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ARTICLE

Achieving one-planet living through transitions in social practice: a case study of Dancing Rabbit Ecovillage

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The per capita resource consumption for inhabitants of Dancing Rabbit Ecovillage (DR) is less than ten percent of the average American in most major categories, approximating "one planet" living in a nation that contributes disproportionately to global resource consumption. This article examines DR's extraordinary energy and resource savings through the lens of social practice theory, which focuses on the meanings, competencies, and materials that individuals combine to form everyday practices. Participant observation and interviews with DR community members reveals how this rural ecovillage achieves remarkable energy and resource savings by transitioning away from the exclusive ownership of capital goods, investing in skills that facilitate the collective management of resources, and eliminating waste by taking advantage of locally available resources. Results suggest that local governments interested in sustainability and climate mitigation should encourage systems of collective resource management rather than maintaining a traditional focus on influencing changes in individual consumption choices.

KEYWORDS: social sustainability, social practice theory, ecovillage, intentional communities, one-planet living

Introduction

During the spring of 1992, a small group of environmentally conscious Stanford University undergraduates decided to form an "eco-town." After graduation, they pooled their resources, developed plans for a community that reflected their ideals, and began searching for land. By October of 1997 the six remaining founders had purchased a 280-acre former pig farm in rural Scotland County, Missouri. Eighteen years later, the population of Dancing Rabbit Ecovillage (DR) has grown by nearly tenfold, including 46 adults and 9 children.[1] The experimental community, which now includes inhabitants of diverse ages and family composition, demonstrates the possibilities and challenges of a lifestyle that consumes less than 10% of the energy and material resources of the average American in several major consumption categories. This level of resource savings approximates "one-planet" consumption (BCSD, 1993; Moore & Rees, 2013; Rees & Wackernagel, 1996), and may therefore serve as an existing model of an ecologically sustainable community in a nation that represents less than 4.5% of global population, but 13.7% of humanity's ecological footprint (WWF, 2014).[2]

While DR has received abundant media attention for its inspirational environmental and energy accomplishments, this ethnographic study highlights how understanding and deconstructing social practices—the day-to-day convergence of materials, meanings, and competencies—at DR is critical to understanding how "Rabbits" (a local term) survive, and by several accounts *thrive*, at uncommonly low levels of energy and material throughput.[3] As isolated units of analysis, the physical technologies, skills, and ambitious environmental goals at DR are neither novel nor inherently sustainable. Yet, when the ecovillage is viewed as a site for the production and integration (or "bundling" in the terminology of Shove et al., 2012) of social practices like car sharing, human-excrement composting, renewable electricity production, and natural building, two things become clear. First, choice-based models of environmental change employed implicitly or explicitly by local governments miss opportunities for transitioning to more sustainable consumption. Second, social competencies of interpersonal

[1] E-mail correspondence with Dancing Rabbit, May 14, 2015.

[2] An individual or community living at "one-planet" consumption levels consumes no more than their fair share of global biocapacity, which is approximately 1.7 global hectares per person (Moore & Rees, 2013). Calculating the precise per capita ecological footprint of DR Ecovillage is beyond the scope of this article, and even if such data were available both the community's ecological footprint and global biocapacity change from year to year. In this article, therefore, "one-planet" living is used as a symbol, and I have been careful to qualify DR's achievements as "approximating" one-planet living.

[3] See DR's media coverage page, which can be accessed at http://www.dancingrabbit.org/about-dancing-rabbit-ecovillage/press/media-coverage.

communication and conflict resolution are critical to sustainable consumption.

The 18-year existence of DR coincides with the diffusion of local plans and regulations for sustainable development (Beatley, 1995; Saha & Paterson, 2008) and climate action (Lutsey & Sperling, 2008; Wheeler, 2008) at multiple scales in the United States. Thousands of local officials, representing hundreds of millions of residents across the country, have signaled their commitment to lowering greenhouse-gas emissions by signing the Mayors Climate Protection Agreement (MCPA, n.d.). Similarly, more than 1,000 municipalities in the country have signed on as members of ICLEI-Local Governments for Sustainability, committing their jurisdictions to conducting at least a baseline inventory for sustainable development and/or climate action. Despite these encouraging trends, progress on the most substantial environmental issues has at best inched forward incrementally (Betsill & Bulkeley, 2007; Culotta et al., 2015; Lane, 2015; Wheeler, 2008). Multiple studies indicate that the association between verbal commitment to climate action and actual investments that reduce carbon emissions in the United States is weak or undetectable (Krause, 2011; Sharp et al., 2011; Wang, 2013). In recent years, state and local governments have even begun to block or abandon plans for sustainability and climate action in the face of ideological opposition (Frick et al., 2015; Hurley & Walker, 2004) and/or perceived ineffectiveness (Krause et al., 2015).

Sociologist Elizabeth Shove (2010) describes how climate action policies in the United Kingdom and the United States have adhered to what she labels an Attitude-Behavior-Choice (ABC) approach that assumes improving environmental outcomes is a matter of modifying individual preferences, and consequently consumption choices. If only we could change individuals' attitudes through information campaigns and economic incentives—follows the ABC model—then they would *choose* more environmentally benign behaviors, "doing their bit" to address major environmental challenges like climate change. This approach is evident in the popularity of incentive-based energy-efficiency standards for buildings and neighborhoods (Retzlaff, 2009; Sussman, 2008), Smart Growth programs that rely principally on financial "carrots" rather than regulatory "sticks" (Krueger & Gibbs, 2008; Lewis et al., 2009) and the prominence of "voluntary" policies for lowering local greenhouse-gas emissions (Wheeler, 2008: 488).

The ABC approach competes with perspectives that view reversing the most troubling environmental and ecosystem trends as an overhaul of entire moral paradigms (Rees, 1995) and/or socio-technical regime transition (Rotmans et al., 2001; Voss & Kemp, 2006). However, these ambitious visions lack a clear picture about the day-to-day realities that lie on the other side of a hypothetical socio-technical transition. In other words, we have relatively few satisfying examples of what sustainable consumption looks like in practice. This article takes advantage of the willing and ongoing experimentation at DR to sketch a picture of the daily practices associated with one version of sustainable community. While the radical socio-material practices at DR may not transplant directly into mainstream contexts, and DR community members are far from representative of individuals in the general public, extreme case studies like the description that follows "activate more actors and more basic mechanisms" than case studies that claim to be representative (Flyvbjerg, 2006: 289). In other words, the DR case study offers a window into an exceptional context that demonstrates the multidimensional challenges that mainstream communities may face if they aspire to accomplish savings of a similar magnitude. The example also contributes to existing social practice theories by offering an in-depth ethnographic account of sustainable practice.

The following section offers an overview of social practice theoretical approaches. The article then provides a background discussion of DR before diving into a detailed discussion of the community's systems of cooperative automobility and human-excrement reclamation. I argue that neither the preferences of individual "Rabbits," nor the strong community environmental rules, nor the materials employed can—as isolated units of analysis—explain the ecovillage's impressive achievements. Rather, interviews and participant observation reveal that active investments in interpersonal-communication and conflict-resolution skills are critical to lowering material and energy consumption. In the final sections, I reflect on implications for policy and planning outside this niche context.

Sustainability as Transitions in Social Practice

As discussed above, contemporary attempts to steer communities toward more sustainable consumption are dominated by a model of change that focuses primarily on transforming individual attitudes, and then behavior and choices. Social practice theory (SPT) has emerged in recent years as an alternative approach. Drawing heavily from the separate work of sociologists Anthony Giddens

(1986) and Pierre Bourdieu (1990), SPT shifts the ontological focus away from transforming the preferences of individuals, without devoting attention entirely to inescapable social structures (Shove & Walker, 2010). Instead, SPT highlights the production and reproduction of practices—mundane, everyday activities like driving a car, skateboarding, or showering—and the material and symbolic elements that individual "carriers" of practice combine to reproduce these practices every day (Reckwitz, 2002).

Shove et al. (2012) simplify older social practice models by dividing practices into three elements: 1) *materials* like physical artifacts, tools, and technologies; 2) *meanings* such as norms, rules, emotions, and symbols; and 3) *competencies* including skills, routines, and background knowledge. Individual practitioners tend to recombine these "ingredients" of social practice in their day-to-day lives (Shove & Walker, 2010), but individuals can reshape practices by integrating new materials, meanings, or competencies that circulate through space. For example, SPT understands the worldwide diffusion of mechanical air conditioning as inseparable from conceptions of luxury, health, and professional attire that have diffused internationally through specific economic sectors and industries (Shove et al., 2013). Similarly, the practice of daily showering has coevolved with perceptions of propriety, freshness, relaxation, and routines associated with the modern white-collar workday (Shove & Walker, 2010). These and other transitions in practice are difficult to explain by the changing preferences of individuals or the introduction of physical technology alone.

Watson (2012) proposes a "systems of practices" perspective that focuses on the overlapping structures that normalize and extend particular practices in favor of others. Automobility, for example, has come to dominate transportation in the United States and most of Europe due to decades of decisions that have extended the practice of driving while recruiting practitioners from other forms of mobility like walking and cycling. Automobiles-as-objects have not simply displaced bicycles, nor do individuals have an inherent desire to drive, but the practice of automobility has extended itself through interrelated changes in infrastructure, land use, safety, and the skills required to operate a vehicle. Transitioning away from automobility and its associated environmental ills, then, requires a series of policy decisions that reconfigure meanings, competencies, and materials associated with driving, and encourage momentum toward alternative modal options. For example, the city of Groningen in the Netherlands has increased the number of cyclists through decades of mutually reinforcing policies that encourage compact land use, restrict driving, and invest in cycling infrastructure (Watson, 2012). These policies have layered upon one another over many years and can be understood alongside an enduring cultural milestone of learning to ride a bicycle as a child in the country. Watson explains that understanding policy decisions as interventions in practice "broadens the suite of potential interventions to promote either recruitment or defection from a practice." In other words, policies that address major issues like energy consumption can engage new meanings and new skills that are typically overlooked as outside the realm of public policy. Shove et al. (2012), for example, discuss how a Japanese initiative to reduce indoor-energy consumption began by changing meanings of appropriate work attire that promoted lighter clothing (and less need for air conditioning) in the summer and heavier clothing (and less need for indoor heating) in the winter.

To date, most SPT adherents have employed historical case studies and secondary data sources to document changes in social practices. Given the incremental, typically long duration of transitions in practice, such an approach is appropriate. However, SPT stands to benefit from detailed, ethnographic explorations of the production and reproduction of social practices. As Tom Hargreaves (2011) explains, "Social practice theory directs research attention towards the practical accomplishment or 'doing' of everyday practices. Accordingly, it implies the use of methodological techniques capable of observing what actually happens in the performance of practice such as ethnography, rather than relying solely on the results of either questionnaire surveys or interviews as is typically the case within conventional approaches." The case study that follows employs an ethnographic approach to illustrate the details of day-to-day practices that allow for dramatically lower consumption at DR. The narrative begins with an overview of the community and continues into more specific practices.

Methods

Data collection for this case study began with the objective of explaining the extraordinary energy and materials savings at Dancing Rabbit, and narrowed to an analysis of daily social practices through participant observation and interviews with community members. Between the summers of 2010 and 2011, I spent a total of twelve weeks living and

working at DR, engaged in routines similar to ecovillage members. In the summer of 2010, I assisted on a small building project and in 2011 returned as an intern for a privately owned bed-and-breakfast inn. Like most full-time inhabitants of the ecovillage, I contributed to community-wide cleaning duties and attended regular community dinners and meetings. Although most days were structured by work obligations, I found time on weekends and off-hours to conduct semi-structured interviews with community members. Detailed memos about daily interactions supplemented my interviews.

Initial interviews (16 total) gauged members' day-to-day routines and how they differed from routines prior to taking up residence at DR. Questions probed 1) the events that led to the decision to move to the ecovillage; 2) a "typical day" in the community; 3) a "typical week"; 4) the community's role in the larger region; and 5) sources of success and concern at DR. Questions were designed to elicit candid stories about resource-consumption decisions at the ecovillage. Responses often led to lengthy discussions and follow-up questions that explored the challenges of cooperative resource management. Interviews typically lasted an hour and were recorded and transcribed. Interview participants were selected to achieve a balance in gender, age, and parental status, although women outnumbered men in the sample ten to six, as they constitute a larger proportion of the community overall. [4] Following Corbin & Strauss (2007), initial observations were tested against follow-up interviews, which challenged the data's internal consistency. I returned to DR about once every year for four years for brief visits, while keeping in touch with members over e-mail and social media.

The following section presents an overview of the environmental accomplishments of DR before describing the daily practices that enable the community to achieve impressive resource savings, and ultimately into the importance of social competencies to achieve these outcomes.

Background: Dancing Rabbit's Ecological Covenants

Since its founding in 1997, DR has operated under six "ecological covenants" that impose extraordinary restrictions upon inhabitants' consumption behavior. The covenants (see Table 1) change rarely, although the community can amend them with a consensus vote.[5] Members of DR agree that they will neither use personal motor vehicles nor keep them on the community's land; that they will avoid using fossil fuels for most purposes (cooking with propane is an exception); that they will follow organic gardening standards; that all electricity consumed on-site will be produced by "sustainable" non-fossil sources *or* that the community will offset any electricity it imports from the grid by returning clean electricity back; that all structural lumber will be harvested within the bioregion *or* acquired from recycled sources; and that they will reclaim all organic waste (including human excrement) on site.

Table 1 Dancing Rabbit Covenants

Covenant 1	DR members will not use personal motorized vehicles, or store them on DR property.
Covenant 2	At DR, fossil fuels will not be applied to the following uses: powering vehicles, space-heating and -cooling, refrigeration, and heating domestic water.
Covenant 3	All gardening, landscaping, horticulture, silviculture and agriculture conducted on DR property must conform to the standards as set by the Organic Crop Improvement Association (OCIA) for organic procedures and processing. In addition, no petrochemical biocides may be used or stored on DR property for household or other purposes.
Covenant 4	All electricity produced at Dancing Rabbit shall be from sustainable sources. Any electricity imported from off-site shall be balanced by DR exporting enough on site, sustainably generated electricity, to offset the imported electricity.
Covenant 5	No lumber harvested outside of the bioregion, excepting reused and reclaimed lumber, shall be used for construction at DR.
Covenant 6	Waste disposal systems at DR shall reclaim organic and recyclable materials.

[4] See Appendix A for a breakdown of gender, age, and parental status of interview subjects. The names and personal details of respondents have been modified to protect the identity of human research subjects.

[5] As a brief example, for thirteen years DR remained proudly disconnected from an external electricity source (e.g., it was "off the grid"). In 2010, however, the community amended its covenants to enable a grid connection (see Covenant #4 in Table 1), which allows the community's solar electricity cooperative to "borrow" electricity during dark winter months and return surplus electricity to the grid during summer months. The amendment did not receive unanimous approval as several members felt strongly that connecting to the grid would contradict a cornerstone of the community's mission and preclude individuals from closely monitoring their electricity consumption. These members articulated their disapproval of the amendment without blocking its passage, a move called "standing aside." Such a stance is not considered an impediment to a consensus decision.

DR members have developed a series of practices to live within these restrictions and work toward the community's mission to "create a society the size of a small town or village, made up of individuals and communities of various sizes and social structures, which allows and encourages its members to live sustainably."[6] The results of this experiment are encouraging. By the community's own calculations, inhabitants of DR consume less than 10% of the resources of the average American resident in categories like vehicles per person (7%), vehicle miles traveled per person (9%), motor-fuel use (7%), electricity use (7.5%), natural gas consumed (8%), water consumed (9%), and still substantially less than average in categories like pounds of household waste per person (26%), and square feet of housing per person (31%).[7]

As the following sections detail, achieving these savings—especially in a rural county with no public transportation—requires a level of skill and coordination that is remarkable in contemporary American society. According to the U.S. Census Bureau, 95.8% of all housing units in the country have their own "complete" kitchens, 97.5% have a refrigerator, 97.6% have a stove or cooking range, 78.6% have a washing machine, and 76.6% have a clothes dryer.[8] By contrast, DR meets many basic services through shared access to a limited number of appliances. Household kitchens, for example, are the exception rather than the norm at DR. One community member described how beginning her day by brushing her teeth in her own dwelling each morning was "a luxury." While individuals live in a variety of custom-built dwellings—ranging from a six-bedroom house to small individual cabins—households typically share cooking, dining, and gardening space in multiple food cooperatives. The entire community of 55 people shares two clothes washing machines that are part of a larger general-services cooperative, with zero clothes dryers on site. Many of these collectively-owned appliances reside inside the community's common house which includes a kitchen, offices, a small library, showers, sinks, a children's playroom, and a "great room" used for social events and meetings. Similarly, the four automobiles at DR are owned by a vehicle cooperative that members support by paying a flat rate proportional to the number of miles they drive. This per-mile fee covers fuel, maintenance, and insurance. Electricity in the community is generated almost exclusively by solar photovoltaic panels and delivered on a micro-grid maintained by a community-wide cooperative called Better Energy for Dancing Rabbit (BEDR). Services like Internet, landline telephone, health insurance, and human-excrement recycling (called "humanure") are all managed by cooperatives as well.

This type of coordination requires that individuals commit to deliberate and ongoing skills development, as almost all inhabitants have migrated from settings in which consumption decisions occur at the household or individual scale. Shared ownership of everyday infrastructure reduces the individual dollar cost for basic services, but individuals also "pay" through investments in skills and routines that appear cumbersome to an uninitiated observer. These practices are critical for coping with the conflict that coincides with shared ownership of resources. After elaborating on two specific practices below, this article discusses how transitioning to low-consumption practices involves changes in meaning, skills, and technologies rather than attitudes, behaviors, and choices, as is typical at the municipal scale.

Collective Automobility: From "Individualized Transport" to "Community Infrastructure"

As discussed above, Rabbits navigate their rural surroundings with a small fleet of four cooperatively-owned vehicles: three sedans and a pickup truck. The DR community is situated two miles from the small town of Rutledge (population 106) and about thirteen miles from the county seat of Memphis (population 1,822), but DR's location offers few convenient employment opportunities. The nearest metropolitan center, Iowa City, is 125 miles to the north. Fortunately, DR members have found ways to subsist with relatively little cash income. What money they have, they typically earn through small online businesses and local enterprises that require minimal travel. One particularly entrepreneurial member explained, "I have ten jobs," including two online-clothing businesses and multiple small remunerated

[6] The DR mission statement is available at http://www.dancingrabbit.org/about-dancing-rabbit-ecovillage/vision/mission-statement. The DR website clarifies that "sustainably" means, "[i]n such a manner that, within the defined area, no resources are consumed faster than their natural replenishment, and the enclosed system can continue indefinitely without degradation of its internal resource base or the standard of living of the people and the rest of the ecosystem within it, and without contributing to the non-sustainability of ecosystems outside."

[7] These data, including explanations about calculation methods, can be accessed at http://www.dancingrabbit.org/resource-use-average-american-vs-dancing-rabbit-2011.

[8] Table C-03-AH, American Housing Survey. Available at http://www.census.gov/programs-surveys/ahs/data/2013/national-summary-report-and-tables---ahs-2013.html.

duties inside the community. One couple started the Milkweed Mercantile Eco Bed 'n' Breakfast, where guests stay and attend workshops ranging from food canning to straw-bale construction. Two women have started a regional midwifery business that requires only intermittent travel outside the ecovillage. Several members have drawn from their experience building their own homes to start independent design-build companies, which also offer temporary work to other members and residents.[9] Other individuals have founded small web-design and online-marketing businesses that they operate from inside the community.

While DR members reduce commuting trips by earning income onsite, they still travel by automobile to nearby towns to purchase building supplies, borrow library books, shop for clothing, access schooling and medical appointments, see movies, among other reasons. For these trips, automobiles are the most practical option. Whereas car use in the United States is typically an act of individual discretion, the Dancing Rabbit Vehicle Cooperative (DRVC) approaches vehicle use as a social act that begins with the exchange of information about the timing and destination of each trip. Members of DRVC can reserve a car at any point during the week by indicating the departure date, time, destination, and estimated return time on a clipboard stored in the common house. Reservations are read aloud at a weekly meeting called the "WIP" (week-in-preview), attended by most of the community. The WIP allows information exchange that facilitates shared trips, which further reduces vehicle-miles traveled. As one member named Oren explains,

> Often we'll find out [at the WIP meeting] if someone is going into town on a certain day. You might call the hardware store and say I need, this, this, and this, pay for it over the phone and have that other person pick it up when they're in town, and I'll do that for others.

Another member explained how she had recently relied on a neighbor to return a book to the county's public library. In exchange for such services, individuals can share some of the per-mile cost of the trip or return the favor later. The system appears to serve the community well. As discussed above, the average DR member drives 9% the number of miles and consumes 7% the volume of motor fuel as the average American motorist. Oren continues,

> [W]hat a relief it is to go from having to drive everywhere [prior to living at DR] to, ironically enough, being here practically in the middle of nowhere where you'd think you have to drive for anything and I get in my car once every few weeks…And there are days when [the cars] don't get used.

Of course, such a system is not immune to conflict. Decisions about maintenance and insurance typically made by households as isolated units are subject to a greater variety of demands when vehicles are owned cooperatively. During my brief residence in the community, members of the vehicle cooperative were struggling to decide whether and how it should accept rate increases brought on by inexperienced drivers or members with a poor driving record. The issue emerged as a teen raised in the community approached driving age and wished to join the vehicle cooperative. Was the cooperative willing to pay for the large and imminent insurance-rate increases as a consequence of a new teenage member? Should the teen (or his parents) have to pay a higher rate, or should all members of the cooperative absorb the more expensive rate?

Addressing this conflict involved a series of highly structured meetings. At one session, the conversation began with an introduction from several appointed "facilitators"—community members trained to summarize, steer, and set the ground rules for discussion. The facilitators of this particular meeting spent the first twenty minutes "filtering" the discussion, having spent the previous week speaking one-on-one with different stakeholders, and began by admitting that they were themselves "exhausted" from the process. The meeting touched on a large number of topics: insurance rates, the neurological development of teenage drivers, different child-rearing philosophies, intergenerational justice, interpersonal tensions, automobile culture, and even the morality of insurance. Advocates of each perspective provided passionate and personal pleas. At one point, a father entrenched strongly at one extreme of the argument repeated, almost verbatim, the perspective of an individual with the opposing opinion. Such "reflection" is a critical element of nonviolent communication (a technique described

[9] At DR there is an important distinction between "members" and "residents." Members are relatively permanent inhabitants. They can both lease land and build permanent structures it. Members have also pledged to follow the community's ecological covenants. To become a member, individuals must live for at least six months at DR as a "resident," and complete an interview process before being accepted as a member. Residents can lease land, but cannot build permanent structures it. Both members and residents can subscribe to any of the community's cooperatives.

below), and it ensures that discussants listen and know they are heard.

The community did not resolve this dilemma by the end of the ninety-minute meeting, and would continue to discuss the topic for over a year.[10] Yet even in the midst of an emotional debate, the gathering concluded with a reflective dialogue about the meeting itself. Such reflection is a routine fixture in important meetings at DR, but in a mainstream municipal hearing such an undertaking might seem bizarre. Open and emotional self-expression and reflexivity is discouraged in mainstream public hearings, which have received criticism for their intimidating, expert-driven, and unidirectional dialogue (Halvorsen, 2001; Innes & Booher, 2004; Lowry et al., 1997).

Managing Excrement: From "Waste Removal" to "Nutrient Reclamation"

Another extraordinary resource-saving practice at DR involves the recycling of human excrement through a network of five-gallon buckets called "humanure" (human plus manure), or the "humey" system. In a study of indoor-water consumption at twelve different sites around the United States, (Mayer et al., 1999) estimated that the average individual uses 18.5 gallons of water per day for flushing toilets. While federal regulations that mandate more water-efficient toilets have likely lowered this figure in recent years, DR members have effectively eliminated the consumption of potable water for sanitation by composting solid and liquid excrement. This community-wide system transforms the acts of urination and defecation from "waste removal" to "reclamation," and involves a substantially different routine than what is customary in contemporary water closets. A "humey" (the alternative word for "toilet") is simply a five-gallon bucket capped with a typical toilet seat. Like mainstream toilets, humeys are enclosed in indoor stalls, often with the bucket hidden inside a wooden fixture. Alongside the humey bucket is typically another bucket with wood shavings or sawdust and a plastic scoop. As one member explained, "After you make your *contribution* [emphasis added], you cover it with sawdust." The sawdust works to mask the odor and jumpstart the composting process. Toilet paper is deposited directly in the humey bucket as well.

When humey buckets are nearly full, they are covered with a tight-fitting lid and placed in a designated outdoor spot to await a weekly pickup. Every member, resident, and visitor must contribute labor, or "humey duty," by collecting the buckets in a wheelbarrow, depositing the excrement in designated humanure-compost bins, rinsing the buckets (a marginal use of potable water), and returning them to their origin. The whole process takes a few hours to complete. Depending on the specific humeys to which individuals subscribe, they complete "humey duty" as little as once a year and no more than once a month. The individuals responsible for humey duty in any given week receive a reminder at the weekly WIP. Humanure compost is kept separate from food scraps and other organic compost in the community because it takes more time to decompose completely. After two years, however, the compost is safe to distribute for application on the community's fruit trees and ornamental plants.[11] The entire system helps Rabbits achieve their obligation to reclaim all organic waste onsite (Covenant #6) and offers an organic fertilizer that allows the community to enhance local soils without resorting to synthetic chemicals (Covenant #3).

Discussion: New Meanings, New Skills, New Materials

It is clear from observing practices of collective automobility and excrement reclamation that accomplishing these resource-saving practices involves transitions in the "ingredients" of social practice—in meanings, competencies, and materials. These changes transcend the traditional ABC model of change typical in the realm of public policy.

Transition in Meanings

The impressive savings of DRs in vehicle-miles traveled and volume of fuel consumed cannot be explained by individuals willingly suppressing their use of a vehicle or choosing an alternative mode of transportation. DR's covenants do not restrict driving *per se;* rather, they forbid individually owned vehicles onsite. As a consequence, DR members have accepted automobiles as components of a community-scale transportation system, signifying an important shift in their *meaning*. Since all users own and manage the system, and pay by the mile, it is in everyone's best interest to limit total mileage by

[10] The vehicle cooperative ultimately resolved to switch from a "family" to a "commercial fleet" insurance plan, which is less sensitive to the age of drivers. Premiums for DRVC increased $100 per year, rather than $8,000, as was projected with the family plan.

[11]. While properly composted humanure is theoretically as safe as commercial fertilizer, the community applies it conservatively, avoiding application with food that comes in direct contact with what people put in their mouths.

"sharing" trips. One casualty of this transportation system, however, is the symbolic "freedom of the road" upheld as a right-of-passage to young Americans throughout the twentieth century (Jackson 1985). The personal automobile emerged from a sports-and-leisure niche in the United States (Geels 2005), so a pivot away from these historical roots is significant, although in parallel with nationwide decline in enthusiasm about driving (Delbosc 2016). The DR automobile cooperative also demands that individuals relinquish some privacy that exclusive car ownership generally affords. While revealing the duration and destination of car trips is meant primarily to improve the efficiency of use, it also requires a level of transparency uncommon in the mainstream.

The humanure system is also founded on a reinterpretation of the *meaning* of human excrement, from "waste" that is typically flushed away to a "contribution" managed and reclaimed for agricultural purposes. Individuals in developed countries learn from an early age that they can simply and permanently separate themselves from their excrement with the flick of a lever or push of a button and no shortage of technologies have emerged to improve the efficiency of a toilet flush. Yet by inverting the *meaning* of the act of urination and defecation, DR undermines the practice of "flushing" completely.

Transition in Competencies

Individuals also invest time developing *competencies* to manage collectively owned resources and resolve inevitable conflicts. Both car sharing and excrement reclamation at DR require an atypical level of scheduling and interpersonal transparency. These social competencies prove useful far beyond the vehicle cooperative or the humanure system, and are worth discussing in some detail.

A surprising portion of day-to-day life at DR is devoted to maintaining interpersonal relationships. The schedules of members and residents are filled with regular "check-ins," "co-counseling" sessions, women's groups, men's groups, and other meetings with the express or ancillary purpose of supporting friends and neighbors emotionally. A "check-in," for example, is a formal technique used in the ecovillage to increase empathy under challenging circumstances. Different individuals practice check-ins differently, but one typical version invites people to verbalize *p*hysical, *i*ntellectual, *e*motional, and *s*piritual needs ("PIES"), without time restrictions or interruptions. Some individuals practice check-ins only as needed, and others schedule regular check-ins with romantic partners and co-workers. These practices create space for emotional transparency and allow community members to isolate interpersonal disputes from day-to-day tasks integral to community functioning. One member found such transparency refreshing when he moved to DR.

> If somebody was upset, they didn't stuff it. It came out. They'd show it, and it was dealt with. It was okay to say, "Y'know I understand that you're in a hurry or whatever, but this just really caught me the wrong way and I'm feeling a little upset about it, and so, I'm hoping that maybe you'll think about that before you do it again." It was powerful.

Emotional transparency is enhanced by adherence to nonviolent communication (NVC), a technique that most Rabbits train themselves to use when addressing concerns with others. Perhaps surprisingly, an individual employing NVC begins by observing and articulating her own needs, and how a particular action has affected her feelings. Explains Rosenberg (2003), "NVC guides us in reframing how we express ourselves and hear others. Instead of habitual, automatic response, our words become conscious responses based firmly on awareness of what we are perceiving, feeling, and wanting." One interviewee explained that NVC was

> [R]eally key in terms of getting along with people in such close proximity and in terms of, like, dealing with your own [problems] which you also need to do to get along with people. It's not just listening to other people; it's also having to listen to yourself in a deeper way.

A short anecdote illustrates how one member used NVC to address a violation of her personal living space. In the summer of 2010, a veteran member, Shirley, left her home under the temporary care of a young resident while undergoing medical treatment. When she returned, she found her self-built house in disarray. The week prior, a group of young residents and interns—this author included—had taken advantage of the empty space for a small gathering and neglected to clean up the mess.

At the first community meeting after Shirley's return, she announced that she was "very saddened" to arrive home and find empty bottles and dirty dishes all over her house. She explained that she "trusted" we would take care in her absence and that

she expected future visitors to show respect for her home as if it were their own. Her message was short, clear, and extremely powerful. Instead of accusing or blaming, her speech focused on how the event affected *her*. We had betrayed her trust and invoked sadness in her. It was a situation I wanted very much to remedy, and I worked consciously to respect individuals' space in the subsequent weeks. The member's choice to express her own emotions invited the "offenders" an opportunity to rectify the situation without feeling attacked or damaged.

Transition in Materials

Low-consumption practices at DR also involve alternative materials, tools, and technologies. Encouragingly, however, all physical technology is either readily available for retail purchase or extracted from DR's property. Transitions in meanings and competencies discussed above position DR members to achieve their environmental goals without having to import costly new technologies. For example, Covenant #5 requires use of only recycled lumber or wood products sourced within the bioregion. As a consequence, Rabbits have reclaimed lumber from abandoned barn structures throughout depopulating northeast Missouri. Members also take advantage of locally-sourced straw bales (a waste product of wheat) to insulate their dwellings. Covenant #4 restricts electricity consumption to "sustainable" sources, which members interpret as solar- and wind-generated electricity. In the community's first thirteen years, members relied on multiple individual solar photovoltaic and micro-wind systems. In recent years, however, DR has received of state and federal subsidies to establish a community-wide solar-energy cooperative and micro-grid, which saves individuals the upfront cost of energy infrastructure and batteries.

The DRVC has taken advantage of the community's solar-energy cooperative to power its newest vehicle with electricity generated onsite, while previously DR has deliberately chosen small, fuel-efficient vehicles to save on the cost and quantity of fuel consumed. Multiple case studies in the social practice theory literature (Watson, 2012; Spotswood et al., 2015) focus upon transitions in practice that involve the displacement of one transportation mode (e.g., automobiles) for another (e.g., bicycles), yet the DR case study shows how a transition away from the environmental ills of automobiles is possible without eliminating automobiles per se. This is an encouraging finding for communities that have invested for many years in vehicular infrastructure. Rural communities and those without the financial capital to install new public transit infrastructure may still find ways to achieve climate-action goals by encouraging shared-access systems that simultaneously lower costs and reduce road congestion.

The practice of excrement reclamation clearly employs new materials, including five-gallon buckets, sawdust, compost piles, and wheelbarrows, much of which is recycled from construction initiatives in the ecovillage. Excrement itself is also reframed as a new type of "material" that can be applied in a new context and used in lieu of petrochemical fertilizers imported from far away.

Conclusion

It is perhaps unreasonable to expect urban and suburban jurisdictions to adopt DR's exact practices which have evolved to fit a specific context and community mission. The ecovillage members unite ideologically around sustainable living and they agree to covenants exceptional in the United States. DR is also a small community in a rural region with limited land-use regulations or legal constraints on building design or materials. Yet the DR case study reveals a blind spot in contemporary sustainable development and greenhouse gas-reduction efforts which have both emerged as mainstream undertakings in recent decades (Lutsey & Sperling, 2008; Saha & Paterson, 2008). Municipalities tend to initiate the climate action-planning process by reducing emissions from municipal operations, with the intention of modeling smart practices to the community at large (Sussman, 2008; Wheeler, 2008). Cities and other local and regional governments invest in fuel-efficient vehicles, increase their renewable energy portfolios, replace aging infrastructure, and improve public transportation options, with the expectation that the private sector will follow suit. When municipalities use public policy to extend climate-action efforts beyond their own operations, they tend to focus on changing individual attitudes, behaviors, and choices without challenging systems of exclusive ownership that render even successful climate action incremental (Shove 2010).

The DR ecovillage, as viewed through the lens of social practice theory, reveals the possibility of incredible environmental and economic savings by 1) transforming individual and household practices into collectively managed community systems; 2) investing in interpersonal communication skills that help guide collective management processes; and 3)

taking advantage of readily available, locally sourced materials that might otherwise be considered "waste." Similar practices are not difficult to imagine in "mainstream" urban settings. Because of a barrage of new mobile applications, an emerging collaborative consumption movement is allowing individuals worldwide to share access to goods and services without necessarily owning them exclusively (Botsman & Rogers, 2010; Belk, 2014). Private and nonprofit initiatives like car sharing (Shaheen et al., 2009; Shaheen & Cohen, 2013), bicycle sharing (Shaheen et al., 2010), cohousing (Williams, 2008; McCamant & Durrett, 2011), and co-working (Spinuzzi, 2012) allow individuals to access goods and spaces without the expense or time commitment of exclusive ownership. Other peer-to-peer applications like Couchsurfing and Neighborgoods allow shared access to living spaces and household goods for free, reducing idle capacity and landfill waste, respectively (Botsman & Rogers, 2010).[12] Local governments can assist these initiatives by reforming regulatory barriers and/or encouraging shared-access services in planning documents.

The DR ecovillage pushes one step beyond private and nonprofit "collaborative consumption" initiatives by investing in social skills that allow individuals to work productively through conflict, facilitating democratic management of limited resources. Its members have chosen to live in an intentional community where shared-access resources are the rule. The skills necessary to function in such a setting are bound to increase in importance outside the ecovillage context as growing urban populations confront unprecedented environmental and resources shocks. Skills like NVC have already established a foothold in other applied social science fields like public education (Rosenberg, 2003a), criminal justice (Marlow et al., 2012), and nursing (Nosek, 2012). It is increasingly common for American municipalities and public libraries to sponsor home-maintenance workshops that help homeowners save on electricity and water bills. The DR case suggests that local governments may benefit from investing in social skills like NVC that help residents work productively through challenging public debates about common resources. Watson (2012) illustrates that "transitions in practice" begin when public policy extends certain practices over others through small, yet mutually reinforcing, steps. Local governments can begin to model NVC and facilitated conflict resolution as part of their own decision-making processes, providing a first step toward low-consumption systems at the local scale. To the extent that conflicting values and competing demands are inherent in all sectors of democratic decision making, DR's communication models offer local planners and elected officials tools to navigate through myriad conflicts including, but not limited to, social equity, economic development, public safety, and land use.

Of course, DR's experiment is not perfect. Some interpersonal conflicts endure for years despite earnest efforts to work through them, and every year some members depart in the face of irresolvable problems. Like any community, the ecovillage's residents cope with emotional fatigue, isolation, and power imbalances. Over nearly two decades, its specific practices have evolved as new meanings, competencies, and materials circulate within a dynamic population. Likewise, transitions outside the ecovillage context are unlikely in practice to resolve issues of resource consumption completely or permanently. New meanings, competencies, and materials will continue to challenge or reinforce old practices. Yet DR illustrates that radically low-consumption, low-waste living is possible without abandoning democracy or relying on hyper-sophisticated (and necessarily undemocratic) technologies. The potential for sustainable living, then, resides in human cooperation and empathy, which can improve with practice.

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[12] For details on Couchsurfing, see http://www.couchsurfing.com and for information on Neighborgoods refer to http://ww.neighborgoods.net.

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Appendix A: Interview subjects, gender, age, and parental status

ID#	GENDER	AGE	PARENTAL STATUS
1	Female	33	yes
2	Male	40	yes
3	Male	57	yes
4	Female	26	no
5	Female	41	yes
6	Female	27	no
7	Female	37	yes
8	Male	27	no
9	Female	36	no
10	Female	58	yes
11	Female	26	no
12	Male	61	no
13	Female	55	no
14	Male	35	yes
15	Male	40	no
16	Female	35	yes

Males (n) = 6
Females (n) = 10
Average age = 39.6 years
Parents (n) = 8
Non-parents (n) = 8