the necessary materials (many presently imported from Europe and Canada) and to build the structure. Inclusion of these expenses would create a greater differential between the construction of a conventional and a passive house. So far, at least in the United States, each passive house is a unique construct. Over time, with growing expertise and increasing demand, some aspects of design and construction could be streamlined in the future, but since passive houses must be adapted to their external surroundings, it may always be the case that some level of customization will be required. And that adds to the costs. To be affordable, a single-family suburban passive house may therefore need to be smaller in size and sited on a more modestly proportioned lot.

In the case of multi-family buildings, the differential in construction costs is much smaller: about 5–8 percent, and dropping. The customization and attendant additional expenses are less of an issue in a multi-family building as is the need to adjust to a more compact living space: both are accepted as part of an urban lifestyle. The value of an apartment in an urban passive structure would derive from its low operating costs, high-quality construction, aesthetic features such as large windows and interior design focused on multifunctionality in a compact space, all especially attractive for people with more leisure time but less discretionary income. For this reason, it is possible that in the future the concept of a passive house will diffuse into the mainstream in the form of an urban apartment located within reach of public transit and basic amenities. Stated differently, the socio-technical transition to passive houses may also be a socio-economic transition from suburban to urban living. This point brings us full circle to the forecasted ‘next real estate boom’ and its drivers (Doherty and Leinberger, 2011).

Would this socio-technical transition be consistent with, and facilitative of, the defining lifestyle characteristics of the ‘new economy’ as characterized by more leisure time, less discretionary consumption, reduced emphasis on material throughput as the key to well-being, greater grounding in local communities, more self-provisioning and emergent understandings of ‘prosperity’? Would it be consistent with its macroeconomic features, such as a shift from consumption-based growth to public investment, making distinctions between different types of growth and different types of socio-technical systems? The answer will partly depend on how
we frame this new technology. On the one hand, passive houses can be viewed as nothing more than an energy-efficient version of the current dominant building technology. In this framing, this development will be another case of ecological modernization, with minor cultural impact and the potential for perverse rebound effects. On the other hand, the community of practice emerging around the putative shift toward the passive house has an opportunity to rethink the design of these kinds of (very likely) urban dwellings, with an eye toward creating public spaces for civic engagement and informal economies, urban agriculture and other types of self and communal provisioning, and various modes of what has come to be known as ‘collaborative consumption.’ For the most part, these questions are still open. What is clear is that one cannot contemplate a regime shift toward passive houses without considering the broader social and economic context.

The passive house case provides a starting point for how in combination the three theoretical perspectives featured in this book – new economics, socio-technical transitions and social practices – can enrich our understanding of what is required to affect a regime shift from conventional home construction to an arguably more sustainable mode of development. It illustrates the roles of diverse actors – from innovators to local governments to citizen-consumers going about their daily lives, to urban planners and economic development specialists – in such a transition and the complex relationships among them. No single perspective alone can offer this level of explanatory power. We now turn our attention to a summary of the other contributions that comprise this volume.

ORGANIZATION OF THE BOOK

The chapters of the book are organized into three parts that correspond to the conceptual perspectives outlined above. The first part is devoted to the emergent field of new economics and brings together work on the macroeconomics and political economy of sustainable consumption. The second part comprises four contributions that draw on research on socio-technical transitions to explore opportunities for change in prevalent mobility and energy systems. The final part considers both conceptual and applied scholarship on social practice theories.

Part I of the book on new economics begins with a chapter by Jonathan M. Harris who makes an explicit case for a new macroeconomic theory, a need made only more urgent by the Great Recession and its aftermath. Since 2008, a political debate has raged calling for, on the one
hand, reassertion of Keynesian prescriptions or, on the other hand, belt-tightening austerity. Focusing specifically on the former set of strategies, Harris reminds us that Keynesianism is not about growth per se, but a broad set of societal objectives including the pursuit of full employment, the satisfying of basic needs, the allocation of sufficient resources for public investment and the need to ensure income equality. Harris notes that all of these objectives are compatible with sustainability and then proposes the formulation of a new economics that makes a sharp distinction between environmentally benign growth (for example, renewable energy, cultural activities) and environmentally problematic growth. He asserts that it will be necessary to redefine basic concepts such as consumption (to be more multidimensional), labor (to provide opportunities for reduced working hours) and capital (to distinguish between environmentally sustainable and unsustainable investments). A transition to a sustainable economy would proceed in two steps: an initial transition to sustainable technology during the first half of the twenty-first century driven by growth while a steady-state economy could become manifest during the second half of the century.

Inge Røpke then explores the connections between an emergent new economics and ecological macroeconomics and discusses the role of citizen-consumers in this framework. She identifies various interdependent problems, most notably ecological degradation, inequality and poverty, security and crises at various scales. Her narrative is illustrated with a critical discussion of a recent Danish report championing ‘green growth.’ Røpke observes that customary macroeconomics is mostly concerned with national and international developments and does not adequately consider global inequalities and the social and environmental costs of growth. For instance, GDP is widely recognized as an inadequate measure of progress and most macroeconomists fail to distinguish between the ‘financial’ economy, the ‘real’ economy in which ordinary people work and live, and the ‘real real’ economy of material and energy flows. Critical challenges include how to shift from consumption to investment, how to change consumers into prosumers and how to combine top-down policies with bottom-up experiments.

John Stutz’s chapter contributes to the new economics perspective by offering a prospective scenario for individual and societal well-being. He explores the conditions under which an envisioned future – referred to as the Better Life Approach (BLA) – could unfold. The BLA is predicated on higher productivity, more effective education, stable (or reduced) working hours (with wages that keep up with productivity growth), diminished economic volatility and less income inequality. Although these dimensions are not ordinarily formulated in ecological terms, if comprehensively
implemented, attention to such matters would yield manifold environmental benefits. While education is at the core of the BLA, curtailment of working hours, without concomitant income decline, and reductions of both economic volatility and income inequality could be attained through a combination of general insurance, tax policies and other forward-looking interventions.

Our treatment of new economics concludes with a chapter by Emanuel Ubert and Michael M. Bell who approach sustainable consumption from the standpoint of political economy. They identify four commonly used stances for studying consumption – neoclassical, competitive, sentimental and productivist. Each of these perspectives captures only a limited view of the consumption process and they contend that a more satisfactory approach is to look at the interdependencies between production and consumption: producers are dependent on the expenditures of worker-consumers but at the same time are under economic pressure to minimize the wages that they pay to the same worker-consumers. This paradox creates co-dependence and conflict between producers and consumers that Ubert and Bell refer to as the ‘wage-price gap.’ This gap is overcome by two types of ‘stretching.’ ‘Financial stretching’ occurs by accessing consumer credit and ‘ecological stretching’ takes place by depleting natural capital. Both forms of stretching are reliant on ‘consumption lines’ that discipline consumers in much the same way that producers are subject to the control of production lines.

Part II of the book comprises four chapters devoted to charting socio-technical transitions in the areas of mobility and energy. René Kemp and Harro van Lente argue that transformations toward sustainability actually entail two challenges: the need to impart long-term change to various technologies and infrastructures and the need to ensure that cultural values and consumer criteria evolve in a consistent direction. They relate the experience of two sustainability transitions in the Netherlands: the hygienic transition from 1870 through the 1930s and the waste management transition from 1970 through 2000. In both of these cases changing societal norms, cultural values and social practices were instrumental to the overall transition because they led to a shift in how the problem – and its solution – were framed and how the criteria for judging the success of a technological shift were defined. In contrast, the ongoing effort to transition toward a more sustainable mobility system has generated neither a shared vision nor much progress on how to gauge the societal suitability or desirability of such a system.

Sabine Hielscher, Gill Seyfang and Adrian Smith then discuss the linkages between strategic niche management and community initiatives premised on grassroots innovations. This perspective lays the groundwork
for analyzing the potential of local projects to catalyze changes in current energy systems. This is a particularly timely and topical endeavor as interest in such community-led initiatives has been growing in recent years among academics, nongovernmental organizations (NGOs) and policymakers. There has been considerable speculation about the potential of these grassroots innovations to prevail where traditional interventions have failed: changing social practices and attitudes toward consumption as well as creating market pull for low-carbon technologies.

The third contribution in this part is by David J. Hess who provocatively asserts that the sustainability transition has already failed, at least in terms of mitigating global climate change, and an adaptation transition is now underway. He claims that this breakdown is likely to have profound effects on the landscape level of the MLP because adaptation responses will seek to enhance systemic resilience and lead in turn to different design parameters. For instance, diversification of energy sources may imply a portfolio containing fossil fuels to augment resilience. But the relationship is not (or at least does not have to be) zero-sum. Hess describes ‘zones’ of compatibility and conflict between resilience and sustainability. He observes that efforts to reduce consumptive throughput are consistent with both objectives while efficient technologies dependent on just one resource input are likely inconsistent. At the household level, enhanced resilience would call for the accumulation of savings to weather difficult periods, as well as access to multiple sources of paid employment. Hess draws on examples from the building industry to demonstrate how distributed renewable energy and energy efficiency could simultaneously support both sustainability and resilience.

The fourth and final chapter of Part II is by Jennie C. Stephens and Stephen M. McCauley who combine insights from work on socio-technical transitions with theories of industrial cluster development. The planned concentration of firms in particularly dynamic industrial sectors has to date been a useful strategy for technological innovation in a number of places. The chapter provides a case study of Worcester, Massachusetts, a former manufacturing center with older building stock that has considerable potential for both sustainable energy production and energy conservation. Stephens and McCauley maintain that a focus on sustainable energy is likely to engage more heterogeneous constellations of stakeholders than is typically the case in cluster initiatives: educational institutions, social movement organizations, business leaders, local politicians and administrative staff of government agencies. The resultant aggregation is likely to bring together agents of grassroots social innovation with proponents of more traditional technology-policy priorities. While such diverse configurations hold some interesting opportunities, there is a strong
likelihood that these participants will harbor irreconcilable visions that could also undermine a transition.

Social practice theories are the third innovative perspective for sustainable consumption considered in this book. Bente Halkier begins Part III with a critical appraisal of dominant policy approaches for conceiving of sustainable lifestyles. Campaigns based on deficient public understanding of relevant issues, or that seek to customize communication to specific target groups, fail to engage with the complexities of everyday life. She traces the intellectual development of social practice theories and defines a practice as a set of interconnected elements comprising bodily and mental activities, things and their uses, background knowledge and know-how, states of emotion and motivational knowledge. More sustainable consumption is dependent on the organization and conditions associated with the relevant practices that constitute people’s ordinary experiences. Moreover, different practices invariably intersect and working toward less resource-intensive lifestyles entails developing different types of achievable practices and identifying their institutional, technological and social preconditions.

Gert Spaargaren then further examines the conceptual basis of social practices from the standpoint of reconciling the dichotomy between structure and agency and he addresses the question of how to develop governance capacity to facilitate sustainable lifestyles. This chapter also contends that most policy interventions have approached the consumer from an individualist perspective and have neglected the systemic aspects of consumption. In contrast, a systemic approach focused primarily on the supply side and technology obviates the potential of human agency. There is a need for a balanced way forward and practice theories offer a possible useful way forward because they understand social life as ‘a series of recursive practices carried out by knowledgeable and capable agents.’ The primary societal challenge is how to transition to low-impact practices and Spaargaren offers two suggestions: through technologies and objects or through culture, images, norms and ideas. The former artifactual alternative relies heavily on insights from STS while the ideational perspective remains substantially underdeveloped. He proceeds to highlight the relevance of ‘interaction rituals’ and ‘emotional energy’ as ways to comprehend how objects and human actions constitute one other. This contribution conceptualizes innovation as new, more sustainable ways of doing, saying, knowing and thinking and provides novel pathways for analyzing technologies, infrastructures, objects and products that coshape prevalent consumption routines.

The book’s final chapter by Emily Kennedy, Harvey Krahn and Naomi T. Krogman operationalizes the concept of social practices by designing
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and implementing a mixed-methods empirical study to explore how life choices – in this case of whether to live in an outlying suburb or a city center – influence transportation behavior. This work represents a pioneering attempt to use quantitative tools to examine social practices and how the location of one’s home shapes mobility. Kennedy and colleagues demonstrate the reciprocal influences surrounding social practices pertaining to residential choices. The chapter also reveals how these factors lead to the proximate aggregation of similarly minded individuals and how such propinquity can foster grassroots innovations that contribute to the emergence of new lifestyles.

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NOTES

1. For reviews of the drawbacks of singularly focusing on technological efficiency, see Huesemann (2006), Speth (2008), Jackson (2009) and Tukker et al. (2010).
2. A notable exception is McMeekin and Southerton (2012).
3. In the United States, the Passive House Institute US (PHIUS) has played a visible role in disseminating knowledge on the general concept and convening events and training programs. Also notable to varying degrees have been the activities of a number of other organizations including New York Passive House, the Northeast Sustainable Energy Association, the National Association of Homebuilders and the US Department of Energy.
4. Refer to David Owen (2011) for a comprehensive overview of rebound effects induced by efficiency improvements.

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