THE ROAD AHEAD: AMERICAN AUTOMOBILITY AND

THE POLITICS OF THE FUTURE

By

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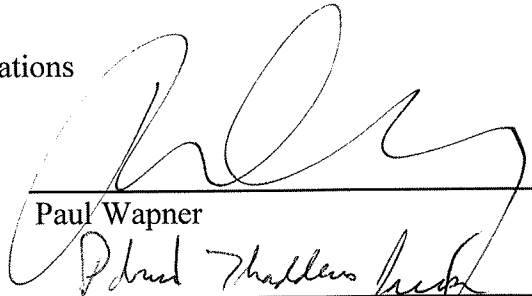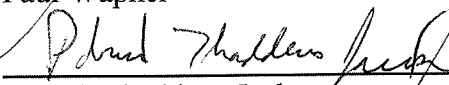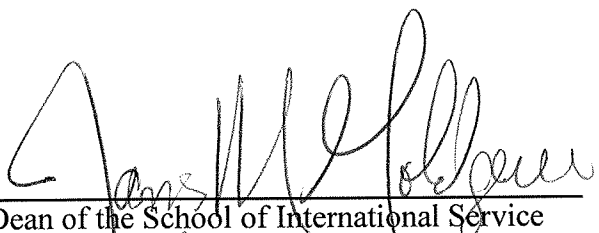
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For my dad: petroleum engineer, nature-lover, and safe driver.

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ABSTRACT

How does the United States envision the future of automobility – the autonomous

mobility made possible by motor vehicles – in the context of global climate change and resource

depletion? This dissertation examines official representations of America's mobility future as

articulated in texts produced by the advanced vehicle research programs of the US Department of

Energy (DOE); the smart growth initiatives of the Department of Transportation (DOT) and

Environmental Protection Agency (EPA); and the writings of Transition US, a part of the

broader transnational grassroots Transition Movement. Using discourse analysis, the dissertation

investigates how, in narrating the future of the automobile in America, these texts perform

political work: producing distinct forms of subjecthood and legitimating a range of actions in the

present. The findings indicate that automobility's dominance of the American imagination is

being unsettled as discourse about the future of the automobile fragments into three narratives.

One narrative envisions technological acceleration into a future where climate change is

manageable and where Americans remain highly mobile, autonomous, driver-consumers. One

sees the future as an opportunity to repair the social and environmental damage wrought by 20th-

century automobility by transforming the built environment to resemble the pre-automobile

landscape, thereby recovering Americans' latent social nature and affinity for neighborhood. The

third expects the inevitable end of the automobile age in the face of runaway climate change and

peak oil; it sees this radical discontinuity as an opportunity for human adaptability and

community resilience. In each narrative, expectations about what can and should happen derive

from irreconcilable core assumptions about human nature and how much of the world is in

human hands. As long as these core assumptions remain contested, we can expect to see the

American imagination remain unsettled.

ACKNOWLEDGMENTS

Many thanks also go to my sisters. To Trish, for her understanding of just how hard writing a dissertation can be, her support through the hard bits, and her joy in the good bits. To Molly, for her example of hard work, heart, and faith in the future. I cannot thank my husband, Aaron, enough, for his rock-like support and willingness to talk through or read over every prospectus draft, every conference paper, every abstract, every chapter conclusion, every everything I ever asked him to. His analytical mind and his editor's eye have improved my work at each step. I should thank our twins, too, whose imminent arrival in the world has provided very compelling motivation to finish. Finally, my mom and dad deserve endless thanks, of course, for all they've done for me. But they also deserve thanks because, in a way that I still can't quite articulate, their unique environmental ethic – which manages to combine Houstonian pragmatism with a world-traveller's breadth of perspective, an openness of mind, and a deep sense of ecological care – has inspired and guided this project from the beginning.

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CHAPTER 1

INTRODUCTION

"I agree that man is preeminently a creative animal, predestined to consciously strive towards a goal, and to engage in engineering, that is, eternally and incessantly, to build new roads, wherever they may lead…"

– Marshall Berman, *All That Is Solid Melts into Air: The Experience of Modernity*

In the above quote, Berman reflects on the human impulse not only follow roads, but to build them. He hints that humans are not content to continue re-treading the same routes but seek new possibilities for human striving and achievement. He suggests that there is a human impulse to strike out for novel and better territory. Whether this impulse is predestined, eternal, or incessant is open to question; however, what seems certain is that in the 21st century, this impulse to "build roads" towards the novel and unknown is at the heart of environmental politics. Environmentalism, as a sensibility and social movement, casts doubts about the ability – and the ethical right – to push every horizon. Humanity's influence over the environment seems to point both to the necessity to "build new roads" (given where our current roads have taken us) and yet skepticism about the ability of humans to successfully "engage in engineering" a better world.

To "build new roads, wherever they may lead" is not merely an ethical question in an era of climate change. It is also a political question; it involves the exertion of power and a certain degree of control. Roads – again, both metaphorical and literal – exert influence. Roads pattern one's movement forward. Unlike finding one's own path through a wilderness, building a new road makes it easier for others to follow. Whereas forging a path can mean exploration, building a road means paving the way for others. It means exerting influence on where others can or cannot easily go in the future. A road thus exerts power in its effects.

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What's more, unlike a path, which can perhaps emerge unintentionally, a road is *built*. It is designed, constructed, or (as Berman highlights) engineered into being. In the modern era, both literal and metaphorical road-building has meant expertise. Literally speaking, to build a good and long-lasting road requires knowledge – both technical knowledge (e.g. what processes must happen to construct the road) and social knowledge (e.g. how people are likely to act on that road). The road, by supplying a public good, justifies the proliferation of such knowledge and the power it exerts in the landscape. At the same time, the building of a road subtly marks a difference between those who are considered capable of building a road – experts – and those who use the road. Taking this back to the metaphorical level, one could say that building new roads in the modern era – planning new futures – has meant a similar justification and deployment of expertise. If to build a road is "to consciously strive towards a goal," then in the modern era, state authority has justified itself in terms of conscious striving for the new: Though the future is by definition uncertain, the exercise of state power and the expansion of expertise in the 20th century have been justified by the promise that such authority holds the power to make the future better. The state has claimed for itself the ability to make the future. What this means in turn is that when an actor is considered to have particularly authoritative knowledge (scientific knowledge in particular) of what the future might hold or if they have training in particular technological processes (advanced automotive engineering), then they hold a degree of control over the landscape, and thus over those who are mere dwellers in the landscape. There is a relation of power between those who are considered capable of making the future and those who are expected to follow along.

This dissertation is about forward motion, both literal and metaphorical. It is about how we physically move through the world; it is specifically about American automobility, i.e. the

autonomous movement made possible by motor vehicles. It's entitled "The Road Ahead"

because it is also about how we move forward in time – how we collectively envision the future,

how we find our way in a world that is changing around us. The idea of a road ahead suggests

that we move through time knowing, more or less, in what direction we're headed. It suggests

that, even if we can't see all the way to the end of the road – even if we are unsure of the

eventual destination – we know that there is a road open to us, a defined path that connects our

present self to a potential future. Yet in the late modern era, when the successes of modern

progress have created new and potentially unfathomable risks, how do we go about this? What

can be expected to continue down the road? What can be expected to change? What do we think

lies within human control, and what can be expected to escape even our best-marshalled

intentions to "consciously strive towards a goal"?

Research questions

How is American automobility being re-envisioned in an era of climate change? What is

the future of the car, car culture and the entire infrastructure that supports the car as climate

change intensifies and fossil-fueled machines appear both problematic and a necessity that few

are willing to give up? In short, what are the pathways forward for automobility in a climate

age?

Defining automobility

Automobility is the autonomous movement made possible by motor vehicles. This is a

slightly different conceptualization of it than is commonly found in the sociological literature on

automobility. This literature, originating with Mimi Sheller and John Urry's (2000) article "The

City and the Car", makes it a point to use the term "automobility" to encompass the systemic

aspects of automobile production and use. Rajan (2006, 113) defines it as "the entire gamut of

practices that foster car culture." This conceptualization sees automobility not as a technical capacity, but as a vast and intricate assemblage: a "self-organizing autopoietic, nonlinear system that spreads world-wide, and includes cars, car-drivers, roads, petroleum supplies and many novel objects, technologies and signs" (Urry 2004, 27). This system, according to Urry, exerts domination through its specific combination of profit-making technologies, daily practices, status symbols, and use of environmental resources (Urry 2004). Defined in this way, it is a useful concept in that it expands the scope of analysis beyond the automobile to include the systems that sustain the automobile: for instance, oil extraction infrastructure, automotive manufacturing industries, and the assemblage of laws, policies, and technologies of control that attempt to regulate automobile use. This conceptualization gives one a sense of the scope of the ramifications of automobile production and use. It also illuminates the wide variety of economic, technological, and social forces that shape automobile use.

However, besides being somewhat unwieldy, this conceptualization has its drawbacks. For one thing, as Paterson (2007; see also Goodwin 2010) has argued, thinking of automobility as a system tends to overlook the politics of automobility, its agentic aspects, and its contested nature. Urry sees the "car system" as "remarkably stable and unchanging, even though a massive economic, social and technological maelstrom of change surrounds it. The car-system seems to sail on regardless" (2004, 32). Despite some acknowledgement that "there are multiple variations in how the car has been desired and 'inhabited' by different social groups, that there are historical shifts in the ways of inhabiting the car, and that there are significant 'technical' changes in the nature of cars," Urry's work, and work that draws on his, tends to fold these differences into the overarching system.

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Though this distinction might seem minor, it matters when conceptualizing the future of automobility, particularly how it might evolve over the course of the next century. If automobility is a closed, stable system, then significant change (going beyond automobility) almost by necessity will be drastic, rapid, and total, a moment where "[s]uddenly, the system of automobility will disappear and become like a dinosaur, housed in museums, and we will wonder what all the fuss was about" (Urry 2004, 36). In such a view, succeeding the automobility system will be a "post-car" system like the one detailed in Urry (2004) and Dennis and Urry (2009). Transformation from one to the other, in a systems mindset, means tipping points and critical junctures – big moments of clear and overwhelming change. But what this dissertation ultimately suggests is we are not an approaching tipping point, where a locked-in system flips to a differently configured one. Rather, we are witnessing a fracturing of automobility and its meanings, such that alterations are occurring at a different levels, enrolling different actors, and unfolding at different time scales. There is a multiplicity of changes that cannot be captured by the ontological assumptions of a single, stable system, and yet taken together, these changes could significantly alter automobility in the future.

For the purposes of this dissertation, then, the term "automobility" will not refer to a system but will take on its simpler, early-20th-century meaning: the "fact and experience of being auto-mobile, of driving a car" (Paterson 2007, 25; see also Featherstone 2004). As will become apparent in the following chapters, the core aspect of automobile use that is re-envisioned, reinterpreted, and generally contested is the idealized experience of "being auto-mobile." What it means to be auto-mobile and what it will mean: this is the fault line around which the different narratives fragment.

<u>Automobility in modernity</u>

Why should one care about automobility as a social and political, rather than merely technological, phenomenon? Analyzing the reimaginings of automobility gives us a window into the fragmented, nearly paradoxical social transformations occurring in the late modern era more broadly. If one takes modernity to be the acceleration and disembedding of the experience of time and space beginning in the early 19th century, tied to technological changes in communication and transportation, as well as shifts in the understanding of humanity and its place in the world (Giddens 1990; Beck et al. 1994; Kern 2003; Berman 1988), then automobility has played a central role in the unfolding of this modernity. As Paterson argues, "Movement is not only *central* to contemporary politics – in the sense that many things would not happen without it – it is a *ruling principle* of contemporary life" (2007,4; see also Urry 2004; Beckmann 2001; Eyerman 1999). Modern wealth and possibility depend upon the ability to travel further, faster, to trade with more people and more easily. Moreover, automobility has helped shape what it means to be that quintessentially modern being: the individual. Automobility is "the (literally) concrete articulation of liberal society's promise to its citizens that they can freely exercise certain everyday choices: where they want to live and toil, when they wish to travel and how far they want to go" (Rajan 2006, 113-4). The actual experience of driving, of being autonomously mobile, "elicits and excites those relations that body forth the 'individual', as *the* key figure in contemporary culture" (Latimer and Munro 2006, 44, original emphasis).

Many others have elaborated on the ways in which automobility has been "both as product and producer of modernity" (Rajan 2006, 113). At its most basic, automobiles "extend where people can go to and hence what they are literally able to do" (Urry 2004, 28), making forms of social and economic interaction feasible across greater distances. In this, the automobile

has shown an "exceptional power to remake time-space" (Urry 2004, 27) as it redefined the patterns of everyday life in the 20th century. Automobiles are now "globally the predominant daily form of mobility. Even for those who do not use a car, the conditions under which we move around are shaped fundamentally by car-led development strategies" (Paterson 2007, 9). These car-led strategies have redefined the landscape of the industrialized world, in a process where the "landscape itself becomes quarried and ingested: valleys and vegetation become the scenic background to roads and long distance transportation. … [Other forms of land use] are expectorated and annihilated: such as children playing in the street, cyclists on major highways, or older people crossing the road, to say nothing of the litter of animal carcasses that decorate the tarmac" (Latimer and Munro 2006, 47).

At the same time, the automobile made "possible the division of the home from the workplace, of business and industrial districts from homes, of retail outlets from city centres" (Featherstone 2004, 2) – allowing for the modern disaggregation of the public and the private, as well as the specialization and rationalization of space. The building of highways, particularly in Germany and the US, made possible new national-scale landscapes tied to military strategy and national security (Koshar 2004). While some have argued that the automobile, particularly in the US, has produced a unique architectural vocabulary and a rich culture of its own (e.g. Wollen and Kerr 2002), others would say that this nationalizing of the landscape ushered in the proliferation of what Mark Augé has termed the "non-places of super-modernity" (Urry 2004, 30) – the homogenous chain restaurants along the side of the highway, the anonymous-feeling gas stations, the miles of identical stretches of asphalt which are experienced as mere space to be passed. Whether worthy of cultural celebration or scorn, the spaces of the automobile have certainly made a significant impact on the landscape, and nowhere more so than in the US.

The experience of being autonomously mobile seems to have had an impact beyond the material configuration of the landscape, as well. It changed the pace of life. It introduced speed as a theme into art, music, and literature while encouraging "the experimental qualities of cultural modernism" (Thacker 2006, 177).[1] At its most dramatic, the automobile meant that thrill-seekers could experience speed as a kind of personal mastery over life and death, making driving, as Schnapp and Virilio argue, a nearly sacred experience: "the driver was always already a potential god in ancient times; but it was modernity that democratized deification through driving, that somatized and secularized its terms, and that promoted its entry into the everyday life-world" (Schnapp 1999, 9-10; Virilio 1986). At its more mundane, the automobile gradually wove speed into daily life such that people began to take it for granted that, in commuting or running errands or taking their kids to daycare, they were expected to cross significant distances in short amounts of time – "to live their lives in spatially stretched and time-compressed ways" (Urry 2004, 28). In these ways, the experience of automobile use has brought about an era where "[b]eing static, stationary, or even just being 'slow', are increasingly more difficult ways of being-in-the-world to defend" (Latimer and Munro 2006, 49).

Beyond the ways in which the automobile reshaped the pattern and rhythm of life in the 20th century, automobility has also been an avenue for state planning and exercise of authority. The modern era saw the exercise of state authority justified increasingly in terms of deploying expertise in order "build roads" towards an ostensibly better future. Giddens has called this "colonizing the future"; he argues that it is an outgrowth of Enlightenment thinking wherein "the more we get to know about the world, as collective humanity, the more we can control and direct

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[1] See Thacker for an account of automobility's influence on the works of T.S. Eliot, E.M. Forster, Joyce, Stravinsky, Virginia Woolf – who wrote of owning a car that it allows one to "expand that curious thing, the map of the world in one's mind" (Woolf, 1982, 147 cited in Thacker 2006, 180) – as well as the Italian Futurists (see also Schnapp 1999 and Kern 2003).

it to our own purposes. Increasing knowledge produced about the social and natural worlds would lead to greater certainty about the conditions under which we lead our lives; and would thereby subject to human dominance what was once the domain of other influences" (Giddens in Beck et al. 1994, 184). Put generously, expertise can here be understood as knowledge put into action to achieve a greater good. Put somewhat less generously, it means attempting to understand the world to better manipulate it. This marshalling of expertise to create the future in our own image is a central thread through the high modern attempts of the state to secure the welfare of its population (Foucault 2006; Scott 1998).

In particular, automobility became a vector of this colonizing of the future as industrialized states worked throughout the 20th century to encourage and yet control mobility. State interventions in automobility were an exercise in the canalization of mobility, using such means as highway construction, traffic engineering expertise, regulation and standardization of signs and signals – all attempts at making roads and automobiles knowable, predictable, and in the service of (a very particular interpretation of) the general welfare. In fact, Paterson (2007, ch 5) argues that the dominance of the automobile can be explained at least in part because such state efforts to channelize mobile, productive subjects were combined with a form of movement that could be experienced as particularly liberating.

<div align="center">Automobility in reflexive modernity</div>

Defining reflexive modernity

Just as automobility has played a central, even constitutive role in the unfolding of the modern era, it provides a prime example of the conundrums of late modernity. We now find ourselves in a situation where we realize that modernity has been, as Giddens (1990) has argued, a double-edged phenomenon. On the one hand, "colonizing the future" has in many ways made

good on its promise of certainty. Modern expertise and technology have produced, at least for certain parts of the population, world-historically new predictabilities. To give only two examples: industrialized agriculture has meant that millions of people are now spared the experience of seasons of unexpected famine, and medical innovations have drastically improved the chances of one's infant surviving to adulthood. Yet, on the other hand, modern expertise and technology have created complex and potentially catastrophic risks. It is not merely that modernity, like anything, has its costs and benefits; it is that the very successes of modernity – its attempts at predictability through expertise – have themselves produced effects which spiral past the ability of expertise to manage. As Beck writes, "the security pact of an earlier modernity is shattered" (in Beck et al. 1994, 34). In an earlier modernity, there were risks, but they could be calculated, predicted, hedged against and managed through regulations and technologies. There was a "controllability of uncontrollable things" (Beck et al. 1994, 180). Now, however, risks have become "incalculable, uncompensatable, unlimited and unaccountable" (Giddens in Beck et al: 34). It is the difference between a season of famine and a future threatened by runaway climate change.

As a wide array of actors become more aware of these risks, we see a transition from "simple" modernity (Beck 1994) to what has variously been called "risk society" (Beck 1999) and "reflexive modernization" (Beck et al. 1994). I focus here on the latter term, as it evokes the idea of reflexivity; as Lash and Urry point out in their discussion of reflexive modernity, "reflexivity means broadly the application of a theory's assumptions to the theory itself, or more broadly the self-monitoring of an expert system, in which the latter questions itself according to its own assumptions" (Lash and Urry 1994, 5). It connotes not merely an awareness of risks but a stance of critical reflection towards the self. When turned upon the modern self, this critical

reflection creates a somewhat paradoxical situation. If one takes the modern self to be one motivated by the promise of progress – a "road-building" self, deploying knowledge and expertise to improve the prospects for the future – then a reflexive stance threatens not merely to cast doubt on past actions but to undermine the possibility of meaningful progress at all. The impulse to make the future predictable – or, more generally, to innovate and change – is complicated by the sentiment that the "more we try to colonize the future, the more it is likely to spring surprises on us" (Giddens in Beck et al. 1994, 58). Is the way forward to attempt to increase knowledge at an exponential rate, making the tempo of modern progress ever faster (see Giddens in Beck et al: 57)? To abandon the entire concept of human control over the future? Or to somehow attempt to reconcile the two? These are the questions that the conditions of reflexive modernity present.

It is no coincidence that Giddens takes global climate change to be the defining issue that separates simple modernity and reflexive modernity. Influenced by Bill McKibben's *The End of Nature*, Giddens emphasizes that "[i]t is not that our life-circumstances today have become less predictable than they used to be; rather the origins of the unpredictability have changed. Many of the uncertainties which face us today have been created by the very growth of human knowledge" (Giddens in Beck et al. 1994, 185). No dimension of the environment is untouched by human intervention; the new incalculable, unlimited risks are human-made. It could be argued that this human-made aspect of new risks is why there is an ethical undercurrent in reflexive modernity.[2] Despite the doubt cast on the promises of human knowledge and modern progress,

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[2] Indeed, the major theorists of reflexive modernity offer the concept as a potential alternative to (or even escape from) the ethical ambiguity of postmodernity à la David Harvey. As Beck argues, the transformations experienced in the late 20th century "not only [bring] commodification and the domination of techno-scientific instrumental rationality," as Harvey argues, "but also opens up possibilities for individuals to reflect critically on these changes and their social conditions of existence, and hence potentially to change them" (Beck et al. 1994, 32).

the implication of humans in the production of incalculable risks means that there is a certain imperative to act: we are responsible for this mess, so we are responsible for doing something about it.

Automobility in reflexive modernity

Its central role in the shaping of "simple" modernity means that automobility opens a window on the difficulties raised in reflexive modernity. The automobile is superlatively human-made – the "quintessential manufactured object," to quote Urry (2004) – and thus acknowledging the risks it engenders necessarily requires a certain amount of critical reflection on the promise and limits of technology. As Chapter 2 will discuss in more detail, the risks it engenders run the gamut from calculable everyday risks to uncontrollable global risks, climate change above all: globally, road transport accounts for an estimated 17% of all global carbon dioxide emissions (IEA 2013, 11). Attempting to grapple with automobility, then, means confronting the possibility that – to again quote Giddens – the "more we try to colonize the future, the more it is likely to spring surprises on us" (Giddens in Beck et al. 1994, 58).

Furthermore, automobility offers a glimpse of how, in the late 20th and early 21st centuries, incalculable global risks – climate change in particular – are bound up in daily practices. Even daily commuting habits take on global ramifications of a significant scope. These global ramifications are both ecological and political in character: "the principal movements carried out on a daily basis are just as important in the reproduction of particular sorts of social and political order, and just because they do not physically cross established borders it does not mean that they are not in an important sense 'globally' organised" (Paterson 2007, 9) To study the automobile and its systems, then, is to identify the ways in which daily life and global politics are connected through state authority – and how those ways are reimagined.

I am not the first to argue that automobile use "has produced risks that have a disruptive cultural and ecological effect, which in turn threaten the very foundations of this mobility paradigm;" Beckmann (2001, 594) has even termed this "reflexive automobilisation." Indeed, Beckmann and I begin with essentially the same premise: that across the array of those with a stake in automobility – from traffic experts and car manufacturers to individual drivers – many are experiencing a moment of critical reflexivity with regard to the automobile. Many people recognize that the automobile "has caused incalculable risks on a global scale and is subsequently threatening its own foundations" or, "[i]n other words, automobilisation has turned against itself" (Beckmann 2001, 604). In this moment, "as automobility threatens its own foundations, it opens itself up to iterative processes of reflexivity, that is to say self-reference, self-awareness, self-monitoring, self-interpretation and self-criticism" (Beckmann 2004, 83).

However, this dissertation takes a slightly different perspective on the problem of automobility in conditions of reflexive modernity. For one thing, the intention is not merely to engage in critical reflection on the automobile (such as Bohm 2006; Conley et al. 2009; Lutz and Ferndandez 2010, etc), nor to put forward suggestions on how to mitigate or escape the problems the automobile produces (such as Sperling and Gordon 2010; Owen 2009; etc). Nor is this dissertation meant to be predictive. I do not ask, for example, what conditions must obtain in order for the fossil-fueled automobile to be widely replaced by electric vehicles or mass transit, or what such a post-car future would entail (such as Dennis and Urry 2010 or Urry 2013). The purpose is not to illustrate possible scenarios, but to analyze the political act of illustrating scenarios. As chapter 3 discusses in greater detail, "thinking the future" is an act of social agency that is interpretive and political. It is social agency in a "projective" sense (Emirbayer and Mische 1998) – actors conceive of possibilities in the future that may not exist in the present, and

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this imaginative process helps to open up social change. It is a question of how social actors envision potential change (as opposed to a question of under what conditions change happens). As will become apparent in the empirical chapters, different social actors may face similar conditions – knowledge that automobile use contributes to climate change, for instance – but may develop drastically different understandings of what can and should happen under those conditions. Moreover, thinking the future is an interpretive act in that envisioning potential future change necessarily requires one to make an interpretive leap: to make a claim about what can change and what will continue into the future. In making such a claim, an actor makes a political claim as well about what can and cannot be controlled, and who has meaningful agency in the present to influence outcomes in the future. In this way, 'thinking the future' can open up or close down possibilities for action or particular subjectivities.

Methodology

Scope of the dissertation: American automobility

Why does it make sense to study the future of automobility in the US rather than elsewhere? Automobility is a global phenomenon. Indeed, future patterns of automobile use elsewhere – particularly in India and China – may well have more of an impact on the 21st century. Yet I have chosen to focus on American automobility for two reasons. One has to do with the position of the US in the world, and the other has to do with the role of the automobile in American identity.

First of all, although the relative geographical distribution of automobile use may be shifting away from the US, automobile use in the US still has remarkable impact in the world. A few numbers point to this impact. Americans travel more per capita than anyone else in the world – roughly 16,000 miles per person per year (IEA 2010, 10). The consumption of fuel for

road transport in the United States accounts for roughly 27% of all road transport CO_2 emissions in the world – making it responsible alone for 4% of the CO_2 produced by all forms of fuel consumption globally (IEA 2013, 71) – and this figure does not include the emissions that come from the construction of transportation equipment or infrastructure. This is far more than any other individual country's contribution: China, the runner-up, accounted for 10% of the world's total road transport-related emissions (IEA 2013, 73). As well as producing by far the largest proportion of transportation-related CO_2 emissions in the world, the US is also responsible for a significant portion of the oil consumed globally. According to EIA estimates, the US consumed roughly one-fifth of the total petroleum consumed globally in 2012 (EIA n.d.). It can be argued that the sheer size of this US demand for oil – and the powerful position that the US holds in energy markets – means that the US is uniquely positioned to influence a transformation away from fossil-fueled transportation – whether by instigating or blocking such a transformation (Roberts 2004). Perhaps most important, however, is the symbolic weight of American automobility throughout the world. For decades, the use of the car has been an integral part of American lifestyle that has served to represent the promises of modern wealth and hegemonic power. Together, all of these mean that a fundamental reinterpretation of automobility within the US may well have global effects through multiple channels.

The US makes for a particularly rich site of inquiry for a second reason: automobility is a dominant part of the American sense of self. As the discussion above of automobility and modernity illustrates, automobility dominates American identity through a number of channels. Through the physical landscape, through the symbolism of freedom and mastery, and above all through the individuating experience of driving itself, automobility has come to be linked with what it means to be American. Envisioning the future of American automobility thus means

envisioning change in a core aspect of identity: it is envisioning difference within the scope of the self. It is about the prospect of collective self-transformation. What's more, these two things together – the US's hegemonic status together with its automobility-dominated identity – mean that envisioning a transformation of American automobility is, in a sense, renegotiating the self-transformation of the powerful.

<center>Selection of the texts: Authoritative voices</center>

The process of selecting texts was iterative. I first cast a wide net for texts dealing with the future of automobility in the context of climate change, in order to get a sense of the general contours of what different futures are envisioned broadly in American public discourse. I identified a provisional set of three narratives: one oriented towards technological optimism, one that seeks a return to pre- or early-modern ways of being, and one that envisioned a radical and almost unknowable break from the present.[3]

Having identified these narratives, I then found authoritative state voices articulating each narrative. Why did I choose to look specifically at authoritative voices? Automobility and the systems that support it are reproduced at many sites and through many texts, many far removed from any degree of officialdom. Given that the research question asks specifically about how the future is envisioned, texts could be narrowed to those that, to draw for a moment from Koselleck, "explicitly or implicitly deal with the relation of a given past to a given future" (Koselleck 1985, xxiii). Of course, even when one looks particularly for texts that depict possible automobile futures, there is still a range of voices – one could analyze depictions of transportation in films,

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[3] Of course, there is a fourth narrative in American discourse, one that does not see climate change as enough of a problem to warrant a change in behavior, much less identity. However, because my interest is precisely in collective re-envisioning of the self in a context of anthropogenic climate change, analyzing this fourth narrative is not particularly useful, as it does not acknowledge itself as in a context of anthropogenic climate change, and it envisions no future transformation. It is therefore excluded from the study.

or articles in car magazines, or the imagery in advertisements. Yet in this dissertation I examine a very specific set of texts. Automobility's dominance in American identity is reproduced at the everyday level, certainly, but it is also reproduced somewhat more powerfully at the level of state-backed expertise. In the first two empirical chapters, I examine texts produced or used by the US government: chapter 4 analyzes a corpus of texts produced or used by the US Department of Energy, while chapter 5 deals with texts produced by and for the US Department of Transportation and Environmental Protection Agency. These texts can be considered what Sheila Jasanoff has called authoritative representations – representations of the world and its possibilities that are in effect sanctioned by the state (see also Milliken 1999, 233). Such texts are uniquely poised to be translated into technologies and landscapes that go on to create the conditions of possibility for particular ways of being in the world.

However, the third narrative has significantly less of an institutional presence in the US government. Thinking that the third narrative would make a useful foil to the other two, I identified instead a social movement that articulates this narrative and whose presence in the US is rapidly growing: the Transition Movement. The movement positions itself as a sort of complement to state expertise and action, understanding itself as acting to adapt to climate change while the state fails to act.

The choice of these texts is partly because the purpose of the research is in part to shed light on – as I put it above – the self-transformation of the powerful. Rather than examining how a powerful actor attempts to influence the weak, the dissertation seeks to understand how a powerful actor attempts to change its own behavior. I examine these texts to see how state power is shifting, acting reflexively or not. In this way, the research uncovers ways in which – contra Paterson (2007) – the state does not act unequivocally as an advocate of the automobile,

regulating its excesses only to ensure its continued dominance. Rather, different actors work in fragmented, superimposed ways, simultaneously encouraging automobility while mitigating its disruptions but also attempting to radically shift its role in the landscape and – to use a term that crops up in urban planning literature – civilize it.

In a similar vein, examining authoritative texts illuminates how experts negotiate the conditions of reflexive modernity – how they attempt to define what future outcomes can be influenced and what is beyond the control of expert interventions. Unlike Beck and others who have written on reflexive modernity (Beck et al. 1994; Lash and Urry 1994), I do not see reflexivity as the exclusive prerogative of individual non-experts or activist social movements, but find that it can unfold within institutions of power. An important part of Beck's understanding of reflexivity is that it defines itself in contrast to, even in opposition to, expert systems; in his view there can be no such thing as expert reflexivity. Indeed, Lash and Urry accuse Beck of "seeing scientific-technical elites as being on the side of the villains" (Lash and Urry 1994, 35). However, as chapter 5 illustrates in the case of urban planning, expert systems can adopt a reflexive stance. The dissertation illustrates how expert institutions – including specifically the state – reassert their relevance in "developing at least partial solutions" to the risks posed by modern life (Beck et al. 10).

Analysis

To analyze the texts, I focus on discursive representations – on the language used to evoke potential futures. Of particular interest here is how discursive representations of the future invite people to be or become particular kinds of subjects. By naming particular social roles, complete with expected behaviors and associated meanings, these representations of the future can define the range of possible roles we can take (e.g. driver, consumer, individual).

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Historically, state encouragement of automobility has meant not only reshaping the landscape but also "attempting to promote and produce a new type of person, a new subject, oriented towards the sort of movement which cars make possible" (Paterson 2007, 121). As the future of automobility comes into question, what other new (or recovered) types of person do we see emerging?

This is tied to the fact that, when discourses articulate social roles, they "define subjects authorized to speak and to act" (Milliken 1999, 229). In the context of the future of automobility, this means that some types of actors (such as highly trained engineers or well-pedigreed urban planners) are represented as capable of making the future, while others simply take the future as it comes. There is thus a particular productivity to the language embedded in policy recommendations and expert estimations of what the future can and should hold. Subjectivities become incorporated into larger story arcs. These narratives or storylines (Hajer 1995) not only define subjects but narrate their roles in solving particular problems. My textual analysis in the empirical chapters thus focuses on subjectivities and narratives, with particular attention paid to representations of change (e.g. who is seen as capable as effecting change?) and continuity (what is seen as unchanging from the present to the future?).

Contributions

Denaturalizing automobility

One contribution of this dissertation is to denaturalize automobility and expose the many ways we think about, value, and assume an identity in light of it. To be sure, I am not the first to denaturalize the taken-for-granted role that the automobile plays in American lives. Yet the goal is not merely to denaturalize automobility by questioning it and pointing out its inconsistencies. Rather, the goal is to illuminate the variety of ways of understanding automobility that already

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exist. Some see it as natural. Some see it as a particularly triumphant accomplishment of humanity. Transportation engineering literature often sees automobility as "derived demand": the demand for travel by automobile is derived from one's desire to get from one place to another quickly and autonomously, making it simply a logistical necessity for the rest of life. Yet one can see automobility in many other ways. As chapter 5 discusses, it can be seen as an isolating phenomenon, destructive to social ties. As chapter 6 discusses, one can see it as a sudden and brief aberration in the course of human existence. There are others – indeed, there are as many meanings of automobility as there are drivers, passengers, and victims of hit-and-run accidents.

However, the point is not to adjudicate between different meanings or valorizations of automobility – to say, for instance, that it is better to think of automobility as an aberration in human existence than to think of it as the culmination of human freedom. Rather, the point is to illuminate the diversity of understandings, and thereby open up a certain amount of freedom in understanding automobility. Such a discussion may be fruitful in terms of whether some understandings of automobility provide the conditions for more or less problematic behaviors – but that is not the goal of this dissertation. Ultimately, the normative objective that undergirds this dissertation is not, for instance, to unmask the power structures that make automobility possible, nor to illuminate a clear path towards reform or revolution. Rather, the dissertation is motivated by a concern about what kinds of people we are asked to be in a world dominated by automobility, what kinds of actions we are encouraged to undertake, what kinds of landscapes we are asked to inhabit or remake. To put it simply, the dissertation denaturalizes automobility to clarify that when we talk about the future of transportation, there is more at stake than infrastructure costs or even carbon emissions.

Illuminating the politics of thinking the future

The second contribution of the dissertation is that it introduces a new way of considering the political work that happens when the future is discussed, planned, or predicted. Considering future change is a moment when intense political work occurs. All discussions about (and perhaps more importantly, all plans for) the future must by their very nature rely on assumptions about what is continuous and what can change. As such, all plans for the future put into play beliefs about what is possible and desirable. After all, the very nature of the future is that no one is an expert on it how it will unfold. To claim to have knowledge of what will be possible or desirable in the future is an attempt to exert control in the present, and one that goes often unnoticed. The "future" in this dissertation, then, is not an objectively existing temporal place; rather, it is a discursive battlefield.

The dissertation deploys this new way of considering "futured" discourse to analyze texts produced by those in a position to effect changes in the configuration of American automobility. The result is an account of how authoritative representations of the future produce subjectivities and define appropriate courses of action – not in the future but in the present. The language in which authoritative planning operates shapes what gets imagined, planned, and eventually built into the landscape. Without the particular lines of continuity and change drawn in the texts of the US Department of Energy, Department of Transportation, and Environmental Protection Agency, the possibilities open to policymakers, researchers, and people in their everyday capacity as cultural beings would be different. For instance, when the DOE plans for the environmental shortcomings of the automobile to be neutralized through advanced research and design, it shores up the authority of the state as a knowledge-producing subject; it subtly marginalizes the possibility of other potential subjects and closes down space for meaningful action in the present by anyone but the state.

The goal of developing this account is not to undermine the authority of these texts or challenge their claims to truth with a rival truth claim of my own – I have no better claim on what the future can or should be than does the US DOE. The goal is instead to illuminate the maneuvers of power that serve to discipline action in the present.

Outline of the dissertation

Chapters 2 and 3 lay the groundwork for the subsequent three chapters. Chapter 2 develops the discussion of American automobility by presenting an overview of discontents with the automobile and the systems that support it. In doing so, the chapter presents a case for considering automobility not merely as a cause for concern in its own right, but as an example of – or a window into – other discontents of modernity, as not merely a technological phenomenon but a profoundly environmental, political, and cultural one as well.

Having problematized automobility in chapter 2, the dissertation continues by theorizing the relationship between solving a problem and envisioning the future. Chapter 3 theorizes thinking the future; in it, I argue that envisioning the future is an interpretive political act. The first part of the chapter argues that envisioning the future requires one to make assertions about continuity and change – and therefore about identity and difference. Envisioning the future requires negotiating the bounds of acceptable difference in the self. I further argue that in the modern era, we have come to think of the future as better, makeable, and new; however, this understanding has come into question in the late modern era, as the successes of modernity produce risks – particularly that of climate change – that seem to defy the logic of unidirectional progress.

The three subsequent chapters present the main research analysis. Each outlines one of three major narratives dealing with the future of automobility in the US. Chapter 4, entitled

"Accelerate," presents a narrative of unidirectional progress, progress that only accelerates in the future as state-supported scientific expertise drive technological development. In the chapter, I examine the technological roadmaps produced by and for the US Department of Energy. These policy documents assess the state of different automotive technologies and make recommendations for what research and development (R&D) merits US government investment. The chapter discusses how, in these texts, the automobile is seen as the necessary site for change, precisely because it is taken for granted that the automobile will continue to play an essential role in everyday life. Similarly, the figure of the American driver-consumer will continue on into the future as she is now, with the same fixed set of preferences for speed, comfort, style, convenience and price. In this view, the technical makeup of cars is in fact the only thing that can change because Americans as drivers won't. This tends to reaffirm the boundaries of a particularly consumerist, particularly autonomous and mobile American identity, with meaningful change basically in the hands of national labs and engineers. The nation-state is taken to be the most meaningful locus of problem-solving by supporting knowledge production – it is only at the national level that the resources and authority exist to produce and centralize the technical knowledge necessary to create a vehicle "advanced" enough both to reduce oil consumption and carbon emissions, and to meet the expectations of American drivers.

Chapter 5, entitled "Rebuild," presents a second narrative. The chapter analyzes a body of texts that sees the future as an opportunity to recapture the past. These texts are core policy documents outlining "smart growth" principles, specifically those produced or used by the US Department of Transportation and Environmental Protection Agency. These documents include policy recommendations, but also design standards. Though different from the technological roadmaps examined in Chapter 4, they, too, are a kind of authoritative representation of the

world and its possibilities: they codify what is desirable and possible. In the texts, there is an acute awareness of the 20th-century history of urban planning, with the understanding that automobile-centric patterns of settlement – particularly postwar suburban expansion – was a rupture in the social fabric. These texts see this expansion as a moment of abandonment, atomization, departure - all in the name of modernization and novelty. There is thus a wariness towards grand gestures of modern progress, and an impulse to repair that rupture in the social fabric, in order to, somewhat paradoxically, make the future better. The chapter reflects the attitude in the texts that change means in large part recovering and rebuilding what was lost in that postwar moment of rupture. This also includes protecting what survived – for example, rebuilding dense mixed-use neighborhoods, restoring transit infrastructure that was abandoned, preserving historic buildings and protecting green space. It means actively creating continuity in the built and natural environment. It sees human nature as fundamentally social, rather than autonomous and mobile, and so rebuilding social neighborhoods is here understood as a return to a deeper continuity, one that modernity may have temporarily ruptured, but that can be repaired. The power to effect change is largely understood to be in the hands of planners and policymakers; the texts see design as governance. In this way, they construct a hierarchy of human agency: though the inhabitants of a city have some degree of agency, the planners and the policymakers have the funding and the expertise to reshape of the city. This discourse, then, makes a bid for not for an autonomous and mobile American identity, but one whose social core is the neighborhood; those neighborhoods, of course, are still implicitly embedded in a structure of expertise and state authority.

Chapter 6, "Transition," introduces a third narrative and analyzes a third body of texts. While chapters 4 and 5 deal with narratives that appear in national-level policy documents, in

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chapter 6 I examine the texts produced by or recommended by the Transition movement in the US, a relocalization movement that began in the UK in the early 2000s but is rapidly growing in the US and around the world. Unlike the narratives presented in chapters 4 and 5, the narrative in these texts sees the impending collapse (and inevitable relocalization) of human societies due to peak oil and climate change. Yet these texts put forward the idea that such collapse – if managed well – can be desirable. In this view, the future holds the promise that as lives are relocalized in scale, people will find a simpler, more fulfilling life lived in community rather than as atomized individuals. This narrative thus balances the grim possibility of civilizational collapse with optimism that humans are adaptable, creative creatures.

The chapter is entitled "Transition" not merely because it analyzes the Transition movement, but because the mechanism of change here is sweeping and multi-level; it is closer conceptually to a sea change than to an acceleration or a return. In these texts, there is not one set of actors, such as engineers or planners, enacting change on behalf of everyone. Rather, change is envisioned at beginning at a personal level and growing from there to a community level. These texts sidestep the question of state action; anyone and everyone is responsible for change. This means that the texts abdicate any kind of authoritative stance. This is most clear when the texts frame action in terms of adventure, suggesting that everyone is on uncertain terrain with climate change, but everyone has strengths they never knew they possessed. This has the effect of drastically widening the scope of what is considered possible, which is an impressive and often difficult discursive move to make. In terms of American identity, then, this discourse frames the future of automobility in terms of an America populated by adaptable, pragmatic adventurers operating in uncertain terrain – pioneers, in fact, of the 21st century, keeping

communities alive in the ruins of a climate challenged global economy and US economic prowess.

Throughout the three narratives, some similarities and overlaps emerge. Each narrative begins with a reflexive stance: each agrees on the basic outlines of the problems of climate change and oil dependence, and tends to speak disparagingly of "business as usual." Each understands us to be at a critical and unprecedented moment in human history, with large-scale change expected in the coming decades. Each of these sees automobility only as part of a broader problem; the transformation of automobility is part of a broader transformation of the modern world. Each understands that change is necessary, and at the same time, that continuity takes work.

Yet the overwhelming finding is that, given the same basic starting premise of needed change and the same basic stance of critical self-reflection, the three narratives have widely divergent understandings of our historical trajectory: what the past century meant, what the future may hold, and what meaningful avenues of action are open in the present. Each elicits different subjectivities – each counts on very different agents for change. To take one example, on the surface the landscape envisioned in a smart growth future (discussed in chapter 5) shares many similarities with the landscape in a post-carbon future (chapter 6): they both envision more pedestrians and cyclists, fewer cars, smaller-scale neighborhoods and vibrant green spaces. But seen in a smart growth lens, this is a vision of well-managed growth; seen in a post-carbon lens, this is a vision of well-managed collapse.

One way of visualizing this is to return once again to the metaphor of the road ahead. One of the Department of Energy technology roadmaps analyzed in chapter 4 states that "the path to success is clearer now than ever before" (DOE 2006, 156). In this technologically optimistic

view, the road ahead is obvious – it's clear, and clearer now than ever before, because with every step we know more than we did before. We just need to accelerate down that road, and the ones best capable of accomplishing this are engineers and scientists; they are the ones in the driver's seat. It is, in many ways, the "radicalizing of modernity" that Giddens (in Beck et al. 1994) mentions: the modern logic of progress still operates, only sent into overdrive.

By comparison, the second narrative reflects the sort of small-c conservative project that has attempted to preserve traditional ways of being in the world for as long as the logic of modern progress has attempted to accelerate beyond them. In this narrative, rather than the road ahead being clear, it's as if we have strayed from the true road to human flourishing; we have disastrously attempted to find a new way, abandoning the ones that work, and need to find our way back again. Here, urban planners and policymakers serve as guides, preservers, and rehabilitators.

It is possible to see the third narrative, which focuses so largely on the concepts of collapse, transition, and adventure, almost as an instantiation of apocalyptic thinking – a kind of secular eschatology. Here, there will come a point in the road ahead where the world as we know it is gone. When that moment comes, we have no idea what our path will be, but we should begin now to think about what we'd like our destination to look like. In this totally new world, there will be possibilities open to us then that aren't open to us now, and everyone shares the responsibility in finding a way forward.

What this ultimately points to is that debate about the road ahead – about automobility and reflexive modernity – is fundamentally unsettled. Each of the three narratives possesses justification and offers insight. However, they also represent incompatible visions of the future and human identity. This dissertation outlines points of conjunction and distinction, and explains

the stakes involved. Furthermore and most crucially, it reflects on the nature of unsettledness in competing societal narratives. What happens when our paths forward are informed by differing visions and understandings? How do we live through the present amidst conflict and uncertainty concerning automobility and human identity? As will become clear, one narrative doesn't necessarily gain ascension and dominate the others. Neither is there a harmonization wherein the lowest common denominator emerges. Rather, the three narratives about the future of automobility operate within a wider conversation about questions that resist answers, a conversation that can never be settled. Automobility and the reflexive modernist road forward are not puzzles in search of solutions but, like much of politics, terrains on which the meaning of collective life and humanity get worked out. By articulating the three visions, explaining the monumental dangers involved, and uncovering the tensions at work, this dissertation captures that crucial moment in political life when past, present, and future assume a type of productive friction wherein societies can see themselves and understand their political destinies in a new light.

CHAPTER 2

UNSUSTAINABLE AUTOMOBILITY

"In many ways, the world is coasting on fumes."

– Edwin Black 2006, *Internal Combustion*

As the introductory chapter elaborated, life in the modern era has been built around the possibilities created by high-speed, frequent movements across space. Automobiles have contributed to the vast scope and intensity of modern trade and travel. The experience of autonomous mobility has influenced what it means to be a modern individual, along with its accelerated rhythms and dislocations. Yet many scholars across a number of fields – not to mention activists and social commentators – argue that "the world is coasting on fumes," as Black suggests in his analysis of the automobile and its prospects. In the view of these critics, the systems that support automobility appear unsustainable. These systems rely on unlimited consumption of limited resources – oil in particular – while producing waste and emissions that undermine the long-term inhabitability of the planet.

Over the course of the past two decades, researchers across many fields have built up a significant body of critique of the automobile and the systems that support it. This knowledge is scattered across disciplines – environmental studies, medicine, transportation engineering, and sociology, among others. [4] This chapter brings together these scattered literatures and presents what is known or argued about the unsustainability – both ecological and ethical – of automobility. It presents the evidence and uncertainties surrounding the idea that the world may

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[4] The most comprehensive and trenchant single scholarly work to discuss in detail the unsustainability of automobility – though the authors do not use the term – remains Freund and Martin (1993).

be "coasting on fumes." The first half of the chapter focuses on studies of the production of automobility, i.e. the systems that make it possible to drive – the roads, oil production, and functioning internal combustion engine. It draws attention to the two major concerns most often raised in relation to the sustainability of the automobile: oil and climate change. The second half of the chapter focuses on the performance of automobility – that is, the experience of being an autonomously mobile subject. The section discusses two of the major concerns raised by those who are critical not merely of the car's ecological impact but of the human and social effects of driving itself: that driving endangers human lives and weakens social ties.

The goal of this chapter is not to compile a litany of critiques of the automobile; the argument is not (or not merely) that automobility is problematic. Rather, the goal is to establish the premise that automobility is being questioned on a number of levels and by a number of different actors. As scholars, activists, and commentators characterize automobility as unsustainable, they open up a moment of reflexivity and interpretive agency. Crucially, "unsustainable" is not merely a general synonym for "environmentally harmful" but has a temporally specific meaning. By definition, an unsustainable phenomenon is one that cannot go on; it cannot continue indefinitely. Claiming that automobility is unsustainable implies a necessary future of change.[5] It is a meaning of "unsustainable" that is related to, but distinct from, the understanding of Bruntland Report offers in its definition of *sustainable development*: "development that meets the need of present generations without compromising the ability of future generations to meet their needs" (WCED 1987). The claim here is not that automobiles currently meet the mobility needs of today only by compromising the mobility needs of

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[5] By contrast, the "risk society" literature thinks of the automobile not as unsustainable but as risk-producing. The difference is that risk-producing automobility does potential harm without undermining the conditions of its own existence, while an unsustainable automobility necessarily undermines the conditions of its long-term existence.

tomorrow – because it is not clear what "mobility needs" even means.[6] Rather, the claim is that automobility as it is now – fossil-fueled, carbon-emitting, high-speed, mechanized autonomy – cannot continue indefinitely. In this, "unsustainable" is as close to "untenable" as it is to "environmentally harmful." In fact, the term "unsustainable" has also historically been used to describe that which cannot be defended. In this, one can see an ethical connotation to unsustainability of automobility: there are aspects of it that cannot be ethically defended. This, too, can take on a temporal dimension: if unethical behavior should not continue, then claiming that automobility is unethical implies a desired future change. Thus, in the claim that automobility is unsustainable, there are two implicit claims about the future of automobility: automobility in its current form *must* change (because it cannot be sustained) and automobility in its current form *should* change (because it cannot be defended).

With this in mind, the chapter concludes by turning to the issue of change, the question of "what next?" – not to answer the question, but to orient the reader towards the rest of the dissertation. The rest of the dissertation deals with the interpretive political work that goes on while attempting to answer the question "what next?" Before getting to that, however, it is necessary to have a sense of why the question of "what next?" is being so widely posed.

Producing automobility

The experience of autonomous movement in an automobile does not simply occur, spontaneously or naturally or ex nihilo. Automobility is produced: the conditions of its existence

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[6] Much of transportation engineering and economics understands transportation as a "derived demand" – i.e., a person's particular mobility needs are defined by that person's economic activities (e.g. Sperling and Gordon 2010; Nijkamp et al. 1997; Black and Nijkamp 2002; Cervero 1998). The individual and her economic activities are ontologically prior to her mobility choices. However, as more anthropological and sociological studies have shown, this understanding of mobility needs as derived demand does not take into account the many ways in which mobility shapes a person's habitus; it does not acknowledge the ways in which a person and her mobility patterns are mutually constitutive (e.g. Sheller 2004; Urry 2006; Thrift 2004). Given this ontological oversight, I find it difficult to think of mobility in terms of need or demand rather than practice.

are built through a complex set of technological, economic, and ecological interventions (Urry 2004, Paterson 2007). In order to be able to drive a car, one must rely upon vast systems of resource extraction and distribution, the construction of infrastructure, and networks of industrial manufacturing. The studies discussed in this section suggest that these systems all have their unsustainable aspects. This section begins by touching on the resources consumed and wastes produced by road construction and auto manufacturing, before turning to the two biggest issues in producing automobility in the future: oil supplies and climate change.

<p style="text-align:center;">Roads and cars</p>

Many scholars have drawn attention to the ecological effects of constructing and maintaining roads. Freund and Martin's *The Ecology of the Automobile*, which is a touchstone of sorts for writers dealing with the unsustainability of automobility, highlights that the construction of roads uses resources, consumes energy, and produces pollution (1993; see also Dauvergne 2008, 57). They also estimate that each mile of roadway requires 25 acres of land and that up to "10 percent of the arable land in the US is taken up by the auto infrastructure" (Freund and Martin 1993, 19). Other scholars, concerned with water management, have drawn attention to roads and parking lots as impervious surfaces; these surfaces carry pollutants into surface water systems and can reduce rates of groundwater recharge (Paul and Meyer 2001; EPA 2003a; Freund and Martin 1993; Dauvergne 2008, 57), while salting roads in winter salinates freshwater habitats (Novotny et al. 2008; DeNoel et al. 2010; ECHC 1999). Still other research suggests that roads create barriers to wildlife migration and fragment populations (Forman and Alexander 1998), and the FHWA has identified 21 threatened or endangered species "for which road

mortality is among the major threats to the survival of the species" (FHWA 2008, 10).[7] In their

current form, then, these studies question the long-term sustainability of the ecosystems through

which roads are built. Continued construction and expansion of roadways and parking lots

cannot physically continue indefinitely to accommodate expanding automobile use; at its absurd

limit, the whole world would eventually be paved before running out of space, leaving no

permeable surfaces for water recharge and no habitats for wildlife.

Other scholars have investigated the ecological impact of manufacturing automobiles.

Writing in 1994, Ginley estimates that the average automobile consists of "2,033 lbs of steel, 126

lbs of aluminum, 38 lbs of copper, 28 lbs of lead, and 233 lbs of plastic" (Ginley 1994, 172), a

total average of 3,000 pounds of material per car. As he further estimates that over 8 million cars

are manufactured each year, this means that "over 240 billion lb of material were contained in

automobiles produced over the last 10 years" (Ginley 1994, 170-1). In 1990, it was estimated

that the US automotive industry consumed 13 percent of the steel, 16 percent of the aluminum,

69 percent of the lead, 36 percent of the iron, 36 percent of the platinum, and 58 percent of the

rubber produced in the US (Freund and Martin 1994, 18). More recently, and on a global scale,

Dauvergne (2008, 57) reports that "automobiles have accounted for almost half of all the oil and

rubber, a quarter of all the glass, and 15 percent of all the steel consumed each year across the

globe." It also takes a great deal of energy to produce an automobile – and this has not improved

much over time. In the 1950s, Ford consumed 6 tons of coal for every car it built (McCarthy

2007, 110). As of 1998, it still took an estimated 114 million btu to produce the average

automobile (Maclean and Lave 1998, 328), roughly the equivalent of 5.9 tons of coal (EIA

2014).

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[7] The list of species includes "birds such as the Hawaiian goose … reptiles such as the desert tortoise … mammals such as the San Joaquin kit fox … and amphibians such as the California tiger salamander" (FHWA 2008, 9).

Still others have tracked the disposal of automobiles. Ginley (1994) and Chicharro et al. (1998) recount how, after the recyclable metals are removed from the car (roughly half of the car by weight (Ginley 1994, 172), the rest is sent through a shredder. This process spills oil, brake liquids, lubricants, and heavy metal particulates into the soil, ultimately producing "automotive shredder residue," a mixture of plastic mixed with paint, which is left in a landfill (Chicharro Martin et al. 1998; MacLean and Lave 1998; Ginley 1994). As automobile designs have begun to move away from steel bodies (which are easily recyclable) and towards lighter-weight materials such as plastic composites, more of the automobile ends up as automotive shredder residue (Das et al. 1995). Besides the car bodies in landfills, tires also have to be disposed of: there are an estimated 2 billion tires stockpiled around the US (Tansel 1998, 786-7). Again, these studies do not merely problematize automobile manufacturing. They suggest, at some level, that automobile manufacturing and disposal cannot continue indefinitely; at some point the world will run out of raw materials and disposal sites.

Oil

In its current fossil-fueled form, automobility is thoroughly intertwined with the production and distribution of oil. Certainly, the two are not entirely synonymous: oil is used for other things than moving cars around. It is used for other modes of transport –diesel-engine trains, container ships, and airplanes; it is also used to manufacture plastics, industrial lubricants, and asphalt. Nevertheless, as Roberts (2004, 170) argues, for most of the past century, "the entire oil industry's business model – from the kind of crude oil it sought to the kind of refineries it built to its intense focus on retail marketing – was built around the gasoline pump." To the extent that automobile use relies on oil production, and oil production is driven by automobile use, it is

impossible to assess the sustainability of automobility without touching on the many unsustainabilities of oil production.

Oil's limits

Of course, an overwhelming concern with oil is that it is a limited resource. There is a long history of concern and debate over the limits of oil resources; as early as at least 1897, the prospect of "oil famine" prompted debate that continued throughout the first decade of the 20th century (McCarthy 2007, Ch. 3). Debate over the possibility of "running out of oil" recurred periodically throughout the last century, not least during the oil shocks of the 1970s (Yergin 2011; Owen 2009; McCarthy 2007, 208). In the 1970s, a wave of environmental writings connected criticism of the car to concerns about resource scarcity following the publication of *Limits to Growth* (see Paterson 2007, 36-40 for an account). In the past several years, the prospect of a peak in the production of oil is again gaining attention.

On the one hand, it seems only logical that there would be an inevitable end to oil: if the world continues to consume oil, and oil is limited, then the world will consume oil until the oil runs out. Colin Campbell, a geologist who has been vocal in the peak oil debate, has been quoted as saying that "It's quite a simple theory and one that any beer-drinker understands … The glass starts full and ends empty, and the faster you drink it, the quicker it's gone" (quoted in Yergin 2011). The amount of oil in the ground seems as though it would be non-negotiable: there is only so much there, and when it's gone, there is no way to create more (at least in this geologic age).

Yet, like so many other ecological limits, it is profoundly unclear what the limits to oil supply are. Many scholars and research groups have estimated remaining oil supplies, but there is considerable debate over the size of reserves and the potential date of a peak in production. Gautier (2008, 86) sums up the variations among reserve estimates: "As of January 2006, *World*

Oil estimated the global proven reserves at 1,293 billion barrels of conventional oil. In January 2007, the *Oil & Gas Journal* estimated these reserves at 1,370 billion barrels … In 2000, the USGS reported an estimate of mean (expected) reserves of about 3 billion barrels, and in 1995 Campbell and Lahérrer produced an estimate of about 1.8 trillion." According to Sperling and Gordon (2010, 115), "it's widely accepted that at least another trillion barrels of easily accessible oil – what's termed proven reserves – are still left in the ground." Daniel Yergin has similarly written that "it is thought that there are at least five trillion barrels of petroleum resources in the ground, of which 1.4 trillion are deemed technically and economically accessible enough to count as reserves (proved and probable)" (Yergin 2011). As for when a peak in oil production might occur, Colin Campbell estimates 2004 while Kenneth Deffereyes estimates 2005 (cited in Dennis and Urry 2009, 14). The IEA has estimated 2020 (Urry 2013, 100), while the USGS, among the most optimistic, estimates 2037 (Gautier 2008, 84).

To some extent, this debate over numbers is due to how reserves are reported. Both state-owned and private oil companies have been known to exaggerate or downplay reserve numbers for political or financial reasons (Gautier 2008, 83; Sperling and Gordon 2009, 115; Urry 2013, 101). Yet to a much greater extent, this debate over numbers stems from a much deeper question about political, economic, and technological potential. It is not a debate over the geological question of how much oil is in the ground – such a question is almost beside the point. Rather, it is a debate over the political and economic question of how much oil can be extracted for use by humans. Clearly, neither high oil prices nor new technologies can "magically and continuously bring new supplies into being" (Gautier 2008, 84): no new technology can put more oil in the ground. Yet technological and economic changes can affect how much of the oil in the ground is considered accessible to humans. To return again to the "coasting on fumes" analogy: we can't

put more gas in the tank, but we might be able to find a way to keep those fumes moving us along for a long while.

This becomes clearer when one considers how proven oil reserves are calculated. Yergin writes: "The idea of 'proved reserves' of oil isn't just a physical concept, accounting for a fixed amount in the "storehouse." It's also an economic concept: how much can be recovered at prevailing prices. And it's a technological concept, because advances in technology take resources that were not physically accessible and turn them into recoverable reserves" (Yergin 2011). Sperling and Gordon illustrate: "Through 2007, the price used to calculate reserves was less than $50 per barrel. At $70 per barrel, if likely advances are made in finding and extracting oil, at least another one to two trillion barrels of conventional oil would be recoverable globally. And at prices of $150, even more oil could be found" (Sperling and Gordon 2009, 115). To some extent, then, the geologic limits to oil are defined by nature; but to a much greater extent, the socially meaningful limits to oil are defined by human efforts. It is for this reason that peak oil arguments are sometimes seen as "overly simplistic" for focusing too heavily on geology and failing to appreciate the role of economics and technology (Sperling and Gordon 2009, 118-9).

Even among those who accept the importance of economic and technological factors, though, there is still debate. Many take the position that political and economic factors will lead to a decline in oil production as surely as geological factors would (Mulligan 2010; Conley and Phillips 2005; Roberts 2004). As the financial and energy costs of producing oil increase (whether the costs of doing business in countries that are politically unstable but have easily accessed conventional oil, or the costs of extracting unconventional oil in comparatively stable countries), these writers expect oil production to decline. Sperling and Gordon (2009, 120) call this "political peaking" – where oil production declines not due to geologic factors but "due to

terrorism, wars, and supplier countries underinvesting, holding back, and even collapsing." In this energy security understanding, uncertain supplies are functionally the same as limited supplies, only worse – one doesn't know when supplies will be cut off or disrupted.

By contrast, there are others – Daniel Yergin most prominently – who argue that technology will extend the limits of what oil can be extracted, even if costs are high (in fact, especially if costs are high): "Higher prices stimulate innovation and encourage people to figure out ingenious new ways to increase supply" (Yergin 2011). They point to the fact that, despite a decline in major new oil field discoveries (Gautier 2008, 83), technological improvements now mean that smaller fields are more easily found and that more oil can be extracted from them when they are (Sperling and Gordon 2009, 118; Yergin 2011; Conley and Phillips 2005). Improved technologies also mean that North American unconventional oil can be extracted at a lower cost, thus avoiding the problem of potential "political peaking." Indeed, the burgeoning production in Canadian oil sands and the Bakken field in North Dakota in the past few years seems to have vindicated the argument that technology can extend the limits of a limited resource. Of course, as many scholars have pointed out (Sperling and Gordon 2009, Mulligan 2010) – and as groups such as 350.org have brought to public attention – extending the limits of oil through unconventional oil production comes at the expense of the climate, not to mention the ecosystems in which production occurs. Such technological prowess, then, is a troublingly unsustainable way to make the oil supply more sustainable (or at least more certain in the short- to mid-term).

The issue encapsulates the basic problem of unlimited consumption in a world with limits. What are the limits? Can human ingenuity design around those, or work within, those limits? It seems only logical that oil will run out. Yet the potential for technological effort to

extend the limits of oil is compelling enough to introduce uncertainty to the question of when –

or indeed, if – that might happen. At least for some, that uncertainty about "when" means that

any claim about limits is suspect (not unlike the predicted resource scarcities that Ehrlich

predicted in the 1970s).[8] What can be said, however, is that even if oil production does not end in

the face of limited oil supply, it will change. Perhaps for the better, in the eyes of automobility

critics, by forcing a shift away from fossil fuels – but perhaps for the worse, by developing

unconventional oil sources to keep gas prices low at the expense of the environment. Altogether,

depending on a limited resource clearly presents a problem, but few can agree on its parameters

and urgency.

Oil's ecological impact

Besides the question of whether automobility *must* change as oil runs out, many critics

make the case that automobility *should* change, given the ecological impact of oil production,

arguing that in both the short and the long term, producing oil does remarkable violence to

human and nonhuman health. In their detailed lifecycle analysis of oil, Epstein and Selber (2002)

have estimated the ecological impacts of oil production from exploration through to combustion

in a car engine. They conclude of oil that "each stage in its life cycle carries hazards for humans,

wildlife and the environmental systems on which we and other species depend" (Epstein and

Selber 2002, 5). These hazards are not small in scale, either; in a separate lifecycle analysis,

Maclean and Lave (1998, 328) estimate that approximately 3000 kilograms of hazardous waste is

generated just by producing the gasoline that one car uses during its lifetime.

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[8] Take, for instance, Yergin's slightly mocking tone when he writes that "The date of the predicted peak has moved over the years. It was once supposed to arrive by Thanksgiving 2005. Then the "unbridgeable supply demand gap" was expected "after 2007." Then it was to arrive in 2011. Now "there is a significant risk of a peak before 2020.""

In the early stages of the oil production process, drilling for oil often involves pumping water into the oil reservoir. This process means that between 60,000 and 400,000 gallons of water are used daily by a single drilling operation; afterwards the water can contain heavy metals, benzene, toluene, and xylene (Epstein and Selber 2002, 9-10). Although the water can be treated to filter out these toxic substances before being reintroduced to the environment, such treatments "seem to be employed selectively" by drilling outfits (Epstein and Selber 2002, 10). Even in their normal operations, offshore drilling rigs dump into the ocean a substance known as "mud" -- "lubricants used to pressure debris out of the well and to cool the path of the drill bit as it rotates" -- that is full of heavy metals, including mercury, cadmium, lead, barium, and hexavalent chromium, which can bioaccumulate in fish (Tamminen 2006, 30). Drilling for oil also can involve flaring natural gas, which releases carbon dioxide, carbon monoxide, methane, nitrogen oxides and sulfur dioxide into the atmosphere (Tamminen 2006).[9]

At the refining stage, oil continues to have many of the same polluting ecological effects, although at a greater scale: Maclean and Lave (1998, 325) estimate that the refining stage "generates the majority of the hazardous waste during the fuel cycle." Despite efforts to contain spills and to filter emissions, refineries are estimated to release 11,000 gallons of oil into the ground each day through leaky equipment. Refineries also release sulfur dioxide, carbon monoxide, and particulates into the air (Epstein and Selber 2002, 27). Some evidence suggests that communities living near refineries and major oil storage facilities have higher rates of cancer (Knox and Gilman 1997).

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[9] In some countries (the US, the Netherlands, e.g.) this natural gas is captured for use instead of flared; however, in many other countries (e.g. Nigeria, Saudi Arabia, and Iran), much of this gas is disposed of by flaring (Epstein and Selber 2002, 25).

As oil moves from its site of production to refineries and on to fueling stations, it continues to have an ecological impact. There are, of course, massive and well-known oil spills: the Exxon Valdez tanker spilled nearly 300,000 barrels of oil after running aground in Alaska's Prince William Sound in 1989 (Oil Spill Intelligence Report 2007; an estimated 11 million barrels of crude oil spilled into the Persian Gulf when the Iraqi military blew up more than 800 wellheads in Kuwait in January 1991 (Husain 1995); and most recently, the Deepwater Horizon offshore rig spilled nearly 5 million barrels of oil into the Gulf of Mexico after a blowout in 2010 (U.S. Coast Guard 2010, 4). There are also large oil spills that go largely unnoticed -- "[l]arge-scale oil spills, defined as spills of over 10 million gallons, have occurred almost every year since the 1960s" -- while smaller spills are so frequent that they cumulatively release more oil into the environment than do the large-scale spills (Epstein and Selber 2002, 20-1). Offshore spills endanger marine life, while on land such spills contaminate soils and groundwater. Tamminen (2006) and Epstein and Selber (2002) have both pointed out that, although the major oil spills get the most public attention, poorly maintained equipment means that even under normal conditions, crude oil and refined fuels leak out of containers at all points in their distribution: from tankers, pipelines, refineries, tanker trucks, and storage containers in gas stations. "Each year, 0.75-1.8 billion gallons of crude oil are unintentionally released into the environment," which then can kill or bioaccumulate in marine animals, livestock, and wildlife, and harm humans (Epstein and Selber 2002, 4, 11).

Lastly, it should be noted that producing oil consumes energy. Because of the high heats required, "Petroleum refining is the most energy-intensive manufacturing industry in the United States, accounting for about 7.5% of total US energy consumption" (Gautier 2008, 93). In total, it takes 99.8 million btu (British Thermal Units) of energy to extract, refine, and distribute the

amount of oil the average car will use in its lifecycle (Maclean and Lave 1998, 328). To put this in context: there are roughly 20 million btu in a ton of coal (EIA 2014), meaning that the energy it takes just to get gasoline from an oil well into a car is the equivalent of roughly 5 tons of coal.

Oil's geopolitical dynamics

A number of critics also make a geopolitical argument against the desirability of the oil commodity chain. Several argue that competition over oil wealth exacerbates conflict. Though there is contention over the extent to which oil contributes to conflict, research in political science has investigated cases where the rights to oil revenues can be a sticking point in peace negotiations, as in Iraq; oil fields can provide a key site of contestation during a conflict, as in Sudan; and oil revenues can more generally exacerbate or prolong intrastate violence, as in Nigeria or Angola (Jaffe and Miller 2012; ICG 2012; Ross 2012; Colgan 2009; cf. Basedau and Lay 2009; Shaffer and Ziyadov 2012).

Others argue that the resources that the US expends on securing a stable oil market – for instance, by deploying the Fifth Fleet to the Mediterranean – constitute a reason that automobility should change. The milder (and somewhat US-centric guns-for-butter) version of this argument is merely that those resources could be better spent elsewhere (e.g. Ogden et al. 2003). The stronger version of this argument comes from writers who claim that the exercise of US power to secure oil supplies represents a form of imperialism, as the US deploys military power to uphold the automobile-centric American way of life (Dennis and Urry 2009; Paterson 2007; Dalby and Paterson 2009).

Finally, there are those who argue that the major oil producers are not merely unreliable (constituting an economic and political liability) but tyrannical (constituting an ethical problem). As this argument runs, to buy oil from a dictator is to subsidize oppression: "When Western

money transfers to the volatile Islamic Middle East, it often directly or indirectly finances anti-American and anti-Western causes, including agitation, religious intolerance, and terrorism" (Black 2006, 269; see also Friedman 2008, ch. 4; Lutz and Fernandez 2010; Urry 2013). In this view, the production of automobility is bound up in providing revenue to (and being beholden to) undesirable causes and dangerous people ("petro-dictators," to use Friedman's phrase [2008]).

These scholars and writers raise questions about long-term feasibility and desirability of oil production. Some aspects of it seem more straightforward: there is little debate that oil production produces wastes and pollutants that undermine the viability of human and nonhuman habitats, doing long-term damage to renewable resources such as water, soil, and the atmosphere.[10] Other aspects are less clear-cut. Oil production consumes limited resources, though the precise nature of those limits is uncertain. It also creates political dynamics that many consider destructive or otherwise objectionable. Though there may not be a clear consensus on the scope and nature of oil as a problem, there is nevertheless an ongoing conversation as to whether oil production – and the automotive consumption that it is enmeshed with – can, or should, continue indefinitely.

Climate change

In all its forms, mobility contributes to climate change. The fossil fuels that go into moving container ships, jets, trains and automobiles accounts for an estimated 14 % of all global greenhouse gas (GHG) emissions (Dennis and Urry 2009, 9). The IEA estimates that transport was responsible for 22% of world CO_2 emissions in 2011 (IEA 2013). Transportation is also the

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[10] See the discussion in Mulligan (2010, 83) of Homer-Dixon's distinction between threats to stock and threats to renewable resources, and Lipschutz and Holdren's distinction between security threats due to scarce mineral resources vs. those due to "large-scale environmental and social 'side effects' of energy sources" (126, cited in Mulligan 2010). Regardless of how one draws the line, oil production undermines sustainability on both fronts, as it both depletes and threatens.

largest anthropogenic contributor to NOx emissions (37% of total emissions), while contributing

an estimated 19 percent of total VOC emissions, 18 percent of CO emissions, and 14 percent of

global black carbon emissions (Fuglestvedt et al. 2008). But of all mobility forms, automobile

use contributes the most to climate change.

To begin with, automobiles contribute to GHG in the production and manufacturing

stages. The IEA (cited in Paterson 2007, 37) estimates that of an automobile's lifecycle GHG

emissions, 60-65 % of come from CO_2 emitted while the automobile is in use; 15-20% come

from extraction, processing, and transport of gasoline; and 10% come from manufacture; and the

rest from the other emissions listed above. The EPA estimates that "upstream emissions add an

average of 27.5 percent to the direct emissions for gasoline vehicles" (cited in Sperling and

Gordon 2010, 262 fn7), while the processes of extracting, refining, and transporting gasoline

"adds another 4 to 5 pounds CO_2 per gallon gasoline consumed" (cited in Sperling and Gordon

2010, 270 fn 3). Others add in to their estimates the CO_2 emitted by road construction and

maintenance, which they claim can contribute up to 20% of an automobile's lifecycle emissions

(Uherek et al. 2010, 4808).

Yet automobiles contribute more by far to climate change during their "use phase."[11]

Road transport – including both private automobiles as well as freight trucks – accounted for

roughly three-quarters of all CO_2 emissions from transport (IEA 2013, 11; see also the IPCC

estimates in Ribeiro et al. 2007). "A gallon of gasoline burned in a vehicle engine produces

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[11] Besides CO_2, automotive GHG emissions also include nitrogen oxides (NOx), a short-lived GHG that varies
seasonally; Uherek et al. (2010, 4808) estimate that NOx from road transport in the contributed to an average of 2-
6% of the formation of tropospheric ozone in the Northern Hemisphere during the summer (see also Whitelegg
1997, 119). Nitrogen oxides also help to form "peroxyacetyl nitrate (PAN), and of hydroxyl radicals (OH), which, in
turn, affect the equilibrium concentration of the greenhouse gas methane (CH_4)" (Uherek et al. 2010, 4808). Others
include carbon monoxide (CO), sulphur dioxide (SO_2), particles (PMs), black carbon (BC) and "fugitive
hydrocarbon emissions" (Uherek et al. 2010, 4808; see Uherek et al. 2010 for an in-depth accounting of the
chemical makeup of automotive emissions and their atmospheric interactions).

approximately 9 kilograms of CO_2. A typical passenger car driven 15,000 miles per year thus puts about 8 tons of CO_2 in the atmosphere" (Gautier 2008, 104). Uherek et al. (2009, 4773, 4790) report that in the 20th century, road transport released a cumulative 114 billion metric tons of CO_2 into the atmosphere; Fuglesvedt et al. (2008) calculate that this represents about 10% of all anthropogenic CO_2 since the pre-industrial era.

As in so many other automobility-related phenomena, the US plays a leading role in GHG emissions from cars. In 2011, road transport in the United States accounted for 1.4 billion metric tons of CO_2, or 27% of all road transport emissions in the world (IEA 2013, 71). This means that American automobility alone was responsible for 4% of all anthropogenic CO_2 that year. DeCicco and Fung (2006, iv) write that the US has only 5 percent of the world's population, but drives 30 percent of the world's cars and produces 45 percent of the world's specifically automotive CO_2 emissions. Calculating their numbers based on the size and performance of the entire US automotive fleet, they estimate the "amount of CO_2 emitted a year from the U.S. vehicle stock is equivalent to the amount of carbon in a coal train 50,000 miles long" (DeCicco and Fung 2006, 21). Another way to get at the contribution of American automobility to climate change is to consider the cumulative historical carbon toll of US road transport emissions. Since January 1973, when the EIA data begin, transportation in the US has released an average of 137 million metric tons of CO_2 each month (EIA 2013). Over the course of 40 years, this has added up to a total of 67 billion metric tons of CO_2. By comparison, the EIA reports that coal-fired power plants have emitted only 62 billion metric tons of CO_2 over the same time period. Of these US emissions, motor gasoline is responsible for roughly two-thirds, or 42 billion metric tons of CO_2 in the past 40 years.

Many transport and environmental scholars find these numbers particularly troubling because road transport seems to be on the increase. Globally, road transport has risen 52% since 1990 (IEA 2013, 11). Overall transportation-related CO_2 emissions "have more than doubled since 1970, increasing faster than in any other sector" (Sperling and Gordon 2009, 4; see also Ribeiro et al. 2007). Transport emissions are increasing particularly relative to other CO_2 emissions. Whitelegg (1997, 118) reports that, "In 1971, motor vehicles accounted for only 12 per cent of total global CO_2 emissions from fossil fuels." According to UNFCCC data (cited in Pulles and Yang 2011, 946), this rose to 17.4% in 2007, while "[a]ll other sectors showed a decrease in emissions over the same time span." "In 2050, as much as 30-50% of the total CO_2 emissions are projected to come from the transport sector (JRC/CONCAWE/EUCAR, 2006)." (Uherec et al. 2010, 4790).

The IPCC expects this trend of growth to continue: "Transport activity is expected to grow robustly over the next several decades. Unless there is a major shift away from current patterns of energy use, world transport energy use is projected to increase at the rate of about 2% per year, with the highest rates of growth in the emerging economies, and total transport energy use and carbon emissions is projected to be about 80% higher than current levels by 2030" (Ribeiro et al. 2007, 325). Paterson underlines the importance of this growth in automobile use: "cars assume greater importance in the politics of global warming than even this [their current emissions rate] suggests since, along with aviation, they are the only sector whose underlying emissions' trend in industrialised countries is one of growth. … Dealing with cars thus becomes particularly important, as it is widely recognised that technical advances can easily be outstripped by growing car use" (2007, 37).

Altogether, there is a groundswell of voices making the case that automobility as it is now practiced cannot continue indefinitely: its production consumes limited resources, oil in particular, and produces waste that undermines the long-term habitability of the planet. Yet even among these voices, it is less clear is how long and to what extent automobility can continue as it is. Though many claim that in the long term there will be neither fuel nor hospitable climate left, it seems as though fossil-fueled automobility can easily continue, at least for a while. There is still some oil, even if it is difficult and expensive to extract. There is still a hospitable climate, even if it becomes less so yearly. And massive and widespread automobile use continues. Whatever economic or ecological conditions might force a change or end to automobility, they do not seem to currently obtain. As this chapter's conclusion will discuss, this uncertainty is what makes the unsustainability of automobility ultimately a political discursive question. This uncertainty is why interpretive agency matters. Geological, economic, ecological conditions: these are always mediated and interpreted. Transformation requires more than a change in conditions; it requires a change in meaning. Narrating the future of automobility connects transportation policy to its long-term consequences and thus its ethical dimensions. And the uncertainty about scope opens up the space for the kind of discursive politics this dissertation analyzes, as people attempt to define what must or cannot change, what must or cannot end.

Performing automobility

Most research dealing with the unsustainability of automobility focuses – with good reason – on the systems that make automobility possible: the oil production, the automobile manufacturing and disposal, the contributions of the internal combustion engine to climate change. As the above section suggests, these systems consume limited resources and produce greenhouse gases and waste at a remarkable scale. Yet automobility is not only materially

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produced; it is also socially performed: "We are how we move" (Vanderbilt 2008, 19). The introductory chapter touched on this – the experience of autonomous mobility can be seen as producing a driving subject that embodies a kind of highly individual, even sovereign, "restlessness" and mastery. This literature questions the social consequences of such subjecthood. Some of this literature can be found in architecture and urban studies, some in psychology, and some in what Sheller (2004) terms "emotional sociology." It makes a case against not the automobile itself, but against driving as a social performance. This section discusses the two major concerns elicited in that literature: that driving endangers others and weakens social ties.

Danger to others

The automobile allows the human body to travel at remarkable speeds and to cover great distances in short amounts of time. Indeed, this is one of the primary great promises of automobility: to cross distance quickly and feel the thrill of speed. Yet the human capacity to process events and react accordingly becomes increasingly overwhelmed and unreliable at high speeds, and the human body is much less able to survive an impact at high speed than at a lower speed (Vanderbilt 2008, ch. 2, ch. 9). Part of performing automobility requires a certain amount of ignoring the intensely dangerous nature of driving. Even as the car expands the possibilities our bodies afford us, the human body's limits mean that the power and speed of the automobile escape our control. The statistics tracked by intergovernmental agencies give an impression of the scope of this fatal disconnect. The World Health Organization has estimated that "[m]ore than 1.2 million people die on the world's roads every year" (WHO 2009, iv). Worldwide, road traffic injuries are the leading cause of death for ages between 15 and 29; they are the second leading cause of death for ages 5-14, and the third leading cause of death for ages 29-44 (WHO

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2009, 3). Globally, cars kill more than 3,000 people and injure 137,000 daily (Dauvergne 2008, 53). Cumulatively, "At least 30 million people have died in traffic collisions over the last century. Given the uncertainties of global data, the actual number could be two to three times higher" (Dauvergne (2008, 59). Across the globe, the average person's odds of dying in a traffic collision are 1 in 100; in the US, it is 1 in 84 (Dauvergne 2008, 59). As critics have noted (see e.g. Lutz and Fernandez 2010), automobiles are designed to protect those inside the car while those on the outside of the car are much more vulnerable: "nearly half of those killed each year around the world are pedestrians, motorcyclists, cyclists and passengers in public transport" (WHO 2009, iv).

Even for those who survive motor vehicle crashes, the toll of an automobile's impact on the human body can be brutal. Though it is difficult to document the number of injuries caused by automobiles yearly, the WHO estimates it to be between 20 and 50 million non-fatal injuries yearly (WHO 2009, vii). In the US, 2.2 million people are estimated to have been injured in accidents in 2010 (NHSTA 2012). Around 206,000 injuries a year are rated as either a 3 (complicated fractures and concussions), 4 (massive organ injury or heart laceration), or 5 (spinal cord injuries or crushed limbs) on the Abbreviated Injury Scale (Leonard Evans 2000, cited in Lutz and Fernandez 2010).[12] Many of these injuries are due to what is known as the "second impact" – the impact of the human body with the inside of the car. Yet Lutz and Fernandez (2010, 188; see also Read et al. 2004), anthropologists who have conducted extensive interviews on the embodied experience of the automobile in the US, have argued that one should also

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[12] In the 1970s, the American Medical Association, the Association for the Advancement of Automotive Medicine, and the Society of Automotive Engineers, with the goal specifically to rate and compare injuries in automobile crashes (MacKenzie et al. 1985, 823-4) established a standard scaled system for reporting automobile crash injuries. This scaled system is now used in emergency rooms in the US, Canada, England, Germany, Japan, France, and Australia.

consider the "third impact" of automobile accidents – the emotional and financial aftereffects that can last for years. Victims of severe crashes often develop post-traumatic stress disorder (Blanchard et al. 1995; Blanchard et al. 1996) and are burdened with ongoing high medical costs. Lutz and Fernandez, who interview psychologists as well as crash victims, highlight that part of what is so shocking about car crashes is how suddenly and easily a normal, everyday activity becomes a scene of violence. Being involved in or losing a loved one in an automobile accident produces an intensely disorienting vulnerability, "a real shaking of the foundation of what is to be relied upon" (Lutz and Fernandez 2010, 192), to the point where one can no longer trust one's commonsense understandings of the world. "Maybe gravity doesn't work either. Maybe chairs aren't meant to be sat on" (Lutz and Fernandez 2010, 192).

Unlike the drawing down of limited resources or the undermining of ecosystems on which we depend, the annual traffic death toll does not necessarily imply that automobility cannot continue as it is. The toll of deaths and injuries caused by automobiles is not precisely evidence that automobility is unsustainable over the long term. Indeed, many scholars have pointed out just how persistent automobility is, given its grim human cost. The violent potential of automobility is normalized (Vanderbilt 2008, ch 4; Simons 2009; Princen 2005, ch 8, 2010, 107). As Bohm et al. put it, "[t]he US might go to war because three thousand people die in a horrific attack on two skyscrapers, and a plane crash might make the headline news for a few days; roughly the same number (around 3200) of people are killed in car crashes on a daily basis, but their deaths are not spectacular enough to make it into the news" (Bohm et al. 2006, 10). As Beckmann points out, this is not merely a cognitive idiosyncrasy but also the product of conscious efforts to sanitize the violence of automobility: he writes about how, after a traffic collision, "Accident-workers cleanse the road, repair the car, heal the victims and lock up

irresponsible drivers – suggesting that afterwards driving has become safe" (Beckmann 2004, 95). Altogether, it seems as though that the world is very willing to sustain the human costs of automobility indefinitely. There is still an argument to be made, however, that just because automobility can continue as it is, it should not.

Social atomization

Finally, there is a body of work critical of autonomous mobility itself and its promise of mastery and freedom. One of the most frequent claims made in this literature is that the aggressive individuality of driving is destructive of social ties and a sense of responsibility to others. As Paterson (2007) writes, "the car is promoted as an expression of individual freedom. But for critics, this is a form of freedom which denies dependence on others, which isolates people from each other, which threatens family cohesion... which destroys community bonds and obligations and entrenches a selfish, competitive, aggressive social form" (Paterson 2007, 51; see also Kay 1997).

Leaving aside the issue of aggression,[13] the claim that automobility destroys social ties is one that resonates with, and builds from, the argument that sprawl destroys social ties (Jacobs 1961; Mumford 1961; K. Jackson 1985; Putnam 2000). This argument about sprawl – and the critics of this argument – are discussed in more detail in chapter 5; for now I will deal only with the claims that the performance of autonomous mobility itself (and not the automobile's role in sprawl) can undermine social ties. One claim is that simply being in a car isolates the driver from the world. By placing a driver in a "private cocoon of glass and metal" (Urry 2006, 24), the car "renders [one] mostly mute" to others (Vanderbilt 2008, 21; see also Katz 1999; Michael 2001).

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[13] Though frustration while driving aggression seems to be a nearly universal experience, it is intriguingly underexplored as a social or cultural phenomenon. Katz (1999) remains the only work to explore aggression in the car as an intersubjective experience, rather than as an expression of an individual's psychology.

Effectively, the car shuts down human communication. In addition, driving lends itself to misinterpretations of behavior such as the "actor-observer effect," where drivers tend to notice the mistakes of others while overlooking their own (Vanderbilt 2008, 22).[14] The anonymity of the car means that drivers are rarely held accountable for their behavior. A driver may see others driving aggressively or carelessly, but she cannot speak to them or hold them accountable, while at the same time she may herself be driving aggressively or carelessly without being held accountable. It may seem a trivial point – these interactions happen in passing, by their very nature. Yet given the amount of time many people spend "inhabiting the car" (Urry 2006), and given the amount of space dominated by automobiles (Paterson 2007, Freund and Martin 1993), these ways of performing the autonomous (and unaccountable) self in relation to others take on a profound significance in everyday life.

Another slightly more complex version of the argument that automobility can undermine social cohesion takes into account the ways in which "cars have been deeply integrated into the affective networks of familial life and domestic spaces, as well as friendship networks and public sociability" (Sheller 2004, 230). For instance, genuine social care is shown when a parent drives his child to school, or when a friend offers another a lift, or when co-workers bond during regular shared commutes. In this view, "there are plural ethics associated with car use in everyday life, and intense negotiations between these ethical stances" (Maxwell 2001, 212, cited in Sheller 2004). Yet even in this case, the integration of the car into familial or social life can create "a conflict between an ethics which is concerned with aggregate effects of personal action on the world at large and a morality that sees caring in terms of more immediate concerns such as one's partner and children" (Miller 2001, 28). Put more critically, even the care that can be

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[14] Vanderbilt (2008, 21) uses the example of a man who honks to show appreciation for another car's Green Day bumper sticker, an effort that is "rewarded with a finger."

expressed through driving is based on exclusion – it is generally limited to whomever is in the car.

One final thread in this literature focuses not on one's relationship with the others but with one's relationship with one's surroundings: automobility degrades one's sense of belonging in, and responsibility to, the landscape one inhabits. By definition, being autonomously mobile means being in some sense unattached to one's surroundings. To drive is to perform a self that can detach itself from its surroundings at will – not unlike the "restlessness" that Jasper (2002) argues has historically been a core dynamic in American culture. Kay (1997) similarly suggests that automobility embodies a kind of escapist frontiersmanship – an attitude that she seems to associate with waste and, ultimately, social irresponsibility (see Kay 1997, 8-9). Automobility can be seen to empty out the content of the landscape, as "one ceases to believe one's surroundings have any meaning save as a means towards the end of one's own motion" (Richard Sennett quoted in Kay 1997, 58). Princen (2005, ch 5) claims, too, that the everyday experience of automobility depletes even one's ability to notice or give any directed attention to the environment around one. In this view, automobility produces a self that is defined by passing through rather than caring for; the world is mere background.

In all these arguments, the effects of performing automobility are hard to pin down. One can collect statistics on road fatalities, but it is difficult to measure or conclusively identify the ways in which automobility does subtle violence to one's ability to relate to the world. Nevertheless, many voices claim that we should be as concerned by what automobility does to us as it does to the world's ecosystems. Regardless of whether or not automobility must change, they argue that it should.

Conclusion

Automobility has generated an array of critics deeply concerned about the car's ecological effects and the ethical quality of driving. This chapter has pulled together the most important claims made across fields about the unsustainable, unethical aspects of automobility. The production of automobility consumes limited resources (even if the those limits are unclear), produces waste and emissions that are destructive to the ecological resources on which life depends, and arguably creates politically troubling dynamics. The performance of automobility, with its high-speed mobility and its glorified autonomy, puts others in physical danger while arguably lessening the driver's ability to relate to others and the surrounding landscape. Given such systematic and sustained criticism, how does one move forward from "automobility and its discontents" (Paterson 2007, ch. 2)? Or, put another way: what next?

One way to answer this question is to identify solutions to the unsustainable or ethically troubling aspects of automobility. In the literature that deals with automobility, there is an abundance and wide array of recommendations or envisioned solutions for the unsustainable and unethical status of automobility, from gasoline taxes to voluntary simplicity. Chapters 4-6 delve in more detail into such envisioned solutions.

I would suggest, however, that there is an additional, somewhat meta-level, answer to the question of "what next?" What is needed next is not merely more scenarios or recommendations. What is needed is scholarship that takes seriously the interpretive political and cultural work that happens when solutions are put forward. Such scholarship does not skip straight to the next step – what is to be done – but dwells on (unpacks, attempts to understand) the act of envisioning as a moment of interpretive agency: when actors provisionally make meaning from the conceptual and cultural resources available to them in order to collectively renegotiate the bounds of their identity (can we live in a world without cars and still be recognizably us?) and recast grand

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narratives (perhaps the 20th century was not the summit of human achievement but a fossil-fueled fluke of prosperity). As the introductory chapter notes, this dissertation neither identifies potential future scenarios for the car, nor makes recommendations about how to pursue one scenario versus another. What it does is analyze the kinds of people we are asked to become when scenarios are identified. It finds the ways in which making recommendations establishes certain actors as meaningful agents of change, while downplaying the agency of others or allowing them to abdicate responsibility for change. The following chapter will delve into theories of how such interpretive, imaginative work happens.

CHAPTER 3

THE POLITICS OF THINKING THE FUTURE

"You never get anywhere looking in your rearview mirror."

– Charles Kettering quoted in Kenneth Jackson, *Crabgrass Frontier*

What does it mean to "think the future"? The term is borrowed from Dennis and Urry (2009, 147), and though they use the phrase merely in passing, it is a useful one. The phrase "thinking *about* the future" conjures up an object (the future) about which we can plan, which, despite some uncertainties, is ontologically independent from our thinking about it – it is more or less out of our control. The phrase "thinking the future," however, seems to hint that we have a hand in envisioning that future and ultimately realizing it. We play a role in thinking the future into being, just as one builds a road into being or writes a novel into being. By "thinking" I mean not what goes on in an individual's mind but social thinking – that is, writing, talking, and acting according to intersubjective understandings about the world. "Thinking the future," then, is the social production of texts, plans, forecasts, and projects that interpret the future in particular ways.

The quote above – "You never get anywhere looking in your rearview mirror" is from Charles Kettering, the head of research at General Motors from 1920-1947, and it launches this chapter for two reasons. First, it expresses the kind of future-oriented action theorized in this chapter. Social or political action that seeks to "get anywhere" is forward-looking in some way; the first half of this chapter delves into the question of what exactly that means. It argues that in the modern era, "thinking the future" has become a fundamental part of our understanding of human agency – which I understand to be the making of meaningful action in the world. In this,

it builds off of social theorists who have drawn attention to the temporal dimension of social action. In particular, it draws from Giddens, who has argued for a "recovery of temporality as integral to social theory" (Giddens 1979, 8), and Emirbayer and Mische, who have defined agency as "a temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented toward the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment)" (Emirbayer and Mische 1998, 963). I argue that the politics of the future is bound up in interpreting continuity and change: the crucial work performed by talking about the future is in reproducing the boundaries of what must and should remain the same, and what must and should be subject to transformation.

Second, the sentiment that "you never get anywhere looking in your rearview mirror" is a particularly modern one. This chapter, besides theorizing the future-oriented dimension of social action, will historically situate thinking the future. The second half of the chapter makes the claim that how we conceptualize the future is not given or innate; the way we "think the future" in the modern West is the product of cultural history. It highlights three developments in the concept of the future that concern us here: the future as better, the future as "makeable," and the future as (potentially) radically new. It argues that the politics of progress have been bound up with modern state authority and expertise; it then introduces two alternative ways of thinking the future that have emerged in resistance to the narrative of progress: Arcadian utopianism, which views the future as an opportunity to recapture a lost past (the future can be better, is makeable, but should not look radically new), and ecological dystopianism, which envisions a radical break from the present, where social change happens not because it is desirable but because it is necessary (the future may or may not be better, is only partly makeable, and inevitably will be

radically new). This chapter sets the theoretical groundwork for the later chapters. First, it brings theoretical attention to the discursive moves made by those engaged in thinking the future of automobility, analyzed in detail in the three following chapters. Second, it introduces three traditions of thought on what the future can and should hold, and who has the power to actualize that future. As later chapters will show, all three ways of thinking the future are at play in narrating the future of automobility. Chapter 4 follows the dominant narrative of modern progress as it plays out in advanced vehicle research; chapter 5 draws out the Arcadian aspects of smart growth principles in urban planning; and chapter 6 highlights the discursive importance of the near-apocalypse in the Transition movement.

Thinking the future as political interpretation

We all have a vague sense that how we think about the future matters – that our assumptions guide our predictions, that some problems demand solutions while others are out of our hands. But what precise political work gets done when we think the future – predict, plan for, and envision different eventualities? Particularly in a reflexive context: when one problematizes an aspect of the collective identity and moves towards envisioning self-transformation, thinking the future is an interpretive political act. Regardless of the logic and language in which talk about the future is couched – whether in terms of extrapolated trends or utopian projects – thinking the future invariably gives meaning to action in terms of what is possible and desirable. The dismissal of possibilities, the bids to redefine the desirable: these are the fundamental ways in which "thinking the future" exerts power.

Much of social science has been engaged in theorizing social continuity and social change; it has paid attention to changes in conditions (economic, demographic, or institutional) that opened up space for actors or social movements to pursue their visions of a different future.

Such a focus on conditions is not misplaced – we all know that women and men "make history but not under conditions of their own choosing" – and so paying attention to conditions is certainly a worthwhile endeavor. Nevertheless, what can get left out of such accounts is the "creativity of action" - the moment where an actor can make socially intelligible sense of a past and present in order to posit potentially different futures.

<u>The reflexive moment</u>

George Herbert Mead has argued that human behavior is not determined by cycles of mere stimulus and response; there is a moment of interpretation that follows the stimulus and precedes the response. This moment of interpretation "makes possible the exercise of intelligent and reflective choice" (cited in Flaherty and Fine 2001, 150). Humans do not merely respond; they experience agency in moments of reflection and imagination. "During these moments, there is a world of possibilities, and selection from this set [of imagined choices] will shape ensuing events in ways that could not have been anticipated beforehand" (Flaherty and Fine 2001, 156).

One can consider such moments as opportunities for reflexivity: being conscious of one's conduct and its consequences, or being "guided by an awareness of the operation of feed-back principles" (Giddens 1979, 216). Reflexivity arises when unreflected belief "and the routines of action based upon it, are repeatedly shattered; what had previously been a habitual, apparently automatic procedure of action is interrupted" (Joas 1999, 128). One interprets a situation as problematic in an "act of reflection in which empirical knowledge becomes an element of moral consideration" (Joas 1999, 58). One example is the articulation of intergenerational equity in environmental thought. The idea expressed in *Our Common Future* (WCED 1987) of an obligation towards future generations' ability to meet their basic needs arises from a recognition of a problematic environmental past leading to a potentially problematic environmental future. In

this case, empirical knowledge of the depletion and pollution of resources in the past and present leads to a moral consideration of the future. Reflexivity involves an interplay between, on the one hand, knowledge of the past and present and, on the other hand, a consideration of what constitutes a better future.

Reflexivity, in turn, is closely linked to problematization. While reflexivity denotes a certain temporal awareness of self and consequences, problematization is its more urgent dimension. Once something is cast as a problem, it creates an imperative: in a problematic situation, "thinking the future" effectively means "thinking a solution." Thus problematization creates the space for a different future – it interrupts continuity not only by creating distance from the patterns that create continuity, but by positing the *need* for a different future. *Our Common Future* specifically defines poverty and ecological damage as one interrelated problem; it posits a potential future where a particular vision of sustainable development eradicates the worst poverty and manages environmental consequences.

However, social theory has mostly sidestepped the question of how a situation comes to be understood as problematic. Certainly, Joas (1999, 131, 160) points out that a problematic situation "must first be recognized as problematic by the actor himself" - "[i]n order to be able to act, the actor must pass judgment on the nature of the situation." Nevertheless, there is an assumption that the situation will somehow force itself upon the actor as problematic; in this view, problems are moments where the "world reveals itself to have shattered our unreflected expectations" (Joas 1999, 128). This moment of revelation - where a problem is naturally identified as a problem and automatically catalyzes a process of creative solution-making - is where these theorists fall short. If a problem simply reveals itself to an actor (as a potential problem-solver), it is already clear what can and should change – indeed, this is inherent in the

problem. At the same time, it is also clear what can and should remain constant; it is even taken for granted. In this view, an actor responds naturally to problems that already exist prior to her recognizing them as such; her creativity consists in responding to that problem.

In his study of policy agenda setting, Kingdon (2003) illustrates some of the limitations of this perspective. Certain problems become more prominent in the political domain because they tend to already be recognized as problems – they are already tracked through indicators like highway fatalities, for instance, or gain attention following a focusing event like a disaster as such focusing events "reinforce some preexisting perception of a problem, focus on attention on a problem that was already 'in the back of people's minds'" (98). But identifying a problem as such is largely the result of political effort, not the world revealing itself. As Kingdon points out, "If things are going basically your way, for instance, you want to convince others that there are no problems out there" (110). Conversely, Kingdon also argues, if you have a policy agenda that has garnered little political attention, you may attempt frame a situation as a problem in need of your particular policy solution.

As to how problems come to be understood as problems, Kingdon notes that "There is a difference between a condition and a problem. We put up with all manner of conditions every day: bad weather, unavoidable illnesses, pestilence, poverty, fanaticism. As one lobbyist said, 'If you have only four fingers on one hand, that's not a problem; that's a situation.' Conditions become defined as problems when we come to believe that we should do something about them. Problems are not simply the conditions or external events themselves; there is also a perceptual, interpretive element."[15] Policy entrepreneurs reframe conditions as problems by juxtaposing

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[15] One interesting thing about Kingdon's examples of conditions is that, while reading his work from the perspective of 2014, one can see all of his examples of "situations" as, in fact, problems that can be acted upon, or that are the result of human action (on a given day, one can only suffer bad weather, but in the long run, life in the Anthropocene means that bad weather is something that one can do about.

those conditions with an ideal state, or with an actual state elsewhere, such as how advocates of high-speed rail compare the grim state of US rail with French high-speed rail ("The mere fact of being behind in 'the greatest country on earth' is enough to constitute a problem for some people" (111), as chapter 4 will discuss briefly in the context of electric car development). Policy entrepreneurs may also redefine the category in which a problem falls, such as when the road safety advocates begin talking less about automotive design and more about urban design.

"Getting people to see new problems, or to see old problems in one way rather than another, is a major conceptual and political accomplishment." Interpreting a condition as a problem is a powerful discursive move. It assigns blame and responsibility.[16] It mobilizes resources in the pursuit of change. Take, for instance, those whose neighborhoods were demolished to make way for highways as their low-income areas became defined as undesirable "urban blight" in the mid-20th century. For those who receive the resources and, on the other hand, for those who bear the "burden of adjustment" (Kingdon 2003), the definition of the problem has significant ramifications.

An actor's creativity lies not only in problem-solving, but in the ability to interpret (and not merely identify) a situation as problematic. Actors bring problems into being - not by causing them, but by reflexively considering the consequences of the past and imagining potentially different futures. This is creativity of action; this is the moment where critique opens up a radically new future. What the following chapters will analyze, then, is those actors who see automobility in its current form as unsustainable and therefore a problem, something that should change. These actors are experiencing a reflexive moment, where they are renegotiating what about automobility can continue and what must change.

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[16] Thanks to Sharon Weiner for this point.

Envisioning continuity and change

If, as Kingdon argues, "[c]onditions become defined as problems when we come to believe that we should do something about them," then believing we should do something about a problem means thinking the future. From problematizing a phenomenon like automobility it follows that one envisions a desired change: automobiles that do not produce carbon emissions, for instance, or cities whose inhabitants rely less heavily on motorized transportation. Yet, as this section will argue, thinking the future means combining envisioned change with very specific envisioned continuities – though such continuities are often taken for granted. Envisioning a change in the layout of cities to make them more walkable, for instance, requires one to expect cities still to exist in the future. Whether implicitly or explicitly, thinking the future means visualizing continuity and change, and as such, it plays upon understandings of identity and difference. Frederic Jameson recognized this interplay within the utopian literary tradition, writing that the fundamental dynamic of such thought will "always lie in the dialectic of Identity and Difference, to the degree to which such a politics aims at imagining, and sometimes even at realizing, a system radically different from this one" (Jameson 2005, xii).

By way of illustration: there is a small subgenre of books that celebrates "yesterday's tomorrows" (Goodman 2006; Corn and Horrigan 1996; Dregni 2006; Benford 2010). These books tend to be brightly colored and full of images of what used to be considered "futuristic" (rocket cars and robots, mostly). They poke gentle fun at the futures envisioned during a certain period, usually from the late 19th century through the end of the 1960s. Some try to learn from failed predictions; some just want to celebrate the imagination of scientists and novelists. What they share, however, is the commonsensical notion of the future. In this commonsensical notion, the future may be uncertain, but what is known for sure is that the future will be similar in some ways and will be different in other ways. This sounds self-evident: obviously some things in the

future will stay the same while others will change. However, this commonsense concept of the future is at the heart of the politics of "thinking the future." One author in this genre points out that a poster from the 1890s envisions a future in which the technology has all changed, but women still wear full-length dresses with bustles (Benford 2010). This poster draws lines of continuity (women always perform gender and will continue to do so in recognizable ways) and change (technology will allow us to travel farther faster in the future). In doing so, it could be said to create "the social space of expectation" (Koselleck 1985,49): it sets the expected boundaries for social change (in technology, not in gender norms).[17]

To put this in more theoretical terms: Giddens (1979, 217) has argued that "neither the couple stability/change, nor that of continuity/discontinuity express mutually exclusive polarities." In other words, no social group ever experiences total disruption or total stability at any point in time, "short of the wholesale physical extermination of the members of a society" (Giddens 1979, 216). Though Giddens makes this point in order to conclude that the social scientist's job is empirically to disentangle the two, I would argue that there is something ontologically much more interesting going on. To disentangle the two – to draw out lines of continuity, to identify moments of change – is to take some connections as meaningful and to discard others. It is to interpret what counts as continuity (which aspects of identity transcend time) and what counts as change (which aspects can be subject to alteration over the course of time). Continuity and change are not there to be discovered by a scientist (social or otherwise), but rather are brought into existence by acts of interpretation.

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[17] Note that "expectation" here has a double sense - its temporal meaning as unfolding in the future, and its defining of social expectations as in acceptable behavior.

Continuity

Continuity by definition is the quality of being uninterrupted, connected, or unbroken across time.[18] It is about sameness. The act of anticipating future continuity, then, involves asserting that there is a self that will remain meaningfully the same in the future as in present, regardless of how drastic a change may occur. Giddens has criticized social theorists for too readily equating continuity with stability; he argues that rather than being a mere lack of change, continuity has to be actively produced. This concept of social continuity stems in part from Giddens' understanding of action as "a continuous flow of conduct" (Giddens 1979, 55). In this view, human agency is not made up of discrete moments of decision-making, nor is it only in evidence during intentional efforts at social change. Rather, it is a "stream of actual or contemplated causal interventions of corporeal beings in the ongoing process of events-in-the-world" (*ibid*.). As such, agents can reproduce already existing social patterns just as often as they can work to change social patterns. Agency can be continuity-producing as much as change-producing. This is particularly the case with routine: the reproduction, often unthinking, of social practices lends them an aura of stability across time. In *Modernity and Self-Identity* Giddens draws a link between this sense of stability and "ontological security" – that is, the sense of having a stable self.[19]

This matters for thinking the future because when continuity comes to be understood as connected to a stable identity and is unthinkingly reproduced across time, then the taken-for-granted character of that continuity comes to be understood as natural. To the extent that routine produces a sense of sameness (identity) across time, it constructs continuity. To the extent that

[18] "continuity, n.". OED Online. June 2012. Oxford University Press. http://www.oed.com/view/Entry/40278?redirectedFrom=continuity (accessed July 03, 2012)

[19] This stability across time shares the same dynamics of the process of institutionalization that Berger and Luckmann (1967) write about in *The Social Construction of Reality*.

routine is taken for granted, it naturalizes the structured patterns of social life. To the extent that those structured patterns of social life constrain action, continuity becomes a disciplining tool. Take, for example, the claim that it is inherent in human nature to seek mobility. When someone claims this of human nature, taking the invention of the wheel, the sail, the car, and the airplane as evidence, is to assert a radical continuity into the future. If people always have sought and always will continue to seek increased mobility, then any future attempt to change is not only contrary to human nature but is doomed to failure. If you expect human nature to be the same in the year 3000 as it is today, then there is no point in trying to change it. In other words, talking about future continuity closes off areas from potential change. If you view the impulse to improve one's mobility to be a part of human nature because "it always has been," then any future that imagines reduced mobility is not just undesirable but impossible.

This taken-for-granted character of continuity plays directly into the reproduction of collective identity. Envisioned social change always remains within the bounds of the self. In other words, there must be a self in order for there to be self-renewal. This is precisely where the tension between identity and difference comes into play. Imagine, for instance, "before" and "after" pictures of a building that undergoes renovation. What still has to be the same in the "after" picture in order for it to be the same building? The general shape? The location? The building materials? If the "before" picture is of a brick warehouse in Albany and the "after" picture is of a wooden bungalow in Kingston, Jamaica, the idea of before and after is nonsensical: there is nothing that remains the same across time in order for change to have any meaning. It is not change; it is simply difference.[20]

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[20] A slightly different example: even in fictional renderings of post-apocalyptic futures, the apocalyptic event is never so complete that no recognizable social practices remain. In fact, continuity is usually the most interesting and meaningful part of such stories: it is the author's distillation of what makes us *us*. It is what remains when all else is stripped away.

Consider the futures envisioned by the French Revolution in the late 18th century. The call to revolution is of course a call to radical change. As discussed above, the French Revolution opened up the concept of the future to include world-historically new possibilities. Yet at the same time, the call to revolution implies a radical continuity: that of the French people. The pivot around which the revolution revolves is the nation. Without a sense of a French people as a coherent self continuous through time, the revolution would have been meaningless. However, as Anderson (1991) has shown us, the continuity of this national community across time had to be "imagined" into existence.

Another illustration of how continuity undergirds change – how constructed identity defines the bounds of envisioned difference – is Dr. Martin Luther King Jr.'s "I Have A Dream" speech. The speech is a call for collective self-transformation; Dr. King puts forward a vision of American identity that includes within its boundaries a future where whites and blacks are equal. He very clearly and powerfully contrasts a violent past with a potential future. Yet the speech also asserts the continuity of the American identity across time by invoking the Declaration of Independence and the promises of freedom it articulates. It calls for difference across time within the bounds of a particular American identity.

Take a far more abstract example of envisioned continuity: the line in a forecast. Forecasts, when graphically represented, almost invariably use a line to visualize the movement of some phenomenon forward in time. Below is a line graph representing a forecast of the Earth's population from 1950 to 2100.

12
10
8
6
4
2
0

1950 1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
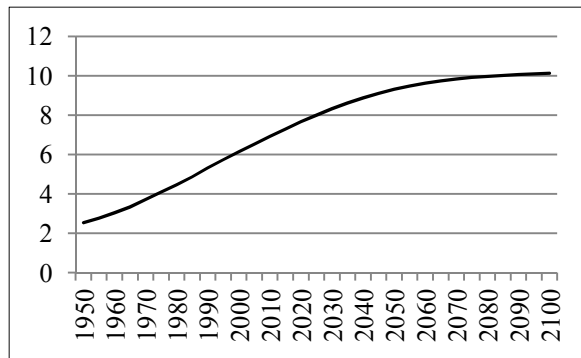
Figure 1: UN World Population Estimate (billions). Source: United Nations Secretariat, World Population Prospects: The 2010 Revision

This image of a line – simplifying reality to illustrate an expectation of the future – is an excellent representation of the way that continuity and change are at play when talking about the future. The line, by moving up and down in two-dimensional space, represents change – in this case, growth. At the same time, the line represents a stable category: this thing we call "world population." This category lumps together billions of individual lives experienced in all different ways. Yet all these are encapsulated in a line that is the same in 2100 (the end of the line), as it was in 1950. Though the actual people alive on the Earth will change over the course of those 150 years, the continuity of the population line remains: world population remains world population, regardless of the passage of time. What that line does, then, is assert continuity in the ontological boundaries of the human species (a continuity that, as will be discussed below, is not necessarily taken for granted in ecological dystopias).

The point is this. Thinking the future in terms of continuity requires constructing a radical *sameness* between unlike things across time. In the same way that Wittgenstein's (2001) "family resemblances" or Lakoff's (1990) "radial categories" point to the construction of sameness across difference, interpreting continuity constructs sameness across temporal difference. In the example of world population, a sameness is asserted between very different lives according to a notion of what it means to be human in order to anticipate continuity in the form of the continued existence of the human species until the end of the century. In this, continuity and identity are

conceptually intertwined; they both rely on understandings of what must still remain in order for the self (here, the human species) still to exist.

Change

Reflexivity and the ability to problematize are almost meaningless without the next step of envisioning self-transformation. As Walzer (1988, 17) has written, the "one common mark of the critical enterprise" is that "it is founded in hope; it cannot be carried on without some sense of historical possibility. Criticism is oriented toward the future."[21] While envisioning continuity draws upon understandings of identity and reinforces ontological security, envisioning change in the shape of a radically new future posits difference across time. As the disjuncture between past experience and expectations for the future, potential change represents "the possible otherness of our future" (Koselleck 1985, 115). Emirbayer and Mische (1998) argue that the ability to imagine such a potential change constitutes the "projective dimension" of agency. This ability to envision a future that is different than the past holds out the promise of change.

The ability to envision potential difference within identity is at the heart of human creativity and critique. Emirbayer and Mische (1998, 971) have argued that "it is the capacity for imaginative distancing ... that drives the development of the reflective intelligence, that is, the capacity of actors to critically shape their own responsiveness to problematic situations." This concept of "imaginative distancing" points to difference - after all, what is distance in this case but a spatial metaphor for difference? Imaginative distancing from one's routine self, then, is the act of envisioning potential difference from what is taken for granted. There is a parallel here with what Edward Said (1988, 15-16) has written about the role of the social critic:

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[21] Walzer (1988, ch. 1) argues that because (a) social critique has always existed, and (b) social critique inherently involves envisioning a better future, then (c) there is nothing uniquely modern or Western about conceptualizing the future as open to change.

On the one hand, the individual mind registers and is very much aware of the collective whole, context, or situation in which it finds itself. On the other hand, precisely because of this awareness – a worldly self-situating, a sensitive response to the dominant culture – that the individual consciousness is not naturally and easily a mere child of the culture, but a historical and social actor in it. And because of that perspective, which introduces circumstance and distinction where there had only been conformity and belonging, there is distance, or what we might also call criticism.

Similarly, too, Ricoeur has argued that "imagination is the very instrument of the critique of the real" (Ricoeur 1991, 171). Here, "consciousness posits something at a distance from the real and thus produces otherness at the very heart of experience" (ibid.). What all these writers point to is the imagining of potential difference, of distance, that opens up the possibility for critique and change. This moment of imagination is the moment where "the field of the possible now extends beyond that of the real" (Ricoeur 1991, 184).[22] As Jackson (2011) has said of science fiction, that domain of imagination and social critique, "talking about the future is an intervention in the present" – it serves very pointedly as a means of creating critical distance and engaging with alterity.

The politics of thinking the future revolve around this moment of identifying possible change. A vision of a better, different future refracts back into the present: it legitimates action in the present. In a way, this is the inverse of how we usually think about the relationship between our actions in the present and what the future holds. The commonsense understanding is that what we do today shapes what the future will look like. I would argue instead that what we think the future could look like shapes what we do today. In this, I would disagree with Luhmann (1976) that a utopian vision is "the future that cannot begin," by which he means that utopian

[22] It is important to highlight that, despite the positive connotations that generally surround the concept of human creativity and the emancipatory potential of change-seeking, imagination is not always an innocent endeavor. ""creativity in itself is neither good nor bad; there are many reasons why routine could be considered praiseworthy, and many a vision of ... creativity is a vision of terror" (Joas 1999, 197). If nothing else, evidence of this can be found in the incredible innovativeness that defines the history of techniques of torture and inquisition.

futures are never actualized.[23] Utopian futures – or, put differently, futures that envision difference as possible and desirable – begin by making certain actions in the present meaningful. Envisioning a future where electric vehicles are used widely gives meaning to government funding of vehicle research and development: it becomes a worthwhile investment, rather than someone's pet project, say. Envisioning a future with drastically reduced reliance on mechanized transportation of food gives meaning to an individual learning to grow one's own food in the present: it becomes meaningful experimentation, even preparation, rather than mere tinkering. Such futures "begin" as they legitimate certain courses of action in the present. Conversely, dismissing the prospect of future self-transformation – for instance, characterizing a social goal as desirable but impossible – recasts as foolish or futile any attempts to work toward that goal. Consider the phrase "It'll never happen." Uttering such a statement is much less about predicting the future than it is about disciplining imagination and action in the present. When "It'll never happen" (or one of its variants) is uttered by a social actor with particular authority (a US government agency, for example), that disciplining is particularly powerful.

Thought of in slightly different terms, this is akin to saying simply that humans can be goal-oriented. Alfred Schutz (1962, 68-9), theorizing how individual actors determine their conduct, puts it this way: "I have to visualize the state of affairs to be brought about by my future action before I can draft the single steps of my future acting … Metaphorically speaking, I have to have some idea of the structure to be erected before I can draft the blueprints." An actor determines what action is appropriate in the present by "bestowing meaning upon his [sic] ongoing action, and this is always … with the intention of bringing about a projected state of

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[23] As such, I would argue that his distinction between the acts of envisioning "present futures" (futures imagined in the present) and forecasting "future presents" (potential events in the future) is ontologically meaningless. Both acts, by narratively joining the present to the future, "begin the future."

affairs, of attaining a preconceived goal" (70-1; see Flaherty and Fine 2001 on Mead's similar understanding). Though Schutz sees this intentionality as purely subjective,[24] inhering in the attitude of the actor, one can draw the parallel to intersubjective intentions: identifying a desirable social goal (i.e. a better, different future) is a way to organize action in the present (to work toward that goal).

However, there is something slightly more interesting than mere rational preference-seeking going on here. For Schutz it is as if an actor recognizes a problem, identifies the desired outcome, assesses alternative means of achieving the outcome, and chooses the best alternative. I would not want to suggest that individuals (much less institutions or social groups – see Kingdon again on the irrationality of how policy alternatives get chosen) are quite so rational in assessing alternatives and putting together goal-oriented agendas in the present. Rather, I would suggest that Schutz's "idea of the structure" – the desired outcome – is given scope from the outset by who we think we are, while the "blueprints" that seem feasible or desirable are not necessarily rational but rather come to us from various conceptual repertoires or learned scripts for action.

This brings us to the discussion of conceptual repertoires for change. How do people go about collectively envisioning radical change? One thing that appears clear is that no matter how radical the change, the future is almost invariably envisioned in terms of things that already exist, that have already been envisioned and realized. Visions of change draw on existing repertoires. There is a parallel here with Wittgenstein's non-existent "private language": just as we cannot think in terms of language we have never learned, so we cannot think about a new world except

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[24] In fact he assigns causality not to the actor's "subjective" intention to achieve a goal, but to the "objective" conditions of that actor's past – as though it is not what an actor means to do that determines her action, but what her past has conditioned her to do. This differs from Mead's understanding, cited above, where the moment of interpretation between past and future opens up the possibility for considering different courses of action (see Flaherty and Fine 2001)

in terms of the old. As William McLoughlin noted in his history of American revival movements, envisioned change is "syncretic," as "self-renewal does not begin de novo" (McLoughlin 1978, 215) but by creating a vision of something new fashioned out of things that already exist. In Dewey's terms: "The new vision does not arise out of nothing, but emerges through seeing, in terms of possibilities, that is of imagination, old things in new relations serving a new end" (Dewey cited in Joas 1999, 143). This syncretism is evident in utopian literature, as well: "even our wildest imaginings are all collages of experience, constructs made up of bits and pieces of the here and now: 'When Homer formed the idea of *Chimera*, he only joined into one animal, parts which belonged to different animals; the head of a lion, the body of a goat, and the tail of a serpent'" – even radical, fantastical change is thought of in terms of things that are already familiar, known, imaginable (Jameson 2005, xiii).[25]

This syncretism – cobbling together radical newness from things that already exist – can also be seen in the policy domain, as becomes evident in Kingdon's *Agendas Alternatives and Public Policies*. In his years of interviews with policymakers, Kingdon finds that policymakers rarely think of new policies except in terms of old policies. For one thing, he suggests that there is a certain degree of performing of expertise that goes with familiarity with old policies and skepticism of new policies. More salient for the discussion here, though, is that he finds that policy "alternatives change not by mutation but by recombination" of old alternatives (141).

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[25] This is a slightly different point than saying that we envision the future in terms of the past. Take, for instance, Schutz's understanding of how a visualized future shapes conduct in the present: "First I base my projecting of my forthcoming act in the Future Perfect Tense upon my knowledge of previously performed acts which are typically similar to the prescribed one" (1962, 69). In the one case, imagination envisions change by taking hold of whatever discursive resources it can find. In the other case, imagination envisions change by expecting a series of "typical" acts. Both are acts of imagination, but they play with very different interpretations of the possible. As Luhmann points out, to base one's present action to achieve future outcomes on past patterns "would be rational" but "only insofar as reality itself is rational." (Luhmann 1976, 142).

Advocates of new or different policies "pull old proposals out of drawers, cut and paste them, rehashing old ideas in response to new demands" (142).

As will become apparent in the following chapters, actors rely not (only) on their own rational assessment of ends and means, but on the particular conceptual repertoires available to them. The commonsense conceptual repertoire available to an automotive engineer – specifically her ideas about how change happens and what the future is likely to look like – differs from the basic set of ideas about processes of change and potential outcomes that an urban planner or an ecologist learns in their training. This, in turn, has meant a divergence among the visions of automobility's future in different fields. We may all agree that change is needed – we may all embark from the same reflexive moment – but we may be working with very different resources with which to cobble together visions of change.

The politics of the future in the modern era

As Latour (1993, 68) reminds us, "the passage of time can be interpreted in several ways – as a cycle or as decadence, as a fall or as instability, as a return or as a continuous presence." Out of the many ways in which one can consider the passage of time, we think the future in the modern West in very particular ways: we operate, generally, in the expectation that it will be better, makeable, and (potentially) radically new. This half of the chapter begins by drawing from Koselleck's history of the concept of historical time, highlighting three aspects of concept of future that have their origins in the cultural history of the West. It then discusses the politics of progress as they have been bound up with state authority – and how this has been contested, first by a tradition of thought I am calling "Arcadian," and more recently by a tradition of ecological apocalyptic thought.

<u>Progress: the future as better, in our hands, and radically new</u>

Although his concern is the concept of historical time writ large, one can find in Koselleck's work three key moments that have given us the concept of the future that we have today. The first is what Koselleck calls "the Pauline dualism" - the idea, stemming from the epistles of Paul in the New Testament, that the future is the domain of Christians while heathens inhabit the past. Koselleck (1985, 175-6) points particularly to the second letter to the Corinthians, in which Paul writes "if any man be in Christ, he is a new creature: old things are passed away; behold, all things are become new." In this way, all "who became defined in a Christian perspective as 'Heathens' ... belong as such to the past. By virtue of the death of Christ, the future belongs to Christians. The future bears the new world." Though there was nothing new about the development of a dualistic us/them relationship, Koselleck argues that the Christian/heathen dichotomy was novel in that its hierarchy posited not a spatial difference but a temporal one (Koselleck 1985, 175); it introduced into Western thought a certain privileging of the future. In this way, although premodern concepts of time lacked "a vivid concept of causation through time, that is, of a lineage of factors, one leading to another, effecting significant change," (Crosby 1997, 30), there was also in the West a sense of moving forward to something better: "God had sacralized the concept of linear time by stepping into time in order to provide humanity with the possibility of salvation" (Crosby 1997, 35).

Of course, until the Enlightenment, this privileged future remained entirely in the Hereafter; the future that belonged to the Christians was not a future on Earth but in Paradise. Before the Enlightenment, the unfolding of historical time was considered preordained (Koselleck 1985, 92); it was "envisioned not as a straight line … but as a stage for the enactment of the greatest of all dramas, Salvation versus Damnation" (Crosby 1997, 28). The future could not be shaped by humans as it had already been fashioned by God. In this view, creativity

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belonged only to God; in fact, "it was still possible for talk of the creative nature of human writing and poetry to be considered blasphemous in Germany as late as the eighteenth century" (Joas 1996, 74). Certainly, humans could "exercise foresight and act accordingly" and engage in "the delicate art of political calculation" of the future within the scope of a few years (Koselleck 1985, 203, 13). However, even in the context of foresight and calculation, the idea of the future was stable: the power of creation was out of the hands of humans, so nothing fundamentally new could happen until Judgment Day. During the Enlightenment, however, philosophers of history began reinterpreting time itself; they "detached early modernity from its past and at the same time inaugurated our modernity with a new future" (Koselleck 1985, 16-7). At the same time, the increasing acceptability of scientific and technological experimentation began to change ideas about the human inability to alter creation (Joas 1996,74). This all culminates, in Koselleck's view, in the writings of Kant, which established the "makeability" of history. In Kant "the design of the future" becomes "the task of a moral imperative, conceiving history as a temporalized house of correction for morality" (Koselleck 1985, 204-5).

The third and last moment that Koselleck points to is the French Revolution, which shaped the term "revolution" as we now know it. Here, he argues, is where the concept of the future became unchained from the past. Until the French Revolution, revolution primarily referred to circulation – the astronomical return of celestial bodies – but from the French Revolution, revolution "led forward into an unknown future" (Koselleck 1985, 41-3). For the first time, the future commonly was understood as being (potentially) radically different, something never before experienced. Indeed, the very promise of the revolution was that it would "write off the past and create its substance out of the future" (Koselleck 1985, 51). Further, the French Revolution was the first instance where there emerged the idea of "the *duty* of activism"

(Koselleck 1985, 52). In the time since the French Revolution, the open future and a sense of a forward movement in time "is organised actively to promote social change" (Giddens 1979, 199-200). It was at this point that progress went from being "*one* of the important ideas in the West" to "the dominant idea" (Nisbet 1980, 171, original emphasis): it became not a value but an organizing principle, rendering all other values, such as freedom or social justice, goals to work towards rather than ahistorical ideals.

It is worth pointing out, too, that although the publication of Thomas More's *Utopia* in the early 17th century had launched a modern tradition of utopian writing, utopian literature did not develop a specifically temporal dimension until the late 18th century. It was only with the French Revolution and the beginnings of industrialization that utopias began to be located in the future, rather than in some distant and exotic locale (Kumar 1991, ch 3). Moreover, it was not until Saint-Simon, Fourier, Marx, and other 19th-century socialist writers that Utopia became a "goal of action" rather than a hypothetical ideal (Kumar 1991, 61). In this new utopianism, radical difference became a part of the unfolding of historical time.

The commonsensical concept of the future in the late modern West, then, is the product of a cultural history, incorporating very particular understandings of historical time. We have learned to think of the future as something that can and will be better (this is the legacy of Christian religious thought); as something that is within the power of humans to shape (this is the legacy of Kant); and as something that can be radically different from the past (this is the legacy of the French Revolution). However, if the particular cultural history of the concept of the future has produced a modern understanding in the West that humans can make a better and different future for themselves, then a certain amount of ambiguity has remained as to exactly how that plays out. One crucial aspect of this ambiguity is the question of who is capable of bringing

change about – a question that will come up often in the later chapters, and which the rest of this section will address.

One useful way to think about who makes the future is to consider the bifurcation of the future that emerged in the early modern era: there were now dual modes of experiencing what was to come. This can be seen in attempts in the early 20th century to make sense of new ways of viewing the future; cultural historian Kern shows us how the mode of "activity," wherein "the individual goes toward the future, driving into the surroundings in control of events" (Kern 1983, 89), came to be distinguished from "expectation," wherein "the future comes toward the individual, who contracts against an overpowering environment" (Kern 1983, 90). Kern points out that for assembly line workers in Henry Ford's plant in Detroit, the predominant way of experiencing the future in the present was one of expectation, as they waited "for the future to come along the line." At the same time the manufacturer was able to experience the future in the active mode, because he was able to control more closely and anticipate more accurately the rate of production (Kern 1983, 91).[26]

In other words, there is a certain relationship between control of the future and power. "In war or peace the rich and powerful have a stronger and more active sense of the future than the poor and powerless. Great wealth is a bridge to the future – it has the power to control people and events, to support oneself and one's family in difficult times, to create trusts and inheritances that insure the well-being of future generations, to build monuments and endow institutions as stakes for immortality" (Kern 1983, 296). Although Kern is more concerned here with the personal experience of the future, the broad point remains. The makeability of the future has come to be bound up in the modern understanding of power. Those who have no control over

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[26] Less dramatically, but perhaps more saliently for daily life, Kern also credits the telephone for creating a familiarity with expectation, as nothing makes one feel as helpless towards the future as waiting for a phone call.

their own futures are considered powerless. The ability to make and follow through with plans has become a crucial element of power.

Over the course of the past two centuries, certain institutions have come to play a particular role in making the future. The state, in particular, has become a locus of planning - that is, of socially legitimated control of the future. After all, the objective of state projects of rationalization is precisely to make social life predictable (Scott 1998). If - to borrow examples from James Scott - you plant trees in straight, exact rows rather than letting them grow without your direct intervention, you are much better able to calculate accurately the eventual timber yields. If you build cities with residential zones neatly separated from business districts and connect the two with freeways, you create the conditions for much more predictable traffic patterns. States impose order in the name of predictability. Alasdair McIntyre (1984) has gone so far as to argue that the actual ability of the state to control outcomes scarcely matters; states have never been able to predict or control outcomes. What matters is the performance of controlling the future - indeed, it is the very promise that states can predict and manage the future that justifies their exertion of social control (McIntyre 1984, 107).

There are almost too many examples to mention of high-handed state control justified in the name of progress. There was the centralized planning of the Soviet state, justified ideologically by the tradition of modern socialist utopian thought (Jameson 2005, Kumar 1991). There were the smaller-scale but symbolically charged urban planning projects, such as those of Robert Moses and Le Corbusier, justified in the grand modern tradition of bringing order and sanitation to cities that were seen as too crowded and potentially politically fractious (see Rabinow 1995; Scott 1998; Foucault 2006). There were also the Western imperial projects justified by the "temporal othering" that viewed a world where "backwards" natives were

brought into the modern era by more "advanced" races (Inayatullah and Blaney 2004; Said 1979). In all these cases, the state exercised its authority in an attempt to make the future better (and in doing so, reinforced the claim that it was the primary actor able to "make" a better future). Yet the interplay between authority and progress is not limited to the history of megaprojects and *missions civilisatrices*. It also extends to the realm of scientific inquiry and technological development. A basic premise of positivist science – to understand in order better to predict (and by extension, control) outcomes – has also undergirded the claim to authority that scientific expertise has had throughout the modern era. The prominent "Promethean" (Dryzek 2013) discourse, which privileges science and technology as a means to shaping the future in desirable, controllable ways, has justified the authority of scientific expertise. In all these ways, then, thinking the future as better, makeable, and new has been bound up with authority for the past two centuries.

Contested progress

The narrative of progress has not gone uncontested. Despite the "powerful support" enjoyed by the idea of progress in the modern era, the past two centuries have seen "an abundance of challenges to faith in progress" (Nisbet 1980, 297; see ch. 9). In the social sciences, the great works of 19th-century sociology evoked concerns about industrialization and its alienations (e.g. Weber's Iron Cage, Tönnies' *gemeinschaft*, Durkheim's *anomie*, Marx's alienation), while in the 20th century social theorists like William Whyte, Marcuse, Jacques Ellul wrote critically of modernity's conformities and passivities (see Kumar 1987, ch 10). In literature, utopian writing ebbed after the first surge of More-inspired works in the 17th century (Kumar 1991), yet it resurged with the rise of industrialization in the 19th century. Since then, utopian writings that celebrate progress and envision shining technological utopias (e.g. Edward

Bellamy and H.G. Wells) have been answered by an "elaborate counterpoint" (Kumar 1991) of

romantic or anti-utopian writings (e.g. William Morris, Aldous Huxley, and George Orwell).[27]

Of particular concern to this dissertation, however, are two alternative ways of thinking the

future emerged in resistance to the concept of progress: an Arcadian vision of recovering a lost

past, and an ecological dystopian vision of a drastically different future era.[28]

The politics of Arcadia

Beginning with the Romantic movement in England and Germany in the 19th century and

continuing through to deep ecology today, there has been a recurring thread of resistance to the

changes wrought by industrialization. This thread of resistance has objected to the ways in which

modern capitalism technological changes have resulted in the loss both of close-knit human

communities and of a connection to nature. Put differently, a "way out of developmental,

progressive, or rational-instrumental ways of thinking has often been found in exploring simpler,

rural ways of life in which small-scale societies are harmoniously embedded in their natural

setting" (Garforth 2005, 405). In contrast to the underlying promise of abundance and growth

that progress espouses, this thread of resistance embraces the ideas of sufficiency and stability

(de Geus 1999; Garforth 2005; Dryzek 2013; see Princen 2005 for a take on sufficiency). For the

most part, this thread of resistance specifically calls up the stability and close-knit ecological

communities of the past. In this it can be considered "Arcadian": it seeks to return to a moment

"before the fall into alienation" when humans lived in touch with nature and each other (Kumar

1991, 18). In this way, it combines the forward-looking utopian impulse with the sense that the

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[27] See Kumar 1987 for an in-depth discussion of this dynamic.

[28] There are other ways of thinking the future in the modern West, of course – the moment-to-moment perpetual present of existentialism springs to mind. But these two are the ones that emerged as relevant in the empirical research, so they are introduced here.

future should not be radically new, but a return to an earthly paradise lost. To return briefly to the quote that opened this chapter: Arcadian thinkers would disagree that "you never get anywhere looking in your rearview mirror" – they would argue instead that one has much to gain by being aware of what has been left behind.

A well-known example of early Arcadian thinking can be found in William Morris's *News from Nowhere*; his work became important in later deep ecological thought (Freeman-Moir 2012). Morris's "images of the utopian future draw on the medieval past;" he sees the past as "a resource for enriching and securing the present as a step toward a better future" (Freeman-Moir 2012, 204). More salient to the dissertation is how, in architecture and urban planning, this Arcadian vision combined with the highly rational impulse of utopian architecture (in the tradition of the "ideal city" – see Kumar 1991). Most famously, Ebenezer Howard's *Garden Cities of Tomorrow* attempted to introduce nature into the city to curb the excesses of capitalist industrialization. His plan for urban areas to be organized in small communities surrounded by green space attempted to build an Arcadian utopia into the context of a modern capitalist economy (a theme that we will see again in chapter 5).

The discursive politics of Arcadia are similar in some ways to all utopian discourse: it envisions future change within the context of a continuous identity. Yet as an alternative way of thinking the future – in its claim that the past had its good points that should be recovered in the future – Arcadian thought struggles to overcome the basic dominance of the idea that life in the past was nasty, brutish and short, and the newer the future is, the better it will be. Sometimes, Arcadian claims take on a pragmatist logic in order to become more widely palatable: the claim is not "we should do this because we always have" but "we should do this because we know it works." Much of the time, however, precisely because Romantic and deep ecological writers

have tried to escape instrumental logic, their claims are based more on aesthetics, ethics, or simply a sense of grief caused by the loss of what progress has cast aside. As such, Arcadian discourse is very often dismissed as backwards, reactionary, or – worse – nostalgic for a world that never existed at all.[29] The accusation of nostalgia "both explains and delegitimates" the political stance behind utopian thinking (Smith 2000, 506). It characterizes Arcadian thought as regressive and wishful (why else would "Romantic" have become such a loaded word?), rather than as a legitimate "staging ground for individual or social action" (Smith 2000, 518). The point here is not necessarily to defend or advocate for Romantic-inflected Arcadian visions of the good life.[30] Rather, it is to point out that there is a political contest at work in claims about progress.

This particular thread of resistance encompasses a complex dynamic of past and future. Its utopian impulse means that it does engage in future-oriented "social dreaming." Whether in its early Romantic versions or later deep ecology versions, this Arcadia utopianism has been "indissolubly antipathetic to the idea of progress" even as "the idea of "progress" has become indelibly written into utopianism itself. … it remains wedded to looking forward" (Garforth 2005, 403-4). Yet at the same time, it views this future through a lens of loss: the profound loss of past community or connection to nature. If one takes seriously the claims made by the long Arcadian utopian tradition in the last two centuries, then one can see that tradition as expressing a utopian impulse of critical distance and thinking of an alternative way of being (in the future). The only difference between it and modern technological utopias is the content, which is drawn from an imagined[31] past rather than an imagined future.

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[29] See Smith 2005 on how nostalgia, as a uniquely modern concept, came to be understood as specifically longing for a past that never existed.

[30] Indeed, on a personal level they appeal to this author much more than technological utopias.

[31] "Imagined" in the sense of interpreted, not in the sense of unreal.

The politics of ecological apocalypse

While Arcadian critiques of the idea of progress have existed for as long as industrialization has, a slightly different form of critique arose in the second half of the 20th century: environmental dystopias. They question not merely the desirability of progress but its long-term viability. To be sure, this dystopian critique shares much with Arcadian critiques of progress: it too tends to understand industrialization as a process of loss and destruction of community and ecological ties. Here, rather than being seen as an unfolding of abundance and well-being, progress is a destructive force leading eventually to overshoot and collapse. Material progress "ultimately represents the negation of organic life. It spreads but it does not grow. It destroys rather than creates" (Killingsworth and Palmer 1996, 23). Yet there is a very different understanding of what the future might hold embedded in this critique. For one thing, dystopian ecological predictions depict the possibility – indeed, the probability – of "a fundamental discontinuity between present and future" (Garforth 2005, 399; see also Kumar 1991), a world that is drastically, radically, catastrophically different from the one we have known in the past.[32] Secondly, while they serve to mobilize action, but they also encompass the possibility that the world escapes the bounds of human control.

Pop culture expressions of radical ecological disaster date at least to the postwar era, when visions of post-nuclear landscapes began to be seen in science fiction literature, film, and television (Buell 2003; Garforth 2005). These pop culture visions expanded to include other forms of "imminent ecological meltdown" in the 1960s and 1970s (Buell 2003, 251), particularly following the 1970s oil shocks and, above all , inspired by the publication of *Limits to Growth*,

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[32] Take, for instance, Bill McKibben's spelling of "Eaarth" rather than "Earth" to illustrate the fact that we now live on a different planet than we thought we did.

The Population Bomb, and *Silent Spring* (Killingsworth and Palmer 1996; Buell 2003).[33] As

Killingsworth and Palmer note, the aim of these early visions of ecological apocalypse is "not to

predict the future but to change it" (41). They served as a warning.[34] The message in *Silent*

Spring and *Population Bomb* is that the world could face disaster unless dramatic steps are taken.

Their value "is not scientific, but political" (41), as they attempt to mobilize political

transformation through a hypothetical exercise in "what could happen if action is not taken"

(Killingsworth and Palmer 1996, 22; see also Dryzek 2013 on survivalist discourse).

Yet there seems to have been a shift within ecological apocalyptic thought in the past

decade or so, seemingly influenced by the burgeoning reality of a changing climate: ecological

disaster is now seen as inevitable.[35] In this new understanding, there is little that human action

can do to prevent catastrophe; humans are not in control. "Our paltry efforts at reshaping animals

and plants to our needs will fail." (Jendrysik 2011, 48). Rigby (2012) sees this as the outgrowth

of the basic premise, present in ecological thinking since the 19th century, that nature is beyond

our control. Yet there is a new dimension: it is not merely that humans do not control everything,

but that our attempts to control only do harm. In an analysis of pop culture representations of a

post-human world, Jendrysik suggests that visions of a post-human world "might represent a

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[33] As Killingsworth and Palmer note, Rachel Carson herself tapped into fears of a nuclear holocaust (Killingsworth and Palmer 1996, 27).

[34] Writing of ecological apocalyptic narratives, Rigby reminds us that "In biblical Greek, apocalypsis simply meant 'to uncover' or 'reveal'" - and thus apocalyptic dystopian visions "perform a prophetic function in the biblical sense, recalling, as Terry Eagleton puts it, that the 'role of the prophet is not to predict the future, but to remind the people that if they carry on as they are doing, the future will be exceedingly bleak' (Eagleton 2004, 175)" (Rigby 2012, 151-2).

[35] Rigby also writes of biblical prophecy that "as Martin Buber (1957) observes, the Bible also provides a model for a different type of apocalyptic speech, one which presupposes the inevitability of catastrophe and construes it as ultimately salutary" (Rigby 2012, 152) – the moment will come when we will be forced to change, to face a radically new world. We have thus two kinds of apocalyptic thinking – that which uses the possibility of apocalypse as a reform tool, and that which uses the inevitability of apocalypse as an opportunity to radically change the terms of what is seen as possible.

change in our understanding … They are a rejection of utopia as it has been understood since Thomas More. We no longer trust in the promises of utopia. We no longer believe that we can build it or live in it. Instead, we imagine a world free of the destructive actions of man (*sic*)." It thus represents a basic questioning of human power and agency: we cannot make a better world, we can only unmake the world. "Our disappearance, in that light, is a boon to the world" (47).

However, it seems that outside the realm of pop culture, political and social action motivated by visions of ecological apocalypse retain the premise that human effort can (and should) make the difference between a bleak post-apocalyptic future and a radically new opportunity to build "the good life" for human societies (see Garforth 2005). In this, it takes a somewhat contradictory position: the world may well escape human efforts at control, but humans should attempt to build a better future anyway. While the contradiction embedded in Arcadian utopias is that they attempt to build a better future out of a better past, the paradox of ecological utopias is that they attempt to build a better future despite their suspicion that humans may only make the future worse. By combining these contradictory elements – the inevitable radical change and the potential for human agency – ecological apocalyptic voices make a powerful discursive move that Arcadian thinking lacks. By positing a future that is radically – and necessarily – different from the present, ecological apocalyptic voices throw open the doors to radical ideas about what will be possible in the future. In this, the apocalypse is emancipatory: one no longer has to rely on experts or authoritative voices to define the bounds of the possible; the change will be so radical that expert knowledge of how the world has worked up until now may no longer be valid. All bets are off, and the possibilities are wide open. To invoke an apocalypse is "to urge others out into the open air of political rebellion" (Killingsworth and Palmer 1996, 41). The prospect of a large-scale ecological disaster can "effect, metaphorically, a

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fresh start in terms of the imagination of future social possibilities" In doing so, it enables "the transition from an unsatisfactory present to a preferable (or at least different) way of life to be scripted as a decisive break, allowing for the prescription of a new socio-political system ostensibly on the grounds of necessity rather than desirability" (Garforth 2005, 398). We will change not because we should but because we must.

At the same time, by positing the potential for human agency following such a disaster, ecological apocalyptic voices legitimate courses of political and social action in the present that would otherwise seem inappropriate. Courses of action in the present that would otherwise seem eccentric (such as survivalism), draconian (such as authoritarian environmentalism – see Garforth 2005 and Buell 2003), or nostalgic (such as relocalization efforts that overlap the pastoral utopianism discussed above). That is not to say that it always succeeds in these legitimation strategies; ecological apocalyptic thinking of course has its critics. Some "bright green" environmentalists (see e.g. Nordhaus and Shellenberger 2007) have argued that pessimism is simply not a very effective political strategy. More to the point, eco-dystopians have been accused of "crying wolf" (Killingsworth and Palmer 1996, 25) – which makes them seem detached from reality. Perhaps because of this criticism, ecological apocalyptic voices – at least those in the political domain, if not in pop culture – seem to see the strategic need to establish a credible claim about the likelihood of apocalypse. This means – as chapter 6 will discuss – that the post-carbon movement, for instance, while it denies that anyone has expertise over what the post-carbon world will be like, it relies heavily on conventional sources of expertise when it comes to climate science and the limits to oil supplies.

Despite the persistence of these two threads of thought, the discourse of the future as better, makeable, and radically new has remained a powerful discipliner of Arcadian utopianism

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and ecological dystopianism. Privileging the future delegitimizes practices, technologies, or norms associated with the past. In this sense, Koselleck's "Pauline dualism" has translated gradually into a dualism where the future belongs to "modern" men and women, while anyone living "traditionally" is chained to the dead weight of the past. The active recovery of past practices (homesteading, for example) or resistance to new patterns of economic or social life can be dismissed as nostalgic. At the same time, privileging the future means dismissing the possibility of future crisis or catastrophe. Political or social attempts to prepare for potentially catastrophic ecological change, in this context, can be dismissed as "doom-saying" or "wolf-crying." The progress narrative continues to undermine the political power of alternative ways of thinking the future.

Conclusion

In the first half of this chapter, I developed a model for how one can analyze thinking the future as an act of political interpretation. First, in a reflexive moment, actors interpret a situation as problematic. They then envision the future as encompassing difference (change) within the boundaries of the self (continuity). In envisioning lines of continuity, actors draw on and reinforce often taken-for-granted aspects of identity, establishing the limits of acceptable change. In envisioning potential change, actors create a critical distance all while cobbling together a vision of a better future from discursive resources that already exist. In doing both, they legitimate certain actions in the present while excluding or dismissing others. This model will guide the analysis in the following chapters: texts are read with an eye to which continuities of the self/subject they take for granted and which present actions they legitimate through references to future transformation.

In the second half of the chapter, I historically situated the politics of the future. Given the legacy of Western cultural history, the dominant mode of thinking the future means generally expecting that the future will be better than the past; it means seeing humans as capable of bringing about that better future; and it means allowing for the possibility that the future may be radically different from anything ever before experienced. However, this narrative of human progress has not gone uncontested. Arcadian resistances to industrialization have questioned the premise that new is better. They have regretted and fought the loss of past forms of community life and connection to nature - even at the risk of being called nostalgic. Ecological dystopians have thrown into doubt the premise that the future will be better and makeable. They have evoked the possibility of catastrophic ecological damage, and have questioned the ability of humans to do anything about it. All three modes of thinking the future – all three narratives about progress and what it means – have been in tension for many decades. As the following chapters will illustrate, all three are at play in the politics of the future of automobility.

CHAPTER 4

ACCELERATE: THE ADVANCED VEHICLE

Figure 2: The "Accelerate" Vision of the Future.

Detail from cover of US Department of Energy,
Quadrennial Technology Review, September 2011

"[T]he path to success is clearer now than ever before."

– Department of Energy, *Basic Research Needs for Clean and Efficient Combustion of 21st Century Transportation Fuels*

This chapter deals with the first of three visions of the future of automobility. While the visions analyzed in later chapters focus on changes to city infrastructure and to local-scale community ties, respectively, this vision anticipates and plans for changes to the automobile itself. The image above, taken from the cover of one of the key texts to be analyzed in this chapter, suggests the major components of this vision: the world is populated with an array of energy technologies, prominent among them "advanced vehicles" – light, efficient cars that run

on solar- or wind-powered electricity or hydrogen fuel cells – and their autonomously mobile drivers. It's a vision that draws effortlessly on the dominant modern narrative of unidirectional progress: the future in this vision is better, makeable, and new. Indeed, as the Department of Energy text cited in the epigraph above has it, the path to this vision "is clearer now than ever before." In the vision, the future is better: the world (or at least the US) has for the most part eluded the worst threats of climate change or instability caused by oil shocks. The future is makeable: the world is defined by human ingenuity in the form of scientific research and technological development. And the future is new: human ingenuity successfully creates "advanced" technologies that have never before existed, or that have never been so efficient.

The reflexive impulse at work in this vision thus seems at first to be a familiar one: scientists identify problems and set to work to solve them. Yet the texts show that, in fact, it takes on a curious form: part of the problem implied by the texts is that technological change is not happening fast enough. The goal is thus not merely progress on solving problems of oil consumption and carbon emissions. Rather, the goal is faster progress. The title of the chapter – "Accelerate" – reflects the concern in this vision for accelerated problem-solving and knowledge production. Here, human effort is oriented not only towards making the future new and better, but towards making it so as quickly as possible. Like the concept of acceleration itself, the vision here is not of merely progress down a path but progress multiplied by itself, progress in how fast we progress.

The chapter examines a corpus of texts produced by, and cited by, the US Department of Energy. The texts are "technological roadmaps," outlining the possibilities for transformation to the automobile and the energy systems in which it is embedded. In these texts, one can see the intertwining of reflexivity and technological acceleration justifying state authority and scientific

expertise. Oil dependency and climate change are here considered problems of great scope, and technological change – driven by knowledge production – is seen as the primary way of solving those problems. Therefore the scope and rate of necessary technological change is great; and this, in turn, means that the scope and rate of necessary knowledge production is great. In these texts, the state positions itself as the actor most able to fund, authorize, and centralize knowledge production at a large scale, particularly within the context of a competitive international system. The focus on science and the state makes sense within a logic where technological change is necessary precisely because consumptive mobility practices cannot and should not be changed. The vision of the future in these texts, accordingly, heavily features the autonomous driver-consumer as a subject. The kinds of action in the present the texts legitimate, then, are limited to agency in the laboratory.

The first section of this chapter introduces the corpus of texts: those produced by and for the US Department of Energy to forecast and guide technological development of advanced vehicles. The section argues that these texts constitute "authoritative representations" of the future and as such, simultaneously position the state as a significant actor and delegitimize small-scale non-state actions in the present. The second section analyzes the reflexive impulse found in the texts, discussing how the texts define the problems of oil dependency, climate change, and international competition. In the third section, the chapter identifies the future continuities that the advanced vehicle literature takes for granted: first, the driver-consumer as an autonomous, functionally unchanging, and even unchangeable subject; and second, the internationally competitive nation-state whose economic power is realized through knowledge production and technological innovation. The fourth section explores the texts' representations of change. It outlines the basic narrative of technological progress and analyzes the role that "acceleration"

plays in how the texts envision possible and desirable change. Finally, the chapter's conclusion reflects on what messages advanced vehicle discourse sends about mobility, power, and the environment in the face of limited resources and a changing climate.

Advanced vehicle texts

There are many modes of "thinking the future" – from apocalyptic fiction to actuarial tables – and thus many different kinds of representations of the future in general and the future of the automobile in particular. Nevertheless, the relationship between state power, discourse, and thinking the future can be seen particularly clearly in the "authoritative representations" of the world produced for governance purposes. Such authoritative representations are texts that present particular characterizations of the world as official or otherwise authoritative: official maps, for instance, censuses, or national museum exhibits (see Jasanoff 2004 on Scott 1998 and Anderson 1992). In this way, one can consider these texts not merely authoritative but authorizing as well: they render particular actions sensible and appropriate.

The texts analyzed in this chapter are such authoritative documents: they map out the officially sanctioned possibilities for new materials and combustion processes to be harnessed through knowledge production and technological experimentation. In these technology roadmaps, the US government defines appropriate avenues for research according to concerns about oil consumption and climate change. In them, we can see "how knowledge-making is incorporated into practices of state-making, or of governance more broadly, and, in reverse, how practices of governance influence the making and use of knowledge" (Jasanoff 2004, 3). By speaking in terms of the future, knowledge production and governance together articulate an authoritative statement of what is possible and desirable. To clarify: I am not suggesting that these texts are authoritative in that they correspond most to reality and are therefore most likely

to be right about the future of the automobile. Rather, I am suggesting that they are authoritative because, in them, the state positions itself as uniquely able to discern the future of the automobile.[36] The state performs itself as an authority, and in doing so reaffirms its claim to "control the future" for the benefit of the public.

This chapter explores one vision of the future of automobility: the vision that centers around the automobile as a technology that can (and should, and will) be transformed in order to address the challenges of climate change and oil use. As such, the analysis in this chapter centers on texts produced by the US Department of Energy – it is the government agency most involved with the project to transform the automobile. Since 1975, when the EPA transferred its advanced vehicle program to a forerunner of the DOE (the Energy Research and Development Administration), the DOE has been the locus of government attention to advanced vehicle research (Buck 1982, 3-4). Currently, the DOE's Vehicle Technologies Office[37] is responsible for coordinating and funding automotive R&D as part of the department's broader mission to reduce energy consumption.

Among all the documents produced by the DOE, the key text for our purposes is the *Quadrennial Technology Review* (QTR). The QTR (DOE 2011a) is the most significant and coordinated attempt at an authoritative representation of the existing, possible, and desirable technological changes to the automobile. Commissioned in 2010 by the President's Council of Advisors on Science and Technology,[38] the QTR was released by the DOE in September 2011,

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[36] One manifestation of this performance of authority is the noticeable lack of the imaginative language that characterizes visions of "the car of the future" in, say, pop culture or other more speculative and less authoritative contexts. The vision of the automobile here is not "the car of the future," evoking flying cars and jet packs, but is instead the "advanced vehicle" – which evokes a sense of forward progress while retaining the gravitas of scientific expertise. The future is a different and better place – but one that is realizable, and by science and the state.

[37] Vehicle Technologies Program until 2012

[38] Co-chaired by John Holdren and Broad Institute President Eric Lander.

with a follow-up document assessing technologies in a more in-depth fashion released in 2012 (DOE 2012a). As the title suggests, it was modeled after the Department of Defense's Quadrennial Defense Review; it was intended to identify energy technology trends and to set policy priorities to achieve a reduction in oil consumption and carbon emissions. It is the first such document produced in the context of energy and technology. Undersecretary Steven Koonin, who led the project, claimed that the document provides "a framework for thinking about our energy challenges" (Sands 2011) in an attempt to "be much more explicit about our [the DOE's] points of view on the future of transportation, the future of electricity, and so on" (quoted in Wang 2011). To be sure, the DOE does not claim omniscience: "No one can predict with certainty the evolution of any one of these [technological] dimensions over a decade, much less over half a century. … This Report strives for a balance between projections so general as to be useless and so specific as to be almost certainly wrong" (DOE 2011a, 4). Nevertheless, the QTR does position itself as a uniquely long-term and therefore "wise" document: Energy Secretary Steven Chu, in the introduction to the QTR, states that the document "will help ensure that we make thoughtful, wise investments to achieve our national energy goals and to strengthen our economic competitiveness in the 21st century" (DOE 2011a, i). By design, the QTR is an attempt to define and compare different technological possibilities and establish which ones hold the most promise in the short- and long-term future. As such, I consider it to be the clearest instance in which the DOE performs itself as an authority on the future of the automobile.

However, this chapter does not only examine the QTR. The corpus of texts analyzed here was built by genealogically following references from the QTR to other works. For instance, the QTR draws from the National Academy of Sciences,' "America's Energy Future" reports, so they are included in the corpus as well. These NAS reports are "designed to inform key decisions

as the nation begins a comprehensive examination of energy policy issues" (AEF et al. 2010, vi).

A "key objective" is to "help resolve conflicting analyses and to facilitate the charting of a new

direction in the nation's energy enterprise" (AEF et al. 2010, vi). Though it refrains from making

explicit policy recommendations, the America's Energy Future project, like the QTR, is an

attempt to set down in writing an assessment of what is possible in the future and therefore what

actions are most appropriate in the present. The QTR also draws heavily on the National

Research Council's (NRC) reports on the USDRIVE effort.[39] USDRIVE is a consortium of the

DOE Energy Efficiency and Renewable Energy program and companies in the automotive,

electricity, and oil and gas industries.[40] Though USDRIVE does not conduct or fund R&D

directly, it acts as a research-coordination body, seeking (grandly) to "contribute to restoring

American leadership in research and its application for the public good" (NRC 2013, 1-4).

Because the QTR draws extensively from these reports, they are included in the corpus here.

Reflexivity in advanced vehicle research

As the last chapter argued, to take a reflexive stance is to problematize a situation and to

open up the possibility for future change within the boundaries of expected continuities. The

texts analyzed in this chapter take a reflexive stance in that they identify and attempt to confront,

the "challenges" – their term – that the US faces as a consequence of its automobile use. Unlike

the texts discussed in later chapters, these texts wholeheartedly embrace the concept of progress;

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[39] For instance, the QTR's assessment of fuel cell vehicles was developed in coordination with USDRIVE (DOE 2012a, 45).

[40] It was formerly the Partnership for Next Generation Vehicles, and before that the U.S. Council for Automotive Research (USCAR), and before that FreedomCAR. Automotive companies in the program include Chrysler, Ford, General Motors, and Tesla; electric companies in the program include DTE, Southern California Edison, and the Electric Power Research Institute (EPRI); and oil and gas companies include BP, Chevron, Phillips, ExxonMobil, and Shell.

however, they envision change in the context of unidirectional knowledge production and technological innovation.

The general approach analyzed in this chapter can be characterized as "technological optimism" in that it sees technological innovation as the key mechanism by which meaningful change is made. Technological optimism is not only forward-looking; it most often operates within a broader historical narrative of progress and the continual improvement of the human condition. There is a well-defined understanding here of time, innovation, and improvement as continual and unidirectional. To take an example from one of the texts examined further on in the chapter, the introduction to the Department of Energy's statement on *Basic Research Needs for Clean and Efficient Combustion of 21st Century Transportation Fuels* (hereafter, *Basic Research Needs*) situates transportation research within this narrative of progress:

> From the invention of the wheel, advances in transportation have increased the mobility of human kind, enhancing the quality of life and altering our very perception of time and distance. Early carts and wagons driven by human or animal power allowed the movement of people and goods in quantities previously thought impossible. With the rise of steam power, propeller driven ships and railroad locomotives shrank the world as never before. ... The commercialization of the internal combustion engine at the turn of the twentieth century brought about a new, and very personal, revolution in transportation, particularly in the United States. Automobiles created an unbelievable freedom of movement: A single person could travel to any point in the country in a matter of days, on a schedule of his or her own choosing. ... American industry grew to depend on internal combustion engines to produce and transport goods ... (DOE 2006, viii).

Or, as another document puts it succinctly, "The history of transportation is one of continuous innovation" (AEF et al. 2010, 172-3). What this understanding of unidirectional improvement means is that technological innovations are understood to be clearly and rather unambiguously linked to human well-being. Any negative consequences incurred by a particular technology (say, the automobile) just mean that there is more work to be done – more

technological improvements to achieve. If throughout history humans have continually solved problems and improved their means of movement, then one can expect such problem-solving to continue into the future. Technological optimism in the context of the automobile, then, parallels what has been termed "Promethean" environmental thinking in its "unlimited confidence in the ability of humans and their technologies to overcome any problems presented to them" (Dryzek 2013 : 45). It is not that natural limits (such as to oil) do not exist in this view; it is that humans have always been able and always will continue to be able to problem-solve around those limits.

The DOE's definition of the problem

Against this understanding of constant, unidirectional progress, there is also an understanding in the texts that the US faces a number of problems related to its automobile use. Chapter 2 introduced the wide range of problems that automobility is understood to generate – climate change, peak oil, traffic fatalities, social isolation – but not all actors weigh these problems equally or even see them as problems. Different collective actors reflexively interpret conditions as problems differently. In the case of advanced vehicle research, the problems of automobility take on the nature of "energy challenges" (e.g. DOE 2011a, i), particularly in terms of oil dependency and environmental harm. There is a refrain of these challenges being "long-standing" (Koonin 2011; DOE 2011a, ii), as "both Republican and Democratic administrations have been grappling with many of the same problems for decades" (Chu quoted in Wang 2011). Yet there is simultaneously a sense that these problems are, in the 21st century, newly urgent.

These challenges are described with varying degrees of detail and straightforwardness in the different texts. Sometimes they are not discussed in any detail whatsoever; the phrase "energy security," for instance, is often used as if it speaks for itself. Clear definitions are

somewhat difficult to pin down; yet overall there are two main energy challenges that the texts reflect: "security" and "environment."

Of the two energy challenges, security gets slightly more attention. The term is used more or less interchangeably with reducing "oil dependence" (PCAST 2010, vii; DOE 2010b, 1), "petroleum dependence" (DOE 2011b, 2), and "U.S. dependence on imported oil" (AEF et al. 2010, 1). One document goes so far as to make the goal of technological innovation to "eventually eliminate petroleum use" (DOE 2010a, ES-2). This is highlighted as a "national security" concern (DOE 2006, 3; AEF et al. 2010, 1; DOE 2011a), with the threat of dependence suggested through references to the oil shocks of the 1970s (AEF et al. 2010, 1; DOE 2010a, ES-1). "Every president since Richard Nixon has known about the dangers of U.S. oil dependence and has talked about freeing the Nation from dependence on foreign oil" (DOE 2011a, 28), yet "this oil dependence continues to increase unabated to the present" (DOE 2010a, ES-1).

There is only one text in this corpus – *Basic Research Needs* – that comes close to using the words "peak oil," and even then it does so in a careful, qualified manner: "Although there may be great controversy over whether the peak in total oil production is near, there is little doubt that the supply of light, sweet crude, the cheap oil on which our economy is built, will peak in the next few decades" (DOE 2006, 7). It refers to the "changing fuel supply picture" (DOE 2006, 15); the US "historic dependence on light, sweet crude oil for our transportation fuels [drawing] to a close over the coming decades as finite resources are exhausted" (DOE 2006, ix); and "the specter of a finite supply of oil" (DOE 2006, 155), as if limits to oil are possibly illusory yet also potentially threatening. Regardless of the use (or not) of the term "peak oil," it is clear that invoking "energy security" also means suggesting the end of cheap and easily accessed oil. One text situates itself in "a critical time for global petroleum supply, demand, and

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pricing" (DOE 2010a, ES-1), while another expects "upward pressure on future crude prices" and an increase in "price volatility" (DOE 2011a, 16). One emphasizes the increasing concentration of light crude in OPEC countries (DOE 2011a, 16), while another highlights the potential for higher prices given the expected growth in demand in the developing world (DOE 2006). What is common to all the texts, however, is the clear understanding that change is occurring or imminent. These texts, then, situate the US within a context of a limited oil supply – but suggest that these limits that are negotiable. Indeed, there is an imperative implicit in the evocation of limited oil: there is a need to find a way around these limits, in order to realize "energy security."

The second challenge most often evoked in the texts is an environmental one. This environmental challenge is seen as simultaneously "long-standing" and newly urgent. Though one text mentions "enhancing environmental stewardship and promoting transportation sustainability" (DOE 2011b, 2) without too much clarity on what it means by that, it would appear in general that environmental stewardship means reducing carbon emissions. It also is seen as having effects that will last long into the future: "CO_2—the dominant anthropogenic GHG—persists in the atmosphere for hundreds to thousands of years. As a result, CO_2 emissions accumulate. Stabilizing concentrations of CO_2 at 450 parts per million will require an 80% reduction in global emissions by 2050 relative to a 2005 baseline. Given the multi-decade lifetime of energy infrastructure, the energy technologies that will contribute to meeting this challenge must be consistently deployed at scale by 2030" (DOE 2011a, 16). Climate change is seen as unarguably anthropogenic (DOE 2006, 6, DOE 2011a, 16), and as such there is "growing concern about how to reduce emissions of greenhouse gases" (AEF et al. 2010, 26). To confront the environmental challenge means to "reduce emissions of greenhouse gases, primarily carbon

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dioxide from carbon-based fuels" (DOE 2010a, ES-2). Indeed, the "growing recognition of the need to reduce emissions of greenhouse gases have [sic] transformed energy efficiency from an option to a necessity" (AEF et al. 2010, 1), while "rapid progress towards lower-carbon energy in this decade [has emerged] as a prudent response to global warming risks" (PCAST 2010, vii). The Vehicle Technology Program Multi-year Program Plan refers to reducing greenhouse gas emissions from vehicles as "a primary responsibility" (DOE 2010a, ES-1). Because "[s]ubstantial climate change in the 21st century would have a serious impact on society" (DOE 2011a, 23), the pressure to solve climate change as a problem is seen as unambiguous.

In the texts, the project of the advanced vehicle is related to an additional third challenge: international economic competitiveness. There is a hint that the US is losing its historic economic and technological hegemony – and that this is problematic. Conversely, there is the sense that global energy demand in the context of limited oil is not just a potential crisis, but an opportunity for the US to reassert its technological prowess. If the US can commercialize advanced vehicles quicker than any other nation-state, then it will retain its leadership position in the international economic system. This comes through strongly in the QTR, which sees the world poised in a critical moment: "the energy technologies deployed during this period of growth will largely determine global energy use through the end of this century. … Firms around the world are competing to supply and service the world's appetite for power, transportation, and built environments; nations that lead in technology will enjoy greater prosperity" (DOE 2011a, 16). Similarly, Secretary Steven Chu introduces the QTR by stating: "Today, our nation is at a cross road. While we have the world's greatest innovation machine, countries around the world are moving aggressively to lead in the clean energy economy. We can either lead in the

development of the clean energy economy or we can stand back and wait for others to move first toward a sustainable energy future" (DOE 2011a, I; see also 21; DOE 2010a, 2.1-20).

Far more so than in the other visions of the future analyzed in later chapters, this is a vision that seems to define its problems in national, rather than global or local, terms. Concern with limited oil is often expressed in terms of dependence on specifically foreign oil. Though the concern about climate change does not operate within a national logic, the arguments for producing technologies that reduce carbon emissions are as often put in terms of cornering the global market than producing a global public good.

Technological solutions

A technologically optimistic viewpoint sees consequences of technology as a temporary oversight, a problem that has not yet been solved. This is apparent in the *Quadrennial Technology Review*'s introduction:

> Access to affordable, secure, and reliable energy has been a cornerstone of America's economic growth. However, the Nation's systems that produce, store, transmit, and use energy *remain deficient* in important dimensions. Energy security, U.S. competitiveness, and the environmental impacts of energy are long-standing challenges. Governments, consumers, and the private sector have worked for decades to address these challenges, yet they remain among the Nation's most pressing issues (DOE 2011a, 15, my emphasis).

Although this passage does not read as overly optimistic – it acknowledges the decades' worth of effort that have not yet quite amounted to a solution – it characterizes of US energy systems as merely "deficient." The energy systems, of which the automobile and its production make up a significant part, are not fundamentally problematic. They are merely deficient, not quite optimized; the negative consequences of the automobile are characterized as not yet resolved. It is only by seeing the problems of automobility as not yet solved that one can characterize the "advanced vehicle" as the solution to oil dependence and climate change, as the

DOE does: "Neither petroleum reduction goals nor carbon emissions reduction goals can be achieved without new and more efficient vehicle technologies" (DOE 2010a, ES-1). The problems of oil consumption and climate change require, first of all, *new* technologies – for instance, hydrogen fuel cells or "advanced" composite materials that are strong enough to replace metal in vehicles but lightweight enough to allow those vehicles to consume less fuel. (The future will be better only if it encompasses things that are new.) Second of all, this logic calls for technologies that are more efficient – for instance, lithium ion batteries that can be produced more cheaply. (Efficiency, after all, means doing the same thing, just at less cost.) No one's behavior has to change. Lightweight materials, efficient vehicle body designs, cheap and light batteries, hydrogen fuel cells: these are the things that will emerge and become widespread in order to accommodate the use of automobiles and yet still solve the problems of oil consumption and climate change.

If one accepts the premise that future automobiles can solve the problems incurred by past and current automobiles, then there is a quite reasonable logic behind making the automobile a key site of solving the problems of oil dependence and climate change. The sheer amount of imported oil that automobiles consume and the carbon emissions they produce make the automobile a good target for change: the DOE Vehicle Technologies Program "focuses on ground transportation vehicles because of their dominant contribution to the nation's oil use" (DOE 2010a, 1.0-1). The QTR states, "Road transport accounts for approximately 80% of U.S. transport fuel use and is therefore the central focus of DOE's transportation activities" (DOE 2011a, 28; see also DOE 2006, viii, 1). The automobile is also seen as faster-changing than other energy technologies: "Because new technologies can diffuse through the transportation sector faster than in heat and power, innovation will have more immediate impact" (DOE 2011a, 124).

As the next section will discuss, the automobile is a good site for change, paradoxically, because of its essential role in everyday life – individual automobiles can be changed but the automobile as a fact of life will remain.

There is one last, meta-level challenge and solution that the texts do not precisely name as such; it is implied rather than stated outright. The challenge is that, as yet, technological innovation and its widespread adoption have not happened fast enough to make significant headway in reducing oil consumption and carbon emissions. Though their faith in progress remains unshaken, these texts question the rate of progress. Yet they take the position that even the rate of progress can be "made" – influenced by enough effort and resources, as the section on change discusses in more detail. In this way, the reflexive moment of the advanced vehicle rests not only on the problematizing of the conventional current fossil-fueled, steel-bodied automobile, and its oil consumption and carbon emissions. The reflexive moment consists, too, in taking stock of how fast technology has changed, and taking the position that it must change faster.

Altogether, the texts position the US at a moment in time when carbon emissions and the consumption of limited oil both need to be reduced. Technological changes to the automobile and the energy systems in which it is embedded are envisioned as the solution. Finally, progress on these fronts needs to be accelerated. The next section, Continuity, goes into who is seen as capable of effecting these reductions, "making" this future.

Continuity: Subjectivities in an "accelerated" future

When actors think the future, they construct lines of continuity (who will we still be?) and, within those lines, envision potential change (what is within our power to change?). Each continuity constitutes a particular subjectivity – a specific type of meaningful actor. As

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continuities create expectations about identities (both in the present and in the future), they are intertwined with expectations about who counts as a subject, and what role that subject performs.

The texts on advanced vehicle research proved something of a challenge to read in terms of identifying visions of continuity and change. As fairly technical documents, they rarely engage in lyrical claims about identity, desirable change, "the good life," or grand catastrophic threats. Those references to continuity and change which do appear are either briefly dispatched within executive summaries or have to be interpreted from cost estimates, for example, or references to research facilities, or expectations about future growth. Nevertheless, as this section explores, there are two major continuities in the envisioned future of the advanced vehicle. The first continuity in the texts is the continued existence and importance of the (specifically American) consumer-driver. The second is the nation-state as the primary actor in producing and centralizing knowledge, and specifically the US as a hegemonic nation-state in a competitive international system.

The American driver-consumer

The first subject – the first figure with agency that is expected to continue into the future – is the American driver-consumer. Before addressing the role of this subject, however, it is worth pointing out the technological condition of possibility underlying the driver-consumer: the automobile. This is almost too obvious to merit attention: of course the project of the advanced vehicle is premised on the continued importance of the vehicle as an economic and social fact of life. Yet it is worth highlighting anyway, if only for the fact that it is so thoroughly taken for granted in these texts: it continues indefinitely while only its components change. The possibility is never even hinted at that cars might someday no longer play a central role in the economy and daily lives of people in the US and around the world; in fact, these texts expect demand for

automobiles to remain steady in the US while increasing globally.[41] The demand for automobiles

is seen as a natural outgrowth of the activities that make life what it is in the US; "[r]educing

these activities may save energy, but may or may not be otherwise desirable" (AEF et al. 2010,

123-4). Having fewer or no automobiles, then, would jeopardize our standard of living.

It is perhaps unsurprising that the consumer as a figure looms so large in the advanced

vehicle literature. After all, the consumer plays a pivotal role in the chain of technological

change. Producing an advanced vehicle will only solve the problems of oil consumption and

climate change if a significant number of consumers buy and use that advanced vehicle:

"Meaningful progress on our energy challenges is underpinned by the adoption of new

technologies by both consumers and industry" (DOE 2011a, 32; see also DOE 2010a, 2.1-19,

2.1-5; AEF et al. 2010, 391). The consumer ultimately has the ability to block any opportunity

for change that is opened up through R&D, by simply not buying what the DOE and advanced

vehicle engineers are designing.

What is more surprising, however, is that the consumer is treated as a probably

unchanging, mostly unchangeable subject. The texts tend to use concepts from the field of

economics; the figure of the consumer in these texts is thus in part a reflection of standard

economic assumptions about consumers. Namely: consumers are generally risk averse (DOE

2011b, 8; see also DOE 2010a, 2.6-2), and their choices are defined largely by price – both the

initial price of vehicles (DOE 2010a, 2.1-14) and the price of fuel (AEF et al. 2010). As such,

"practical commercial utilization" of technologies like advanced lightweight materials "requires

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[41] This assumption is less obviously stated in the corpus of government texts than it is elsewhere (e.g. Gordon and
Sperling 2010); nevertheless, it comes through, for instance, when the Quadrennial Technology Review expresses
concerns about the ability of the electrical grid to support a fleet of electric cars, or doubts about the ability to
produce enough hydrogen to power a fleet of fuel cell cars (DOE 2012a): the expectation is that so many cars will be
in demand in the future, it will stress whatever fuel system those cars run on, whether oil, electricity, or hydrogen.

that such materials are affordable" (Oak Ridge 2010, 10). Similarly, new engine designs "must be cost competitive to make a business case for market introduction if their benefits are to be realized" (DOE 2012a, 16) and widespread use of hybrids "will require reducing cost to a level at which consumers can economically justify purchasing an advanced vehicle" (DOE 2010a, 2.1-17). These economic assumptions about consumers justify the creation of electric vehicle tax incentives, which, according to the DOE, "have been proven effective in providing the additional boost needed for mainstream consumers to choose EVs" (DOE 2011b, 6), and which are seen as likely to prove more so if the credit is available at the time the driver-consumer buys the car (DOE 2011b, 8). There is also an understanding, though it appears infrequently, that a rise in fuel prices will prompt different consumer choices: "Fuel price matters when consumers make automobile purchasing decisions. If oil prices increase, or expectation of further oil price increases becomes prevalent, interest in EVs will likely increase as well" (DOE 2011b, 8). Similarly, *Real Prospects for Energy Efficiency* estimates that "as incomes and energy prices rise, they will spur demand for ... energy-saving technologies" (AEF et al. 2010, 130). What all of these varied assumptions about consumers point to is a figure whose preferences are fixed.

Perhaps more telling, however, is that the consumer in these texts is also generally understood to be a driver, and an American driver at that (e.g. NRC 2013, 1-3). This understanding comes with several very set ideas about the American driver as a constant across time – the driver in 2050 will want the same things that the driver in 2013 wants. The American driver likes big cars, and this precludes the possibility (at least in the short term) of reducing the size of advanced vehicles in order to be more fuel-efficient (DOE 2011a, 39; AEF et al. 2010, 138). In fact, the smallest category of electric vehicle discussed in the Vehicle Technology Program Multi-Year Program Plan is what is currently considered a "compact" car, which still

weighs in at 1,000 kilograms (DOE 2010a, 2.1-16). This assumption about size also includes an assumption about comfort, which the American driver also seeks: over one-third of the average car's weight comes from components that fall into the category "comfort/convenience" (DOE 2013a, 6), which must be made more lightweight because it cannot be eliminated. Similarly, fuel economy is "a low priority" with American drivers (DOE 2010a, 2.2-2); they are more interested in "performance:" "vehicle manufacturers compete on—and consumers expect—ever better performance" from their cars (AEF et al. 2010, 142). Despite saying that consumers are "willing to pay premiums for vehicle options or attributes that resonate with them" (DOE 2011a, 8), the QTR considers these "attributes" to mean things such as high torque and low noise levels rather than, say, low carbon emissions. The idea of consumers buying fuel-efficient cars precisely because they are better for the environment does not appear as a possibility.

These fixed preferences of the driver-consumer become effectively synonymous with fixed needs. For instance, the QTR's technical assessment of electric vehicles is that they only have commercial potential to the extent that they are able, among other things, to recharge their batteries "in a time compatible with consumer needs" (DOE 2012a, 43). The driver is also seen to need to drive both short and long distances, and electric vehicles are better for short distances while hydrogen fuel cell vehicles are better for long distances; "Thus, a large-scale replacement of petroleum usage by these alternate fuels will potentially rely on both technologies to satisfy consumer needs" (NRC 2013, 5-2; see also DOE 2012a, 15). Again, technology must adapt itself to the habits of the driver-consumer. For instance, if consumers are "to accept, purchase, and use vehicles with advanced propulsion systems, the proper facilities and infrastructure must be in place to enable the full utilization of the technology *with minimal impact to the usage habits of the consumer*" (DOE 2010a, 2.2-2, my emphasis).

The American driver-consumer is treated as effectively autonomous, even sovereign. These texts can seem oddly naive about the influences on consumer behavior. They reflect a precise knowledge of how materials can be manipulated while lacking any understanding of how people can be persuaded, disciplined, or otherwise managed (the difference here with the smart growth literature, discussed in the next chapter, is remarkable). Perhaps this seeming naiveté in fact reflects an unacknowledged ontological stance – that the driver-consumer exists prior to any given automobile, with her preferences for low cost and high performance already well in place when she makes a buying decision. Consumers like what economics research tells us consumers (ahistorically) like: the highest performance at the lowest cost. That cannot be changed; it can only be met with various engineering schemes. On a different level, it may reflect an unspoken political stance – that the driver is, and should be, sovereign over her vehicle and driving choices. The authority of the state, in this view, does not extend so far as to tell Americans what car to drive (much less whether to drive a car at all). Either way, it introduces a peculiar tension in the problem-solving agenda of the advanced vehicle project: driver-consumers play an absolutely key role in reducing oil consumption and carbon emissions, yet their fixed preferences, habits, and needs all make it awkwardly unlikely that they will choose to play that role.

Either way, the design of technology becomes an effort in reconciling consumer preferences with solving the problem of oil consumption and carbon emissions. The design of vehicles (and incentives to change their use) must fit the contours of the consumer's preferences, and not the other way around. What this means is that future technology has to do all the work to close the gap between current consumer behavior (which will stay the same in the future) and future oil consumption and carbon emissions. Funding and effort can be directed toward

changing the cost of the technology, for instance, because when the price of an advanced vehicle is low enough, it will redirect consumer behavior, and then carbon emissions and oil consumption will go down – not because consumer behavior has changed (in terms of buying the cheapest high-performing car they can) but because the negative consequences of that behavior have been successfully neutralized by better technology.

Again and again in these authoritative representations of what future possibilities exist for automobility, it is the driver-consumer whose expectations have to be met if change is to happen. This can be seen in the many statements that emphasize technological innovation within the constraints of today's consumer preferences and "current lifestyles:" "Today's technologies allow new vehicles to be twice as efficient as those they replace, while retaining the same consumer characteristics" (DOE 2011a, 33). Or "technologies exist today that can help make it possible to achieve significant energy savings and still maintain current lifestyles" (AEF et al. 2010, 1). The DOE's Vehicles Technologies Office states its mission "to develop more energy-efficient and environmentally friendly transportation technologies while meeting or exceeding drivers' performance expectations and environmental requirements" (DOE 2013a, ii; the same language is repeated almost verbatim in the DOE's 2013 congressional budget request [DOE 2012b] and in NRC 2013,1-8). This expected continuity, influenced partly by economic assumptions and perhaps partly by an unspoken political stance, fixes clear and seemingly non-negotiable boundaries of a better and new future. The American driver-consumer will not change, so technology must.

<u>The automotive engineer</u>

The second subject in the narrative of the advanced vehicle is the automotive engineer. To be sure, the texts rarely discuss engineers as individuals. But, in a corpus of texts that is

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heavy on graphs and light on pictures, engineers are the only people that appear in images. Even images of cars don't have drivers in them; note that the image at the top of the chapter, taken from the cover of the QTR, includes a picture of a gas station with no humans, only cars, and a plug going into a fuel tank that is clean with the sterility of the lab. More to the point, however, the figure of the engineer, though it is directly invoked only infrequently in the texts, is heavily implied by the overall narrative of the advanced vehicle. The engineer is the one who effects the transformation of the automobile. The engineer is the one who makes it possible for technology to reconcile driver-consumer behavior with the goals of reducing carbon emissions and oil consumption. While the driver-consumer remains as unenlightened as she chooses, the engineer experiments, discovers, produces knowledge, and innovates. By doing so, the engineer makes the future.

The category of "engineer" also sometimes includes the figure of the scientist working on basic research – advanced materials or combustion, for instance. But even there, the scientist only matters to the extent that she delivers new knowledge to the engineer, who then applies that knowledge to designing a better vehicle. Yet the engineer is not merely a tinkerer, either, cobbling together an advanced vehicle in her garage. In these texts, the engineer is a figure who works within a laboratory, bolstered by many years of training. One text in particular, the DOE's 2010 Multi-Year Program Plan, makes suggests that the training and knowledge required to work on advanced vehicles is so specialized and difficult that there is a shortage of qualified engineers – requiring more funding for education and outreach efforts (DOE 2010a, 2.6). The engineers who can make a future that includes advanced vehicles are – and will be – a highly educated elite, working at the cutting edge of science and technology.

The narrative of technological change gives agency – responsibility and capacity for change – to the engineer. It places all meaningful action in laboratories. Indeed, given the advanced character of vehicles needed to reduce carbon emissions and oil use while still appealing to the American driver-consumer, only elite engineers are able to effect the achieve – and accelerate – technological innovation to the necessary degree. This means that people are not asked or expected to change – or, put another way, to learn anything new about themselves or the world. It merely asks scientists and automotive engineers to keep doing what they are doing, only maybe a bit faster.

What's more, the figure of the engineer is not one who works on just any problem; she is particularly focused on the technology of the advanced vehicle. While the texts make the point that this idealized engineer thinks systemically, the system in question is the technological system of the automobile itself: the engineer works "as vehicle integrators to make sure that these complex systems work together" (DOE 2010a, 2.6-7). This systemic thinking does not extend to thinking about mobility. The engineer in question is an automotive engineer – perhaps keeping in mind other systems that support or contribute to the automobile, but never required to think in terms of alternatives to the automobile. To the extent that the texts define the appropriate role for the engineer, it becomes clear that this role does not include considering mobility more broadly.

That is not to say that the texts ignore alternatives to the automobile altogether, as they do occasionally refer to alternative modes of mobility such as transit.[42] However, the texts evoke

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[42] The QTR notes that transit can "increase the efficiency of moving people" (DOE 2011a, 9), while *Real Prospects for Energy Efficiency* states it "could contribute to a reduction in total energy use" (NAS *et al.* 2010, 127) and a reduction in GHG (NAS *et al.* 2010, 174). It also suggests that "major insights and improvements can result from a broader and deeper understanding of transportation system issues" and that a systemic approach to mobility "needs further exploration and quantification" (NAS *et al.* 2010, 14). In one particularly odd instance, the Vehicle Technology Program's *Multi-Year Program Plan* estimates significant reductions in oil consumption and CO2 emissions through a program of encouraging public transport and ride sharing – in fact, it estimates that such a

these alternatives only to immediately abdicate responsibility putting thought, effort, or resources into producing knowledge about them. The texts specifically reject those as an avenue of action for the engineer or those government programs who fund and support the engineer. Alternatives to the automobile, such as changes to urban planning or transit "fall outside of DOE's purview" (DOE 2011a, 28). *Real Prospects for Energy Efficiency* has this telling passage: "While a shift toward dense urban corridors would be at odds with long-term trends, changes in individual preferences (e.g., interest in urban amenities) and values (e.g., environmental concerns) may foster such a movement. For such a diversified system to evolve, numerous changes would need to occur, not only in people's preferences but also in policies and institutions that govern land-use management and the provision of transportation services. [This report] cannot delve into these broader topics" (AEF et al. 2010, 174). While going so far as to admit that "new vehicle technologies alone are unlikely to be sufficient and additional approaches to transportation" are necessary, the Vehicle Technology Program states that such "intermodal shifts" "lie outside the current VTP portfolio," and it therefore does not discuss them (DOE 2010a, ES-1). The role of engineers, and the government programs that support them, is to change automotive technology, and let others worry about the rest.

On the one hand, perhaps this single-mindedness should not be surprising. Not every document can discuss every alternative in depth. Not every engineer can work on every problem. Not every government agency can be responsible for pursuing every course of action. Perhaps this lack of engagement with other approaches reflects a reasonable division of problem-solving labor. After all, why should the Vehicle Technology Program focus its efforts on anything other

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program would produce greater reductions by 2050 than any technological change except full-scale electrification of the US vehicle fleet. Yet these estimates are buried unnoticed in a lengthy table, with "Public acceptance; inadequate public transport" listed briefly and almost tautologically as barriers to progress; they are not once mentioned in the text of the document, much less highlighted as an important avenue for action.

than vehicle technology? On the other hand, abdicating responsibility for approaches that do not focus on changes to the automobile functionally eliminates space within the discourse of officially sanctioned technological innovation for pursuing transit or walking or biking as a solution – even a technological solution. It excludes the possibility of the Vehicle Technology Program putting effort and funding into, say, maglev trains or lightweight electric bicycles, even though either of those could logically fall in the category of "vehicle technology." All the resources that these texts seek to mobilize around a high-tech vision of progress are to be directed towards automotive technology. More important, though, is that this exclusion of alternative approaches from the role of the engineer means that tensions and tradeoffs between different approaches go unacknowledged. No one working on advanced vehicles is asked to weigh the benefits of their work against the cost of more cars on the road. The fundamental assumption that is the bedrock of the advanced vehicle as a project – that the automobile is and always will be a central fact of life – goes unchallenged.

The competitive nation-state

The third major continuity in the texts is the continued importance of the nation-state as a locus of problem-solving. In these texts, the role of the state is not so much to coerce or to regulate (despite a few mentions of CAFE standards, e.g. DOE 2012a, 13) than it is to support knowledge production with a view to solving the problems of oil dependence and climate change. Indeed, in these texts, the only way to solve these problems is at the national level; only the state has the resources and authority to produce and centralize the knowledge necessary to create a vehicle advanced enough both to reduce oil consumption and carbon emissions and to meet the expectations of American drivers.

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At its most basic, this comes across in the expected continuation of government-funded research. Effectively, all of the texts examined in this chapter are exercises in justifying and directing R&D funding. To be sure, funding for advanced vehicle research is not terribly abundant (say, in comparison to funding for military technologies): $422 million in 2012, with $675 million requested for 2014 (DOE 2013b, EE-2).[43] Nevertheless, the DOE sees itself playing a meaningful role in supporting transportation research that would not otherwise be undertaken. For instance, the "Vehicle Technologies Program carries out its mission by focusing its R&D investments on long-term, high risk technology projects that are unlikely to be pursued by industry alone, but have significant potential public benefits" (DOE 2010a, 1.0-2). This is sometimes referred to as supporting "precompetitive" technologies – technologies that can be commercialized, just haven't been yet (DOE 2012a, 50; DOE 2011a, 39; DOE 2012a, 21). The state is also seen as having the ability to "jump start" systemic transportation changes, such as mass production of lithium-ion batteries or a hydrogen refueling infrastructure (NRC 2013, 3-43, S-3).

The texts also reaffirm the importance of the nation as the level at which meaningful knowledge production occurs (as opposed to the local or transnational level). This comes through when, for instance, Quadrennial Technology Review justifies the existence of national research labs as opposed to industry or university labs: "major research facilities at the national laboratories accelerate industry and university R&D by providing capabilities that are too costly for users to support on their own" (DOE 2012a, 21). More important, though, is the role that the state plays in ordering knowledge: identifying targets for technological improvements, setting

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[43] In 2012: $321 million for electric and internal combustion vehicle technologies and $101 million for hydrogen fuel cell research. Requested for 2014: $575 million for electric and internal combustion vehicle technologies and $100 million for hydrogen fuel cell research.

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priorities, and creating authoritative roadmaps. After all, as the QTR reminds us, not every technological possibility merits investment: "mere technical possibility that something could work is an unjustifiably low bar for the commitment of public funds" (DOE 2011a, 113). For instance, a 2010 workshop at Oak Ridge Laboratories was convened with the specific purpose to set "theoretical and practical" targets for fuel efficiency (Oak Ridge 2010, 1). In so doing, the goal was "to set realistic upper performance bounds and identify which R&D paths might be the most productive to pursue" (Oak Ridge 2010, 2). The scientific identification of targets is thus tied to defining the path for what is appropriate action.

One of the central goals of the Quadrennial Technology Review was to set priorities for R&D and policy. As Undersecretary Koonin said in his testimony to Congress when presenting the QTR, "One of the salient facts about energy technology R&D is that there are always many different technical approaches to solving the same problem—and more are being proposed every day. While a testament to the power of human ingenuity, this excess of options creates a practical problem: since we have limited resources and urgent problems to solve, how do we choose which subset of these many approaches to pursue?" (Koonin 2011). He later continues: "As every dollar matters, we must give priority in our research portfolio to those technologies that are most likely to have significant impact on timescales commensurate with the urgency of national energy challenges" (Koonin 2011, 4). Similarly, the QTR emphasizes quite clearly that "DOE's informational and convening roles are among its most highly valued activities. Information collected, analyzed, and disseminated by DOE shapes the policy and decisions made by other governmental and private-sector actors. That expertise in energy-technology assessment gives DOE the standing to convene participants from the public and private sectors to coordinate a

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collective effort" (DOE 2011a, xi). In doing so, it positions itself as authoritatively ordering knowledge into useable guidelines.

The texts also reflect the expectation that many nation-states in the international system are pursuing similar – and competing – technological agendas. As was discussed above, the problems of automobility – and specifically the problems of the US automotive industry – are tied to a broader sense of the US losing its economically hegemonic position in the 21st century. In this context, sustainable energy technologies in general, and advanced vehicle research in particular, are seen as an important opportunity for the US to continue its technological and economic dominance. The QTR hints at a threat to US leadership on technological innovation: it states that the "United States has led in innovation because of a culture of creativity and entrepreneurship coupled with government and private sector investment in basic and applied research" (DOE 2011a, 22) before warning that the US is being outspent on R&D by China, Japan, Korea, and France (see also DOE 2010a). The report recommending the creation of the QTR puts the US' identity as leader most starkly: "Historically, the U.S. has been a technology leader in energy and in many other critical industries. This, of course, rests on the foundation of our unparalleled research and innovation enterprise. … We must "ride the wave" and be at the forefront of energy technology innovation over the next decade … The alternative will be uncharacteristically to become a "technology-taker," with the implied economic and leadership consequences" (PCAST 2010, 2). Other texts specifically state international competitiveness as the goal of advanced vehicle research (NRC 2013, 1-2 fn3). Hinting that the US identity among nations is at stake effectively argues for any actions that will reassert US technological dominance. In so doing, it justifies and endorses those actions which secure continued US "leadership" in the world. As Secretary Chu states in the introduction to the QTR: "The stakes

are high for our country, and I am optimistic that we can still lead the world in technological innovation" (DOE 2011a, i). The broader continuity here is not merely the nation-state as the meaningful convener of knowledge production, but as a competitor for economic dominance in an international system of rivals. The role of the US as (rightfully, benevolently) hegemonic is reinforced by calls to continued technological leadership in order to keep secure the US' rightful place among nation-states.

Functionally, these texts reflect the position that centralized knowledge and state wealth are necessary if we are to understand new advanced materials in order to bring them to technological fruition. Though it might not seem surprising for the state to reinforce its own importance, it is worth underlining that the state in this case shores up its power by way of a particular concept of the future – namely, a future that can be managed through scientific and technological innovation. It is a future where only action by the state can effectively marshal human ingenuity and supply it with advanced enough facilities to produce the technology – and therefore the change – needed to solve the problems of oil dependence and climate change. Note that this performance of "stateness" positions the state differently from the kinds of authoritarian environmental state – mutual coercion mutually agreed upon – envisioned by early survivalists like Garrett Hardin, where the state strictly enforces rigorous environmental protections. If it were, these texts might, for example, recommend an outright ban on internal combustion engines in order to coerce a change in consumer behavior. Rather, in these texts the US positions itself as a knowledge-producing, technology-developing state – the kind that supports the continual growth of capitalist production, and presumably limitless mobility and consumption.

Expecting continuity reaffirms the boundaries of identity. As a whole, the project of the advanced vehicle reaffirms the boundaries of a particularly capitalist, particularly autonomous

and mobile American identity. The driver-consumer is sovereign over her own vehicle choices, choices whose impact the highly trained engineer minimizes, bringing new technologies into the world in order to reduce oil consumption and carbon emissions. The nation-state supports the engineer by providing resources and centralizing knowledge, and the US in particular keeps its rightful place as a leader among nations. Unlike in the other visions of the future of automobility, there are no cities (except as clusters of fuelling stations; e.g. DOE 2010a, 2.6-4); there are only laboratories and test tracks, transcontinental pipelines, and "points-of-sale" (DOE 2011a). There are no communities (except as research communities; e.g. DOE 2011a). People are consumers or engineers – not voters, community members, inhabitants, or social creatures at all.

Change: Avenues for action in the present

If continuity matters because it shores up identity and marks the limits of possible change, then change matters because it is the mechanism by which problems can be solved. It is how the vision of a new and better future becomes refracted back into the present; envisioned change legitimates certain courses of action in the present while silencing or dismissing others. In the case of advanced vehicle texts, change occurs in two domains. First, a transformation is envisioned for the automobile itself: there is a fairly consistent narrative of technological changes progressing from minor efficiency increases in the short term to more significant and systemic changes in the long term to the automobile and to the energy systems that support it. Second, and more interestingly, the texts envision (or seek) a transformation in the process of technological innovation itself: an acceleration in research and development through an influx of resources but also through new software and design techniques. These envisioned future changes serve to legitimate a marshalling of state and scientific resources as a means to technological (but only technological) goals.

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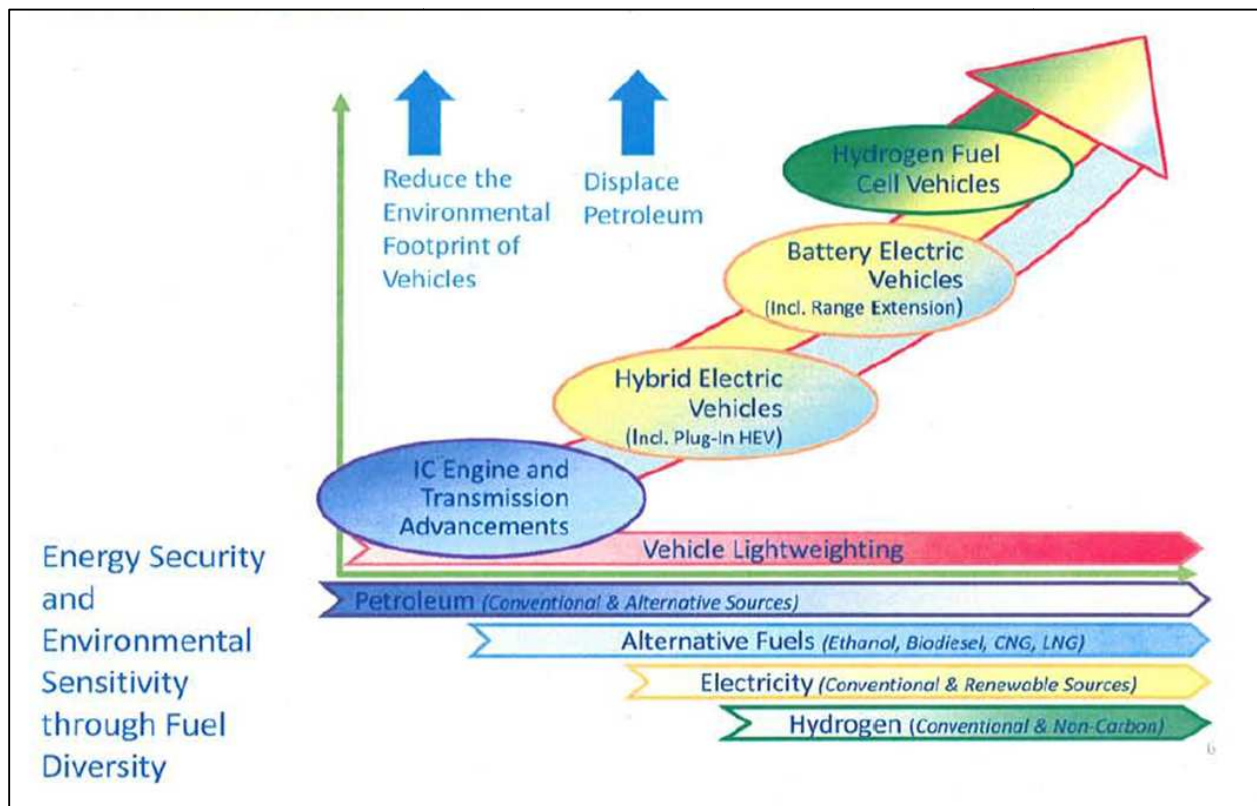
Figure 3: Typical narrative of the advanced vehicle. *Source: NRC 2013*

The figure above, taken from the NRC's *4th Report on USDRIVE*, provides an excellent illustration of what is a fairly consistent consensus on the transformation of the automobile. There are changes that are expected to be possible in the short term (increased efficiency of the internal combustion engine, more widespread use of hybrid electric vehicles), and transformations that may be seen in the mid- to long-term (adoption of plug-in electric vehicles, development of hydrogen fuel cells). The document *Real Prospects for Energy Efficiency* gives the basic outline of this narrative quite clearly:

> [E]volutionary improvements in gasoline vehicles using ICEs are likely to prove the most cost-effective technology for improving fuel efficiency and reducing petroleum

consumption, at least through 2020. Because changing the manufacturing, servicing, and fuel infrastructure to serve electric or fuel cell vehicles would be expensive and time-consuming, the new technology would have to offer major advantages. For the medium term, plug-in hybrid electric vehicles (PHEVs) and the associated electricity fueling infrastructure could be deployed more rapidly and more cheaply than hydrogen fuel-cell vehicles and the associated hydrogen fuel production and distribution infrastructure. Thus, if high-energy-storage battery technology progresses sufficiently, PHEVs would be a promising mid- to long-term option. In contrast, it would take decades—perhaps until 2050—for hydrogen fuel-cell vehicles (HFCVs) to have a major impact on U.S. oil use. (AEF et al. 2010, 10-11)

Of all the expectations about the advanced vehicle, there is most agreement around the idea that the internal combustion engine (ICE) will remain in the short- to mid-term: "Internal combustion engines play a dominant role in U.S. transportation and are expected to continue to do so well beyond 2020" (Oak Ridge 2010, 1; see also NAS 2009). *Basic Research Needs* goes so far as to tells us: "The reality is that the internal combustion engine will remain the primary driver of transport for the next 30-50 years, whether or not one believes that the peak in oil is past or imminent, or that hydrogen-fueled and electric vehicles will power transport in the future, or that geopolitical tensions will ease through international cooperation" (DOE 2006, viii). The QTR says of internal combustion engines (ICEs) that it is "likely that they will continue to dominate the vehicle fleet for at least the next several decades" (DOE 2011a, 39); "they are "expected to maintain significant market share for many years" (DOE 2012a, 1), with fuel economy having the potential to improve between 25%-40% (DOE 2012a, 16).

Several of the texts make a clear link between the continued use of the ICE and the justification for channeling money and effort specifically into ICE research. For instance, *Basic Research Needs* states that ICEs will "remain a mainstay for the next 50 years… For internal combustion engines to provide environmentally acceptable impacts and be compatible with national security and competitiveness needs, substantial investments in combustion science are

needed" (DOE 2006, 156). The Vehicle Technology Program's *Multi-Year Program Plan* states, similarly: "There seems to be little doubt that, regardless of the success of any pathways discussed, the internal combustion engines (ICE) will be the dominant prime mover for light-duty vehicles for many years, probably decades. Thus it is clearly important to perform R&D to provide a better understanding of the fundamental processes affecting engine efficiency and the production of undesirable emissions" (DOE 2010a, 2.3-1). This is echoed again in the NRC's report on USDRIVE: ICEs "are going to be the dominant automotive technology for decades … Because a better understanding of the combustion process and emissions production can help to overcome a major barrier to more advanced ICEs, this work is important to the country" (NRC 2013, S-5; see also AEF et al. 2010; DOE 2009, 1).

There is also broad consensus that a potential transition to electric vehicles and hydrogen fuel cells can happen only in the mid- to long-term: "Electric drive vehicles have the potential to eventually be a large share of the light-duty fleet, as well as some share of the urban heavy-duty fleet. Projections of market penetration rates vary widely, ranging from less than 10% in 2050 to 90%–95% in 2050" (DOE 2012a, 8). Within electrification, there is a "pathway" that technology is expected to follow (NRC 2013, 1-5): hybrid electric vehicles first, then plug-in hybrids, then all-electric vehicles, and finally hydrogen fuel cell vehicles (NRC 2013, 3-36; DOE 2012a; DOE 2011a, ix), which are "unlikely before 2035" (AEF et al. 2010, 14). This transition is seen as necessary because, as the texts recognize, "Increasing vehicle efficiency is the most effective near- to mid-term strategy for reducing oil consumption in the transportation sector …However, because efficiency technologies can never eliminate oil consumption, other measures will be necessary for longer-term improvements" (DOE 2011a, 28).

This basic narrative reflects a well-defined sense that less radically new things will have more of an impact in the short term. Despite there being the possibility of a breakthrough technology (e.g. DOE 2010a, 2.1; PCAST 2010, 2), there is a clear understanding that for at least "the next several decades" the most significant impact on oil consumption and climate change will be made by those technologies that are least novel. The "appropriate balance" between short- and long-term research "requires the Department [of Energy] to focus on accelerating innovation relevant to today's energy technologies, since such evolutionary advances are more likely to have near- to mid-term impact on the Nation's challenges. ... [T]oo much effort in the Department is devoted to research on technologies multiple generations away from practical use at the expense of analyses, modeling and simulation or other highly relevant fundamental engineering research activities that could influence the private-sector in the nearer term" (U.S. Senate 2011; the same passage is verbatim in DOE 2011a, x). This emphasis on short-term technologies stems partly from the understanding that technologies "will be deployed rapidly and seamlessly if they can integrate with the existing energy infrastructure" (DOE 2011a, 48). It is also because, as discussed above, consumer-drivers, as the widespread adopters of technology, are the key agents of change; because they are seen as continuously desiring similar technologies in the future, the technology to have the most significant impact is understood to be the technology that closest to what consumers are already accustomed to. As such, investment in the least novel technologies is the most justified. In fact, one text notes that the focus has shifted since 2010 to shorter-term projects because in the economic downturn it is no longer "appropriate" to channel significant funding to high-risk technologies, which in this case means specifically hydrogen fuel cells (NRC 2013). In this way, there is a link made between the short term, what is possible, and what is most appropriate for action.

Conversely, there is a sense of the future being fairly open in the long term. There is a significant degree of uncertainty regarding which technology, if any, will dominate, and which barriers will prove insurmountable (NRC 2013). This, too, translates into specific R&D policy in the present: The DOE continues to support the development of several different technologies, even those considered "high-risk," as part of a "portfolio" of long term investments. As *Real Prospects for Energy Efficiency in the 21st Century* states, "a prudent RD&D portfolio includes high-risk, potentially high-payoff projects as well as those involving lower-risk, incremental improvements" (e.g. AEF et al. 2010, 390). The same general concept is also expressed in terms of maintaining "parallel paths" of technological development (DOE 2010a, 2.1-19), where "more assured activities" are balanced "against higher-risk transformational work to hedge against situations where reasonably assured paths become blocked by insurmountable challenges. DOE will reserve up to 20% of the Department's energy technology R&D funding for 'out of the box activities'" (U.S. Senate 2011).

The openness of the long-term future also means that changes to the automobile are situated within envisioned changes to the entire system of energy production and consumption in the US. The QTR, for instance, is a step in a broader project "to identify and recommend ways to accelerate the large-scale transformation of energy production, delivery, and use to a low-carbon energy system" (PCAST 2010, vii). Interestingly, one intended purpose of the QTR is to provide a degree of stability in the trajectory of R&D such that political changes (such as a change in administration) do not affect funding to energy research. In an interview about the QTR, the director of Oak Ridge Laboratories expressed the feeling that "oftentimes, it is like watching the fashion world, things come and go, and sometimes it takes longer than seems to be the attention span in order to solve the technical challenges" (quoted in Sands 2011). There is a sense, then,

that the research takes time and stable sources of funding; that significant change requires a lengthy and sustained effort. The scope and "complex mix of scientific, technical, economic, social, and political elements" involved in energy production and consumption in the US "means that the necessary transformational change in how we generate, supply, distribute, and use energy will be an immense undertaking, requiring decades to complete" (AEF et al. 2010, vi).

Transforming the production and consumption of energy does not in this case mean transforming the social landscape in any way; however, it certainly implies a significant economic transformation. Specifically, the transformation of the components of the automobile means the transformation of vast supply chains and infrastructure (AEF et al. 2010, 27). Entire systems have to be in place in order to produce and distribute lithium-ion batteries, for instance, or hydrogen for fuel cells. Indeed, entire systems underlie the production of each component of the automobile; given the number of components of an automobile, each component represents a potential transformation of supply chains, "processing technologies," and a widespread set of connected endeavors (DOE 2010a, 2.1-9; NRC 2013, 1-8). New facilities have to be built to produce the new technologies and their components, and, as the QTR points out, this means research into more than the components the automobile; it means significant effort going into the development of methods of manufacturing those components, the ecological impact of those methods, even the safety standards of the new facilities (DOE 2012a, 61).

This broader transformation of the production of transportation energy also incorporates a goal of thinking systemically about the ecological impacts of transportation technology. For instance, the development of electric vehicles is understood to occur in the context of a new "clean" electric supply (DOE 2011a, 28). The DOE's lightweighting roadmap includes targets for keeping components recyclable (DOE 2013), a particular concern as new composite materials

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are developed that are more difficult to recycle. One document raises concerns about technologies' lifecycle environmental costs (NRC 2013, 2-14-16) and even recommends that any new technological designs adopt a cradle-to-cradle approach, citing McDonough and Braungart (NRC 2013, 2-17). Not all the texts mention the need for a fundamental transformation of the energy landscape (see e.g. DOE 2011b); but at its most ambitious, the project to create the advanced vehicle sees it as part of "a unique opportunity for the U.S. to establish a sustainable energy infrastructure" altogether (DOE 2010a, 1.0-1).

<u>The transformation of research and development</u>

This transformation of the automobile as a part of the wider transformation of energy systems fits into the basic sense of progress in these texts, where change is unidirectional. This does not mean that change is seen as necessarily linear – sudden breakthroughs and exponential change are considered possible and even desirable. What it does mean, however, is an expectation of continued improvements. This is a hallmark of technological optimism and the dominant modern understanding of the future as better, makeable, and new.

This unidirectional understanding of change as improvement can be explored through some of the common terms used to talk about expected or planned change. For instance, take the basic concept of a "baseline" for improvement. Baselines are used to indicate the starting point for improvement: increases in fuel efficiency, for instance, are measured against fuel efficiency in given automobiles at a given moment in time. Baselines functionally erase the past of a technology; all previous action is irrelevant; all that matters is future improvement. The Quadrennial Technology Review is full of trends indicating past and future progress: we see engine efficiency increasing at a mostly steady rate (DOE 2012a, 13); with use of lightweight materials such as high-strength and mid-strength steel, polymers, magnesium, and aluminum

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gradually increasing (DOE 2012a, 24); and the costs of electric drives going down continuously (DOE 2012a, 46). There is never an expectation that one's efforts could lead to technology regressing, dipping below the baseline. In a related way, the potential for future technological change is referred to as technical or technology "headroom" (DOE 2012a, 2, 90, 63; DOE 2011a, ix, 38, 39), conjuring up an image of room to grow, to move up and forward. It expresses potential that one can already see; there are perhaps limits to a technology's potential, but the limits have not yet been reached. It defines and delimits potential, with the expectation that there is only one direction to grow: up.

Of course, continual progress does not mean smooth or effortless progress. One of the most frequent terms to surface in these documents is "barrier." In a discourse riddled with journey metaphors, with progress guided by "roadmaps" and marked by "milestones" (DOE 2010a; DOE 2012a, 40), barriers are anything that blocks forward movement, from "inadequate understanding" of various aspects of combustion and a lack of data (DOE 2012a) to initial costs of raw materials (DOE 2011b, 2). Understood one way, talk of barriers is a way of shutting down action. For instance, the NRC's 2013 report on the USDRIVE program says this of the potential for advanced vehicles: "there are production and infrastructure barriers that must be resolved (e.g., the need for widespread affordable hydrogen if mass-produced HFCVs are to become a reality, a feedstock and production combination for biofuels that does not compete with food crops, and a low-carbon electric grid)" (NRC 2013, S-3). One can easily read that as a justification for abandoning work on advanced vehicles, as the scope of each barrier is daunting in itself, and combined they amount to a dramatic shift in infrastructure at a continental scale. Indeed, when discussing barriers to progress, technological optimism does not always sound overly optimistic (e.g. DOE 2013; AEF et al. 2010).

And yet, a barrier is not considered immutable; it is considered a challenge that has not yet been overcome. The potential exists for the barrier to be overcome in the future. As such, identifying a "barrier" is a way of focusing attention, of directing action, of defining something that can conceivably change. So, somewhat counterintuitively, identifying barriers is not a way of closing down action; it can be generative of a certain kind of action, problem-solving focused specifically around defined barriers. When the NRC writes that hydrogen fuel cell development "is not on a path to overcome" cost barriers, the solution it recommends is that "[b]asic research and generation of new ideas are needed" (NRC 2013, S-6). In the same way that defining a problem implies a solution, identifying a barrier – such as cost of materials – implies potentially overcoming that barrier through more research and "new ideas." The understanding in these texts is that barriers can be overcome through more research and development; costs come down, emissions come down, processes get streamlined, everything continually improves; as in science, even missteps are opportunities to learn and improve.

Indeed, what these texts claim is needed is not merely to make a new and better future, but to make it as quickly as possible. The texts seek a change – an acceleration – in the very process of R&D. This perceived need for acceleration comes from a tension between two understandings in this literature. On the one hand, there is the understanding – discussed above – that oil consumption and climate change are urgent problems. On the other hand, there is a commonsense understanding in this literature that it takes several decades for transportation technologies to change and commercialize at a wide scale, and up to half a century for energy infrastructure to change (e.g. DOE 2012a, 13; DOE 2011a, 10; DOE 2010a). "To have a significant effect, advanced-technology vehicles must garner a sizable share of the market. Generally, a decade or more is required to develop a technology to the stage that it can be

deployed, to introduce it on a commercial vehicle, and then to achieve significant sales" (NAS 2010, 12). If technological change is to solve the problems of oil consumption and climate change on a timescale shorter than 50 years, research and development must somehow speed up that technological change. In the Congressional hearing on the Quadrennial Technology Review, Edward Moniz, an advisor on the QTR process and now Secretary of Energy, put it this way: "history tells us that many decades have been required for major changes of the energy enterprise. However, the imperative for accelerating change is real" (U.S. Senate 2011; see also DOE 2011a, ii). At the same hearing, Undersecretary Koonin stated similarly: "The burden of oil imports and the need to reduce greenhouse gas emissions dramatically by 2050 sets a relentless clock on our actions. Because significant changes in energy supply can take 20 years or more, the Department will focus on a portfolio of technologies that can confidently be predicted to be material by 2030" (U.S. Senate 2011). In this, they both echo the document that recommended the creation of the QTR: "Responding to the energy-related challenges of competitiveness, climate change, and security will require leadership across the energy innovation chain – from invention to diffusion – but with a dramatic acceleration relative to the half century that has been the norm to move new energy systems from initial development to thorough integration in the economy" (PCAST 2010, v). Not just innovation, but accelerated innovation, is the key to problem solving here.

This is where research comes in. Given the evolutionary understanding of how change happens, the goal is not to abandon that process (because this is how progress works) and certainly not to reverse it; the goal is to accelerate evolutionary change, by the production of more knowledge (e.g. about materials, combustion, or manufacturing processes). The understanding is that advanced vehicles will be developed, but it is the role of R&D to make sure

they get designed and developed sooner than they otherwise would (DOE 2010a, 2.6-1; NRC 2013, 3-23; DOE 2011a, 114, see also 39).

One somewhat unexpected thing to emerge from the texts is how important engineering software is seen to be in accelerating the process of technological innovation. As the QTR sees it, "The goal of fundamental engineering research is to make better predictions about the behavior of human-made systems and components, which will broadly improve our ability to design, build, and maintain engineered products and services for particular purposes" (DOE 2011a, 114). As such, the ability of software to improve and manage those predictions – and to do it quickly – is fundamental: "Design processes that over-rely on "build and test" prototype engineering are too slow," the QTR tells us, and "[p]redictive computational design and simulation tools will shrink engine development timescales, reduce development costs, and accelerate time to market" (DOE 2012a, 18). Physically building an engine is too slow: "[h]istorically, integration and evaluation of advanced technologies have required multiple vehicle builds and long term testing which are expensive and time consuming" (DOE 2010a, 2.2-2). But software is able to simulate the same process and bypass the stage of testing a technology physically rather than virtually (DOE 2010a, 2.1). It can "accelerate design cycles, reduce the number of prototypes needed, reduce battery development cost, and provide a competitive advantage to U.S. original equipment manufacturers (OEMs), suppliers, and battery manufacturers" (DOE 2012a, 43). In fact, *Basic Research Needs* goes so far as to call the development of high-functioning predictive software the "one overarching grand challenge" (DOE 2006, ix) that the advanced vehicle project faces, because "only through the achievable goal of truly predictive combustion science will the engines of the 21st century realize unparalleled efficiency and cleanliness" (DOE 2006, xi). In contrast to slow and bumbling 20th-century processes of "trial and error" (DOE 2013a, 38)

or "cut and try" design (DOE 2006, x), where engineers merely tinkered, advanced vehicle design requires new, streamlined, more powerful ways to experiment more quickly and to predict more accurately, in order to have widespread technological change happen in less than 50 years.

In a way, these justifications for simulations and virtual engineering provide a certain urgency to this discourse. It is as if we don't have time to waste, as if we don't have the luxury of tinkering: "American economic competitiveness, environmental stewardship, and enhanced security depend on picking up the pace of energy technology innovation in this decade" (PCAST 2010, 1). And yet, it is worth noting that this urgency is merely a variation on the modern understanding of technological progress: to solve our problems, all we need is more technology, more progress – just faster.

In contrast to the chapters to come, these texts operate within a unidirectional sense of progress, where acceleration of progress is seen as the necessary change. By doing so, these texts draw on the dominant progress narrative, but they complicate that narrative with what seems to be a commonplace understanding within the advanced vehicle research community: that technology transformation takes decades, a slow experimental process of overcoming one barrier after another. This commonsense knowledge about slow technological transformation comes up against the understanding that oil consumption, climate change, and international competition are urgent problems. The texts reconcile the slowness of past progress with the most powerful tool in the modernist conceptual toolkit: accelerated progress through more knowledge production.

What does this vision of technological transformation legitimate? The narrowest, most critical interpretation would be that it legitimates nothing more than government support of engineering software design and incremental improvements to the internal combustion engine. It is a vision that defers (perhaps indefinitely) any systemic changes to the energy landscape. A

broader interpretation might be that these texts legitimate – indeed, actively seek – an outpouring of scientific effort. Such effort is directed not merely at changing the components of automobiles, but transforming the energy systems in which those components operate and are produced, as well as developing ways of modelling and accelerating that transformation.

Conclusion

In the texts examined in this chapter, there are three basic challenges that the transformation of the automobile can and will address: oil consumption, climate change, and international economic competition. The possibilities for and constraints on this transformation are bounded by three continuities. First is the American driver-consumer, who will continue driving and consuming. Second is the engineer, who will produce knowledge and design around the driver-consumer's preferences. Third is the nation-state, which will play a central and centralizing role in knowledge production and innovation; it provides the resources necessary to produce those technologies that are advanced enough to address the above challenges while still allowing for the driver-consumer's preferences. Within these bounds, the texts envision a transformation to the automobile itself: increased efficiency to the ICE in the short term, with energy infrastructures changing only in the long term (thereby privileging small-scale efficiencies in the present over large-scale systemic transformation). Yet the real key to the transformation envisioned by the texts is the need not just for innovation but for accelerated innovation. Not only should we progress, we should produce so much knowledge that the rate of technological change accelerates as we go along. This vision of progress does not only point the way forward towards a presumably new and better future, it insists on going forward faster.

<u>Power</u>

There is nothing necessarily statist or elitist about technological optimism in the face of environmental challenges. To the extent that technological knowledge and innovation can be decentralized, small-scale phenomena – to the extent that humans are capable of making things, figuring things out, and then making better things – technological optimism is an orientation that can play out at any level.

Yet it becomes clear in the logic of the advanced vehicle that the kinds of technologies that are expected to close the gap between consumer behaviors and environmentally desirable outcomes are big enough demands that it justifies the existence of the state. In the face of a problem of the scope of climate change, and coupled with the expectation that behaviors won't change, then technological optimism effectively demands the centralized knowledge production of expertise at the level of the nation-state. What does this tell us about the legitimation of power?[44] The texts legitimate a specific form of knowing about the world: scientific expertise, above all scientific expertise that is inscribed in an institutional logic; not people in their garages building their own bio-fueled retrofitted cars, but highly trained, coordinated, scientifically cutting-edge engineers. Engineers have the expertise to produce knowledge to effect the necessary transformations in the world. The texts also legitimate a specific form of power: state authority. The texts posit problems at a scope that requires large-scale technological effort – the kind of effort that can only be coordinated, convened, funded, and supported by a large-scale state structure. Thus, in the texts, the state positions itself not just as an authority, but as the only actor capable of providing the resources and centralizing the knowledge needed to produce

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[44] There's a difference between power that is legitimated in the texts and power that is external to the texts, that derives from some other source. On the one hand, the texts are authoritative because it is the powerful authoritative state producing these texts – so the DOE has power and authority external to the texts. In that sense, engineers may not be particularly authoritative or powerful; yet their expert authority is legitimated in the texts.

advanced enough technology to do what we need done. The necessary envisioned technological transformation can't happen without the state.

Altogether, the texts posit a large, centralized system of power-knowledge that is justified because it is knowledge put to good use: the state is putting its power towards, and science puts its knowledge towards, this enlightened project of progress on oil consumption and climate change. This has significant political implications. Beckmann (2001) has argued that shifting responsibility for the problems of the automobile to technical experts "frees the individual driver from any personal responsibility or individual judgment. In trusting the machinery, we lose our ability for reflexivity" (605). Reflexivity is still at work; agency in interpreting problems and marshalling resources to address them still exists. But it is – intentionally – entrusted to engineers and to the state – and there are bounds to what future possibilities engineers are willing to entertain. By displacing this potential for interpretation and agency to expert authority, the power to think the future is displaced as well.

<center>Environment</center>

These texts make it clear that advanced vehicle research is directed towards addressing environmental challenges. In contrast to in later chapters, the scope and unfolding of these challenges are known and knowable. We know that climate change exists and is urgent, but we know the scale of carbon reductions needed, and we can work within the limited supply of oil. These are challenges that can be, if not solved, then sufficiently addressed through technology.

It would be a mistake to think of such technological optimism as merely a "quick fix" approach. Understanding technologies as a key mechanism to solve social problems does not necessarily entail a shoring up of the status quo. The most ambitious text – indeed, the definitive statement of the DOE on the possibilities of the future, the QTR – sees an entire transformation

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of the energy landscape. It's not just bumping up efficiency a few points. The scale of the transformation envisioned here is large. Though the changes experienced by the American driver-consumer are expected to be minimal – by design – it still entails a significant shift in the economy, in the built environment, and in the incursions made into the landscape by coal mines, oil derricks, and fossil-fueled power plants. To change a few components of the car in order to reduce oil consumption and carbon dioxide emissions is to change the entire supply chain, with all the ramifications that entails. Technological optimism, then, does not necessarily imply only short-term or small-scale change, nor does it necessarily suffer from a lack of transformational vision. To envision technological change can indeed be to envision significant, wide-ranging, systemic change.

That said, the systemic change envisioned within these texts is a large transformation in only a very narrow dimension. It is a vast change that revolves around one presumed fixed point: the unchanging behavior of the driver-consumer. The driver-consumer in these texts is not asked to make good environmental decisions. In fact, it is presumed that the driver-consumer will not make decisions beyond considerations of performance and cost. These texts do not ask anybody to change; they just ask engineers to do what they're doing, only faster. Advanced vehicle research seeks to change what is being consumed, not the act of consumption itself. As such, it does not perpetuate the precise same systems of automotive production and consumption as the world currently knows. Yet it does keep in place the culture of consumerism. It specifically, intentionally eschews building up an environmental sensibility. What does this mean for environmental politics? As a project, advanced vehicle research seeks to solve big problems – to reduce a significant portion of global carbon emissions and fossil fuel consumption. But looked

at in a different light, it solves very narrow problems; it does not promote or envision a cultural shift towards sustainability, sufficiency, or ecological awareness.

The future

This chapter began with a line from the DOE document *Basic Research Needs for Clean and Efficient Combustion of 21st Century Transportation Fuels*, a text which concludes with the resounding claim that "the path to success is clearer now than ever before" (DOE 2006, 156). Coming after a hundred and fifty pages of vehicle technology assessments, this statement encapsulates with delightful precision the technological optimism that underlies the advanced vehicle as a project. Success is ahead of us and we can see our way there clearly; indeed, with each authoritative report produced, with each conference on fuel efficiency held, the appropriate path only becomes clearer as barriers are identified and research efforts marshaled to overcome them. With each completed carbon fiber experiment and each software-accelerated engine design cycle, we speed up progress towards the goal of reduced oil consumption and carbon dioxide emissions. What's more, the boundaries of the path are clear: we will not stray into territory that threatens our automobile-anchored "standard of living" or trespass on the American driver's "freedom of vehicle choice" (DOE 2010a, 2.0-1). We know what we're doing; we can make the future.

Such clarity of vision can be appealing. However, when considering the clear path described by authoritative representations of the advanced vehicle, it is worth remembering that "the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it" (Jasanoff 2004, 2). As the next chapters will explore, there are other ways to represent the future of the world and other ways to choose to live in it

CHAPTER 5

REBUILD: THE SMART GROWTH NEIGHBORHOOD

The second vision of the future of automobility deemphasizes the car and envisions a built environment that accommodates bicycles, walking, and public transport options. As such, it represents both progress and return. Its future is not radically new – no cutting-edge hydrogen fuel cell infrastructure here. When smart growth is defined as "the opposite of automobile-based suburban development" (Duany et al. 2010, xiii), that opposite is not understood to be some futuristic negation of the car-centric suburb – high-rises connected by high-tech self-driving pods, for example. Rather, its envisioned landscape is one that intentionally resembles the pre-automobile past. This means rebuilding historic forms of neighborhoods, complete with dense, narrow, tree-lined, pedestrian-filled streets. As US Transportation Secretary Ray LaHood put it, smart growth "means being able to take your kids to school, go to work, see a doctor, drop by the grocery or post office, go out to dinner and a movie, and play with your kids at the park – all without having to get in your car" (quoted in DOT 2010, 1).

Despite its affinities with the past, smart growth is future-oriented in several key ways. For one, it embraces the idea of growth. Though it is sometimes specified that this means population growth in particular, "growth" generally hints at more in the future: more homes, more food, more jobs, more wealth. The future envisioned here is certainly better. And the future envisioned here is makeable as well. Smart growth seeks to actively redesign the landscape to reduce the dominance of the automobile, in order to address a wide range of consequences of automobility (this is the "smart" aspect of smart growth).

In this contradictory intertwining of past and future, this vision shares much with the Arcadian thread of utopian thought introduced in chapter 3. Arcadian utopias are those that seek to recover a way of being that has been lost. In the past two centuries, this has generally been

understood in terms of actively recovering small-scale (often rural) communities in the face of

rationalizing, mass-producing, nature-devouring modernity. Arcadians see the need to actively

pursue change simply to conserve a degree of continuity, both in the landscape and in

community. Just as the smart growth imagination intertwines the past and the future, it

intertwines change and continuity. The name of this chapter – "Rebuild" – reflects this dynamic

of reconstructing a lost era. The use of the term "rebuild" is not wholly metaphorical, either: the

smart growth texts analyzed here articulate a vision of change where the landscape in the future

has been rehabilitated, rebuilt to recover what was lost when the automobile took over.

This chapter begins by putting the smart growth texts in their historical and institutional

context as a set of authoritative design standards, developed in the past 15 years but drawing on

decades of anti-sprawl critique. The second section discusses the particular reflexive stance taken

by the texts: that automobile-centric urban planning in the mid-20th century produced a rupture in

the landscape, and thus in the social fabric; and that smart growth principles promise to repair

that rupture in the future. In the third section, the analysis turns to the three major continuities

articulated in the texts as continuing into the future: the neighborhood inhabitant, the urban

planner, and the state. The fourth section discusses the transformations envisioned in the text:

first and foremost, a transformation in the built environment to recreate the pre-automobile

landscape, and secondarily, a transformation of urban planning practices as planners find new

ways to conserve old forms in the built environment.

Smart growth texts

While the previous chapter focused on advanced vehicle research as a project, this

chapter focuses on the smart growth movement in urban planning. Advanced vehicle research

focuses on technological changes to the automobile itself, while smart growth seeks to reduce the

dominance of the automobile in the built environment. The most frequently cited definition of smart growth takes the form of ten principles defined by the Smart Growth Network (a partnership between the Environmental Protection Agency (EPA) and nongovernmental organizations); these principles include mixing land uses, building densely, creating walkable neighborhoods, preserving open space, directing development towards existing communities, and providing a range of transportation and housing choices. The concept of smart growth shares much with, and is sometimes used interchangeably with, other similar concepts, particularly new urbanism as a movement and "livability" as a goal.[45] Regardless of the term, however, at the core is a concern to reshape the landscape for denser living and less automobile use.

The smart growth movement grew out of a long history of social critique of sprawl and the suburbs. Much of the early criticism of sprawl in the mid-20th century was aesthetic and social (Duany et al. 2010, xii; see e.g. Keats 1956; Whyte 1958; Mumford 1961). The landmark 1974 study *The Costs of Sprawl* raised economic questions about suburbanization. Following on in the 1980s, "[n]umerous studies challenged traditional growth assumptions" (DOT 2010, 3) as urban planners began paying significant attention to sprawl as a problem. In the late 1990s, anti-sprawl sentiment developed into the concept of smart growth, which coalesced into a more cohesive movement embedded in institutional structures. The state of Maryland established a smart growth program that caught national attention; the EPA, together with a number of NGOs and government agencies, formed the Smart Growth Network (SGN 2014) ;[46] then-Vice-President Al Gore launched the "Livability Agenda," which sought to "provide communities

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[45] In general, "livability" is a significantly broader and vaguer term than smart growth, while new urbanism differs slightly from smart growth in that it places less emphasis on rehabilitating existing neighborhoods and more on the form of the neighborhood (i.e. one can produce a new urbanist town from scratch, in a greenfield development). See Ye et al. (2005) for a more in-depth analysis of variance among different conceptualizations of "smart growth."

[46] The SGN now includes the EPA, the APA, the CNU, the ITE, the NRDC.

with new tools and resources to preserve green space, ease traffic congestion, and pursue regional 'smart growth' strategies" (White House 1998); and the Federal Transit Administration published *Building Livable Communities with Transit* (1999).

In the 21st century, the smart growth movement coalesced further and began inscribing its vision of the future in design standards, policy recommendations, and guides for action – the texts analyzed in this chapter. The American Planning Association, the primary professional association for urban planners, published its first urban design standards manual in 2006 (APA 2006), with smart growth concepts introduced throughout; in the same year, the Institute for Transportation Engineers published a recommended practice document for transportation engineers building walkable communities (ITE 2006). In 2009 the US Green Building Council (USGBC), the organization that maintains Leadership in Energy and Environmental Design (LEED) standards, established a certification system for LEED standards for smart growth, called the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) and based on the smart growth principles delineated by the Smart Growth Network (APA 2006, 483). The USGBC worked with the Natural Resources Defense Council and the Congress for the New Urbanism to develop the certification scheme expressly to standardize and quantify the ideal smart growth neighborhood.

In the last five years, three government agencies also contributed to the inscribing of the smart growth vision in authoritative documents. In 2009 the Department of Transportation, the Environmental Protection Agency, and the Department of Housing and Urban Development formed the Partnership for Sustainable Communities to "help communities nationwide improve access to affordable housing, increase transportation options, and lower transportation costs while protecting the environment" (Partnership for Sustainable Communities 2014). Their stated

six "livability principles" echo the smart growth principles defined by the Smart Growth Network. Also in 2009, the EPA published its *Essential Smart Growth Fixes* – a guide to help cities "fix" their built environment through smart growth principles. The following year, the Department of Transportation published its own *Livability Guidebook* (2010). We are seeing a moment of discursive consolidation: an array of critiques of suburbanization and automobilization are cohering around the concept of smart growth, an idea that is increasingly being formally codified. Smart growth is definitively defined in these documents, allowing urban planners and local government officials across the country to be able to adhere to the smart growth vision. Thanks to such standardization, "municipalities, developers, and prospective residents will be able to objectively determine the degree to which proposed projects embody smart growth principles" (USGBC 2009, 6.8).

Though the vision of smart growth may sometimes echo Arcadian visions of an idyll regained, these urban planning texts are not wide-eyed lyrical fantasias, where country and city, technology and nature, the automobile and its alternatives blend harmoniously. These are technical documents. They deal with things like street typologies, zoning codes, tax incentives, and transit headways. What's more, these texts do not envision change in order to critique the present state of things and liberate political imagination. True, these texts set out smart growth standards in order to "encourage people to try new things" as the DOT's *Livability Guidebook* puts it; they are standardized in order to enable, not to constrain, transformations of the built environment. Yet by their very nature, these are texts written to govern. After all, their vision of dense, tightly knit, interconnected community is not expected to be realized by, for instance, prophets leading us into the wilderness to start intentional communities. Nor is it a vision expected simply to unfold organically. "Livable communities do not simply happen," as the FTA

tells us. They require a very specific form of governance – "smart" governance, to be sure, but governance nonetheless. These texts outline the contours of such governance, making very clear and sometimes fairly bold claims about the possible and desirable transformations that can occur in urban landscapes. In this way, just as the technological roadmaps in the previous chapter can be considered authoritative representations of the possible transformations of the automobile, these texts can be considered authoritative representations of the possible transformations of automobile-centric cities.

Reflexivity in the smart growth movement

If reflexivity is a consciousness of one's conduct and its consequences – if it is reflected in the moment when a group reflects on its behavior in a moment that blends critique and imagination – then the texts examined in this chapter take on a very particular form of reflexivity. In some ways similar to the texts analyzed in the previous chapter, these texts problematize the automobile in terms of its contribution to climate change and oil depletion. However, they also link driving to problematic changes in the American landscape in the past century. These changes are seen to produce not only environmental concerns but – to recall the issues raised in chapter 2 – social effects that cannot and should not continue: road fatalities and social isolation. More important for the question of how these texts think the future, however, is that the texts – written largely by and for urban planners – give the problems of the automobile-centric landscape a very particular narrative arc, in which urban planners of the mid-20th century made a number of destructive mistakes that urban planners of the 21st century must seek to repair.

<u>The problems</u>

Compared to the three major challenges outlined in the advanced vehicle texts (carbon emissions, oil consumption, and international competitiveness), these texts pull together a wide, diffuse variety of problems associated with the automobile and the automobile-centric landscape. These range across the unsustainabilities discussed in chapter 2. Greenhouse gas emissions and the automobile's contribution to climate change are frequently evoked (DOT 2010, 1, 103; USGBC 2009, ix; Duany et al. 2010, xii; SGN 2002, 51; EPA 2009, 2). Automobile-produced air pollution is also often defined as a pressing problem (DOT 2010, 1; USGBC 2009, ix; Duany et al. 2010, xii; SGN 2002, 51; APA 2006, 566). Other environmental concerns related specifically to the landscape appear as well: wildlife habitat fragmentation (USGBC 2009, ix; SGN 2002, 51), the disruption of water ecosystems (USGBC 2009, ix; SGN. 2002, 51), and the overall consumption of land (USGBC 2009, ix; SGN 2002, 51). Dependence on foreign oil does appear as a concern (DOT 2010, 1; Duany et al. 2010, xii; APA 2006, 566), the sense of urgency is significantly less in these texts than in any of the texts analyzed in either the previous or the next chapter. Instead, social problems are highlighted: public health issues such as obesity and road safety (e.g. Duany et al. 2010) are attributed in part to the automobile-dominated landscape, and social isolation is evoked as a major problem throughout the texts.

What is particularly notable about the problematization of the automobile-centric landscape in these texts – which, again, were written largely by and for urban planners – is the understanding that urban planners in the recent past were in large part responsible for the creation of that landscape. The basic narrative that orients these smart growth texts holds that the automobilization of the landscape in the mid-20th century was a rupture in the built environment – and therefore in the social fabric. "Before the mid-1900s, urban communities and neighborhoods focused on the pedestrian ... However, in the past fifty years, dispersed

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development patterns and the separation of uses have led to an increased reliance on personal automobiles and to an elimination of many characteristics that support walkable communities" (EPA 2002, 25). "Historically the five-minute-walk pedestrian shed created the neighborhood, street-cars determined the corridor structure of urban expansion, and trains generated the nodal patterns of the early suburbs. But recently the automobile has allowed new development to spread thinly and without discipline across the landscape" (Duany et al. 2010, 3.1).[47] Where once there was neighborhood, structure, and pattern, there is now "new development" that is "without discipline," spreading across the landscape like a blight. Postwar suburbanization meant "disinvestment in [urban neighborhoods] ... as they were abandoned for newer, low density, dispersed developments" (SGN 2002, 51). At its most blunt: "highways have reamed out much of America's urban fabric" (Duany et al. 2010, 3.9). The postwar expansion of suburbs and increase in automobile use was a moment of dispersion, abandonment, elimination, departure, and disinvestment – all in an attempt "to replace time-tested models with unprecedented inventions" (Duany et al. 2010, xv). Duany et al. sum up this narrative eloquently: "It is now clear that many current social, economic, environmental, and physiological ills are direct outcomes of the way we have built our communities since World War II. Single-use zoning, massive road construction, and urban disinvestment have turned a nation of ecologically sustainable neighborhoods into a collection of far-flung monocultures, connected only by the prosthetic device of the automobile"[48] (Duany et al. 2010, xii-xiii).

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[47] The "five-minute-walk pedestrian shed" refers to the area defined by the distance a pedestrian can walk in five minutes.

[48] Of course, this claim that pre-automobile neighborhood was ecologically sustainable is a bold one, considering the degree of deforestation, wetlands draining and other, non-automobile-related ecological destruction that went into building pre-20th century neighborhoods.

The smart growth solution

Given these problems, these texts see themselves positioned in a critical moment, where the weight of past problems has become heavy enough to require a change. Though there is a lesser degree of urgency in these texts compared to the narratives discussed in chapters 4 and 6 (e.g. no climate projections or predictions of when peak oil might occur), there is nevertheless a sense that the time has come for a change. Take this passage from the Smart Growth Network's (2002, i) *Getting to Smart Growth:*

> [C]ommunities are questioning the economic costs of abandoning infrastructure in the city and rebuilding it farther out. They are questioning the necessity of spending increasing time in cars locked in traffic and traveling miles to the nearest store. They are questioning the practice of abandoning brownfields in older communities while developing open space and prime agricultural land and thereby damaging our environment at the suburban fringe. As these quality-of-life issues become increasingly important for American communities, local and state policymakers, planners, developers, and others are turning to smart growth as one solution to these challenges.

As it continues several pages later, "Americans have a real opportunity" to reshape the landscape in better ways (SGN 2002, 2).

To all the above problems, smart growth is offered as the solution. Its design principles are seen to address a number of issues. For example, these design principles encompass alternative modes of transportation that are understood to reduce driving and therefore greenhouse gas emissions (USGBC 2009, xix, ix; Duany et al. 2010, xii). They include "traffic calming" design elements (such as narrow lanes or trees) that slow traffic and make the roads safer (EPA 2009), and elements (such as inviting public spaces) that "support stronger communities through improved social interaction" (SGN 2002, 26). These design elements, by changing the landscape itself, are understood to be holistically able to address the wide range of automobile-fueled problems (APA 2006; SGN 2002, i) and to do so with a degree of permanence (FWHA 1999, 15). It is even suggested that smart growth is, indeed, the only solution capable of

attaining all these ends: "in monitoring the crises surrounding climate change, energy dependence, public health, decaying infrastructure, and financial instability, we are reminded that all five are the result of sprawl and thus can find solutions only in smart growth" (Duany et al.: xiii).

The previous chapter analyzed the narrative of the advanced vehicle, which sees the need for a technological solution to a small number of large-scale issues that are understood to become only more pressing in the future: climate change, oil dependence, and international economic competitiveness. In contrast, the texts in this chapter see a wide host of issues associated with the automobile-dominated landscape. These include climate change and oil dependence, to be sure – but they also include a range of social and ecological issues that the "Accelerate" vision of the future does not take into account, not least among these safety and social isolation. It is worth noting, too, that while two of the three challenges evoked in the "Accelerate" chapter are understood to be national in nature – US dependence on foreign oil and US competitiveness in the international system – the problems evoked in the smart growth literature are far more local and yet simultaneously more universal. Any city in the world whose landscape is dominated by the automobile struggles with, for instance, road fatalities, air pollution, and the consumption of land. Though the US landscape is particularly automobile-centric, suburban sprawl is not an exclusively an American phenomenon. This smart growth discourse, then, articulates problems that are local and transnational, but not necessarily national in character. While the "Accelerate" narrative trades specifically on a sense of potential threat to US economic interests, the smart growth narrative has no such sense of impending national challenge. Rather, its sense of urgency – to the extent that it has one – stems from an understanding that past mistakes need to be rectified. Indeed, as the following sections will

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discuss, the particular narrative arc constructed in these smart growth texts posits that the automobile created a rupture in the American landscape. The future is thus not for heading off threats through ever-accelerating progress; rather, the future presents the opportunity to repair that rupture.

Continuity: Subjectivities in a "rebuilt" future

Thinking the future means articulating a space of expectation: imagined change unfolds within the bounds of expected continuities. By articulating these continuities, these texts make a claim about what kinds of subject positions are available – whom it is possible to be, both now and in the future. In the smart growth literature, there are three subjects that are expected to continue from the past and present into the future. The first is the neighborhood inhabitant, who is mutually constituted with the built environment in which she lives. The second is the urban planner, who designs the built environment so as to produce particular social outcomes. The third is the state, which positions itself as uniquely able to scale up transformation by diffusing the principles and design standards of smart growth.

The neighborhood inhabitant

Unlike the driver-consumer of the last chapter, the neighborhood inhabitant is neither a consumer nor *homo economicus*, calculating costs and seeking to maximize performance against price. The smart growth texts, for instance, do not discuss "standard of living," often associated with material goods like the automobile (and prominent in advanced vehicle texts); rather, they are concerned with Americans' "quality of life" (DOT 2010, i; FTA 1999, 1; USGBC 2009, x; SGN 2002, 82). Though it is never made clear what quality of life entails precisely, it seems to include things like time spent in traffic, safety, and living in a lively neighborhood. Like the driver-consumer, the inhabitant in these texts seeks convenience, to be sure; but she also wants

her life to include things like open space, beauty, and a sense of connection to the place where she lives. Given the choice, the inhabitant prefers a neighborhood that offers "an attractive, safe, nurturing environment in which to live and work" over "new neighborhoods at the edge of suburban development" (FTA 1999, 11).

The inhabitant in these texts is just that: one who inhabits, who dwells. As such, it is difficult and perhaps impossible to separate out the inhabitant from the neighborhood in which she lives. The embodied experience of a city - the visual cues, the absence or presence of "unsightly" telecom towers (SGN 2002, 39) or utility boxes (Duany et al. 2010), the lack of natural light in an underground walkway – all such elements have an impact on the inhabitant. Unlike the individual driver-consumer of the advanced vehicle, whose mobility practices cannot (and should not) be changed, in these texts the inhabitant is not ontologically prior to the neighborhood she inhabits. This view of the inhabitant reflects the kind of behavioral assumptions at work in architecture and urban planning, rather than economics. Rather than being the result of preference-maximizing choices, the inhabitant's mobility practices are shaped at least in part by the built environment. If the neighborhood inhabitant uses an automobile, this use is influenced by the conveniences afforded by the built environment (such as free parking), rather than a fixed preference for autonomy and mobility, performance or a powerful driving experience. Like the driver-consumer, then, the neighborhood inhabitant is mobile; unlike the driver-consumer, however, her mobility is not precisely autonomous. Rather, it is social. Besides being intertwined with the mobilities of other inhabitants, this mobility relies upon the infrastructure that the urban planner has designed and the state has built. That is not to say that the inhabitant has no autonomy over her movement – but it is mobility made possible by the fact that the inhabitant lives in a social context.

The inhabitant could also be considered plurally mobile. The same inhabitant is sometimes a passenger, sometimes a cyclist, sometimes a driver, and sometimes a pedestrian. Given the option to do so, the inhabitant as articulated in these texts takes advantage of the full gamut of transit infrastructure. Jitneys, buses, streetcars, light rail, and subways: each plays its own specific role in her mobility practices. The inhabitant has a number of ways of moving through and being in the neighborhood. She may take advantage of the opportunity for stillness (sitting at a sidewalk cafe, say), or for slow and meandering movement through a park; but she still sometimes moves as a purposive commuter or efficient errand-running. Again, given the opportunity – i.e. if she lives in a neighborhood whose design allows for it – the inhabitant will move plurally, using different modes, at different speeds, for different purposes. The design guidelines for the smart growth community are all well aware that different bodies travel at different speeds, and that even the same body may have varied abilities and responsibilities over the course of its existence: "most of us, at some time in our lives, will need to get wheelchairs and strollers onto sidewalks and into buildings" (Duany et al. 2010, 14.5; see also EPA 2009, 24 and AASHTO: 96-100). Again, there is the sense that the same inhabitant is – and will be – mobile in different ways at different times.

There is also in the texts an understanding that, within a small-scale neighborhood, the juxtaposition of many such plurally mobile subjects contributes to a sense of place and community. As inhabitants interact through their plural mobilities, they build ties with each other and the neighborhood.

One prerequisite for such sociality seems to be a small scale: the neighborhood in which the inhabitant lives is small in scale (otherwise, presumably, it would not count as a neighborhood). In fact, the USGBC LEED-ND guidelines offer an intriguingly exact definition

of a neighborhood: "research has determined that a reasonable minimum size is at least two habitable buildings and that the maximum area that can appropriately be considered a neighborhood is 320 acres, or half a square mile" (USGBC et al. 2009, xiv). The small scale of the ideal neighborhood is often discussed in terms of "human scale" (e.g. SGN 2002, 29, 63; USGBC 2009, xvii; DOT 2010, 89; APA 2006), which "represents buildings that can be observed within a short distance and at the speed of a pedestrian, and sites and districts that are walkable" (ITE 2006, 13). This is in contrast specifically to "auto scale," which "represents a built environment where buildings, sites, signs, etc. are designed to be observed and reached at the speed of an automobile" (ITE 2006, 13). Though it is in fact a technical term, the concept of building at a "human scale" tends to cast the ideal neighborhood in a friendly, organic, more humane light.

There is also the understanding that inhabitants' plurality of mobility practices should be complemented and accommodated by having a mix of building uses: e.g. having homes, restaurants, a medical clinic, bars, a park, and a church all within sight of each other. This emphasis on diversity does partly aesthetic, partly instrumental work. There is a "vitality that a creative mix of uses can generate" (SGN 2002, 7), which is considered valuable in itself; but there are also clear links made in the literature among having a diversity of uses, safety, and economic wellbeing.[49] "The key to active street life is to create a 24-hour city, which implies an area so diverse in use that it is inhabited around the clock. … Such diversity contributes to safety by ensuring that areas don't empty out at night" (Duany et al. 2010, 5.2) and avoids "a lack of foot traffic and consumers in evenings or weekends" (SGN 2002, 18). Having juxtaposed and plural mobilities, in other words, is seen to make neighborhood safer.

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[49] The debt of smart growth literature to Jane Jacobs is clear.

Finally, the plurality of mobilities and building uses should be complemented by having inhabitants be unlike – by encouraging racial and socioeconomic diversity among residential and commercial buildings. More fundamentally, however, the call for diversity made by recommendations for smart growth reflects a vision of community that is only authentic when it is participatory and includes "a diversity of ages and incomes" (Duany et al. 2010, 5.3). The emphasis on diversity appears in recommendations for "inclusionary zoning," zoning which requires a certain number of affordable housing units within a neighborhood, in the expectation that this "helps to both increase the number of affordable units and create mixed-income communities" (SGN 2002, 18). It appears in the LEED-ND certification guidelines, which grant credits for having mixed-income housing and mixed-use developments in order to encourage "balanced" and "socially equitable and engaging communities" (USGBC: 31, 57). The emphasis on diversity also appears in the second "livability principle" of the Partnership for Sustainable Communities: to "promote equitable, affordable housing" (DOT 2010, i) – a goal that reflects not only a concern for social equity but also a stance that the ideal community is one inclusive of different groups of people in terms of race and economic status.

The importance of the small-scale, diverse neighborhood, inhabited by people who sometimes drive but sometimes meander, rests on the concept that such a neighborhood allows for spontaneous, face-to-face social interactions, which in turn play an important role in social cohesion. The EPA's *Getting to Smart Growth* puts it like this: having homes distant from jobs, restaurants and public spaces "lev[ies] larger social costs ... by fundamentally changing the character of communities and undermining the viability of opportunities for people to walk to shops or work, and to meet and chat with their neighbors on the way" (SGN 2002, 2).

The smart growth vision, then, sees the inhabitant as a public-oriented sharer of social space rather than a private consumer of individualized space. Hence, for example, the importance of public places and open spaces in the smart growth vision: these are the spaces where people's different mobilities intersect. Public places - including streets - play an important role in encouraging social cohesion. Whereas suburban developments do "little to stimulate civic pride or contribute to a strong sense of place with which community residents can identify" (SGN 2002, 33), smart growth neighborhoods use highly visible sites and topographically high points for public space or civic buildings to create civic pride (USGBC 2009, xviii; see also APA 2006, 451 and Duany et al. 2010, 4.4, 5.6, 5.9, 14.9). This is supplemented by recommendations to organize community events, as "The most well-designed street in the world will fail to evoke a sense of community if there are no opportunities for interaction or vibrant exchange among neighbors" (SGN 2002, 39).

What this points to is the fundamental importance placed on the public rather than the private; it is an invitation for people to be citizens rather than consumers, for community to take its form from public places rather than in private domains. Altogether, these texts make a bid to define the primary member of the public as a neighborhood inhabitant rather than a driver or consumer: a fundamentally social creature who dwells with a sense of place. The texts take the basic position that, given the opportunity, people would naturally interact with their neighbors, take advantage of well-designed transit, and contribute to the fabric of their community. This is fairly radical, at least in the American cultural context. Part of the premise (and promise) of the suburbs is that one can be at a remove from society without being entirely isolated from it. The automobile allows one ostensibly to shuttle at will between (urban) society and one's own (suburban) privacy. This duality – and the ability to engage it on one's own terms – is precisely

what the cultural myth of automobile-enabled independence is based on. Yet these texts

challenge the premise that, in order to be happy, one has to be able to escape to one's own

domain; indeed, the EPA goes so far as to recast the individuality of the suburban single-family

home as monotony (EPA 2009, 5). Smart growth principles do away with this duality precisely

by asserting that human nature is fundamentally social. They suggest that, given the option,

people want to live in the kind of dense neighborhood that allows for spontaneous social

interaction (see e.g. SGN 2002, 10-11). Dense cities are "vibrant" - difference in proximity is

valued – and "lively", not chaotic. Streets in such neighborhoods are "complete", not crowded.

These texts characterize the independence promised by the automobile-dominated suburbs as

either antisocial arrogance or a form of false consciousness; either way, it is seen as a

deformation of the true course to human flourishing.

There is one last but crucial point to make about the neighborhood inhabitant, and that is

in relation to the next continuity discussed below: the urban planner. For all the inhabitant's

different ways of being and moving in the city, she is – crucially – still seen as a predictable

creature. The behaviors of inhabitants are patterned, and those patterns can be known and

designed for. For instance, the half-mile appears almost universally within the smart growth

literature as the upper limit of an ideal distance because it is considered to be the distance that the

average person can walk in ten minutes (APA 2006, 450), which "research shows" is the farthest

"that people will walk" to reach amenities or transit (USGBC 2009, xvi; see also SGN 2002, 10;

Duany et al. 2010; AASHTO 2004, 96). Inhabitants' behaviors are enmeshed with the

neighborhood in predictable ways: for instance, "people who live in neighborhoods with finely

grained street networks have been shown to walk more, use transit more, and drive less than

those who live in conventional large-block and cul-de-sac suburbs" (Duany et al. 2010, 7.1), and

"[p]eople feel more comfortable in neighborhoods in which buildings and landscape properly frame the street area" (SGN 2002, 11). If the inhabitant and her reactions to the landscape were entirely erratic, the urban planner's changes to the built environment would have no predictable effects. Yet, as the next section explores, the fact that the inhabitant's relationship to the neighborhood is seen as predictable is precisely what allows the urban planner to design landscapes to change behavior.

The urban planner

In these texts, the built environment is malleable, and it has an impact on how people experience and move through the city. This understanding underlies virtually the entire range of smart growth recommendations. To give a few examples: "[a]ttractive and well-maintained walkways encourage more people to walk to their destinations" (SGN 2002, 31). Abandoned buildings pose a risk of "economic disinvestment and increased crime for the neighborhoods surrounding them" (SGN 2002, 22). "Communities that are well defined and easy to navigate ... attract new activity and investment" (SGN 2002, 38). "Vistas that run straight and far into the distance cause drivers to speed" (Duany et al. 2010, 7.6). The presence of bike lanes means that "bicyclists feel they have a safe space on the road and tend to be more law-abiding" (APA 2006). "Diverse streetscapes with retail shops, restaurants, public art and other amenities encourage people to linger" (SGN 2002, 28). "Large areas of surface parking ... discourage walking and actually increase parking demand by forcing people to drive between destinations" (EPA 2009, 14). "Pedestrians also have a basic resistance to changes in grade or elevation … and tend to avoid using special underpass or overpass pedestrian facilities" (AASHTO 2004, 96). "To attract ridership in communities that are already automobile-oriented," transit must be simple and run frequently; it must offer "a dignified wait" that is "safe, comfortable, clean, and dry;" and should

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be accessible by means of a path that is "direct and pleasant" (Duany et al. 2010, 3.5; see APA 2006, 279 for a nearly identical design recommendation).

Given this predictable relationship between the built environment and inhabitants' behaviors, the means to a better future is good design. Design is in part aesthetic, but in part instrumental. Urban planning is premised on design as a structuring of possibilities, an invitation to certain behaviors and social relations. Wherever you want people to go, make that place pretty and easy to get to. However you want them to get there, make the pathway inviting and safe. To design is to build the conditions for desirable change. Put slightly differently, design is the skillful manipulation of people's impulses towards beauty and convenience in the service of producing socially desirable behaviors. Though the design of a city never wholly determines the behavior of the people within it, good design allows for socially beneficial outcomes while poor design forecloses them. In other words, if good design invites desirable behaviors, then good design can create a better future. As such, the figure of the urban planner looms large in these texts. The texts are for the most part written by urban planners, intended largely for urban planners. They are blueprints for change; like the engineer in the last chapter, the urban planner is the one who effects change. The urban planner, by designing the built environment, shapes what shapes behavior. The urban planner can foster, can create the conditions for, can usher in a new era of, rehabilitated neighborhoods.

To be sure, the texts acknowledge the need for a certain amount of give and take between the urban planner and the inhabitant, with a participatory dynamic between expert design and the general public. In its guidelines to urban planners, the APA states that public participation "is inherently good. It is a source of wisdom and information about local conditions, needs, and attitudes, and thus improves the effectiveness of decision making," as "the built and natural

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environments work better if citizens are active and involved in its creation and management instead of being treated as passive consumers" (APA 2006, 46). For this reason, the technique of "visioning" is highlighted in many texts as a way of getting public input. Visioning is a process by which urban planners supply images or plans of different potential developments in a series of public forums, and the public provides feedback or chooses between the different visions put forward by the planners (SGN 2002, ch. 10). Visioning, the texts suggest, "promotes greater awareness of societal change and deepened citizen involvement. It also gives communities a stronger sense of control over their destinies" (APA 2006, 55). Engaging with the public in fact liberates inhabitants' latent concern for their neighborhood: "for many people, there remains a fundamental appeal in talking about the future of their community. The reason is probably the abiding importance of "place." People relate to and care about where they live; it's one of the fundamental ways through which we continue to connect as human beings" (APA 2006, 56). The role of the urban planner, then, is to provide the means for inhabitants to feel they belong in their neighborhood.

Yet there is also a clear sense that, though the public's input is important, the planner is likely to need to educate the public. "Often, the public does not understand how its everyday activities influence these conditions or how planning or smart growth could relieve some of the problems and improve quality of life" (SGN 2002, 82). There are several recommendations that urban planners attempt to "communicate" well with the public (e.g. Duany et al. 2010, 1.3) and to "educate community members" (EPA 2002, 10). The Smart Growth Network seems to expect negative reactions in particular to the concept of density, warning that the public may suffer from "a lack of familiarity ... with examples of high-quality, high-value compact building design and the benefits associated with them" (SGN 2002, 10), and as such, the "concept of density requires

ample discussion and education to allay misconceptions and correct misunderstandings about its purpose and benefits" (EPA 2009, 19). Then, as "the public becomes more informed about density and the benefits it can convey," smart growth solutions will become more acceptable (SGN 2002, 10). In other words, the urban planner is expected to need to enlighten the public to some degree as to the problems of automobile-centric development and the potential for a better future.

It is the urban planner's job not to take a city's infrastructure for granted. The texts may well be correct when they treat the inhabitant as largely unaware of the work that goes into the built environment: most people moving through a city may rarely think about how that city is designed (beyond, at least, thoughts like "I wish there were a crosswalk here" or "who would ever have thought it was a good idea to have a four-lane traffic circle?"). Yet urban planners are trained to notice things like the layout of the street, to question them, and to envision potential change. A neighborhood's inhabitants may interact with and dwell meaningfully in their built environment; but they are generally expected not to think about changing it. The urban planner is the reflexive one, capable of envisioning and guiding change. This privileging of the planner occasionally comes through in the very form the smart growth texts take. One example illustrates this quite literally: the image below, taken from the US Green Building Council's LEED-ND standard guidelines. The image shows a bird's-eye view of a standardized layout for a neighborhood meriting LEED-ND certification. The neighborhood has a few basic features: a rail stop that is no farther than a half-mile from anywhere in the neighborhood; a clear boundary; short walking distances between buildings. More important, however, is the view itself: a neighborhood from above.
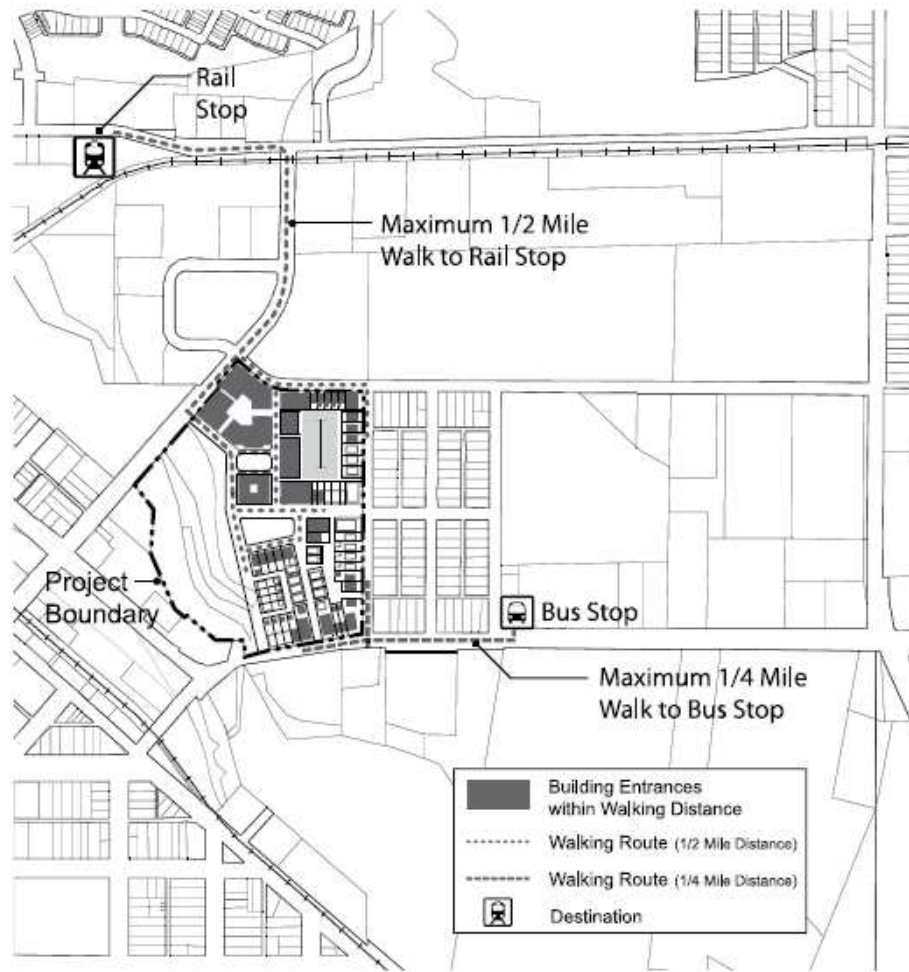
Figure 4: Design guide for a smart growth neighborhood. Source: USGBC et al. 2009.

This from-above model neighborhood echoes the older tradition of modern urban

planning, as it adopted a view from above in order to manage, make legible, and ultimately better

the city (Scott 1998). As the smart growth planner designs, she makes the neighborhood a

legible, reproduceable, standardized space. Similarly, this from-above view of the smart growth

neighborhood recalls the Foucauldian gaze of the expert (Foucault 1995). Though the design of a

neighborhood may be significantly more benign than the design of a Panopticon, the means by

which power is exerted is not dissimilar. Neighborhood design, like prison design or highway

design, canalizes movement; it just works with a different vision of order. A specific configuration of space produces a specific social outcome; design becomes a technology of control.

Smart growth and new urbanism are frequently criticized as exercises in social engineering (see Cervero 1998; Talen 2002; Greenhut 2006; Ivey 2011). The claim is that urban planners attempt to guide the otherwise free and choices of autonomous individuals. Of such criticisms I would say: of course smart growth is social engineering. Of course the urban planner is a social engineer. That is the whole point: consciously to guide inhabitants' mobility patterns towards outcomes that are considered socially desirable. In the case of smart growth advocates, this means shifting mobility patterns away from a form of automobility that depletes oil, changes the climate, endangers human lives, and degrades social relationships. More importantly, however, I would add that the urban planner is no more or less a social engineer than the automotive engineer of the previous chapter. The automotive engineer works with different materials than the urban planner does – carbon fiber and fuel cells rather than streetcars and zoning codes – but both are engaged in designing a better future. The automotive engineer also works within a different space of expectation than the urban planner does, in which people are – and will be – autonomously mobile drivers rather social and mobile inhabitants. Yet both design around expectations about who people fundamentally are and will be, and how they would move through the world if given the opportunity to be fully themselves.

<div align="center">The state</div>

As an entity, the state is more diffuse and multi-layered in these texts than was the nation-state of the last chapter. Given the nature of transportation and land use policy, smart growth is inevitably an issue for local government; yet attempts to scale up smart growth

changes mean that regional- and national-level manifestations of the state are involved as well. Also in contrast to the nation-state of the previous chapter, the importance of the state seems to end at the national borders. International competition does not really appear as an issue in these texts. Yet the state in these texts does have an important, and remarkably similar role to play. It does not precisely instigate change – the urban planner does – but it creates the conditions for change at a broader scale, primarily through its role in centralizing and legitimating knowledge.

In the texts, the state makes its impact felt at the local level largely through design regulations. The texts see transformation as more likely to happen if the state implements regulations rather than waiting for voluntary change. Many of the recommendations in the texts are for changes to legal requirements for particular design elements. For instance, the Smart Growth Network advocates implementing legal requirements for developers to build and maintain sidewalks, with the understanding that if there is no local requirement for developers to do the right thing, they will not build sidewalks – thereby reducing the walkability of the area (SGN 2002, 29-31). As the section below will discuss, changing zoning codes form an important part of the smart growth vision of transformation. Change does not merely encompass design, in other words; it is also encompasses the legal means by which some designs are permitted and others made illegal. At the local level, then, the state is the enforcer of good urban planning.

At all levels, the state is important in funding or providing financial incentives to attract people to smart growth neighborhoods. It provides tax incentives as to bring businesses into largely residential areas, so as to introduce mixed uses into the landscape. Federal funding through transportation bills supports the "integration of bicycling and walking into the transportation mainstream" (SGN 2002, 26; see also DOT 2010). The federal government "can play a powerful role by directing financial resources and technical support to aid local efforts.

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Targeted use of state and federal transportation funds can assist communities in initiating or completing pilot retrofitting projects, thus demonstrating the benefits of improved walkability and generating further support for expanded local financing of pedestrian-friendly retrofits" (SGN 2002, 26). The different levels of the state are seen ideally to work together to fund good design.

Though the state in this chapter may differ from the state in the last chapter – its power is more diffuse and layered, its power more capillary, and its context is less international – the state plays a similar role in standardizing and consolidating knowledge at the national level. Just as the nation-state plays a "convening" role in advanced vehicle research, here it plays a centralizing role in knowledge about smart growth design. The knowledge here takes a slightly different form – instead of research findings about lithium ion batteries, knowledge is bound up in neighborhood design standards. But there is a similar attempt to centralize and re-diffuse knowledge in order to move change along. Two texts in particular serve as examples of this. First, the EPA's 2009 *Essential Smart Growth Fixes* justifies its existence by stating that local governments seek to transform their cities along smart growth lines, but "might not have the resources or expertise to make the specific regulatory changes that will create more sustainable communities" (EPA 2009, 2). At the same time, a "significant challenge to developing a walkable community is the lack of design standards or performance measures for walkability, like those that guide other kinds of transportation planning and design" (EPA 2009). Specifically to "respond to this need," the EPA convened "a panel of national smart growth code experts to identify local zoning code topics that are essential to creating the building blocks of smart growth" (EPA 2013) and published their findings in *Essential Smart Growth Fixes*. In doing so,

the EPA positions itself as an actor capable of centralizing knowledge – legitimizing local knowledge and making it replicable at a broader scale.

The Department of Transportation's 2010 *Livability Guidebook* also serves as an example. The text "provides examples of communities and agencies across the country that have approached today's new livability in transportation context with innovative and practical strategies" (DOT 2010, 6). It pulls together the "lessons learned" from 15 city- and regional-level smart growth projects (including among others rail transit in Denver; bus rapid transit in Eugene, OR; brownfield redevelopment in Chattanooga, TN; and Transit-Oriented Development in Charlotte, NC). The document specifically disavows constituting "a standard, specification, or regulation" (DOT 2010, i). Yet it was "disseminated under the sponsorship of the USDOT in the interest of information exchange" (DOT 2010, i) and was "intended to be an overview on the importance of livability in transportation" (DOT 2010, 6). In other words, it has an agenda behind its "information exchange." In "highlighting elements in the case studies that worked well – practical strategies, processes, applications, and common techniques," it seeks to "encourage the reader to "try something new" to promote livability in transportation" (DOT 2010, 6). Its very name suggests that it is intended to be a guidebook for change. At the same time, it is clearly intended to be a guidebook for change anywhere and everywhere in the US. There is a replicability to it: even though it emphasizes the uniqueness of each individual city, and even though it draws on 15 very specific cases, it is geared towards making these things potentially universal. The ideal smart growth neighborhood is a small, tightly knit, unique neighborhood with a sense of history and place; yet there is an understanding that building such neighborhoods effectively and widely means creating a kind of national standard for such neighborhoods.

Though the urban planner is the one to "try something new," the state (thanks to its resources and authority) is the one to secure the conditions for this to happen at a meaningful scale.

The lines of continuity drawn in these texts – the predictable inhabitant dwelling in a timeless neighborhood, the planner capable of effecting design, the state that will continue to standardize knowledge now and into the future – have political implications. First of all, to characterize the public as made up of inhabitants rather than drivers or consumers is to make a fairly bold claim about American identity. It makes a bid to recast what it means to be American. It claims that we are not meant to be autonomously mobile, ruggedly individualists ensconced in our own suburban domains, able to retreat from society at will, demanding the fastest and most comfortable cars at the lowest possible price. Rather, it claims that we are fundamentally social, aesthetic creatures; our mobility patterns do not inhere in our autonomous, ontologically prior selves, but are brought into being through our interactions with the built environment and the others with whom we share a city.

These texts further imply a claim that people have a latent capacity and desire for dense active neighborhood life – a latent desire that a well-designed neighborhood can draw out and realize — hence the central importance of the urban planner in these texts. The urban planner – similar to the engineer in the previous chapter – designs around the predictable preferences and whims of the members of the public to produce socially desirable outcomes. However, the urban planner differs slightly in that, while the automotive engineer seeks not to guide the driver's choices but to reduce the impact of those choices, the urban planner's well-designed neighborhood represents a technology of control. The expected continuity of the role of the urban planner shores up the idea that the ideal neighborhoods of the smart growth vision "do not simply happen" but require the skillful intervention of the urban planner. Finally, though the

state is more diffuse and less clearly demarcated in these texts than in the previous chapter's texts, its similar role in authorizing knowledge reinforces the link between authority, expertise, and perhaps even territoriality as the state acts to standardize urban forms across the nation.

Change: Avenues for action in the present

While articulating future continuities exerts (or contests) power by asserting certain roles as natural or powerful, both now and in the future, envisioning future changes makes certain courses of action meaningful in the present. Some actions are rendered appropriate as means towards a desirable future end, while others become irrelevant or counterproductive. In the smart growth vision of the future, continuity and change are far more intertwined than in the other visions analyzed in this dissertation. This is in part due to the particular narrative described above, in which the postwar suburban expansion that encouraged automobile use is seen as a moment of rupture, a disruption in the broader continuity of how humans have always lived. As such, future change is oriented towards repairing that rupture and recapturing that continuity. Two major transformations are envisioned in these smart growth texts. One is a transformation of the built environment: the rebuilding of forms of neighborhood that were largely destroyed in postwar suburban expansion. This is closely tied to the second envisioned transformation: a change in urban planning as an endeavor, where the goal becomes innovating to preserve and rebuild, rather than creating new forms of living in and moving through cities. Given that sprawl is largely understood as a destructive force for which urban planners were partly responsible in helping to unleash (see Burchell et al. 1998), there is a heightened sense in these texts, as in the smart growth community more broadly, that future urban planning in the US must not recreate the mistakes of the mid-20th century.

<u>Transforming the built environment: rebuild</u>

Continuity and change are thoroughly, almost confusingly intertwined in these texts. The neighborhood is seen both as a deep historical continuity and yet the goal of necessary change: because that deep continuity was interrupted, change is needed to repair the rupture and recover the continuity. For this reason, transformations of the built environment within a smart growth framework are often referred to in terms of return. Often this is implied simply through the prefix "re-": Smart growth "seeks to *regain* a balance among transportation modes by encouraging walking, biking, and all types of transit" (Duany et al. 2010, 3, my emphasis). It is "the process of *reintegrating* the components of modern life ... into compact, pedestrian-friendly, mixed-use neighborhoods" (APA 2006, 602, my emphasis). "[P]olicies must not limit choice, but expand it to include the possibility of living in neighborhoods *again*" (Duany et al. 2010, 1.13, my emphasis). Building a better future means "*[r]estoring* the centrality of the neighborhood" in the fabric of everyday life, as "old, dependable neighborhood structure is the very heart of smart growth" (Duany et al. 2010, xvii, xvi, my emphasis).

One example of this understanding of change as rebuilding can be seen in efforts to recreate main streets. Within the smart growth literature, Main Street projects are a particular type of project that seeks to rebuild or renew a street so as to be the core of the smart growth neighborhood. "Main Street is often thought of as the heart of the community, occupying an iconic position within the typical American small town. … During the 1960s, as cities expanded outward automobile use increased, and retail stores were reconfigured to depend almost exclusively on automobile access, main streets declined" (APA 2006, 444). It's clear that here, main streets are the "heart of community," are thoroughly American, and were destroyed by the automobile. Current efforts by the smart growth community to restore them, then, are part of the broader project of repairing the damage of automobilization (APA 2006, 445).

Another example of how this plays out is in the seemingly technical issue of street connectivity, i.e., the degree to which a street network has short blocks and interconnected streets. A common distinction is made between prewar grid-like street systems, which are referred to as "traditional," and postwar street systems, which are known as "conventional" (APA 2006; SGN 2002; see especially ITE 2006, 28-9). Handy et al. (2003, iii) illustrate this distinction:

Look out the window as you fly into a major metropolitan region in the United States and you can easily identify the era during which different areas were developed. The most telling clue, besides the extent of the tree canopy, is the layout of the street network. Those areas with a regular, rectilinear street grid were almost certainly built sometime after the middle of the nineteenth century and before the middle of the twentieth. Those areas with curvilinear, disconnected streets were most likely developed after World War II.

The "conventional" street system, it is understood, "places the automobile at the top of the hierarchy of transportation modes," while "[t]raditional street design offers considerable advantages over conventional street design for providing a sense of security and convenience. Short blocks, narrow widths, landscaping, on-street parking, through streets and walkways characterize traditional streets and lead to streets that balance the needs of different transport modes" (SGN 2002, 29). The terms "traditional" and "conventional" are simply technical terms here; yet they point to a key understanding in the smart growth literature: the postwar expansion of automobile use and suburbs represents a "significant departure from" how neighborhoods were built (SGN 2002, 1). Part of recapturing how neighborhoods were built includes returning to traditional street grids. In its guidelines on urban design, the APA makes quite clear that conventional street design, with its series of subdivisions connected only by major arterials, "is

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not advisable" (APA 2006, 230-1). In this way, the broader narrative of past departure and potential future return becomes translated into very specific ways of organizing space. Planning to build unconnected conventional streets becomes a less justifiable action, while planning streets in a traditional manner is cast as more appropriate.

The use of the term "traditional" also extends to one of the central endeavors recommended in smart growth texts: "Traditional Neighborhood Development." The APA's *Planning and Urban Design Manual* defines it as "a style of development that works to emulate many of the features of urban neighborhoods of 50 to 100 years ago. It stresses a walkable scale, an integration of different housing types and commercial uses, and the building of true neighborhood centers with civic uses" (APA 2006, 602). LEED-ND "prerequisites and credits are written to encourage a type of development that recalls the siting and design of traditional neighborhoods " (USGBC 2009, xvi). The *Smart Growth Manual* is the most vocal on the issue of traditional neighborhoods. It states that "[t]he neighborhood is not an innovation; it has been the fundamental increment of human settlement throughout history, interrupted only by the 60-year aberration that we now call suburban sprawl. Traditional villages, towns, and cities across the centuries and across cultures are all assembled from this same basic building block" (Duany et al. 2010, 1.3). "It was the abandonment of this model in favor of novelties that led to the current crises – ecological, economic, and social – that make the smart growth campaign necessary. There may be other, more creative ways to reorganize our national landscape, and many of these may be sustainable, but the neighborhood is the only one that has proven itself so, ten thousand times over" (Duany et al. 2010, xv-xvi).

To be sure, not all the texts are equally tradition-oriented: DOT texts, in general, tend to use more instrumental discourse, deploying arguments about efficiency and cost rather than

aesthetics or appropriateness, while the Smart Growth Network uses both instrumental and aesthetic arguments. Nevertheless, there is a persistent claim in the smart growth literature about the appropriateness of traditional (pre-sprawl) neighborhoods. As such, it is perhaps unsurprising that smart growth in general and neo-traditionalism in particular, like other Arcadian visions of a better future made from a better past, is sometimes accused of nostalgia. I would, however, offer a slightly different interpretation. The impulse to live in a neighborhood is not seen as merely a historical one; it is, in some of the smart growth literature, a universal one. For instance, in introducing the guidelines for LEED-ND certification, the USGBC quotes Lewis Mumford: "neighborhoods, in some primitive, inchoate fashion exist wherever human beings congregate … and many of the functions of the city tend to be distributed naturally – that is, without any theoretical preoccupation or political direction – into neighborhoods" (quoted in USGBC 2009, xvi). In this sense, rebuilding neighborhoods is not so much an attempted return to a past moment as a return to the natural, timeless way of doing things. Smart growth does not just mean building neighborhoods as they once were, it means building neighborhoods as they always have been. Rebuilding the landscape means a return, not just to the past, but to a timeless ideal.

There is one last point to highlight here. In the last chapter, change was expected to accelerate in the future, and in the next chapter, change is expected to be sudden and discontinuous; however, in these smart growth texts, change is expected to be gradual. The DOT assures the reader that "relatively small, incremental actions do add up. Completing street, sidewalk and bicycle networks to connect apartments, schools, and shopping; making every street walkable and wheelable within a half-mile of every transit stop or activity center; and making the street safe to cross at each bus stop" (DOT 2010, 103) - these actions will eventually aggregate into a larger, systemic change. Small changes to the landscape will eventually reach a

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"critical mass" (ULI 1994, 20). Intersection by intersection, block by block, transit line by transit line, city by city, the vision is an automobile-centric space transformed into a walkable, livable, wheelable, and connected place. Given the expected slowness of change, then, several texts emphasize the importance of not losing any small opportunities: "Each subdivision or office development built ignoring transit strategies is just another lost opportunity or obligation to retrofit later at a greater expense" (ULI 1994, 22).

<p align="center">Transforming planning: innovate to conserve</p>

The second dimension of the change envisioned in these texts is within the practice of urban planning – what it means to plan. There is a sense within the smart growth literature, that sprawl-promoting actions in the recent past must end and be succeeded by conservation and rehabilitation of the existing urban fabric. There is a "nationwide change in how we are building our transportation system" (APA 2006, 238; see also Duany et al. 2010, 1.13). Again, this relies on an understanding of rupture in the recent past. Planning in the mid- to late-20th century meant creating wholly new, future-oriented developments on a *tabula rasa*. It meant actively, decisively changing the landscape in order to realize a new and different future. If "conventional" planning meant building roads and suburban subdivisions on greenfields located outside the city (or on urban areas cleared by razing low-income neighborhoods) – bringing something entirely new into being in an area understood to be empty and primed for development – then smart growth planning in the 21st century is to mean something very different. It means taking infrastructure that is already in place – empty lots in downtown areas, closed-down gas stations, abandoned elevated train lines – and finding ways to rehabilitate them to new uses. It means actively creating continuity in the landscape.

This is not to say that there is no space in smart growth discourse for new things – that there are no new developments, no new transit lines, no new infrastructure envisioned. But it means that new developments should adopt "traditional" characteristics. Further, it means that the kinds of projects that are lauded and seen as particularly innovative (and appropriate and legitimate) are the ones that actively engage the past, working with inherited constraints rather than creating something new out of whole cloth. For instance, the first prerequisite of LEED-ND certification is "smart location," by which it means that a smart growth neighborhood entails "development within and near *existing* communities … while limiting the expansion of the *development footprint*" (USGBC 2009, 1, original emphasis; see also EPA 2009). There is a sense that innovation now means finding new ways to actively conserve the traditional landscape wherever it still exists. "Preservation," according to the *Smart Growth Manual*, "is a cornerstone of smart growth. The challenge is not just to reaffirm the importance of our architectural heritage, but to actively prevent it from being carted off to the landfill" (Duany et al.: 14.6).

One example of this innovation-to-conserve is in smart growth's emphasis on changing zoning codes. Again, there is a distinction made in the texts between conventional mid-20th century planning, with its Euclidean zoning (which separates out residential zones from commercial and industrial zones) and smart growth zoning. The latter allows for higher densities, mixed-use buildings, and a variety of transportation forms in the same space – changes that allow neighborhoods to take on the characteristics of pre-automobile neighborhoods. Zoning from the mid-20th century "has made our development patterns inefficient, forcing residents to drive longer distances to get to their jobs, schools, shops, and services, which increases traffic congestion, air pollution, and greenhouse gas emissions" while it "frustrate[s] efforts to promote alternative modes of transportation and create lively urban places" (EPA 2009, 4; see also SGN

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2002 and APA 2006, 601). As such, "many local governments want to modify or replace their codes and ordinances so that future development and redevelopment will focus on creating complete neighborhoods—places where residents can walk to jobs and services, where choices exist for housing and transportation, where open space is preserved, and where climate change mitigation goals can be realized." (EPA 2009, 2). In another intertwining of change and continuity, the suggestion is not that zoning be abandoned altogether in a return to anarchic premodern organization of space. The suggestion is specifically to create new ways of zoning that allow for planners and developers to maintain continuity in the landscape. Creativity means changing in order to preserve (or rebuild), not creating new developments out of the air. In an overview of new changes to zoning codes, the APA writes that "Innovations in local development regulations will continue to evolve, and new innovations are sure to arise. What makes the newest innovations special is the context in which they are being developed – not just as variations of conventional development controls, but reflective of new and increasingly accepted concepts about how neighborhoods and communities should be shaped and function" (APA 2006, 603). Like other examples in this chapter, zoning codes may seem like a merely technical issue. Yet in fact these codes regulate the landscape; they are very precise standards for how social space can and should be organized. When changing zoning codes is seen as innovation, it points to a moment of reinterpreting high modern ways of viewing the landscape, where new is better.

This innovate-to-conserve, change-to-stay-the-same goal is evident as well when the texts provide guidelines on ecological preservation. When the Smart Growth Network, for example, writes about innovation, it does not mean cutting-edge technologies; it means new legal tools to protect wildlife habitats (SGN 2002) and new zoning codes that make it easier to build on

brownfields (previously developed and/or potentially polluted land) than on greenfields. "There is a sense of urgency to saving critical environmental areas. Once a greenfield has been developed it is hard, if not impossible, to return the land to its original state (SGN 2002, 44). The second and third prerequisites for LEED-ND certification are "[t]o conserve imperiled species and ecological communities" and "[t]o preserve water quality, natural hydrology, habitat, and biodiversity through conservation of wetlands and water bodies," respectively (USGBC 2009, 10, 12, emphasis removed). Again, this reflects a sense in the smart growth community that the postwar "conventional" way of doing things has meant such widespread destruction that it requires new ways of urban planning just to keep intact what still exists.

Altogether, the smart growth vision is intriguingly contradictory in its vision of transformation. It is clearly future-oriented, situated as it is in a broader tradition of utopianism, in which for centuries "architects and urban planners have sought to realize the good life in the bricks of buildings and the grids of squares and streets" (Kumar 1991, 14). Yet it also echoes (and indeed is often directly inspired by) Arcadian utopias, viewing the future as an opportunity to recapture paradise lost. Its visions of transformation are as much about continuity as they are about change. The envisioned change in the built environment is about recovering what is understood to be a deeper historical continuity: living in neighborhoods. This renders appropriate actions such as reintroducing streetcars or reducing, rather than expanding, the number of lanes of traffic on a residential street. The envisioned change in urban planning is about protecting continuity in the landscape against the same forces (including a narrative of progress as novelty) that created sprawl to begin with. This part of the vision legitimates actions such as changing zoning codes or strengthening restrictions on historical and ecological preservation. Unlike in the previous chapter, the change envisioned in the smart growth texts is not acceleration, where

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progress is unidirectional and the most urgent objective is to move forward as quickly as possible. Rather, the change envisioned is one where the landscape is literally rebuilt to once again allow for people to be inhabitants rather than drivers. The future in this view is certainly makeable and may well be better; but it is not, and should not be, radically new.

Conclusion

In the 21st century, critiques of automobile-centric suburban expansion have coalesced into a fairly clear smart growth discourse. This discourse has gained institutional traction in professional associations, NGOs, and government agencies at all levels; it has also come to be inscribed in design standards that seek to expand smart growth in cities across the country. This chapter examined these design standards and found a narrative in which the automobile-centric urban planning in the mid-20th century represents a rupture in the landscape, smart growth in turn offering the means to repair that rupture in the future. In this narrative of the future, three figures play important roles: the neighborhood inhabitant, who is plurally mobile, fundamentally social, and influenced by the built environment in predictable ways; the urban planner, who designs the landscape to produce socially desirable behaviors in the inhabitant; and the state, which standardizes and authorizes smart growth expertise in order to make it replicable at a broad scale. The transformations envisioned in the texts involve a future where the landscape has been rebuilt to more closely hew to the form of the pre-automobile neighborhood, an exercise in rehabilitation and preservation that requires a certain amount of innovation and creativity.

Power

If in the previous chapter, power operated through a logic where the state and high-tech expertise were positioned as the only means to creating a truly advanced vehicle, in this chapter power is significantly more subtle and Foucauldian. It operates at many levels: it is exerted by

the nation-state, to be sure, but it is also diffused through multiple levels of government, shared across planners and policymakers, and operates through the very arrangement of the built environment. Design functions as governance: it gently encourages everyone to be ideal inhabitants, in love not with their cars but with their neighborhoods. As the one that designs, the urban planner is the key figure and the single most powerful actor – not dissimilar to the role played by the engineer in the previous chapter. The state, too, plays a similar function as in the previous chapter – it is a crucial source of funding, but more importantly, it positions itself as the key locus of knowledge centralization. It takes local knowledge and centralizes it, legitimates it, and holds it up for emulation. This positioning of the state as a central locus for smart growth knowledge is interesting in part because it provides evidence against the claim that the state is a consistent and univocal advocate of automobility – that even its attempts to tame the automobile represent efforts to coopt criticism (Paterson 2007). However, more important is that in these texts we see the state reinterpreting the narrative of the future as radically new. Unidirectional progress is not the only narrative to be found in authoritative discourse; there is space, it seems, for themes of Arcadian return.

Environment

Compared to the driver-consumer of the previous chapter, the inhabitant is a much more environmentally benign, even idyllic, creature. The smart growth vision seeks to produce a subject who walks to work, bikes to the store, and takes transit. As a social creature and not an autonomously mobile individual, this subject is invested in her neighborhood and embedded in her landscape. She's a civically minded, low-carbon individual. Yet in one key way, this idyllic inhabitant is not dissimilar from the driver-consumer. Her environmental behavior is not necessarily the product of intention or moral consideration; rather, it is the product of good

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design choices on the part of the urban planner. She may take transit because it is environmentally less harmful than driving, but she may do so because the transit system has been designed to be convenient and attractive. It's not that driving represents an important moral or environmental issue, it's that life is – has been designed to be – more fun and interesting and beautiful without a car.

That, in turn, is why the urban planner is the key figure in this narrative. A well-designed landscape produces the (environmentally and socially) optimal inhabitant. To be sure, the public has some input on the shape of the landscape, and any design can be resisted or subverted. Yet, just as reflexivity is displaced to the engineer the previous chapter, so is the potential for interpretation and agency displaced to the urban planner in this narrative. Though the behaviors of the public change, it is largely through the agency of the planner, the skillful deployment of the neighborhood as a technology of control. An environmental sensibility on the part of the inhabitant is not a necessary part of the transformation. The neighborhood inhabitant can easily live an environmentally benign existence without, for instance, knowing in what watershed she lives, for instance, or how her daily mobilities contribute to climate change. Such knowledge might occur as a byproduct of an inhabitant's investment in the neighborhood, but it is not fundamental to the entire project of change. I point this out not to say that smart growth should insist upon environmental enlightenment on the part of all the public. Rather, I highlight this simply to set up the contrast for the next chapter's vision of the future, in which reflexivity – and thus transformation – is seen as deeply, irrevocably personal.

The future

In these smart growth texts, there is a clear understanding that the mid-20th century automobile-centric reconfiguration of the landscape was a rupture in the social environment. The

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future, then, is an opportunity to repair that rupture by retransforming, rebuilding the landscape to closer resemble the pre-automobile landscape. The vision is at least in part one of return, heightened by the fact that much of the smart growth vision stems from an Arcadian-inflected tradition within urban planning, seeking to tame modernity's excesses and regain pre-modern paradise lost by reintroducing nature and small-scale community into cities. Yet at the same time, the vision does not only see a return to the past. For one thing, the very concept of smart growth embraces the possibility of growth, not stasis or de-growth. Far more important, though, is that the vision is one not just an idealized past, but a deeper continuity that can pull together past with future: humans have lived in neighborhoods for centuries, because that is how humans best flourish; and they can live in neighborhoods again in the future.

While the "accelerate" narrative of the last chapter saw a clear path before us and emphasized the need to progress along that path as quickly as possible, this "rebuild" narrative sees a very different path. Indeed, it sees two paths. There is the one on which we find ourselves, where the social fabric is being further and further unraveled by automobile-dominated sprawl. And there is the one from which we have strayed, and to which we should return: the deeper continuity of humans living in neighborhoods. Making a better future is thus not a question of simply letting things run their course (as then we would just stay on the automobile path). Nor is it a question of retracing steps. The world has changed and is changing, and it takes innovation and creativity to get back to living in neighborhoods. In the previous chapter, the narrative of the advanced vehicle saw a future that was better, makeable, and new. In contrast, the smart growth narrative views a future that might not (indeed, should not) look new or dramatically different from what human history has seen before. Yet in these texts the future can certainly be better, and the capacity to shape it is well within human hands. There is, however, a third narrative, to

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which the next chapter turns. In this vision, the future may not necessarily be better nor entirely

in our hands: it will be radically different, whether we want it to or not.

CHAPTER 6

TRANSITION: THE POST-CARBON MOVEMENT

Figure 5: The "Transition" Future. Source: Transition US 2011.

So far this dissertation has discussed narratives of progress and paradise regained. There

is still a third narrative to discuss: one that envisions a world radically – and inevitably –

different. The image above, taken from one of the key texts analyzed in this chapter, illustrates

the core message of this third narrative about the future of automobility. In the image, this "lane"

– the path we're on now – is about to end. In these texts, the way of life we have come to take for

granted in the industrialized West – automobility included – will end, whether we want it to or

not. Metaphorically changing lanes, then, is inevitable. Notice, too, that in the image, the only

road ahead involves changing directions towards an unnamed, unknown destination. We can be

sure that our path will change; what we cannot yet know is where that path will take us. The

post-carbon narrative thus acknowledges a profound uncertainty about the future – uncertainty

that creates a remarkable degree of latitude for envisioning possibilities for life. While both

advanced vehicle research and smart growth planning are thoroughly concerned with what is likely to happen under given conditions, the texts analyzed in this chapter take trends and predictions with a grain of salt. Social action should not be bounded by what is considered likely or unlikely to happen, but should be motivated by a sense of imagination and possibility. "Probabilities are abstractions," as one text puts it. "Possibilities are the stuff of life" (Transition Seattle 2010, 12).

This chapter analyzes a narrative in which automobility, like all fossil-fueled aspects of life in the early 21st century, will change dramatically as the era of cheap energy ends and the climate era worsens. Without cheap gasoline to fuel or easy energy to manufacture cars, petroleum-fueled automobility will become effectively obsolete. It will drop out of daily life, one of many conveniences of modernity that will likely no longer be available in the wildly different post-peak-oil and climate changed future. Where the narratives discussed in the previous chapters claim a better future – one through technological transformation of the automobile itself, one through a redesign of the car-dominated landscape – this one strikes a very delicate balance as it posits a future that may only potentially be better. It claims that the future may well be grim, as the climate changes unpredictably and energy inevitably becomes scarce; but it tempers this with a relentless optimism about the ability of humans to adapt. This optimism sees humans thoughtfully transitioning to a new post-carbon world, where life at a smaller scale is not just inevitable but desirable. "The party is over," as one text says of the oil-fueled prosperity of the last century (Heinberg 2003), but perhaps "collective intentional transition could lead us to a far better place than where we are today. Who's to say that the world we see today is the best we could ever do?" (Hopkins 2011, 39).

The first section in this chapter introduces the Transition movement, an increasingly global social movement, and situates this chapter's corpus of texts within that movement. The second section discusses the reflexive stance taken in these texts: one entirely concerned with the future consequences of past and present actions. These post-carbon texts see climate change and peak oil as world-historically new and potentially catastrophic at a planetary scale. Yet they are less concerned with somehow atoning for the sins of the past two centuries – repairing the ruptures that modernity created, for instance – than with transforming society before it is too late to survive in the unpredictable new world unintentionally unleashed by industrialization. The key to this transformation, the texts suggest, is not government-led technological change but cultural change at the community level. The third section analyzes two major continuities expected in the texts. One is the human as an adaptable creature. As articulated in these texts, the human is an evolutionary creature who adapts or dies – but is also an adventurer capable of discovering strengths and skills she did not know she had. The other major continuity articulated in the texts is the community: the locus of resilience and thus the most viable site of long-term continuity in a world that is incessantly, unpredictably changing. The fourth section discusses the texts' vision of radical, inevitable, and only potentially desirable change. The texts posit the inevitability of an "energy descent," i.e. a drastic drop in the availability and use of fossil fuels, likely leading to the relocalization of social and economic life (and the near-disappearance of automobility from daily life). Though the energy descent is not seen as a particularly desirable development, the texts narrate it as a decisive break in the future, which in turn creates space for many actions to seem possible that would otherwise be considered infeasible. Such actions include "transition," a radical but intentional adaptation to a smaller-scaled, slower-paced life without oil – a transformation of self and community that ultimately creates a better future.

Post-carbon texts

This third narrative about the future of automobility does not have the same kind of authoritative institutional home that the previous two narratives do. There is no program at the Department of Energy planning for a drastic drawing down of energy consumption in the next century; there is no partnership between the DOT and EPA to plan for the end of Western mobility as we know it. While the previous two chapters analyze authoritative representations of the possibilities of the future, this chapter examines a set of texts that are not meant to be authoritative, exploring the views of those who fall outside the position of state-sanctioned expertise. In doing so, this chapter sheds a slightly different light on those authoritative representations discussed in the previous two chapters. To be sure, these post-carbon texts are not totally divorced from sanctioned expertise. As the Reflexivity section discusses in further detail below, these texts rely heavily on expert authority on some questions (e.g. "is climate change happening?") while rejecting expertise on other questions ("what can be done about it?"). Yet by focusing on texts that do not position themselves as authoritative, this chapter is able to bring into higher relief the extent to which advanced vehicle research and smart growth planning legitimate state power and expertise.

Though this third narrative does not have a significant presence within state institutions, it does have an organizational home in the US: Transition US. Transition US is the US headquarters of the broader Transition movement, an environmental and social movement that is rapidly expanding globally. The Transition movement has its ideational roots in a number of environmental thought traditions. Primary among these is permaculture, a school of thought that models its agricultural and architectural designs after the functioning of ecosystems – buildings or gardens are designed holistically to be self-sustaining systems (Quilley 2012, 2; Connors and

McDonald 2011, 568).[50] Transition has arguably "picked up where Permaculture left off" as it extends the principles of permaculture – "care of people, care of the earth and distribution of surplus" – beyond agricultural techniques to "the collective aspects such as building local economies and strengthening social networks" (Connors and McDonald 2011, 568). Beyond permaculture, the movement "draws implicitly on: limits to growth thinking (Meadows et al. 1972; Odum 1971, 2007); the steady state concept associated with Ecological Economics (Daly and Farley 2004); the appropriate technology movement; the philosophy of self-actualising creativity associated with Ivan Illich (1971; 1973); and Schumacher's Buddhist economics with its insistence that 'small is beautiful '(1975)," not to mention "the precepts of bioregional integrity associated with deep ecology" (Quilley 2012, 2). Yet the Transition movement appeals to more than the environmentally concerned. Its emphasis on localism appeals to those with anti-globalization sentiments (Felicetti 2013; Stevenson 2012).[51] It also arguably taps into an emerging transnational "resurgence of interest across the whole range of artisanal activities and crafts" (Quilley 2011). Not least, it also speaks to those concerned with energy scarcity.

As a coherent movement, Transition's "story begins in 2005 with an encounter between Colin Campbell, the ex-Shell engineer and executive who initiated public concern regarding peak oil, in the process founding the Association for the Study of Peak Oil and Gas … who had retired in Ireland, and Rob Hopkins, who at the time was living in the same area and teaching a course in permaculture" (Atkinson and Viloria : 582). Hopkins combined the concerns of peak

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[50] The founder of the Transition movement, Rob Hopkins, began the movement while teaching permaculture. Transition US even recommends that Transition leaders undertake training in permaculture (Transition US 2011).

[51] Connors and McDonald (2011) point out the irony of a globally diffused localism movement, writing that Transition "appears to have tapped into a potentially powerful meshing of the local/global debate here. Yes, we want to act local, indeed it is arguably the only way forward, but we need to know that we have the support of other groups, just like us – despite our differences, all around the world. We celebrate place and diversity at the same time as we erase it." (Connors and McDonald 2011, 568)

oil with permaculture as he subsequently launched the first Transition initiative in Totnes, UK.

By 2006, Transition Totnes joined with other emerging groups in the UK to create the Transition

Network (Atkinson and Viloria : 582). In the intervening years, nearly 500 official and

Transition initiatives have been launched across the world (transitionus.org), along with another

500 unofficial initiatives (Transition Network). The vast majority of these initiatives are the work

of civil society groups, though there are many instances – mostly in the UK – where "local

governments have embraced the movement, financing some of their activities and carrying out

research on key topics" (Atkinson and Viloria: 583).[52] Transition initiatives have expanded

primarily in the English-speaking world, with some diffusion in Francophone countries and,

more recently, South America and Asia (Felicetti 2013, 561). Transition US was launched as a

non-profit organization in January 2008, after receiving start-up funding from the Post Carbon

Institute, which in turn is a nonprofit think tank founded in 2003 (Transition US 2013a). The

same year, the first official Transition initiative to launch in the US was in Sandpoint, Idaho

(Hopkins 2011). There are now 151 official US Transition initiatives in 37 states (Transition US

2013b). Although Transition US is closely tied to the UK-based Transition Network, it has

developed many of its own publications: a primer and action guides to encourage and guide

transition in the American context.

These documents produced by Transition US form the core of the corpus of texts

examined in this chapter. Because Transition US relies heavily on publications by the broader

Transition Network, documents from the entire movement are included in the corpus under

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[52] According to Feola and Nunes (2014), the vast majority of Transition initiatives operate with some form of
cooperation with local authorities – though Feola and Nunes do not clarify what is meant by "cooperation."

consideration.[53] The *Transition Handbook* (Hopkins 2008) is the key text of the Transition movement; it was followed up by *Transition Timeline* (Chamberlin 2009) and *Transition Companion* (Hopkins 2011). The corpus also extends beyond Transition documents to include texts recommended by the Transition texts as particularly eye-opening or held up as models for orienting action. These include the "energy descent action plans" of various towns and cities (e.g. Berkeley, Bloomington, and Portland). These action plans lay out policy proposals for their respective cities to transition to a post-peak oil world.

Reflexivity in the post-carbon movement

Like the texts in the previous two chapters, these texts reflect a moment of reflexivity: when actors reflect upon the future consequences of their past and present behavior, interpret the situation as problematic, open up space for critique, and envision potential future self-transformation. Similar to in earlier chapters, these texts cast doubts upon automobility, not least because of its contribution to climate change and oil depletion. They also rely on expert authority to orient themselves with regard to these problems. What sets these texts apart, however, is the dramatic, even apocalyptic, scope of the threat posed by climate change and oil depletion. Whereas in previous chapters climate change was knowable and potentially manageable, here it is unpredictable and all-encompassing, with an uncertain outcome. Furthermore, whereas in chapter 4 oil depletion threatened the US' position in an internationally competitive system, here peak oil threatens the very existence of the modern economy and the lifestyle it affords. In the texts, the enormous scope of these threats exceeds the ability of technology to control the future;

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[53] The *Transition Handbook* (Hopkins 2008) is by far the key text of the Transition movement; it is often recommended as the most important resource for anyone wishing to get involved or learn more about the Transition movement. Two other key texts in the movement are the *Transition Timeline* (Chamberlin 2009), which sets out in more detail different potential post-peak scenarios, and the *Transition Companion* (Hopkins 2011), which is intended to be both an evolved version of the *Transition Handbook* and an overview of all the Transition initiatives that have begun since the publication of the *Handbook*.

change cannot be technological but must be social and cultural. Like the smart growth texts, the post-carbon texts challenge the narrative of modern progress; yet rather than entirely condemning modernity as a destructive force, the texts trivialize it as an anomaly. The future they envision, then, encompasses the possibility of catastrophic collapse yet retains optimism about the future.

<div align="center">Impending catastrophe</div>

The post-carbon literature takes for granted that anthropogenic climate change is certain. What's more, climate change is fast-moving and unpredictable. Writing in 2008, Hopkins says that "whatever I write will almost certainly have been overtaken by events by the time this book is printed. Climate change is happening faster than most models are able to keep up with, continually confounding expectation" (Hopkins 2008, 30). Climate change is characterized as barely within human control, if at all. If a temperature tipping point is reached, "we are into unstoppable climate change," at which point "we are perilously close to losing control of the situation and running out of options altogether" (Chamberlin 2009, 143, 147; emphasis removed). Furthermore, climate change is characterized as already happening. *Transition Companion* presents a survey of recent record-breaking high temperatures, droughts, and sea ice decline, before suggesting that, although "[c]limate change is often talked of in a future tense," for anyone who has "suffered from fire, drought and flooding on a Biblical scale over the last few years the impacts of climate change have already arrived" (Hopkins 2011, 32). Writing in 2012, Transition US states that "[t]he world has changed" in the few years of the organization's existence: extreme weather events such as heat waves, record-breaking drought, forest fires, and Hurricane Sandy are signs that climate change has arrived. Indeed, "[i]f climate predictions are right, this year was just the beginning" (Transition US 2012, 3).

Complicating and compounding the issue of climate change is oil depletion, referred to fairly consistently in these texts as peak oil. Unlike in the texts in chapter 4, where oil supplies may become unstable but can ultimately be managed with the right technology, in these texts peak oil is certain. "The jury is not out," as one text puts it (Colin Campbell quoted in Heinberg 2003, xi). More specifically, it represents a non-negotiable, geological, natural limit that lies outside human control: "Until now, humankind has at least theoretically had a choice regarding the use of fossil fuels" but "we are about to enter a new era in which each year, less net energy will be available to humankind, regardless of our efforts or choices" (Heinberg 2003, 5, emphasis removed). As chapter 2 discussed, much of the peak oil debate is over economic and political dimensions of extraction in unstable areas; such debate, *Transition Timeline* claims, "is really beside the point" as "if there were no geological limits to production in more stable areas, the world would not be dependent on these more challenging supplies in the first place" (Chamberlin 2009, 19). Ultimately, then, peak oil is seen as a fact of nature: "matters geological, rather than matters political or economic, are increasingly playing a role" (Hopkins 2008, 22, 25). As to the precise timing, despite much discussion in the texts of when, precisely, peak oil may occur, ultimately "the exact date of peak oil is really not so important. What matters is the fact that it is inevitable, it is going to be happening soon, and we haven't even begun to think what we might do about it" (Hopkins 2008, 29).

Part of what distinguishes the post-carbon narrative from those presented in earlier chapters is the potentially catastrophic scope of climate change and oil depletion. Though the Transition writers often explicitly try to distance themselves from "apocalyptic scare tactics," (Hopkins 2008, 30), the texts do emphasize the potentially catastrophic nature of climate change. They evoke the prospect of a new Ice Age in Europe and North America; the collapse of the

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Great Barrier Reef and the Amazon ecosystem; and drought, heat waves, water conflict, and "a number of island nations submerged by rising sea levels" (Heinberg 2003, 32; Hopkins 2008, 33). Sometimes it is put simply: "runaway climate change is not something you want to experience, or leave as a legacy to your children" (Hopkins 2008, 33) and sometimes bluntly: "If we allow global temperature to rise by more than 1.7°C, we will likely be committing the planet to the sixth mass extinction in its long history, with humanity very much on the endangered list" (Chamberlin 2009, 147). This potential for catastrophic damage means that the post-carbon texts tend to operate with a much longer time horizon than the approaches discussed in earlier chapters. In fact, the author of *Transition Timeline* goes so far as to take issue with the IPCC's 100-year time horizon, implying that it is not useful unless "we plan on maintaining a habitable planet only to the end of this century" (Chamberlin 2009, 145). He writes elsewhere that the "years we are now living are the time when the future of our planet's climate for millennia to come will be decided" (Chamberlin 2009, 18).

The post-carbon texts are also distinctive in their sense of sudden, nonlinear change and the possibility of systemic collapse. In this the post-carbon movement draws on ecological and systems scholarship, which understands that systems "do not change in a predictable, linear, incremental fashion" (Walker and Salt 2005, 31), but go through identifiable stages of a lifecycle, moving through stages that include, among others, overshoot and collapse. The concepts of time and change available to ecological and systems analysts are wholly different to those of automotive engineers or urban planners. While the engineers in chapter 4 are most familiar with processes of technological improvement – largely unidirectional, if non-linear – the conceptual repertoire available to those who study complex adaptive systems includes things like sudden change, overshoot, and collapse, so they tend more to actively expect such events in the

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future. In this view, ecosystems or societies may be stable for centuries but reach a threshold event and then rapidly collapse, with "collapse" referring "to any substantial reduction in social complexity, and not necessarily to the complete, sudden, chaotic disintegration of all institutions" (Heinberg 2003, 206). The situation, then, is not that we need to find a solution to one problem, or rather to two different problems, but that "we are facing a systems failure" (Transition US 2011, 9).

This is clear in the more catastrophic visions of reaching a climate tipping point, after which feedback mechanisms lead to runaway climate change (Hopkins 2008, 34; Chamberlin 2009, 45). The more catastrophic interpretations of peak oil take a similar view of sudden non-linear economic collapse. In this the reference point is not so much the incredible growth of the past century, but the rise and fall of empires and earlier collapsed societies (Heinberg 2003, x, 37). It is way of thinking that acknowledges a certain lack of control over the systems in which we live: "While we can hold parts of the system in a certain condition, the broader system is beyond our command. Indeed, no one is control; this is a key aspect of complex adaptive systems" (Walker and Salt 2005, 29). Furthermore, it is a way of thinking that includes the possibility – indeed, the likelihood – of "discontinuities" (Heinberg 2003, xi, 228) and "'surprise' events" (Walker and Salt 2005, x). Those arguing for a post-carbon world remind us that "[t]he unexpected can happen" (Colin Campbell quoted in Heinberg 2003, xi). Just because everything seems to be stable now – just because today seems much like yesterday – does not mean that tomorrow could not be radically, rapidly different. For the average American this means that "for a few years he can buy a large car. He can smile that there's not a cloud on the horizon, and then the crisis when it hits will be that much worse" (Campbell quoted in Greene et al. 2004). Echoing the dystopian tradition of ecological apocalypse discussed in chapter 3, the

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texts contemplate the sudden end of life as we know it. "Nowadays, it seems that every week there is a new report adding to the growing chorus of recognition that our society's current way of life is unsustainable … But, strangely, what seems to be less widely acknowledged is that if something is unsustainable, then, by definition, *it's going to end"* (Chamberlin 2009, 14).

This prospect of societal collapse makes it appear in the texts that the need for change is self-evident, and if it isn't yet universally accepted as self-evident, it will be so eventually. For instance, in one worst-case scenario presented in *Transition Timeline* – entitled "Denial" and written speculatively as a retrospective from 2027 – "we failed to heed the ever-stronger evidence that we were facing a sustainability emergency until the consequences of our choices became overwhelmingly clear" (Chamberlin 2009, 24). In other words, even the most dedicated, extreme denial is not possible in the long run. This points to the unacknowledged reliance in the post-carbon movement on a gestalt moment: a discontinuous "step change in human response" to peak oil and climate change (Chamberlin 2009, 34) or an "evolutionary leap" (Hopkins 2008, 11). Reflexivity here is not just a matter of finding out about peak oil and climate change – though that is necessary – it is a matter of finally recognizing the truth. Of course, in these texts the truth is potentially catastrophic enough that recognizing the truth is inseparable from seeing the need to change our way of being in the world. We face "the consequences of our former cultural stories honestly" (Chamberlin 2009, 33) – and accept responsibility for those consequences. It is sometimes characterized as a moment of awakening or daybreak: "We are either going to wake up or die" (Stuart Pimm cited in Chamberlin 2009, 47). We can hope that climate change is a nightmare which "humanity woke up from and avoided before it was too late" (Hopkins 2008, 11). If oil-fueled prosperity is a party, then "the party itself will be a fading memory – not because anyone decided to heed the voice of moderation, but because the wine

and food are gone and the harsh light of morning has come" (Heinberg 2003, 6). However it is characterized, this moment of truth does significant political work in the post-carbon texts' envisioned process of change.

<div align="center">What to do about catastrophe</div>

Given these differences with the ways in which automobility in the early 21st century is problematized in advanced vehicle research and smart growth planning, it is somewhat unexpected to find that the texts' understanding of climate change and peak oil relies heavily on traditional sources of expertise. For instance, several texts refer to a report produced by the US Department of Energy in 2005 (the "Hirsch Report") for their information about as the single most important statement of the problem of peak oil.[54] Indeed, they refer frequently to DOE figures for trends in oil production and consumption. Similarly, they refer to the IPCC for their expectations about climate change. Despite the many uncertainties that the texts acknowledge and even embrace, it seems that when asserting the certainty of climate change and peak oil, the texts defer to authority. The incongruity of this becomes especially clear when one considers the second aspect of the reflexive moment: envisioning potential future transformation. Despite the reliance on expertise in framing the situation as a problem, the texts reject expertise when it comes to the question of what to do about it. Though the texts may cite trends identified and projected by experts, they ultimately take the position that "[t]rends and events only relate to what is probable. Probabilities are abstractions. Possibilities are the stuff of life, visions to act upon, doors to walk through." (cited in Hopkins 2009, 95; Transition Seattle: 12). Though it uses the information from the DOE to lay out the case for peak oil, *Transition Handbook* suggests that "in the wrong hands," this same information in the report could be used to justify policies that

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[54] Incidentally, the DOE's own advanced vehicle research texts do not refer to this report.

"are in effect collective suicide" (42). The text does not throw doubt on the DOE's knowledge of future problems; it just rejects its exclusive ability to make a better future.

Instead, the Transition movement insists that on the question of what the future should look like, "we must learn to look to each other as experts, and for each of us to become our own experts" (Transition Seattle: 3). At the same time, the texts explicitly avoid taking an authoritative stance on the ideas they themselves offer. One common phrase that appears in the core texts is the "cheerful disclaimer" that "We truly don't know if this will work. Transition is a social experiment on a massive scale" (Transition US 2011, 22; see also Hopkins 2011, 17). *Transition Companion*, for instance, positions itself as a text written by ordinary people: there is "not an ivory tower in sight; no professors in musty oak-panelled studies churning out erudite papers; no model carved in stone" (Hopkins 2011, 17). *Transition Timeline* quotes "the wonderful Chinese proverb: '*When men speak of the future, the Gods laugh.*' One thing we can be sure of is that all of our stories and forecasts about the future will, to some degree, be wrong." (Chamberlin 2009, 38; original emphasis). Altogether, the texts couple authoritative statements about the inevitability of climate change and peak oil with the acknowledgement that we cannot know what the future will hold.

Despite this stance of uncertainty, the texts do make claims about what will not make a better future. They take the position that, given the scope of the problem, technology will not save us. There is an understanding – contrary to the one presented in chapter 4 – that technological innovation cannot accelerate or scale up in time for renewable sources of energy to replace oil on the scale that it is used now. One text, after considering the possibility of replacing the automobile fleet with more fuel-efficient vehicles, concludes that "at the current state of technology, and based on the fact that it takes time to phase out and replace the existing vehicle

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stock," such rapid technological innovation and change is "close to utopian" (Bloomington Peak Oil Task Force 2009, 117). Another identifies the same timeline for widespread technological change as can be found in the advanced vehicle research literature: "decades will be required – and we do not have decades before the peaks in the extraction rates of oil and natural gas occur" (Heinberg 2003, 165). However, it draws a very different conclusion. Rather than arguing that research and development can accelerate the process, it argues that adapting to peak oil "will entail an almost complete redesign of industrial societies" (Heinberg 2003, 165). The most effective approach to adapting to climate change and peak oil, in other words, must be social and cultural, and it must unfold at a community scale. As *Transition Timeline* states, "techno-fixation cannot be the focus of our efforts" (Chamberlin 2009, 151).

The texts also make claims about what might be able to effect a change at the scale needed to adapt to catastrophe. Because "cultural stories help to define who we are and they strongly impact our behaviours," (Chamberlin 2009, 22), transformation is as much a process of learning new stories – reinterpreting the world – as it is about building new technologies or shifting old habits. The texts also see the dominant cultural stories of the industrial age as part of the problem: "Most of us grew up with cultural stories that valued human 'progress' above traditional measures of well-being, and even above ethics. Change will be difficult unless we can unlearn and rewrite those stories" (Transition Seattle 2010, 3). In *The Party is Over*, Heinberg criticizes "the mistaken belief that we are somehow entitled to endless energy" (Heinberg 2003, 5-6), while in "The End of Suburbia" he rejects the notion that the 20th century world is "what we should expect, this is what we should expect for our children" (Heinberg in "The End of Suburbia"). Because stories about a wealthier future and the inevitability of economic globalization are "profoundly misleading and indeed positively harmful for the challenges we

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find ourselves facing faster than we think," the texts see the need for "new stories that paint new possibilities, that reposition where we see ourselves in relation to the world around us, that entice us to view the changes ahead with anticipation of the possibilities they hold" (Hopkins 2008, 14).

That said, although the texts suggest that the narrative of progress is a mistaken and even counterproductive one, they do not precisely condemn modernity. Unlike the smart growth movement, the transition texts seem to appreciate the modern era as a generally positive time for humanity: "we are ... extremely fortunate to live at a time in history with access to amounts of energy and a range of materials, products and possibilities that our ancestors couldn't even have imagined" (Hopkins 2008, 20). When industrialization created dependence on oil, "It is easy to understand why this happened and why people embraced it. We all would have done the same, had we lived in that time. … No one could have foreseen the implications fifty years down the line" (Hopkins 2008, 64). Yet one important aspect of this reflexive stance that the texts adopt – one way in which they reinterpret the past in light of its expected future consequences – is in recasting the modern era as an anomaly. The era since the invention of mechanized transport has "sometimes been called the 'Petroleum Era' or the 'Industrial Age,' but, in view of its relative brevity, it may be more appropriate to call it the 'Petroleum Interval' or the 'Industrial Bubble'" (Heinberg 2003, 44). It is "the brief, transitory historical interlude" when "car was king" (Hopkins 2008, 15). "Oil has allowed us to create extraordinary technologies, cultures and discoveries, to set foot on the Moon and to perfect the Pop Tart. But can it go on forever? Of course not" (Hopkins 2008, 20; "Why Transition"). Modernity is trivialized in this way, implying that it is not some grand fate for humanity or the fulfillment of human reason or the desirable unfolding of inevitable human innovation, but rather the frenzied scrambling of people who had a good thing going. It was a party, as Heinberg (2003) calls it, and now the party is

over. "Shall we vainly continue reveling until the bitter end, and take most of the rest of the world down with us? Or shall we acknowledge that the party is over, clean up after ourselves, and make way for those who will come after us?" (Heinberg 2003, 242). Recast in this fashion, modernity and all its conveniences seem easier to let go of; if we see modernity not as the pinnacle of human achievement but as a temporary madness, then "loving and leaving all that oil has done for us" (Hopkins 2009) – transitioning to a new era – is not a betrayal of the human endeavor but merely the next step in that endeavor.

Continuity: Subjectivities in a "transitioned" future

The prospect in these texts of inevitable global collapse implies change so radical that it is at first difficult to identify much continuity in the vision they evoke. The nearly apocalyptic vision seems to blow apart the social space of expectation, such that nearly anything can be considered possible: total extinction, resource conflict, international coordination, a new era of living in community. No 20th-century economic, geopolitical, or social truths can be taken for granted in a post-carbon world, these texts suggest; the only impossibility is a future that resembles the present.

Nevertheless, the texts do still articulate expectations about what forms of subjecthood are possible, both in the present and in even a post-apocalyptic future. The two things we can know about the future – besides that it will be different from the present – are that humans are adaptable and that resilient communities survive. The texts spend a great deal of time focusing on processes of personal transformation – social change is expected to be built on personal, even emotional and psychological change – but underlying this expectation is a confidence in the nature of humans as fundamentally creative creatures who learn, experiment, and thrive in hardship. This figure of the adaptable human is formed by, and helps in turn to form, the other

important expected continuity: the resilient community. The resilient community is self-sufficient, assuring its continuance into the future by disengaging from global commodity chains and systems of expert knowledge, both of which are expected to be dismantled (or at least harder to access) in a post-peak world. The resilient community survives and perhaps thrives in an otherwise grim future, making a better future in an era when the state no longer can.

The adaptable human

The one thing that we can expect is that humans will adapt; the one thing that will not change, even in a post-carbon world, is the human capacity to change. Unlike the driver-consumer and the neighborhood inhabitant of the previous chapters, both of whom are treated as fundamentally predictable in important ways, the human in post-carbon discourse is not necessarily predictable. Her past behavior may be an indication of her future behavior; but then again, it may not. Humans learn, and adapt, and survive. Interpreted in a slightly more grim fashion: the only thing we know about a radically different future is that the humans who still exist will be those who adapt. Also unlike the driver-consumer, whose expected behaviors are based on assumptions found in economics, or the inhabitant, whose expected behaviors are based on assumptions found in architecture and urban planning, expectations for the adaptable human draw on a number of wide sources. Not least among these is ecology, in which it is assumed that humans, like any other species, adapt or die. This, however, is cause for optimism: "As a species with the creativity, adaptability and opposable thumbs that enabled us to create an Oil Age in the first place, we can be pretty certain that there will be life beyond it" (Hopkins 2008). This ability to adapt is not just biological; it can be intentional. Rather than seeing people merely as economic creatures with fixed preferences, responding to incentives that others create for them (as in chapter 4), or as aesthetic creatures, responding to the beauty and convenience that others

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build for them (as in chapter 5), these post-carbon texts – especially the Transition texts – see humans as emotional creatures who can, with enough support and motivation, transform themselves. "It is not 'simply human nature' to continue with business as usual as the world shifts around us, any more than it is 'simply human nature' to do whatever it takes to ensure a desirable collective future. … human nature is the ability to choose our path" (Chamberlin 2009, 39).

One example of how this expected ability to adapt emotionally emerges in the texts is "visioning." "We can only create what we can first vision," the Transition US *Primer* tells the reader. "If we can't imagine a positive future we won't be able to create it" (Transition US 2011, 8). The smart growth movement also uses a process called "visioning," but the two groups mean very different things. For smart growth planners, visioning means public meetings where planners present a range of options for a particular street or development, and discussion follows about which is best for the neighborhood. In contrast, the visioning suggested by the Transition movement is a highly personal, emotional, speculative process. Transition Seattle (2010, 17) recommends the following exercise for groups to do in partners:

> Imagine yourself in a future time, after the transition has happened. You're at a celebration dinner where people are being thanked for the contributions they made towards the transition. Take a few minutes now to close your eyes and imagine some of the changes that you have been especially grateful for. … Now open your eyes. Take turns. One of you will pretend that your partner is the very person whose actions many years ago turned out to be so significant to you now. Thank them, and tell them how much it means to you that they did what they did. … Now switch. The other person will thank their partner for the good changes they have experienced.

Here, visioning is a profoundly emotional act, asking the potentially adaptable human to step outside the bounds of more conventional ways of planning for or anticipating the future. It is

not merely a process of setting targets and implementing policies; it is a process of exploring hope and imagining the contours of future gratitude.

However, the human ability to adapt does not mean that change comes easily or happily. The texts (particularly the *Transition Handbook*) draw on addiction psychology to flesh out the character of the adaptable human and the challenges she faces: a human adapting to less oil consumption is seen as akin to a recovering addict. Here the texts are not just using an easy metaphor (it is not that uncommon to claim that the industrialized world is addicted to oil); they intentionally apply the tools of addiction psychology to social change. As with overcoming addiction, the human transitioning to a post-carbon world must begin with admitting there is a problem – "unless we are willing to hear and accept the bad news first, the good news may never materialize" (Heinberg 2003, 5). She may be traumatized by admitting the possibility of the end of social life as we know it, experiencing "post petroleum stress disorder" and a range of responses that "run the gamut from shock, denial, despair, and rage to eventual acceptance – and a determination to do whatever is possible to help avert the worst of the likely impacts" (Heinberg 2003, 199-200). She also has to own the process of self-transformation. "In the field of addictions, the idea that aggressive, authoritarian or coercive approaches are effective tools is increasingly being discredited" (Hopkins 2008, 92), and thus her transformation cannot be forced upon her. But ultimately, with enough support and practice, the adaptable human can transform.

Another way in which the texts characterize the human as an adaptable, creative, bold creature is by casting the human as a potential hero and adventurer. "There has never been a time in history when we have all been called to action in such a manner; where life on earth is in the balance. The future is calling out for all of us to take heroic action" (Transition US 2012, 3). It is also a way to put a positive spin on the massive scope of necessary change: "even at this late

date, a truly heroic national effort" in reducing oil consumption "could succeed in substantially reducing social chaos and human suffering in the decades ahead" (Heinberg 2003, 222). To some extent, framing ordinary people as potential heroes is a fairly standard way of legitimizing and motivating action. More unusual is the role of the adventurer that is evoked in Transition Movement texts. This plays on the understanding that the adventurer sets out against the odds, without a clear idea of what she is doing. As the *Handbook* puts it, "Harry Potter began his life in the cupboard under the stairs, without a very promising-looking future, Frodo did not seem a very likely hero, and you may be thinking to yourself 'What, me? Take on climate change and peak oil?'" (Chris Johnstone cited in Hopkins 2008, 176). Part of what makes the beginning difficult for the figure of the adaptable human adventurer is that it is not always clear which way the path lies. To transition is not merely a quest, where the way forward is clearly set; it is a "quest for a way forward" (Hopkins 2008, 88) – it requires not just going forward, but finding one's way forward as one goes. The adventurer cannot control – or learn to manipulate – the world, as the engineer or the planner does. The adventurer does the best she can with the world she travels through. And, as such, a slightly different set of rules apply: the adventurer has a little bit of leeway to do things that would in more normal circumstances be thought peculiar, or improper, or impossible. What's more, because adventure is a transformative process, it means that the hero's past behaviors and attributes may not be an indication of what to expect in the future. Heroes "take on challenges they feel unprepared for and find new strengths and inner resources" (Hopkins 2008, 14). This analogy that the Transition Movement texts draws with adventure makes it possible to think that just because a human acting in a certain way (no longer driving) sounds improbable now does not mean it will be impossible in the future. It is an analogy that, like so many of the other concepts and discursive resources that the post-carbon

movement uses, opens up the scope of what is possible in the future far beyond what is considered possible in the present.

What does all this mean for the adaptable human's relationship to automobility? The texts seem to suggest that, as adaptable creatures, humans have no necessary relationship to any particular form of mobility, or really to mobility at all. They are not necessarily nomadic; they can get as much enjoyment from being in place than from travel. The adaptable human certainly may be a driver now, while oil is still relatively cheap and functioning automobiles plentiful. She may have enjoyed automobility along with all the other conveniences and luxuries afforded by the raucous party that was modernity. Yet if she is no longer a driver in a post-carbon future, it will not fundamentally change who she is. She will still be an adaptable human. She will find other ways to move through and be in the world. In this she is much closer to the neighborhood inhabitant of the smart growth texts: able to be mobile in a number of ways. If the joy of a road trip is no longer available to her, she may yet learn to "appreciate the quality gained by slower motion" such as on a train trip, "[j]ust as gourmets celebrate the emphasis on quality found in the 'slow food' movement" (Gilbert and Perl: 9). She may also learn to appreciate the benefits of stillness. If she can no longer enjoy autonomous mobility, she may instead learn to feel "more connected to [her] immediate area, more intimately acquainted with its nooks and crannies" (Hopkins 2008, 113). She may learn how to be a neighbor, ending the loneliness and anxiety of the modern era (Chamberlin 2009, 35). She may appreciate the reduction in "love miles" – the distance she has to travel visit her loved ones (Chamberlin 2009, 48). We are not chained to thinking that humans will always want personal mobility or that humans will always do what is most convenient. If we instead assume that humans will always be capable of change, even and especially when on unknown terrain, then the future of mobility is wide open.

By introducing profound uncertainty, this figure of the adaptable human both undermines and empowers. Uncertainty strips the texts of any pretense of authority. After all, it's remarkably difficult to sound authoritative when saying, "well, it'll be an adventure." The very idea of adventure implies unknown terrain, and authority in the modern era is above all about knowing terrain; the very source of authority is the guarantee that the outcome in the future will be better – that is what justifies the expenditure of funds and the implementation of rules. In contrast, adventure is an endeavor with an unclear path and a decidedly unguaranteed outcome. To voluntarily embrace ignorance of the future is thus to relinquish a certain amount of power. If the state were to take a stance of such profound uncertainty, what justification would it have for exercising control? And yet, at the same time as they cede authority, the texts make a remarkable discursive move by characterizing humans as fundamentally adaptable creatures. They open up a huge range of possibilities. Humans recover from addiction; they find their way even when they don't know where they are going; they discover hero-like attributes in themselves that they didn't know they had. Past behaviors are no guide to their future potentialities. Again, this is in marked contrast to how the advanced vehicle project sees humans, where behavioral change will not happen, and so technology must do the important work in neutralizing the effects of those behaviors. It is also in contrast to how smart growth texts see humans, where behavioral change can happen, but only if the conditions for that change are expertly designed to produce that change. Here, each human is capable of, and responsible for, her own transformation.

The resilient community

In these texts, continuity is a question of resilience. Or, put the other way around: a community's resilience is the only way to maintain continuity in a world that is rapidly and unexpectedly changing. Resilience here is taken to mean "the capacity of a system to absorb

disturbance and still retain its basic function and structure" (Walker and Salt 2005, xiii, 32). In other words, resilience means responding to change so as to maintain the coherence of the community. The resilient community, made up of adaptable humans, absorbs shocks. The preface to Walker and Salt (2005), which the Transition texts draw on for their concept of resilience, gives this analogy:

> Imagine you are on a boat docked in a calm harbor and you want to quickly carry a brim-full cup of water across a stateroom without spilling. Now imagine the same situation but with the boat in rough seas. In harbor, the solution is simple: just walk quickly, but not so quickly that the water spills. At sea, speed is a secondary concern; now the real challenge is to maintain balance on an abruptly pitching floor. The solution now is to find secure handholds and footholds and to flex your knees to absorb the roll of the boat. In harbor, the solution is a simple optimization problem (walk as fast as possible but not too fast); at sea the solution requires you to enhance your ability to absorb disturbance – that is, enhance your resilience against the waves (William Reid quoted in Walker and Salt 2005, x).

Resilience matters because we cannot assume that the same solutions that have worked in the past will work in the future, because the future will be unstable in ways to which we are not now accustomed. Resilience "accepts that change is inevitable and in many cases out of our hands, focusing instead on the need to be able to withstand the unexpected" (Jamais Cascio, quoted in Transition US 2011, 5).

There are various aspects of a resilient world defined in the ecosystems literature: diversity, modularity, tight feedbacks, and innovation, for instance – but, essentially, here it means a community's "ability to not collapse at first sight of oil or food shortages" (Hopkins 2008, 54). It means long-term self-sufficiency, its "ability to function indefinitely and to live within its limits" (Hopkins 2008, 13). [55] In the post-carbon world, the global systems that now

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[55] This meaning of resilience is distinct from another common usage of the term, which refers more to the ability to recover from short-term, one-off disasters such as a hurricane or terrorist attack. A city that recovers easily from a hurricane, for instance, is not necessarily a city that recovers easily from a decade of unstable oil prices.

sustain everyday life in a community – oil production and distribution, manufacturing and shipping – are expected to fall apart in the long run. The only community that can be expected to continue is a community that does not depend on those systems. The resilience of a community is closely linked to its independence from long-distance transportation. To the extent that it relies on fossil-fueled transportation for the delivery of food, it remains vulnerable to disruptions in the supply and price of oil. The resilient community, then, disengages from global commodity chains and unreliable transportation systems by producing much of its own food and building houses from locally sourced materials. It knows its own ecological assets, its water sources and its native species, and fosters them so as to not rely upon the ecological assets of other communities. It has a local economy, perhaps even with its own currency. It is not necessarily isolated, but it does not rely on global commodity chains for its most basic needs.

To the extent that a community's members rely on automobiles for transportation, they are dependent upon systems that cannot be expected to continue indefinitely. The texts also make it clear that within the resilient community, the use of the automobile can undermine resilience in other ways. For instance, the Transition US *Primer* uses the "ratio of car parking space to productive land use" as an indicator of resilience; the more land given to the automobile, the less land available for local food production. It also sees "average commuting distances for workers in the town" as a measure of resilience. If a community's members commute elsewhere for work, not only are they more likely to rely on systems of transportation that can break down, but the local economy is weakened. To be clear: the resilient community is not necessarily an immobile one – as the section on Change below discusses, in the resilient community of the future people are still expected to cycle, and share cars, and ride in buses. But it is a mobility that (in the ideal) does not rely on expertise or supplies from elsewhere. In the resilient community, people know

how to fix their own bikes (e.g. Transition US 2011, 11) and produce their own biodiesel (e.g. Hopkins 2011, 56).

The local scale of the resilient community matters. It means, at one end of the spectrum, that the resilient community is larger in scale than the individual survivalist. Though both may share the same expectation of collapse and the need not to rely upon global markets or national governments, the resilient community is expected to continue well into the future while the self-sufficiency of the individual survivalist will ultimately fail: "The strategy of individualist survivalism will likely offer only temporary and uncertain refuge during the energy downslope. … If you live in a community that is weathering the energy downslope well, your personal chances of surviving and prospering will be greatly enhanced, regardless of the degree of your personal efforts at stockpiling tools or growing food" (Heinberg 2003, 214). It is not merely a question of surviving for a few years post-peak but building a social system that can last. Transition US quotes: "If you want to travel fast, go alone. If you want to travel far, go together" (Transition US n.d.: 7).

At the other end of the spectrum, the resilient community is seen as capable of making the future where the nation-state is not. In contrast to the previous two chapters, the postcarbon texts do not take it for granted that the state will continue to play a central role in making the future. Indeed, the resilient community is a key continuity precisely because the texts take it as uncertain what the state will be capable of in the future; local-level communities will have to act because the state may not. That is not to say that the post-carbon texts recommend rejecting state resources if they are available in the present. They acknowledge that legislation can help build resilient communities (Hopkins 2008, 43; Chamberlin 2009, 25), such as through funding to transit projects (Portland Peak Oil Task Force: 39). Engaging with local government is also seen

as an important step– Transition US even recommends running for municipal office to get resilience on the agenda (Transition US 2011, 7). Yet fundamentally, these texts operate with the expectation that governments – and national-level governments in particular – will not act in time to avert the worst effects of climate change and peak oil. This is a key message that appears in several of the core Transition Network documents: "What we are convinced of is this: If we wait for the governments, it'll be too little, too late. If we act as individuals, it'll be too little. But if we act as communities, it might just be enough, just in time" (e.g. Transition US 2011, 22; Hopkins 2008, 2011, 17). Several texts also suggest that state resources simply will not be available in the future – indeed, may already be declining. In particular, federal resources for transportation are expected to drop off, leaving local communities to find ways of adapting to a world without national-level transportation funding, whether for road repairs (Bloomington Peak Oil Task Force 2009) or transit projects (Heinberg 2003, 173). The self-sufficient resilient community, then, does not rely upon the state any more than it relies upon global commodity chains. It is made up of "ordinary people" engaging in community-level projects to reduce oil consumption and carbon emissions, "[p]eople who understand that we can't sit back and wait for someone else to do the work" (Transition US 2011, 22).

In these texts, continuity is resilience – the ability of a community to continue to exist regardless of ecological or energy disruptions outside of that community's control. Similar to the previous chapter, continuity is the goal of change. One difference, however, is that there is not necessarily a sense of going back to how things were. The only things that continue is that the human continues to adapt, and the resilient community still exists. It may not look like it did – indeed, in order to survive it cannot look like it did – but it still exists. The other difference is in who makes that change – who ensures that continuity. Whereas in the smart growth texts, the

urban planner, backed by years of training and buoyed by authorized standards of design, carefully plans change to ensure continuity, here each individual human is responsible for their own adaptation to change. Each community is responsible for its, and only its, survival.[56]

Change: Avenues for action in the present

In viewing change as the only continuity, these postcarbon texts make a bid to contest the cultural power of expectations about people in the future. They suggest that present social truths may not necessarily hold in the future. By doing so, they envision a world where the bounds to future action are not defined by what is currently taken to be socially possible. Because humans and communities are adaptable, creative, resilient entities, past and present expectations – and expertise – have no claim on what the future can and should hold. This matters a great deal, because these postcarbon texts envision a radical coming. Just as an example of how the future may be radically different: *Transition Timeline* has a list of "wildcard" events, arranged in "rough order of likelihood," that includes wars; pandemic; nuclear disaster; the collapse of the UN; transformative technological breakthrough; collapse of the internet; human sperm count or fertility collapse; extraordinary natural disaster such as an asteroid or comet hitting Earth; and, rounding out the list, extra-terrestrial or divine intervention (Chamberlin 2009, 84). Though it's a good-humored kind of list, it illustrates how these post-carbon texts insist that we drastically expand our set of what may happen in the future.

As this section discusses, the postcarbon texts envision forced geophysical and economic change intertwined with potentially desirable social change. Primarily, it envisions an "energy descent" or forced reduction in the amount of energy used in the industrialized West. This will

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[56] One critique that localism has faced is that it does not have a vision for global change; local efforts do not necessarily aggregate into global efforts. Transition sidesteps this critique by expecting that global change will be inevitable. An individual community need not have a plan for global change, because global change will happen regardless of that community's actions. All that community has to worry about is its own survival.

mean a number of changes to all aspects of life, with dramatic changes to automobility

prominent among them. Overall, it reflects the position that there are hard environmental limits

that will constrain human action in the future in a way that they don't in the present; as such, the

future is not entirely makeable, and may not necessarily be better. Yet, though nothing can be

done in the present to avoid the energy descent, things can be done to prepare for it. This is

where the idea of transition comes in. Akin to adaptation (as opposed to mitigation), the concept

of transitioning to a post-carbon future means preparing in the present for a future that will look

dramatically different. Transition, now and in the future, is seen as the difference between

experiencing a future worse than the present and making a better future.

<div align="center">Energy descent</div>

The major inevitable change envisioned in these texts is frequently characterized as an

"energy descent," decline, or downslope. The term "energy descent" was coined by David

Holmgren "as the least loaded word that honestly conveys the inevitable, radical reduction of

material consumption and/or human numbers that will characterise the declining decades and

centuries of fossil fuel abundance" (quoted in Hopkins 2008, 53). To illustrate the idea of energy

descent, Heinberg (2003, 168) suggests the following thought experiment:

> Go to the center of a city and find a comfortable place to sit. Look around and ask
> yourself: Where and how is energy being used? … After you have spent at least 20
> minutes appreciating energy's role in the life of this city, imagine what the scene you are
> viewing would look like if there were 10 percent less energy available. What
> substitutions would be necessary? What choices would people make? What work would
> not get done? Now imagine the scene with 25 percent less energy available; with 50
> percent; with 75 percent less. … [I]n your imagination you will have taken a trip into the
> future, to perhaps the year 2050.

One key implication of this expected radical change is that global transportation, as a

massive consumer of energy, is expected to decline. Because transportation fueled by cheap oil is

globalization's "Achilles heel" (Hopkins 2008, 14, 71), the increasing cost and decreasing supply of transportation will lead to the collapse of the global economy and the relocalization of most social and economic systems on the planet. Without cheap oil, transportation systems stop functioning, and a complex and high-capacity global economy is infeasible as intercontinental travel falls (Gilbert and Perl 2010, 2). "As transportation fuels dwindle – for air, sea, and land travel – we will see an inevitable return to local production for local consumption" (Heinberg 2003, 174-5). Global businesses will unravel (Hopkins 2008, 112), tourism will languish (Heinberg 2003, 174), and airlines will fail (Chamberlin 2009). The texts almost seem to layer the temporal onto the spatial: permanence is local while the global is not only transient and ephemeral but ultimately doomed. One way or another, these texts treat localization as inevitable (Hopkins 2008, 14, 73). "For years people have argued over the economic advantages and disadvantages of localisation. Peak oil puts an end to that debate. … localisation is no longer a choice – it is the inevitable direction in which we are moving, one we can do nothing about" (Hopkins 2008, 70, see also p. 14). The "principal reason for this," it continues, "is transportation."

This relocalization means a number of dramatic changes to everyday life in the industrialized West. Not least among these envisioned changes is a significant drawing down of automobility. There will be little fuel for automobiles; what there is will be expensive; and burning any fossil fuels will be socially unconscionable in an era of runaway climate change. There will be fewer cars on the road. The global supply chains necessary to produce automobiles will become too costly to maintain, and thus "the relentless economics of the energy decline will mean that – eventually but inevitably – fewer cars will be built" (Heinberg 2003, 173; emphasis removed). They won't disappear altogether, but "[o]nly the wealthy will be able to afford them.

The global fleet of autos will gradually age and diminish in number through attrition." At the same time, the road network will contract, as "road building will grind to a halt and existing roads will gradually disintegrate as even repair efforts become unaffordable" (Heinberg 2003, 173). There will be no oil cheap enough to produce asphalt or fuel asphalt rollers. There will not even funding for road construction or repair (Bloomington Peak Oil Task Force 2009). Where the smart growth texts see the dominance of the automobile in the built environment gradually designed away, the postcarbon texts see it simply falling apart.

Again and again, the post-carbon texts remind us that radical change is inevitable: "When discussing visions of the future, there is often a temptation to compare them with the present and decide which we prefer, but it is important to remember that this is not a valid comparison – for better or for worse we know that we cannot freeze time" (Chamberlin 2009, 38). The only thing that is impossible is for tomorrow to be like today. "The end of the Age of Cheap Oil is rapidly coming upon us, and life will radically change, whether we want it to or not" (Hopkins 2008, 15), as "whichever way we look at it, we must learn to live with less energy" (Chamberlin 2009, 41). and so "[t]here is no longer a cosy 'if' to wrap around ourselves" (Hopkins 2008, 77). This inevitability of energy descent does important political work in these texts. It forces change. It is the source of the crucial addendum "whether we want to or not." Yet there is an unacknowledged issue that lies behind the claims of inevitability. Even if the texts are correct and energy descent is inevitable, to what extent will it be recognized as such? For instance, the texts acknowledge that this radical transformation might happen at different times in different places: even after facing the unpleasant reality of peak oil and climate change, people and countries – particularly the wealthier ones – may continue on as if nothing has changed, driving cars and drilling for oil; they may even increase the rate at which they do so (Chamberlin 2009, 127; Heinberg 2003, 181;

Bloomington Peak Oil Task Force. 2009, 117). Those who will be reluctant to change will mount "an attempt to maintain the entitlements of suburbia long after the world has made it clear that you just simply can't continue living that way" (Kunstler in Greene et al. 2004). Politicians are not expected to "act decisively until crisis has arrived full-blown" (Heinberg 2003, 188). It is a situation arguably not dissimilar to the current one. If the wealthy, the suburban-dwellers, and the politicians can continue on as they are today, to what extent is this energy descent inevitable? If it can be ignored or avoided in some places at some times, then how will it force dramatic global change?

The texts sidestep this question by insisting that change is seen to be inevitable because it is driven by geological and ecological forces – forces not entirely within human control. "It is true by definition that all life on this planet *will* ultimately live within the ecological limits of our environment. Temporary overshoot is possible, but limits are limits" (Chamberlin 2009, 89). Even if the impacts of hitting ecological limits are experienced differently in different places and at a different rate, ultimately, nature will make it self-evident that change is inevitable. "The developing physical realities" of peak oil and climate change "will surely change our cultural stories, whether we like it or not" (Chamberlin 2009, 22). One can "take it as a given that we have already overshot Earth's longterm carrying capacity for humans – and have drawn down essential resources – to such an extent that some form of societal collapse is now inevitable" (Heinberg 2003, 10). Unlike the limits of the technological optimists in chapter 4, these cannot be designed around. There is no action that can be taken in the present to avoid peak oil or climate change. The future, in other words, is not entirely makeable.

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<u>Transition</u>

Though the future may not be wholly makeable, what is makeable is the degree to which this radically new world is better. Humans face the choice "whether to actively engage with this process" of energy descent, "or to simply be subject to it" (Chamberlin 2009, 22). Put differently: "[c]hange is happening – our choice is between a future we want and one which happens to us" (Transition US 2011, 8). In some texts this is thought of somewhat grimly as the best we can do: "If collapse cannot be avoided altogether, the best alternative is clearly a *managed collapse,* in which society would undertake a deliberate, systematic process of simplifying its structures and reducing its reliance on nonrenewable energy sources" (Heinberg 2003, 206). Yet, though descent and decline are not necessarily the kind of feel-good images that inspire positive action, the *Handbook* assures us that "'down' need not necessarily mean deprivation, misery and collapse. … The idea of energy descent is that each step back down the hill could be a step towards sanity, towards place and towards wholeness. It a coming back to who we really are" (Hopkins 2008, 53).

This intentional transformation is captured by the concept of transition. One Transition US text describes it in these words: a "positive response to the challenges of climate change and the end of cheap oil. Resilience. Relocalisation. Cutting carbon" (Transition US n.d.: 2). Another (Transition US 2011, 6) describes the principles underpinning the movement in slightly more detail:

- The challenges of our time require urgent action
- Adaptation to a world with less access to cheap fossil fuels is inevitable
- It is better to plan and be prepared, than be taken by surprise
- Industrial society has lost the resilience to be able to cope with shocks to its systems
- We have to act together and we have to act now
- We must negotiate our way through these challenges using all our skill, ingenuity and intelligence

- Using our creativity and cooperation to unleash the collective genius within our local communities will lead to a more abundant, connected and healthier future for all

The difference between grim collapse and a better future, then, is the difference between taking meaningful action in the present (launching transformations), and "doing nothing" (allowing the status quo to continue). "[B]y taking a proactive response rather than a reactive one, we can still shape and form that future, within the rapidly changing energy context, in such a way that it ends up preferable to the present" (Hopkins 2008, 15, see also p 50), and "the horror of what could happen if we do nothing and the brilliance of what we could achieve if we act can both, at times, be overwhelming" (Hopkins 2008, 17).[57] There is thus a sense of urgency to pre-empt sudden, forced relocalization with gradual, intentional localization, and to begin as soon as possible. The "Why Transition?" video produced by Transition US puts it this way: "We need to relocalize. Now." What's more, action in the present may in fact make the otherwise potentially grim future better than the past. "If we collectively plan and act early enough, we can create a way of living that's significantly more connected, more vibrant and more fulfilling than the one we find ourselves in today" (Transition US 2011, 3). Indeed, *Transition Companion* suggests that relocalizing may be something we should do regardless, as it connects us "more with place, with each other and with ourselves" (Hopkins 2011, 35). "As life without fossil fuels becomes a reality, we not only survive, we thrive" (Zolno n.d.).

The *Handbook* and *Timeline* give the reader a glimpse of what mobility would ideally look like in a post-transition world. Peak oil is closely followed by "peak cars," after which car

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[57] Of course, there are very specific meanings attached to "doing nothing" and "taking a proactive response." Buying a car or expanding oil production facilities, for instance, could both be considered actions – but here, they both fall into the category of "doing nothing." It is not just that they are undesirable action – it is that they do not count as action at all. "Doing nothing" does not actually mean literally doing nothing – it means acting in ways that do not take seriously the threat of climate change and peak oil.

ownership falls (Kinsale 2005, 40; Gilbert and Perl 2010, 6). Indeed, "private car ownership is seen as positively anti-social," (Hopkins 2008, 113; see also Transition Forest Row 2009, 16), as "those who still tried to flaunt financial riches by driving a car everywhere … increasingly became seen at best as rather selfish and passé figures of fun" (Chamberlin 2009, 35). "Oilcars" come to be "regarded as dirty relics of a bygone age" (Chamberlin 2009, 76). Instead of private automobiles being the norm, cars are shared collectively (Hopkins 2008, 113; Chamberlin 2009, 74; Kinsale 2005). Locally produced biofuels replace petroleum (Kinsale 2005, 42; Portland Peak Oil Task Force 2009), or vehicles are powered by locally produced solar electricity (Transition Forest Row 2009, 16).[58] Parking lots are converted into urban gardens, complete with greenhouses and chicken coops; people travel into town by boat or rail, though in general people "have much less reason to travel" (Hopkins 2008, 105, 104; Chamberlin 2009, 76). "Public transport is now exceptionally well thought out and integrated" while streets "now prioritise pedestrians and cyclists, cars having been designed out of many public spaces" (Hopkins 2008, 113; see also Kinsale 2005). Small local schools proliferate, as the cost of fuel makes it "unfeasible for children to travel long distances to school" (Hopkins 2008, 111). Instead, communities organize "walking school busses" (Kinsale 2005; Transition US n.d.b). Farmers use working horses rather than tractors (Hopkins 2008, 104), tram manufacturers profit (Hopkins 2008, 113; see also Kinsale 2005), and commercial sailboats return "with a vengeance" (Hopkins 2008, 113). The energy descent means a proliferation of ways of moving through the world and a

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[58] This seems a little contradictory – the solar panels may be used locally, but it is difficult to envision them being manufactured locally out of all local materials. Indeed, compared to the relentlessly local visions for food, energy, and housing construction, the actions legitimated by these texts seem occasionally inconsistent with a vision of radically relocalized social and economic life. Any of the transportation policies that require advanced technology (even telecommuting) requires precisely the kind of high-level, high-functioning, high-energy-use dynamics of research, capital, and global supply chains that the rest of the post-carbon movement vision sees dismantled.

decreasing importance of the automobile. The following image from *Transition Timeline* illustrates this nicely.

Figure 6: Energy Descent. Source: Chamberlin (2009, 168).

At the top of the energy descent, vehicles outnumber people six to one. At the bottom of the energy descent, there are no vehicles in sight. There is what appears to be one electric bike and a bus stop; the rest is people walking to school and meeting face to face. It is clear that this vision is not a horrific dystopia where, lacking the means to be autonomously mobile, humans are unhappily forced into an unnaturally downsized and parochial version of life. This is a better future.

What action does this better future legitimate in the present, then? How do post-carbon

texts suggest we begin disentangling ourselves from the automobile and its global commodity

chains? Transition US' *Action Handbook* outlines many possibilities, including, among other

things: starting a car-sharing co-operative, organizing a "walking school bus," reclaiming an

underused parking lot as a site for an outdoor market, converting a street into a pedestrian public

space, and then making a documentary about it all to "inspire other groups to begin their own

projects" (Transition US n.d.b: 4). In contrast, the *Post-Carbon Reader*'s chapter on

"Transportation in the Post-Carbon World" suggests that cities begin expanding the use of grid-

connected electric rail, including trams and streetcars (Gilbert and Perl 2010). The chapter's

authors argue that "[e]lectricity is the ideal transport fuel for an uncertain future. Unlike other

alternative energy transition paths for transport, only electric mobility can move people and

goods using a wide range of energy sources. … Thus, whatever the exact paths of the transitions

toward renewable generation of electricity, transport systems based on these vehicles can readily

adapt" (Gilbert and Perl 2010, 4). To steer efforts and resources towards such a change, they

recommend putting a stop to highway expansion; and introducing an escalating gas tax to

encourage people to "retire what could soon be "stranded assets": their automobiles (Gilbert and

Perl 2010, 8).

Particularly useful in identifying how communities are expected to begin transitioning are

the energy descent plans produced by various communities and cities. Given the radical scope of

the vision of the future, the insistence that humans are adaptable creatures, and the sense of

urgency that drives the idea of transition, some of the actions recommended in the present are,

frankly, unremarkable. Several recommend taking advantage of technological changes to the

automobile itself, embracing the use of electric vehicles (Berkeley Oil Independence Task Force

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2009, 7; Portland Peak Oil Task Force: 41)[59] or biofuels – though specifically locally produced or reclaimed biofuels (Portland Peak Oil Task Force 2007, 41; San Francisco Peak Oil Preparedness Task Force 2009; Kinsale 2005, 41). In fact, most of the policy proposals would not look out of place in a smart growth document.[60] They include prioritizing bike lanes and providing more bike parking (Bloomington Peak Oil Task Force 2009, 142; Berkeley Oil Independence Task Force 2009, 7; San Francisco Peak Oil Preparedness Task Force 2009, 65; Kinsale 2005, 40), as well as adopting a bike-sharing program (Berkeley Oil Independence Task Force 2009, 7). They include decreasing free parking (Portland Peak Oil Task Force 2007, 40; Berkeley Oil Independence Task Force 2009, 7), increasing pedestrian-friendly spaces (Portland Peak Oil Task Force 2007, 38; San Francisco Peak Oil Preparedness Task Force 2009, 66; Kinsale 2005, 41), and encouraging car-sharing (San Francisco Peak Oil Preparedness Task Force 2009, 64). Expanding and improving transit also appears frequently in these policy proposals (Portland Peak Oil Task Force 2007, 40; San Francisco Peak Oil Preparedness Task Force 2009, 5; Bloomington Peak Oil Task Force 2009, 144; Kinsale 2005, 41). Above all, they include incentivizing dense, walkable, transit-oriented development (Berkeley Oil Independence Task Force 2009, 7; Bloomington Peak Oil Task Force 2009, 140; San Francisco Peak Oil Preparedness Task Force 2009, 62; Portland Peak Oil Task Force 2007, 37).

However, the justification for these policies differs significantly than the justifications found in smart growth documents. For instance: "Transportation modes and patterns will shift at the same time that transportation agencies face inflated construction costs with rising prices for

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[59] Interestingly, San Francisco's plan specifically states that the electric car "should not be seen as a viable replacement" for the automobile because of its energy requirements (San Francisco Peak Oil Preparedness Task Force 2009, 63) – the electricity required to fuel a large electric vehicle fleet could not be supported by the city, especially in an uncertain future.

[60] In fact, San Francisco's plan even recommends supporting the Congress for the New Urbanism (67)

fuel, asphalt and other materials. Gas tax revenue will also be affected. Combined, these factors call for transportation agencies to adapt infrastructure plans to meet mobility and access needs in a post-peak environment" (Portland Peak Oil Task Force: 39). In putting forward the case for expanding its bike lane network, the Bloomington energy descent plan recommends that the city build lanes on existing streets at the expense of automobile traffic lanes, "keeping in mind that in a post-peak future, automobile travel is likely to shrink, making this kind of conversion more feasible" (Bloomington Peak Oil Task Force 2009, 143). The San Francisco plan justifies shifting its transportation infrastructure away from automobiles not in terms of a lost social cohesion, but because "[w]hen gasoline prices sharply rise and supplies become unreliable, mode shift will occur regardless of whether San Francisco plans for it or not" (63). As such, "the City should actively induce shifts away from automobile use toward more efficient and sustainable alternatives as vigorously and as soon as possible." (San Francisco Peak Oil Preparedness Task Force 2009, 63). Changes in the built environment must happen, not because the social fabric has come unraveled in the automobile age, but because "[c]onditions will be far better in the long run if the City begins addressing this unfolding challenge immediately. The transition cannot be done quickly; the City faces a limited window of opportunity to begin, after which adaptation will become enormously difficult, painful, and expensive. *There is no time to lose*" (San Francisco Peak Oil Preparedness Task Force 2009, 5; original emphasis).

Altogether, like their ecological dystopian counterparts discussed in chapter 3, these post-carbon texts do see space for human agency even in a world of inevitable collapse. Indeed, the radically different nature of a post-carbon, post-peak, nearly post-apocalyptic world opens up the scope of potential human effort. The decisive break afforded by a rapid energy descent means that what is possible and desirable now has no bearing on what will be possible and desirable in

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the future. That has serious implications for how one orients one's action in the present. It means that "while proposals for basic infrastructural, economic, and political change may seem hopelessly unrealistic within the current context, we must remember that the context is shifting. Times of crisis offer both danger and opportunity, and we are approaching a time of cascading crises – and hence, perhaps, large and unexpected opportunities" (Heinberg 2003, 239). Indeed, this future threat of unexpected, rapid, catastrophic, systemic collapse imbues action in the present with a particular urgency. Heinberg writes: "If by 'Is it too late?' we mean 'Is it too late to make the transition painlessly?', then the answer may well be *yes*," before continuing: "If by 'Is it too late?' we mean 'Can we do anything now to make the future better than it would otherwise be?', then the answer, of course, is that it is never 'too late' " (Heinberg 2003, 238).

Thus the post-carbon texts envision "global revolutionary change" (Monbiot cited in Hopkins 2008, 37), a transition that is "extraordinary and historic" (Transition US 2011, 21), even "monumental" (Hopkins 2008, 50). It is change so radical that it is difficult even to imagine. Compared to the vision of change in the chapter on advanced vehicles, in which we know what we're doing (it's just a question of doing it faster), this vision of change is so radical that it is hard to fathom. It is as "impossible for anyone now to describe the world that could evolve" from such a radical transformation "as it would have been for an English coal miner of 1750 to imagine a Toyota assembly line" (Heinberg 2003, 207). Compared to the vision of change in the chapter on smart growth, where we can plan the future according to what was lost in the past, attempting to plan a post-carbon future is akin to "trying to create a 'parallel universe'" (Transition US n.d.c.: 5).

Transition means, as the tagline of Transition US has it, "bringing a new world to life" (see also Chamberlin 2009, 35). These post-carbon texts leaven the expectation of an inevitable

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collapse with a hope for a better future through local-level community effort. Heinberg (2003, 237) articulates this hope in these terms:

> Taken together, these recommendations [for transitioning to a relocalized world] imply a nearly complete redesign of the human project. They describe a fundamental change of direction – from the larger, faster, and more centralized to the smaller, slower, and more locally based; from competition to cooperation; and from boundless growth to self-limitation. If such recommendations were taken seriously, they could lead to a world a century from now with fewer people using less energy per capita, all of it from renewable sources, while enjoying a quality of life that the typical industrial urbanite of today would perhaps envy. Human inventiveness could be put to the task of discovering ways not to use more resources, but to expand artistic satisfaction, find just and convivial social arrangements, and deepen the spiritual experience of being human. Living in smaller communities, people would enjoy having more control over their lives. Traveling less, they would have more of a sense of place and of rootedness, and more of a feeling of being at home in the natural world.

In this way, the post-carbon texts intertwine the inevitability of collapse with a wide-open future. The energy descent is unavoidable, but if we transition, we can make a better future. "We live in extraordinary times. Scary times. Exhilarating times. Bewildering times. Yet times so pregnant with possibilities as to be unprecedented," states *Transition Timeline*. "Everything may well be up for grabs" (Chamberlin 2009, 10).

Conclusion

This chapter has presented a narrative in which the future is radically different than the present. The texts examined in this chapter differ from ones in previous chapters in that they view climate change and peak oil as being contemporary, ongoing catastrophes that threaten to reach apocalyptic scale. They are also distinctive in that they narrate a decisive break in the future. We can't know what the future is going to hold, other than it will be different from the present. The texts envision the only continuity as change. Humans always have been, are now, and will in the future be adaptable creatures; the fundamental distinguishing feature of humans is that they are capable of self-transformation. We're adventurers: it may seem at the beginning that

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the odds are stacked against us and that we don't know what we're doing, but we're going to figure out where we're going and we're going to discover strengths we didn't know we had. In mobility terms, this means that although humans are mobile now – although we love our automobiles – our current mobility is almost irrelevant to issue of our future mobility. If in the future we are more bound to one place, we can learn to be just as happy being in place as being mobile. There is no necessary relationship between humans and mobility. Just because we all drive cars now does not mean that we will always drive cars; just because we are all happy driving cars now does not mean that we cannot be happy without them. The other continuity-as-change is the resilient community. The resilient community weathers the collapse of global trade; as transportation systems fall apart, the only communities that will still continue to exist are those that are self-sufficient. In this way, the texts specifically position the local community – and not the state – as the meaningful locus of future (and therefore present) action.

The change envisioned is radical, with inevitable change prompting intentional change. Inevitable change is energy descent: we will run out of cheap energy, and this will trigger massive social and economic transformations as the world relocalizes. Intentional change is transition. The decisive break presented by energy descent could offer a dystopian future, but if we organize action in community – if we tap into people's natures as adventurous, adaptable creatures – then we can use this decisive break as a new beginning, where we build closer-knit, self-sufficient, ecologically sustainable communities in which life will be better in a number of ways. There is room for human agency, both now and in the present. The change will be drastic but will be for the better rather than the worse.

Power

Somewhat unexpectedly, when the texts make the case that peak oil is imminent and climate change is already upon us, they rely on scientific expertise and state-produced information. On this, they take no novel alternative epistemological stance on how we know or access problems in the world. They rely upon the authority of expertise to shore up their position that climate change and oil depletion are in fact major, pressing problems. To that extent, the texts do indirectly legitimate scientific expertise and the state as a producer of knowledge (for the moment).

However, they rely on expertise only to define the scope of the problem. When it comes to what to do about imminent collapse, the texts break from the authority of science and the state. They claim that expertise has no privileged knowledge of what can happen in a radically different future. We cannot use past behavior as any indication of future behavior; we cannot rely on pre-peak-oil knowledge in a post-peak-oil world. In this, the texts make a dramatic emancipatory discursive move. The space of possibility becomes wide open. By contrast, in the advanced vehicles chapter, the prospect of people changing their behavior to reduce oil consumption falls outside the realm of possibility. The prospect of people building forms of mobility without the guidance of expertise and resources of the state was outside the realm of possibility. In the smart growth chapter, the prospect of effective civil society-led transformation was outside the realm of possibility. In the previous two chapters, state authority is justified specifically because it is seen as the only entity capable of ensuring a better future. Yet in this chapter, these texts question – and perhaps outright reject – the ability of expertise or state authority to make a better future.

Environment

The environmental politics of transition revolve, for better or for worse, around the prospect of inevitable radical change. The adaptable human will be forced by circumstances to be a profoundly environmentally attuned subject. Far more so than the driver-consumer, totally divorced from the environment and the ecological consequences of her actions, or even the neighborhood inhabitant, environmentally benign but not necessarily intentionally so, the post-transition adaptable human will know her bioregion in and out. She will be the one responsible for her own environmental impact in the world, and she will be a good steward of her ecosystem because she is conscious of her own precarious position in it. The implicit message of these texts is, bluntly, that Nature will force us to all become environmentalists in the end. The texts may take cultural stories seriously, but ultimately their trump card is Nature. Nature does the tough political work. It – and not human social effort – effects systemic change. It confronts communities with the need to adapt locally, but absolves them of the need for a vision of systemic change – it has already effected global change. It limits the oil; it changes the climate. It confronts people with the necessity of change, whether or not they want to be so confronted. The physical realities of the environment override any cultural stories that allow for denial. And then, if people do not change, the grim realities of Nature in a world of runaway climate change and energy scarcity will ensure that they do not survive in the long run. People can attempt to deny the need for change, but ultimately they must adapt or die.

What does this mean for the prospects for environmental politics, now and in the future?

For one thing, it means that the crucial differentiation between inevitable and intentional change is quite not as clear as the texts imply. Any intentional self-transformation is, to some extent, forced by circumstances – something of a contradiction in terms. Far more important, however, is the possibility that Nature may not, in fact, do the political work expected by the

post-carbon texts. Arguably, we are already in crisis now; the need for change is already as self-evident as the tools of scientific research can make it. Yet it is currently not treated as such. This may just point to a political problem – it is politically inconvenient for those with something to lose to admit to the need to change, regardless of how inevitable the need is.

However, I want to suggest that it might be a more fundamental ontological and epistemological issue. To illustrate this briefly: in *Powerdown*, Heinberg writes that he often feels like he is on an enormous, decrepit, slowly sinking raft with hundreds of others. Water is lapping at his feet, but no one else seems to notice or care that the raft may fall apart at any moment. Minutes pass and somehow "still the damn thing is afloat" (Heinberg 2003, 12). It's a vivid metaphor because it is surprising that no one notices the raft sinking below them; it would be nonsensical if the raft did sink entirely and everyone still continued to act in the same way. The physical experience of not yet sinking can be ignored, but sooner or later, there is a decisive break – sunk – that is self-evident and universally experienced as such. However, when applied to the complex unfolding of phenomena of climate change and peak oil, the analogy may be too facile. It raises ontological questions: Is a crisis still a crisis if it can be ignored? Is a decisive break possible if people can continue to act as though nothing has happened? To expect energy descent to offer a decisive break (as decisive as sinking) is to expect a complex series of ecological and economic events to only offer one interpretation – crisis – and a clear interpretation at that. Yet Nature can be interpreted in a number of different ways. Environmental crises have to be interpreted into existence; as chapter 3 argued, problems do not simply reveal themselves to actors. Actors reflexively consider the consequences of the past and present – and they then may interpret a situation as a crisis. By taking the stance that the crisis is (or will be) self-evident, Transition hides its own interpretive political move. Of course, this is an entirely

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justifiable strategic choice on their part. To view the inevitability of radical change as a story is to lessen the urgency behind it and to lose the potential for radical intentional change. But this discursive choice may also lead to an over-reliance on Nature to effect the difficult political work.

The future

In the first narrative this dissertation analyzed, found in advanced vehicle research, there is a clear path before us. Change involves simply accelerating down a given path; the future is better, makeable, and new. In the second narrative, we have strayed from the right path, lured away by novelty and automobility. Change means getting back to the right path; the future is better and makeable, but not precisely new. In this third narrative, the path that we're on is ending. Whether we want to or not, we have to strike out in a new direction; to that extent, the future is not entirely ours to make. It is profoundly uncertain where the path will lead. The future will be so different that experts cannot tell us where to go or how to get there, nor can they ensure that the future will be better. But we're all adventurers, so although we don't know where this new path will take us, we can do the best we can with what we're given, and perhaps make a future that is in fact better in a number of ways.

CHAPTER 7

CONCLUSION

"Tell me how fast you go and I'll tell you who you are."

– Ivan Illich, *Energy and Equity*

This dissertation began by making the case that modernity has meant an autonomously mobile self. American identity in particular has been tied to a "restlessness" that, in the 20th century, seemed to reach its full expression in the mobility afforded by motor vehicles. Yet automobility, like modernity more broadly, has come under increasing scrutiny in recent years. As the second chapter highlighted, critics from a number of scholarly fields have raised questions about the unsustainabilites of automobility, both in its production (its reliance on limited oil resources, its destructive impact on the ecosystems that support life itself) and in its performance (its potential to kill and to isolate socially). There is a large and growing groundswell of critique holding that automobility in its current form neither can nor should continue. This increasingly urgent awareness of the long-term unsustainability of automobility has opened up a reflexive moment, a moment where automobility and its relation to the self are being reimagined. It offers the opportunity not merely to critique the excesses of automobile production and use, but to interrogate in a more profound manner who we are asked to be when we consistently move through the world isolated and at high speed. By questioning how fast we go, we question who we are. The second chapter also argued that what is needed at this reflexive moment is not another voice chiming in on who we could be, nor another vision to compete with or supplement those that are already in play. What is needed – and what this dissertation has sought to provide – is a reflection on the interpretive political and cultural work that we perform

as we weigh the possibilities for future self-transformation. As the third chapter argued, the act of thinking the future is a moment of interpretive agency. As actors narrate the future of automobility, they reproduce or challenge taken-for-granted bounds of the self (who are we expected to still be in the future?) and give meaning to action in the present (what must we do now?). In the 21st century, one can witness actors not merely problematizing automobility, but narrating its unsustainabilities in one of three very specific ways: accelerate, rebuild, or transition. The three empirical chapters went into depth respectively with these three narratives.

These narratives encompass more than collective identity and more than projections of what will happen. As the empirical chapters illustrate, the question of "how fast you go" and "who you are" is far more fundamental than any supposed modern ("restless") American identity. It is a question of one's subjecthood – whom one is expected to be and how one is expected to act in the world. As they narrate the future of automobility, the texts examined in this dissertation ask us to become particular kinds of subjects, imbued with particular characteristics and capable of only particular kinds of change. Are we – and will we continue to be – highly mobile subjects, performing a mobility that enmeshes us in a vast and high-functioning system of expertise and deployment of state resources? Will we uncover our latent civic selves, pluralizing our forms of mobility and becoming the subjects of planning expertise? Are we fully responsible, each and every one of us, for however fast we want to go and whomever we want to be in a drastically reduced energy landscape?

These narratives diverge along the lines of things that may not be definitively resolved soon – or ever. Their expectations about what can and should happen derive from core assumptions about the basic contours of human nature and how much of the world can be controlled by human hands. There is no clear way to settle disagreements about such

assumptions. As such, it is unlikely that one of the three narratives will soon come to be seen as the correct one (either empirically or ethically). These narratives are not scenarios, which would eventually either occur or be proven inaccurate. As long as there is space in American discourse for divergence along these core assumptions, these three narratives can continue to coexist, operating in parallel. And as long as they operate in parallel, there will be a plurality of ways of moving through the world, a multiplicity of tempos, and divergence as to what that means. Taken together, these widely diverging narratives point to an American imagination that is profoundly unsettled.

Findings

What are the basic contours of each narrative? What do they share, and where do they diverge? The following table captures the key ways in which the narratives overlap and, more often, differ.

	Chapter 4	**Chapter 5**	**Chapter 6**
Why automobility must/should change	Automobiles produce carbon emissions and make the US reliant on foreign oil	The automobile-dominated landscape has destroyed the social fabric of the US	Automobiles rely on systems that will end abruptly and soon
How we know it must change	Expert knowledge	Expert knowledge	Expert knowledge
How we know what future change is possible	Scientific research	Tradition	We cannot definitively know
Process of desirable change	Accelerate	Rebuild	Transition
Key object of change	Automobile	Built environment	Self and community

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Agent of change	Engineer	Urban planner	Human
Mechanism of effecting change	Design	Design	Adventure
Subject	Driver-consumer	Neighbor inhabitant	Adaptable human
Tempo of change	Continuous, exponential	Gradual	Potentially discontinuous, sudden
Scale of change	Systemic	Systemic	Systemic
How change scales up	The state	The state	Nature
Conceptual repertoire	Economic	Architectural	Ecological

Table 1: Similarities and differences among future-of-automobility narratives

As the table indicates, the differences among the narratives far outnumber the similarities. To begin with, all three understand the unsustainabilities of the automobile differently. I began the project expecting all three to frame the problem fairly similarly, with a stable consensus on the need for change in transportation in an era of climate change and oil depletion. To some extent, this understanding held. All three acknowledge that, given the automobile's contribution to climate change and oil depletion, automobility is unsustainable in its current form. Beyond this, however, the three narratives share only family resemblances in the reasons they given for automobility to change. For instance, oil depletion is an issue in all three. Yet, in chapter 4, oil depletion threatens US energy security; in chapter 5, it's simply another item on a litany of sins of the automobile-centric landscape; and in chapter 6, it's the sword of Damocles. All three narratives share a concern about climate change and reducing carbon emissions. But in chapter 4, climate change is a knowable, predictable, potentially manageable risk; in chapter 5, it is not particularly even a risk – like oil depletion, it is another (not necessarily urgent) reason to shift mobility away from the automobile. In chapter 6, climate change is a wholly wild phenomenon,

outside the ability of humans to control. Altogether, the texts in chapters 4 and 5 tend to take the position that automobility should change; the texts in chapter 6 take the position that it must, whether we want it to or not.

This initial divergence is particularly unexpected because, as the second row above illustrates, all three narratives base their knowledge of the problems of automobility on expert knowledge. This similar use of expert knowledge to define automobility's unsustainable nature is also somewhat surprising in turn. It may not be surprising that the advanced vehicle texts or the smart growth texts draw on expert knowledge, given that they position themselves as the encapsulation of expert knowledge. But the post-carbon texts rely specifically on expert knowledge to define and legitimate their claims about the urgency of climate change and peak oil, even while rejecting the ability of expert knowledge to speak to the social possibilities of a post-carbon era. Transition's stance of profound uncertainty about the future does not extend to uncertainty about the magnitude and urgency of climate change and peak oil as imminent catastrophes – and for that certainty, they look to scientific expertise.[61] When Transition action guides encourage everyone to consider themselves an expert, they mean that anyone is capable of understanding the IPCC's findings and then telling others. They don't claim to be able to make truth claims that rival the IPCC's. All three narratives, then, seem to share an epistemological stance, at least on the importance of science in knowing problems.

As the third row indicates, this similarity among narratives disintegrates when it comes to what precisely to do about the unsustainabilities of automobility. What transformations are possible? To answer this question, the narratives look to difference sources of knowledge. The

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[61] A somewhat absurd counterfactual to clarify this: the post-carbon texts do not, for instance, suggest that we consult oracles or interpret dreams about cows in order to divine whether climate change presents a potential catastrophe. We can rely on science to describe the current world accurately, but we cannot rely on it to predict what will be socially possible in a radically different future.

advanced vehicle texts look to scientific research: modern methods of knowledge production can indicate what is likely from what is impossible – and that sets the bounds of what change should be envisioned. The smart growth texts look instead to tradition; potential change can be modeled after forms that we know work. Lastly, the post-carbon texts take the radically different stance that there is no way to know what change will be possible in a radically different future; it will be so unlike the world of the past that we cannot necessarily rely on forms of social life that worked in the past, and it will be so unlike the world of the present that we cannot expect even scientific research to be able to accurately predict what may unfold in a post-energy descent world.

The narratives also diverge as to what processes of change are desirable. Chapter 4 suggests that the best approach to dealing with the automobile's unsustainable contributions to climate change and oil depletion is to accelerate technological research. Chapter 5 suggests that the best approach to the social ills unleashed by automobilization is to rebuild the landscape along the lines of the pre-automobile era. Chapter 6 suggests that we attempt to transition to a relocalized world while it is still in our ability to do so intentionally, before the systems that support mobility collapse around us. The key object of each of these change differs accordingly. Accelerated technological change focuses on components of the vehicle itself; rebuilding is directed towards the built environment; and transition inheres in the relationship between the self and the community.

Who effects these changes? Who, in these narratives, makes the future? In chapter 4, it is the engineer: we may all be accelerating, but it is the engineer with her foot on the pedal. She is the highly trained expert producing and applying the knowledge that accelerates technological development. In chapter 5, the urban planner is the key agent of change: we have taken a wrong

turn and she is the one that can guide us smoothly back. She is the one in a position to rebuild the landscape and to foster repairs in the social fabric. In chapter 6, the human – any human, every human – is a key agent of change. Each human is equally capable of self-transformation, and each human is capable of being a part of a community; thus each human is capable of fostering learning and resilience in themselves and in community. Not everything may be in that human's capacity to control, but all humans are equally (in)capable of making the future.

As the seventh row above indicates, the engineer and the planner play similar roles in creating the conditions for change, though the temporal orientation of the engineer (forward to accelerated technological progress) differs from the urban planner (back to a more social form of human settlement). They are each responsible for the key mechanism of change: design. Each deploys expected constants in human behavior (e.g. economic or aesthetic preferences) to produce socially desirable outcomes. The engineer designs a technology that follows the contours of the driver-consumer's nature (preferences for high-speed, comfortable, low-cost); the planner designs the built environment to follow the contours of the neighborhood inhabitant's nature (preferences for inviting, convenient, social places). There are, however, two slight differences: the engineer designs to accommodate the driver-consumer's current (assumed fixed) behavior while the planner designs to encourage the neighborhood inhabitant's potential future (assumed currently latent) behavior. Moreover, the engineer designs using fundamentally new things: she uses newly invented materials or applies newly understood processes of fuel combustion. The urban planner designs using fundamentally old things: she rehabilitates already existing neighborhoods or applies (what is considered to be) age-old knowledge of human settlement patterns. Despite these differences, however, there is a shared sense of predictability: good design is based on predictabilities in human nature, and thus good design creates the

conditions for predictably desirable outcomes. In contrast, the individual engaged in transition relies on no sense of predictability. Given the profound social uncertainties of a world in the throes of energy descent, she does not know if what she is trying will produce the outcome she wants. But given the imperative to adapt or die, she tries anyway.

The eighth row above presents the subjects articulated in the three narratives. The texts in chapter 4 expect us to be American driver-consumers. The American driver-consumer is imbued with particular characteristics: fixed preferences for speed, comfort, and low costs. This figure of the driver-consumer is not seen as capable of, interested in, or responsible for change. By contrast, the texts examined in chapter 5 invite us to become neighborhood inhabitants. As a neighborhood inhabitant, one is mobile in as many ways as the built environment allows. As long as there are the opportunities to do so, the neighborhood inhabitant bikes, walks, takes transit, uses car-sharing, and even occasionally comes to rest in public spaces. The neighborhood inhabitant is profoundly, fundamentally social; her plural mobility brings her to interact with her neighbors in a way that constitutes the neighborhood as such. Finally, the texts analyzed in chapter 6 ask us to be adaptable humans. They expect us to learn to appreciate a new and radically different world; they invite us to embrace our nature as adventurers. This figure of the adventurer blazes a path where there was none before and uncovers new-found capabilities. This adaptable human is not definitively and forever fixed in one way of moving through the world; how fast one moves does not, in fact, reveal whom one is. One can fully embrace automobility now but in the future learn to appreciate being in place.

As the ninth row in the table above shows, these subjects – and the narratives they inhabit – operate within almost wholly separate conceptual vocabularies.[62] Their assumptions about

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[62] This is a slightly more tentative finding than the others. More research would shed more light on this. To what extent does the practice of these fields of expertise shape how we think the future of the automobile? To what extent

human nature seem to derive from the particular knowledge bases of particular fields. In chapter 4, the driver-consumer seems to be a creature constructed largely in the field of economics and inserted into a narrative about the future of the automobile. In chapter 5, the neighborhood inhabitant is a creature constructed in the literature and practice of architecture and planning (and the Arcadian utopian tradition). In chapter 6, the adaptable human is an ecological creature, as prone to overshoot and collapse as any other species.

The processes of acceleration, rebuilding, and transitioning are all expected to unfold at different paces. By definition, accelerated technological development is expected to be continuous and exponential. Rebuilding the landscape is expected to be slower, almost piece-meal, as the landscape is transformed infrastructure project by infrastructure project, street block by street block. Transition, by contrast, is expected to unfold in a context of potential discontinuity – a break from the present as energy becomes (perhaps unexpectedly, perhaps suddenly) scarce. Despite these different tempos of change, however, each narrative envisions the eventual transformation to occur at a large scale. This systemic scale of transformation envisioned across all three narratives – is somewhat surprising. One might easily assume a priori that a transformation envisioned for only the automobile (as in chapter 4) would imply small-scale change. It is literally just trading out the parts instead of overhauling the entire idea of the thing. Yet every part it trades out means a change in the commodity chains that supply the part, thus the social and environmental impact of those commodity chains. The transformation of the automobile is expected to unfold in the context of a near-total transformation to a renewable

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are, for instance, their commonplace understandings about behavior, their intellectual canon, even the modelling technologies they use, deployed to narrate the unsustainabilities of automobility? Put differently, to what extent is thinking the future a moment of creative action, and to what extent is it repeating the script that one has inherited? Further ethnographic work in these particular fields (or even a series of ordinary language interviews) would get at how the practice of the epistemic community and how its commonplace concepts bleed into what future is ultimately envisioned.

energy system. In this way, advanced vehicle research, no less than smart growth or Transition, does envision a significant and systemic transformation beyond just the vehicle itself. However, the narratives differ on how they expect transformation to reach a systemic scale. In both chapters 4 and 5, the state plays a key role in translating local or isolated changes (breakthroughs in research, success stories in smart growth) into systemic change. Its role in consolidating and standardizing knowledge makes that knowledge replicable and scaleable. In contrast, the state plays no such role in chapter 6. The vision of transition is emphatically local – but systemic transformation is seen as possible (indeed inevitable) because Nature itself prompts wide-scale change in the form of self-evident ecological limits.

In sum, each of the narratives thinks of the path ahead in a very different way. In chapter 4, the narrative hews generally to the typical narrative of the modern project. We can see the path before us – it's clear, and clearer now than ever before, because with every step we know more than we did before. We just need to accelerate down that path. The second narrative embraces the sort of conservative (small c) project that has long been the countermovement to the modern project, attempting to preserve traditional ways of being in the world. In chapter 5, it's as if we have strayed from the path, disastrously attempted to find a new way, abandoning the ones that work, and need to find our way back again by rebuilding the landscape without the car as the dominant mode of mobility. The third narrative presents a kind of secular eschatology: there will come a moment where the world as we know it is gone. When that moment comes, we have no idea what our path will be, but we should begin now to learn to strike out on our own.

Taken together, the number and scope of these divergences suggest that the American imaginary is profoundly fragmented. Automobility came to dominate the American landscape in the 20th century; but that dominance is being unsettled – certainly in meaning, if not (yet) in

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physical terms of cars on the road. Rather than only one naturalized understanding of automobility as effectively the only way of moving through the modern world, there is a multiplicity of ways of narrating automobility. Certainly, a narrative of automobility continuing unquestioned into the future still obtains among those who work to improve the automobile. Yet there is also an increasingly institutionally established narrative that the dominance of automobility was a mistake from the beginning, as well as a narrative that automobility, whatever its past role in our collective sense of self, has no future. What the future will look like, how we get there, and what transformations of self that will demand of us: these remain fundamentally unsettled.

What do these findings mean?

How can one make sense of this narrative fragmentation, this unsettled imagination? Is one of these narratives right or preferable? It is a reasonable question to ask. If we consider each narrative as a blueprint for society in its totality – if we see them not as orientations but as destinations – then it seems that the destinations or end-states offered by each narrative are mutually exclusive. The three envision different landscapes, inhabited by different kinds of subjects, performing different mobilities and undertaking different forms of action. A society cannot, for instance, be wholly populated by driver-consumers and powered by high-tech renewable energy – and at the same time have transitioned to a relocalized landscape of non-mechanized transport, inhabited by tinkerers and gardeners. As mutually exclusive endpoints, then, the narratives can and perhaps should be compared against each other. After all, these narratives play out in authoritative representations of the world that shape which mobilities are planned and eventually built into the landscape. These narratives have effects in the world; as such, there is an underlying ethical concern about those effects. The narrative in chapter 4 is

particularly troubling on this account. To narrate the continued existence of automobility (even in a carbon-neutral form) is to endorse a future world where the social impacts of automobility – its casual violence, its social isolation – continue unabated. It is also to envision a wholly anthropocentric landscape, where the inroads of the automobile on the non-human world are maintained and even expanded. Just as important, the destination envisioned by the accelerate narrative is a world populated by driver-consumers, where social actors are limited in their agency to a buying decision: to buy, or not, an electric vehicle.

However, ultimately the goal of this dissertation is not to pick a winner among the narratives, either in ethical terms or in terms of which one is most likely to unfold. The goal is neither to predict nor recommend; the goal is to highlight the political effects of attempting to predict and recommend.

The tension between the narratives has political effects at the level of policy. Thinking the future means creativity of action – recasting aspects of the self as possible and desirable – but it also means disciplining imagination. It means discursively opening possibilities, but it also means delegitimating other possibilities, often as retrograde or unrealistic. However, the texts examined in this dissertation performed less discursive closure than anticipated. In the texts themselves, there was little disciplining of other orientations. Although the rebuild texts and the transition texts rejected the modern metanarrative of progress, only rarely did they did go the next step to reject the specific avenues of action legitimated by the progress narrative.

This lack of disciplining might simply reflect the fact that the three corpuses of texts operate in discursive silos: they are insular domains of epistemic knowledge, each deploying its own conceptual vocabulary and seeking to effect change only within its own sphere of action. Because each narrative operates in a slightly different policy sphere and at a different level of

governance, there is a certain live-and-let-live, agonistic dynamic at work: each operates in parallel to the others, occasionally acknowledging the others but generally producing its own future in its own way. The lack of disciplining language in the texts may also reflect that, although these narratives interpret the problems of automobility differently, there is enough of a family resemblance among them – they all are motivated to reduce carbon emissions and oil consumption, wherever else they diverge – that the actors tackling these problems do not want to tear down the work of others also working to solve the same problems. All three narratives embrace transit and walkability to some extent, though their meaning and relative importance differ. In the advanced vehicle texts, though transit is a secondary consideration, it still merits an occasional mention. Those working on reducing carbon emissions in cars are not blind to the benefits of better transit systems. Conversely, the electric vehicle appears in both smart growth texts and post-carbon texts (though it is not central and, in the case of post-carbon texts, somewhat contested). Though the transitioners protest that technology cannot ultimately save us, they still seem not to want to disparage attempts to reduce the carbon impact of automobiles. Though each form of mobility is open to interpretation – are we building bike lanes because it returns us to pre-automobile forms of sociality or because it helps us to survive collapse better? – there seems to be at least some common ground: a world without runaway climate change and drastic energy scarcity can and should be avoided.

Either of these explanations would suggest that, if all three narratives continue to operate agonistically or in parallel, we may see a growing multiplicity of mobilities in the US landscape. The divergence of narratives may well produce a landscape where renewably fueled electric vehicles run alongside retrofitted biodiesel cars and trolleys on streets populated by cyclists and meandering pedestrians. It may mean a plurality of tempos within the same space, each imbued

with its own meaning (e.g. when I drive my electric vehicle I'm impressed by the technological feats of science and engineering; when I ride transit I feel invested in my neighborhood; when I walk I applaud my own self-sufficiency). We may see spaces where three different geographies are superimposed upon each other within the same space, each with its own meaning and way of moving through the world.

However, it is likely that a different site of empirical inquiry might show a dynamic among the narratives that is more antagonistic. In order to see the three narratives deployed to discipline action in the present, one must look elsewhere besides authoritative texts. The divergences among narratives may develop into direct contestation when it comes to debate over specific bills or infrastructure projects, for instance. When there is limited land or funding at stake, there may be more direct condemnation of the other narratives and less room for them to operate side-by-side. For instance, each narrative would assign contradictory meanings to a road expansion project. Looked at in an "accelerate" light, road expansions are necessary even for advanced vehicles; but looked at in a "rebuild" light, the same project actively takes us further in the wrong direction towards continued automobile dependence. When it comes to public debate over whether to fund such an expansion project, the divergence between narratives may become more directly confrontational. Clearly, more empirical research on debate over specific policies or projects would be useful in understanding where and how narrative fragmentation translates into direct contestation over policies.

While the impact of these narratives on policy is critically important to understand, the narratives have more political effects than at the level of policy. Politics is about power, and the narratives have the potential to exert power down to the level of individual everyday life and sense of the self. With this in mind, the fragmentation of narratives about the future indicates a

degree of freedom in self-making for the individual finding her way through a rapidly changing world. One is not limited to one role, nor one script. The forms of subjecthood articulated in each narrative provide compelling ways to be in and move through the world – and these are not necessarily mutually exclusive within the same person. One can appreciate the joys of automobility without being committed solely to the role of a driver: one can equally appreciate the joys of moving in a variety of ways through the city, or the joys of being in place. Perhaps by embracing the mobilities offered by all three narratives one might cultivate a more empathetic sense of mobility: when one has played the role of empowered driver, vulnerable pedestrian, and pissed-off cyclist equally, one might be more inclined to treat others on the road with consideration. Perhaps one might even lead a fuller existence, having experienced the landscape in a multitude of ways.

What's more, each narrative offers the individual compelling courses of action towards the transformation of automobility. For one who is aware of these narratives and can make use of them, they create a range of agentic possibilities. Here too, these courses of action are not mutually exclusive. Though it is unlikely that one person would play all three crucial change agent roles articulated by the three narratives envision three very different agents of change – few people are simultaneously automotive engineers, urban planners, and peak oil activists – yet one person can pursue the multiple actions legitimated by the three narratives. One can purchase a low-carbon automobile, become more informed and concerned about the urban transit improvements, and attempt to reduce one's food miles without too much cognitive dissonance. The multiplicity of narratives legitimates a broader array of actions and allows one to see oneself as a meaningful agent making the future in a variety of ways.

Finally, for the person who can play them against one another, the multiplicity of narratives offers a range of perspectives on change that can be useful in envisioning a potentially better future. Indeed, each narrative can be a powerful tool for orienting both personal and social transformation. There are times when the most appropriate way to think about change may be to research the world and attempt to understand and improve one's ability to manipulate that world. There are times when it may be imperative to conserve and rehabilitate. And there are surely moments when the best course of action is to acknowledge the limits of one's power to control the world, and to reinterpret oneself as a resilient, rather than omnipotent, being.

Finally, then, this narrative fragmentation may have ambiguous effects on policymaking (thus more research is needed), but relatively positive effects at the level of the individual. As to the question of which narrative is best, then, I would suggest that any attempt to adjudicate among narratives means a closure of possibilities for moving through and being in the world. Though there are benefits to discursive closure (e.g. everyone agrees on what problems to solve, and efforts are all directed towards the same goal), [63] this narrative fragmentation does not need to be resolved. The openness that it affords not only offers a degree of personal interpretive freedom, but perhaps hints at the possibility of a richer, more empathetic existence.

Power

One implication of the findings is that even within the state, the meaning of automobility is fracturing. This is somewhat unexpected; as a number of critics of automobility have claimed, the dominance of automobility in the last century was in no small part due to its active endorsement by the state. Yet in another way, it is possible to see this as the state merely

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[63] There is a clear parallel here with paradigmatic knowledge within academic disciplines.

reconfiguring its position, changing its definitions in order to keep the same role. The modern state has always been thoroughly involved in the production and ordering of mobility (see the discussion of Foucault and the "problem of movement" in Paterson 2007, 126-8). In Virilio's view, the political power of the state is fundamentally "highway surveillance" – a controlling of movement, a canalization of flows, "confusing social order with the control of traffic (of people, of goods), and revolution, revolt, with traffic jams, illegal parking, multiple crashes, collisions" (Virilio 1986,14; see also Paterson's discussion of Virilio (2007, 7)). Through regulations, funding, and knowledge production, the 20th-century state exerted power as traffic control: making movements orderly and smoothing the way for desirable flows such as mobile labor or international trade and tourism (see Reese forthcoming).

In the 21st century, it is no longer just revolution or collisions that the state is seeking to order; now, the state has to perform control over climate change and the depletion of oil resources. This means that the forms of "traffic" may be shifting and fragmenting; yet the findings of this dissertation suggest that the state is still engaged in "highway surveillance." Even as the meaning of automobility fragments, the state still positions itself as the authority on what forms of mobility can and should be produced. As it accumulates, centralizes, and disseminates knowledge, it positions itself as an arbiter of what is possible in the future and the entity best suited to scale up that knowledge. The state may no longer exert power to order movement into automobility specifically – but it has not given up its claim to order movement for the (ostensible) future betterment of society.

One question this raises is whether the state is similarly repositioning itself in other policy domains. Many other types of policy are implicated in the uncertainties of resource depletion and climate change – food policy and electricity production, for instance. Furthermore,

how automobility is produced and experienced in the US – its confluence of high-tech production, inscription in the landscape, and everyday habit – has parallels in these domains. It seems well possible that the basic contours of these three narratives – accelerate, rebuild, transition – would play out in similar ways across different policy fields. A similar interplay between narrative fragmentation, state authority, and expertise may thus be occurring in such domains. Further research beyond transportation policy would lead to a better understanding of how the state is renegotiating its authority in a moment of widespread reflexivity.

Environment

The environmental crisis presents profound uncertainties and yet an ethical imperative to act. As Giddens argues, we face "confusing circumstances in which – as the protagonists of postmodernism have stressed – there are no longer clear paths of development leading from one state of affairs to another." And yet this "does not mean – as some followers of postmodernism say – that the world becomes inherently refractory to human attempts at control. Such attempts at control, in respect, for example, of high-consequence risks, remain necessary and feasible" (Giddens in Beck et al. 1994, 185). Whatever else they diverge on, all three narratives share this normative stance – this attempt to control despite confusing circumstances. None abdicate responsibility for the future, or reject the necessity for building a better world. Yet the ethics of making a better future are complicated by the blurred line between "automobility must change" (as we hit ecological limits) and "automobility should change" (as an ethical stance). In the texts, ethics get smuggled in as arguments about what is possible or desirable – as if taking an ethical stance is tacitly acknowledged not to be a winning political strategy. There is normative language (we should rebuild cities as they were because it this is how people should live; we

should relocalize our economies because otherwise we will suffer in the future) but rarely is it framed as a directly ethical question: how should we transform automobility?

I would suggest that, if we want automobility to change (and I would further suggest that we should), we cannot rely on automobility to change because ecological limits reveal themselves. It is difficult and perhaps impossible to know limits when one sees them – even after one has passed them. And even if a hard limit is recognized by some, others can interpret it differently; if a crisis is not recognized as such, it may not force change. Insisting that automobility must end whether we want it to or not is not a bad discursive strategy; but it may ultimately underestimate the capacity for humanity for a multiplicity of interpretations. Just as problems do not reveal themselves fully formed to actors, ecological limits have to be interpreted as such. This does not mean that problems and ecological limits do not exist. It means that, in order for us to recognize them, interpretive agency is required. Recognizing problems and limits takes human actors narrating the connection among, for instance, everyday driving, rising temperatures, and the need for alternative forms of mobility.[64] To expect the environment to self-evidently reveal its limits is to expect Nature to do all the difficult political work. The world is more in the hands of humans (through interpretation if not through physical or technological control) than the post-carbon texts admit – but that makes it more imperative, not less, to engage directly with the ethics of automobility.

If ecological limits do not reveal themselves as self-evident but must rely on human interpretive agency, then this ultimately hints at a chronic condition of unsettledness. The meaning and impacts of automobility can always be contested. Interpretations can always

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[64] Contrast the case for transforming automobility with the case for ending animal cruelty. There is no argument (at least that I'm aware of) that animal cruelty will end whether we want it to or not – perhaps because it seems obvious that the treatment of animals is wholly in human hands.

diverge. This is, of course, precisely where we find ourselves now: in conditions where narratives fragment. Over the course of researching this dissertation I found evidence hinting that this has long been the case: the envisioned future of automobility has been unsettled for as long as the automobile has existed. Though further genealogical research would be able to shed better light on this, it seems that we've had the same narratives, the same metaphorical geography – go forward, turn back, strike out in a wholly different direction – for decades. Throughout the 20th century there were voices in the US arguing that automobility cannot and should not last. The history of automobility has been marked by a chronic re-emergence of reflexive moments. This undermines somewhat the idea that we are now experiencing a uniquely reflexive, newly unsettled era. Perhaps the future has never been as settled – makeable, new, better – as theories of modernity indicate. More to the point, perhaps we can expect such chronic unsettledness to continue into the future.

<u>The road ahead?</u>

The American imagination has fragmented along the lines of how fast we can expect to go in the future and thus who we will be. What, ultimately, does this tell us about the road ahead?

One interpretation is that, for a while, modernity had us all on the same road. Its particular understanding of progress gave us all the same understanding of where we are headed: to a future that is better, makeable, new; populated by ever more drivers; and defined by ever more efficient and high-speed mobility. Yet modernity's discontents – and particularly the peculiarly human-made but not humanly controllable nature of climate change – have split this road. There are now those who see the same road ahead: progress is promisingly in front of them and the tools to get there are at hand. There are those who are confident that this road is the

wrong one to be on, who see their way back to a road that was abandoned decades ago. And there are those who see the road ending. For them, any possible desirable future is off somewhere at a tangent, far displaced from the trajectory we were promised in the 20th century. Any road to it is one we will have to build ourselves. Given this interpretation, what might we expect from the future? Will we see three different groups building roads in three different directions, as actors make the future according to disparate narratives? As time passes, will they get farther and farther away from each other, enveloped in their own endeavors and isolated from other ways of moving (and progressing) through the world?

Perhaps. But I would like to end by suggesting a slightly different interpretation. These narratives are not destinies but tools. They do not commit one to a course of action where there is no looking back or considering alternatives – because that would rob the future of any potential moments of reflexivity. As long as reflexivity and critique exist, there is the possibility to say "we need to go back" or "this road has no future" – and thus every moment is a potential diverging of the paths. What matters is not which road one picks, but the moment of considering a different road; what matters is not the future but what that future means for the present. The critical thing is not whether you successfully control or predict the future (because you probably can't), but what that performance of prediction allows you to justify, what space it creates for you to act, whom it invites others to be, in the present. As long as there is interpretive agency, we cannot definitively follow one and only one path, as the prospect of imminent divergence is always before us. There is a crossroads at every point in the road. The future is – and will be – chronically unsettled.

REFERENCES

America's Energy Future Panel, National Academy of Sciences, National Academy of Engineering, and National Research Council. 2010. *Real Prospects for Energy Efficiency in the United States*. Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=12621.

American Association of State Highway and Transportation Officials. 2004. *A Policy on Geometric Design of Highways and Streets*. Washington, D.C.: American Association of State Highway and Transportation Officials.

American Planning Association. 2006. *Planning and Urban Design Standards*. Hoboken, N.J.: John Wiley & Sons.

Anderson, Benedict R O'G. 1991. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. London; New York: Verso.

Atkinson, Adrian, and Julie Viloria. 2013. "Readjusting to Reality 2: Transition?" *City* 17 (5) (October): 580–605.

Basedau, Matthias, and Jann Lay. 2009. "Resource Curse or Rentier Peace? The Ambiguous Effects of Oil Wealth and Oil Dependence on Violent Conflict." *Journal of Peace Research* 46 (6) (November 1): 757–776.

Beck, Ulrich. 1999. *World Risk Society*. Malden, MA: Polity Press.

Beck, Ulrich, Anthony Giddens, and Scott Lash. 1994. *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*. Stanford, Calif.: Stanford University Press.

Beckmann, Jorg. 2001. "Automobility - A Social Problem and Theoretical Concept." *Environement and Planning D: Society and Space* 19: 593–607.

Beckmann, J. 2004. "Mobility and Safety." *Theory, Culture & Society* 21 (4-5) (October 1): 81–100.

Benford, Gregory. 2010. *The Wonderful Future That Never Was*. New York, NY: Hearst Books.

Berkeley Oil Independence Task Force. 2009. "Berkeley Energy Descent 2009-2020□: Transitioning to the Post Carbon Era". Berkeley, CA. http://postcarboncities.net/files/BerkeleyEnergyDescentPlan.pdf.

Berman, Marshall. 1988. *All That Is Solid Melts into Air: The Experience of Modernity*. New York, N.Y., U.S.A.: Viking Penguin.

Black, Edwin. 2006. *Internal Combustion: How Corporations and Governments Addicted the World to Oil and Derailed the Alternatives*. New York: St. Martin's Press.

Black, William R, and Peter Nijkamp. 2002. *Social Change and Sustainable Transport*. Bloomington: Indiana University Press.

Blanchard, Edward B., Edward J. Hickling, Neil Mitnick, Ann E. Taylor, Warren R. Lops, and Todd C. Buckley. 1995. "The Impact of Severity of Physical Injury and Perception of Life Threat in the Development of Post-Traumatic Stress Disorder in Motor Vehicle Accident Victims." *Behaviour Research and Therapy* 33 (5): 529–534.

Blanchard, Edward B., Edward J. Hickling, Ann E. Taylor, Warren R. Loos, Catherine A. Forneris, and James Jaccard. 1996. "Who Develops PTSD from Motor Vehicle Accidents?" *Behaviour Research and Therapy* 34 (1): 1–10.

Bloomington Peak Oil Task Force. 2009. "Redefining Prosperity: Energy Descent and Community Resilience." http://bloomington.in.gov/peakoil.

Böhm, Steffen. 2006. *Against Automobility*. Malden, MA: Blackwell.

Buck, Alice. 1982. "A History of the Energy Research and Development Administration". Washington, D.C. http://energy.gov/sites/prod/files/ERDA History.pdf.

Buell, Frederick. 2003. *From Apocalypse to Way of Life: Environmental Crisis in the American Century*. New York: Routledge.

Burchell, Robert W., and Naveed A. Shad. 1998. "The Evolution of the Sprawl Debate in the United States." *West-Northwest Journal of Environmental Law and Policy*: 137–160.

Cervero, Robert. 1998. *The Transit Metropolis: A Global Inquiry*. Washington, D.C.: Island Press.

Chamberlin, Shaun. 2009. *The Transition Timeline for a Local, Resilient Future*. White River Junction, Vt.: Chelsea Green Pub.

Chicharro Martin, A, V. Cala Rivero, and M.T. Larrea Marín. 1998. "Contamination by Heavy Metals in Soils in the Neighbourhood of a Scrapyard of Discarded Vehicles." *The Science of the Total Environment* (212): 145–152.

Colgan, Jeff D. 2010. "Oil and Revolutionary Governments: Fuel for International Conflict." *International Organization* 64 (4) (October 1): 661–694.

Conley, Heather, and Warren Phillips. 2005. "Energy, Security, and Cooperation over the next Quarter Century." In *From Resource Scarcity to Ecological Security: Exploring New Limits to Growth*, edited by Dennis Pirages and Ken Cousins. Cambridge, Mass.: MIT Press.

Conley, Jim, and Arlene Tigar McLaren. 2009. *Car Troubles: Critical Studies of Automobility and Auto-Mobility*. Farnham: Ashgate.

Connors, Phil, and Peter McDonald. 2011. "Transitioning Communities: Community, Participation and the Transition Town Movement." *Community Development Journal* 46 (4) (February 26): 558–572.

Corn, Joseph J, Brian Horrigan, and Katherine Chambers. 1996. *Yesterday's Tomorrows: Past Visions of the American Future*. Baltimore: Johns Hopkins University Press.

Crosby, Alfred W. 1997. *The Measure of Reality: Quantification and Western Society, 1250-1600*. Cambridge; New York, NY, USA: Cambridge University Press.

Dalby, Simon, and Matthew Paterson. 2009. "Over a Barrel." In *The Geopolitics of American Insecurity: Terror, Power and Foreign Policy*, edited by Francois Debrix and Mark Lacy. New York: Routledge.

Das, Sujit, TR Curlee, CG Rizy, and SM Schexnayder. 1995. "Automobile Recycling in the United States: Energy Impacts and Waste Generation." *Conservation and Recycling* 14 (3-4): 265–284.

Dauvergne, Peter. 2008. *The Shadows of Consumption: Consequences for the Global Environment*. Cambridge, Mass.: MIT Press.

De Geus, Marius. 1999. *Ecological Utopias: Envisioning the Sustainable Society*. Utrecht, the Netherlands: International Books.

DeCicco, John, and Freda Fung. 2006. "Global Warming on the Road: The Climate Impact of America's Automobiles". Environmental Defense. http://www.environmentaldefense.org.

Dennis, Kingsley, and John Urry. 2009. *After the Car*. Cambridge; Malden, MA: Polity.

Denoël, Mathieu, Marion Bichot, Gentile Francesco Ficetola, Johann Delcourt, Marc Ylieff, Patrick Kestemont, and Pascal Poncin. 2010. "Cumulative Effects of Road de-Icing Salt on Amphibian Behavior." *Aquatic Toxicology* 99 (2) (August 15): 275–280.

Dregni , Dregni, Jonathan.,, Eric. 2006. *Follies of Science: 20th Century Visions of Our Fantastic Future*. Denver, CO: Speck Press.

Dryzek, John S. 2013. *The Politics of the Earth: Environmental Discourses*. Oxford: Oxford University Press.

Duany, Andres, Jeff Speck, and Mike Lydon. 2010. *The Smart Growth Manual*. New York: McGraw-Hill.

Emirbayer, Mustafa, and Ann Mische. 1998. "What Is Agency?" *American Journal of Sociology* 103 (4): 962–1023.

Environment Canada, and Health Canada. 2001. "Priority Substances List Assessment Report: Road Salts." http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/road_salt_sels_voirie/road_salt_sels_voirie-eng.pdf.

Epstein, Paul R, and Jesse Selber. 2000. *Oil: A Life Cycle Analysis of Its Health and Environmental Impacts*. Boston, MA: The Center for Health and the Global Environment, Harvard Medical School.

Eyerman, Ron. 1999. "Moving Culture." In *Spaces of Culture: City, Nation, World*, edited by Mike Featherstone and Scott Lash, 116–137. London: SAGE.

Featherstone, M. 2004. "Automobilities An Introduction." *Theory, Culture & Society* 21 (4-5) (October 1): 1–24.

Federal Highway Administration. 2008. "Wildlife-Vehicle Collision Reduction Study." http://www.fhwa.dot.gov/publications/research/safety/08034/08034.pdf.

Federal Transit Administration. 1999. "Building Livable Communities with Transit". Washington, D.C. http://safety.fhwa.dot.gov/ped_bike/docs/livable.pdf.

Felicetti, Andrea. 2013. "Localism and the Transition Movement." *Policy Studies* 34 (5-6) (November): 559–574.

Feola, Giuseppe, and Richard Nunes. 2014. "Success and Failure of Grassroots Innovations for Addressing Climate Change: The Case of the Transition Movement." *Global Environmental Change* 24 (January): 232–250.

Flaherty, Michael, and Gary A Fine. 2001. "Present, Past, and Future: Conjugating George Herbert Mead's Perspective on Time." *Time & Society* 10 (2/3): 147–161.

Forman, Richard T T, and Lauren E Alexander. 1998. "Roads and Their Major Ecological Effects." *Annual Review of Ecology and Systematics* 29 (January 1): 207–C2.

Foucault, Michel, and Alan Sheridan. 2006. *Discipline and Punish: The Birth of the Prison*. New York: Vintage Books.

Freeman-Moir, John. 2011. "Crafting Experience: William Morris , John Dewey , and Utopia and Utopia." *Utopian Studies* 22 (2): 202–232.

Freund, Peter E S, and George T Martin. 1993. *The Ecology of the Automobile*. Montréal; New York: Black Rose Books.

Friedman, Thomas L. 2008. *Hot, Flat, and Crowded: Why We Need a Green Revolution, and How It Can Renew America*. New York: Farrar, Straus and Giroux.

Fuglestvedt, Jan, Terje Berntsen, Gunnar Myhre, Kristin Rypdal, and Ragnhild Bieltvedt Skeie. 2008. "Climate Forcing from the Transport Sectors." *Proceedings of the National Academy of Sciences of the United States of America* 105 (2) (January 15): 454–8..

Garforth, Lisa. 2005. "Green Utopias: Beyond Apocalypse , Progress , and Pastoral." *Utopian Studies* 16 (3): 393–427.

Gautier, Catherine. 2008. *Oil, Water and Climate: An Introduction*. New York, NY: Cambridge University Press.

Giddens, Anthony. 1979. *Central Problems in Social Theory: Action, Structure, and Contradiction in Social Analysis*. Berkeley: University of California Press.

Giddens, Anthony. 1990. *The Consequences of Modernity*. Stanford, Calif.: Stanford University Press.

Gilbert, Richard, and Anthony Perl. 2010. "Transportation in the Post-Carbon World." In *The Post Carbon Reader: Managing the 21st Century's Sustainability Crises*. Healdsburg, Calif.; Santa Rosa, Calif.; Berkeley, Calif.: Watershed Media; Post Carbon Institute; Distributed by the University of California Press.

Ginley, DM. 1994. "Material Flows in the Transport Industry: An Example of Industrial Metabolism." *Resources Policy* 20 (3): 169–181.

Goodman, Donna. 2008. *A History of the Future*. New York: Monacelli Press.

Goodwin, Katherine J. 2010. "Reconstructing Automobility: The Making and Breaking of Modern Transportation." *Global Environmental Politics* 10 (4): 54–58. http://www.mitpressjournals.org/doi/pdf/10.1162/GLEP_a_00031.

Greene, Gregory. 2004. *The End of Suburbia: Oil Depletion and the Collapse of the American Dream*. Toronto: Electric Wallpaper Co.

Greenhut, Steven. 2006. "New Urbanism: Same Old Social Engineering." *The Freeman*, April. http://www.fee.org/the_freeman/issue/april-2006.

Hajer, Maarten A. 1995. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Clarendon Press.

Handy, Susan, Robert G. Paterson, and Kent S. Butler. 2003. *Planning for Street Connectivity: Getting from Here to There*. Chicago, IL: American Planning Association, Planning Advisory Service.

Heinberg, Richard. 2003. *The Party's Over: Oil, War and the Fate of Industrial Societies*. Gabriola, BC: New Society Publishers.

Hopkins, Rob. 2008. *The Transition Handbook: From Oil Dependency to Local Resilience*. Totnes [England]: Green.

Hopkins, Rob. 2011. *The Transition Companion: Making Your Community More Resilient in Uncertain Times*. White River Junction, VT: Chelsea Green Pub.

Husain, Tahir. 1995. *Kuwaiti Oil Fires: Regional Environmental Perspectives*. Oxford: Pergamon.

Illich, Ivan. 1974. *Energy and Equity*. New York: Harper & Row.

Inayatullah, Naeem, and David L. Blaney. 2004. *International Relations and the Problem of Difference*. New York: Routledge.

Institute of Transportation Engineers. 2006. *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*. Washington, DC: Institute of Transportation Engineers.

International Crisis Group. 2012. "Iraq and the Kurds: The High-Stakes Hydrocarbons Gambit." http://www.crisisgroup.org/~/media/Files/Middle East North Africa/Iraq Syria Lebanon/Iraq/120-iraq-and-the-kurds-the-high-stakes-hydrocarbons-gambit.pdf.

International Energy Agency. 2010. *World Energy Outlook*. Paris: International Energy Agency.

International Energy Agency. 2013. "CO2 Emissions from Fuel Combustion". International Energy Agency. http://www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2013.pdf.

Ivey, Mike. 2011. "New Opportunities for New Urbanism?" *The Capital Times*, June 1.

Jackson, Kenneth T. 1985. *Crabgrass Frontier: The Suburbanization of America*. New York: Oxford University Press.

Jackson, Patrick Thaddeus. 2011. "Talking About the Future." http://kittenboo.com/blog/2011/02/08/talking-about-the-future-slides.

Jacobs, Jane. 1961. *The Death and Life of Great American Cities*. New York: Random House.

Jaffe, Amy Myers, and Keily Miller. 2012. "The Spoils of Oil." *The Majalla*, May.

Jameson, Fredric. 2005. *Archaeologies of the Future: The Desire Called Utopia and Other Science Fictions*. New York: Verso.

Jasanoff, Sheila. 2004. *States of Knowledge: The Co-Production of Science and Social Order*. London; New York: Routledge.

Jasper, James M. 2002. *Restless Nation: Starting over in America*. Chicago, Ill.; London: University of Chicago Press.

Jendrysik, Mark S. 2011. "Back to the Garden: New Visions of Posthuman Futures." *Utopian Studies* 22 (1): 34–51.

Joas, Hans. 1996. *The Creativity of Action*. Chicago, Ill.: University of Chicago Press.

Katz, Jack. 1999. *How Emotions Work*. Chicago: University of Chicago Press.

Kay, Jane Holtz. 1997. *Asphalt Nation: How the Automobile Took over America, and How We Can Take It Back*. New York: Crown Publishers.

Keats, John. 1956. *The Crack in the Picture Window*. New York: Ballantine Books.

Kern, Stephen. 1983. *The Culture of Time and Space 1880-1918*. Cambridge, Mass.: Harvard University Press.

Killingsworth, M. Jimmie, and Jacqueline S. Palmer. 1996. "Millennial Ecology: The Apocalyptic Narrative from Silent Spring to Global Warming." In *Green Culture: Environmental Rhetoric in Contemporary America*, edited by Carl George Herndl and Stuart C. Brown. Madison, Wis.: University of Wisconsin Press.

Kingdon, John W. 2003. *Agendas, Alternatives, and Public Policies*. New York, NY: Longman.

Kinsale Further Education College. 2005. "Kinsale 2021: An Energy Descent Action Plan". Kinsale. http://transitionculture.org/wp-content/uploads/KinsaleEnergyDescentActionPlan.pdf.

Knox, E G, and E A Gilman. 1998. "Migration Patterns of Children with Cancer in Britain." *Journal of Epidemiology and Community Health* 52 (11): 716–726.

Koonin, Steven E. 2011. "Department of Energy's Quadrennial Technology Review." Senate Committee on Energy and Natural Resources. November 15. http://www.energy.senate.gov/public/index.cfm/hearings-and-business-meetings?ID=a5329a86-3dcc-4ca7-86e8-e62fabd3ef91

Koselleck, Reinhart. 1985. *Futures Past: On the Semantics of Historical Time*. Cambridge, Mass.: MIT Press.

Koshar, R. 2004. "Cars and Nations Anglo-German Perspectives on Automobility between the World Wars." *Theory, Culture & Society* 21 (4-5) (October 1): 121–144.

Kumar, Krishan. 1987. *Utopia and Anti-Utopia in Modern Times*. Oxford, UK; New York, NY, USA: Blackwell.

Kumar, Krishan. 1991. *Utopianism*. Minneapolis: University of Minnesota Press.

Lakoff, George. 1990. *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind.* Chicago: University of Chicago Press.

Lash, Scott, and John Urry. 1994. *Economies of Signs and Space*. London; Thousand Oaks, Calif.: Sage.

Latimer, Joanna, and Rolland Munro. 2006. "Driving the Social." *The Sociological Review* 54 (September 18): 32–53.

Latour, Bruno. 1993. *We Have Never Been Modern*. Cambridge, Mass.: Harvard University Press.

Luhmann, N. 1976. "The Future Cannot Begin: Temporal Structures in Modern Society." *Social Research* 43 (1): 130–152.

Lutz, Catherine, and Anne Lutz Fernandez. 2010. *Carjacked: The Culture of the Automobile and Its Effect on Our Lives*. New York: Palgrave Macmillan.

MacIntyre, Alasdair C. 1984. *After Virtue: A Study in Moral Theory*. Notre Dame, Ind.: University of Notre Dame Press.

MacKenzie, EJ, S Shapiro, and JN Eastham. 1985. "The Abbreviated Injury Scale and Injury Severity Score: Levels of Inter-and Intrarater Reliability." *Medical Care* 23 (6): 823–835. http://www.ncbi.nlm.nih.gov/pubmed/3925257.

Maclean, Heather L, and Lester B. Lave. 1998. "A Life-Cycle Model of an Automobile." *Environmental Science & Technology* (July): 322–330.

McCarthy, Tom. 2007. *Auto Mania: Cars, Consumers, and the Environment*. New Haven: Yale University Press.

McLoughlin, William Gerald. 1978. *Revivals, Awakenings, and Reform: An Essay on Religion and Social Change in America, 1607-1977*. Chicago: University of Chicago Press.

Michael, Mike. 2001. "The Invisible Car: The Cultural Purification of Road Rage." In *Car Cultures*, edited by Daniel Miller. Oxford: Berg.

Miller, Daniel. 2001. "Driven Societies." In *Car Cultures*, edited by Daniel Miller. Oxford: Berg.

Milliken, J. 1999. "The Study of Discourse in International Relations: A Critique of Research and Methods." *European Journal of International Relations* 5 (2) (June 1): 225–254.

Mulligan, Shane. 2010. "World Energy, Environment, and Security: Critical Links in a Post-Peak World." *Global Environmental Politics* 10 (4): 79–100.

Mumford, Lewis. 1961. *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace & World.

National Highway Traffic Safety Administration. 2012. "Traffic Safety Facts". Washington, D.C.

National Research Council. 2013. *Review of the Research Program of the U.S. DRIVE Partnership: Fourth Report*. Washington, D.C.: National Academies Press.

Nijkamp, Peter, Sytze A. Rienstra, and Japp M. Vleugel. 1997. *Transportation Planning and the Future*. New York: J. Wiley.

Nisbet, Robert A. 1980. *History of the Idea of Progress*. New York: Basic Books.

Nordhaus, Ted, and Michael Shellenberger. 2007. *Break through: From the Death of Environmentalism to the Politics of Possibility*. Boston: Houghton Mifflin.

Novotny, Eric V, Dan Murphy, and Heinz G Stefan. 2008. "Increase of Urban Lake Salinity by Road Deicing Salt." *Science of The Total Environment* 406 (1–2) (November 15): 131–144.

Oak Ridge National Laboratory. 2010. *Report on the Transportation Combustion Engine Efficiency Colloquium Held at USCAR , March 3-4, 2010*. Oak Ridge, TN: Oak Ridge National Laboratory.

Ogden, JM, RH Williams, and ED Larson. 2004. "Societal Lifecycle Costs of Cars with Alternative Fuels/engines." *Energy Policy* 32 (1): 7–27.

Oil Spill Intelligence Report. 2007. "Exxon Valdez Spill Anniversary Marked." *Oil Spill Intelligence Report* 30 (14) (March 29): 1–3.

Owen, David. 2009. *Green Metropolis: Why Living Smaller, Living Closer, and Driving Less Are Keys to Sustainability*. New York: Riverhead Books.

Partnership for Sustainable Communities. 2014. "About Us." Accessed July 17, 2014. http://www.sustainablecommunities.gov/aboutUs.html.

Paterson, Matthew. 2007. *Automobile Politics: Ecology and Cultural Political Economy*. Cambridge; New York: Cambridge University Press.

Paul, Michael J, and Judy L Meyer. 2001. "Streams in the Urban Landscape." *Annual Review of Ecology and Systematics* 32 (1): 333–365.

Portland Peak Oil Task Force. 2007. "Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas." http://www.portlandonline.com/shared/cfm/image.cfm?id=145732.

President's Council of Advisors on Science and Technology. 2010. "Report To The President On Accelerating The Pace Of Change In Energy Technologies Through An Integrated Federal Energy Policy." http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-energy-tech-report.pdf.

Princen, Thomas. 2005. *The Logic of Sufficiency*. Cambridge, MA: MIT Press.

Princen, Thomas. 2010. *Treading Softly: Paths to Ecological Order*. Cambridge, Mass.: MIT Press.

Pulles, Tinus, and Hongwei Yang. 2011. "GHG Emission Estimates for Road Transport in National GHG Inventories." *Climate Policy* 11 (2) (March): 944–957.

Putnam, Robert D. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.

Quilley, Stephen. 2011. "Resilience Through Relocalization: Ecocultures of Transition? Transition to a Post-Carbon, Post-Consumer Society: New, Traditional and Alternative Ways of Living in the 'Adjacent Possible'". Ecocultures Working Paper 2012-1. http://www.ecocultures.org/2012/02/resilience-through-relocalisation- ecocultures-of-transition.

Rabinow, Paul. 1995. *French Modern: Norms and Forms of the Social Environment*. Chicago: University of Chicago Press.

Rajan, Sudhir Chella. 2006. "Automobility and the Liberal Disposition." *The Sociological Review* 54 (September 18): 113–129.

Read, Kathleen M., Joseph A. Kufera, Patricia C. Dischinger, Timothy J. Kerns, Shiu M. Ho, Andrew R. Burgess, and Cynthia A. Burch. 2004. "Life-Altering Outcomes after Lower Extremity Injury Sustained in Motor Vehicle Crashes." *The Journal of Trauma and Acute Care Surgery* 57 (4): 815–823.

Reese, Katherine. Forthcoming. "Traffic Light." In *Making Things International*, edited by Mark Salter. Minneapolis: University of Minnesota Press.

Ribeiro, Kahn, S Kobayashi, M Beuthe, J Gasca, D Greene, D S Lee, Y Muromachi, et al. 2007. "Transport and Its Infrastructure." In *Climate Change 2007: Mitigation of Climate Change*, edited by Bert Metz. Cambridge: Cambridge University Press.

Ricoeur, Paul. 1991. *From Text to Action*. Evanston, Ill: Northwestern University Press.

Rigby, Kate. 2012. "Utopianism, Dystopianism and Ecological Thought." In *Utopia: Social Theory and the Future*, edited by Michael Hviid Jacobsen and Keith Tester, 141–160. Farnham; Burlington, VT.: Ashgate.

Roberts, Paul. 2004. *The End of Oil: On the Edge of a Perilous New World*. Boston: Houghton Mifflin.

Ross, Michael. 2012. *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations*. Princeton, NJ: Princeton University Press.

Said, Edward W. 1979. *Orientalism*. New York: Vintage Books.

Said, Edward W. 1988. *The World, the Text, and the Critic*. London: Vintage.

San Francisco Peak Oil Preparedness Task Force. 2009. "Report of the San Francisco Peak Oil Preparedness Task Force."

Sands, Derek. 2011. "Koonin, Who Recast DOE's Tech Mission, to Return to Private Sector, Academia." *Inside Energy*, November 14.

Schnapp, Jeffrey T. 1999. "Crash (Speed as Engine of Individuation)" 1: 1–39.

Schutz, Alfred, H. L. van Breda, Maurice Natanson, Arvid Brodersen, Ilse Schutz, Aron. Gurwitsch, Helmut R. Wagner, George. Psathas, Lester E. Embree, and Michael D. Barber. 1962. *Collected Papers*. The Hague: Martinus Nijhoff.

Scott, James C. 1998. *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven: Yale University Press.

Shaffer, Brenda, and Taleh Ziyadov. 2012. *Beyond the Resource Curse*. University of Pennsylvania Press.

Sheller, Mimi. 2004. "Automotive Emotions Feeling the Car." *Theory, Culture & Society* 21 (4-5) (October 1): 221–242.

Sheller, Mimi, and John Urry. 2000. "The City and the Car." *International Journal of Urban and Regional Research* 24 (4): 737.

Simons, Derek. 2009. "Bad Impressions: The Will to Concrete and the Projectile Economy of Cities." In *Car Troubles: Critical Studies of Automobility and Auto-Mobility*, edited by Jim Conley and Arlene Tigar McLaren. Farnham: Ashgate.

Smart Growth Network, International City/County Management Association, and U.S. Environmental Protection Agency. 2002. *Getting to Smart Growth: 100 Policies for Implementation*. *Development*. Washington, D.C.: Smart Growth Network. http://www.smartgrowth.org/pdf/gettosg.pdf.

Smart Growth Network. 2014. "Smart Growth Network." Accessed July 17. http://www.smartgrowth.org/network.php#partners.

Smith, KK. 2000. "Mere Nostalgia: Notes on a Progressive Paratheory." *Rhetoric & Public Affairs* 3 (4): 505–527. doi:10.1353/rap.2000.0019.

Sperling, Daniel, and Deborah Gordon. 2010. *Two Billion Cars: Driving toward Sustainability*. New York; Oxford: Oxford University Press.

Tamminen, Terry. 2006. *Lives per Gallon: The True Cost of Our Oil Addiction*. Washington, DC: Island Press.

Talen, Emily. 2002. "The Social Goals of New Urbanism." *Housing Policy Debate* 13 (1) (January): 165–188.

Tansel, B. 1999. "Automotive Wastes." *Water Environment Research* 71 (5): 785–794.

Thacker, Andrew. 2006. "Traffic, Gender, Modernism." *The Sociological Review* 54: 175–189.

Thrift, N. 2004. "Driving in the City." *Theory, Culture & Society* 21 (4-5) (October 1): 41–59.

Transition Forest Row. 2009. *Forest Row in Transition*. http://www.transitionforestrow.org.

Transition Network. 2013. "Where." http://www.transitionnetwork.org/where.

Transition Seattle. 2010. "The Transition Handbook Discussion Course."
http://www.transitionseattle.com/resources/discussion.

Transition United States. "The 2-Hour Energy Descent Action Plan: A Complete Guide to Doing
It Anywhere."
http://www.transitionus.org/sites/default/files/HowTo_OrganizeA2HourEDAP_v1.0.pdf.

Transition United States. "Action Handbook: Ideas for Transition Projects."
http://www.transitionus.org/sites/default/files/HowTo_ActionHandbook_v1 0.pdf.

Transition United States. "Governance Toolbox v2.0." http://transitionus.org/guides/governance-
toolkit.

Transition United States. 2011. "Transition Primer: A Guide to Becoming a Transition Town."
http://transitionus.org/sites/default/files/primer-us-v2.0.pdf.

Transition United States. 2012. "A Year in Review."
http://transitionus.org/sites/default/files/TUS-2012-AYearinReview.pdf.

Transition United States. 2013a. "Our Story." http://transitionus.org/our-story.

Transition United States. 2013b. "Official Transition Initiatives."
http://transitionus.org/initiatives-map.

Uherek, Elmar, Tomas Halenka, Jens Borken-Kleefeld, Yves Balkanski, Terje Berntsen, Carlos
Borrego, Michael Gauss, Peter Hoor, Katarzyna Juda-Rezler, and Jos Lelieveld. 2010.
"Transport Impacts on Atmosphere and Climate: Land Transport." *Atmospheric
Environment* 44 (37) (December): 4772–4816.

United Nations Population Division, Department of Economic and Social Affairs. 2011. *World
Population Prospects: The 2010 Revision*. New York: United Nations.

U.S. Coast Guard. 2010. "National Incident Commander's Report: MC252 Deepwater Horizon".
Washington, D.C.
http://www.nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-
1065NICReport/$File/Binder1.pdf.

U.S. Department of Energy. 2006. "Basic Research Needs for Clean and Efficient Combustion of
21st Century Transportation Fuels". Washington, D.C.: U.S. Department of Energy.
http://www.osti.gov/servlets/purl/935428-bbBji1/.

U.S. Department of Energy. 2009. "Advanced Combustion Engine R&D: Goals, Strategies, and
Top Accomplishments". Washington, D.C.

U.S. Department of Energy. 2010a. *Multi-Year Program Plan*. Washington, D.C.: U.S.
Department of Energy.

U.S. Department of Energy. 2010b. "Vehicle Technologies Program□: Goals, Strategies, and Top Accomplishments". Washington, D.C.: U.S. Department of Energy.

U.S. Department of Energy. 2011a. *Report on the First Quadrennial Technology Review*. Washington, D.C.: US Department of Energy.

U.S. Department of Energy. 2011b. "One Million Electric Vehicles By 2015: February 2011 Status Report". Washington, D.C. http://www1.eere.energy.gov/vehiclesandfuels/pdfs/1_million_electric_vehicles_rpt.pdf.

U.S. Department of Energy. 2012a. *Report on the First Quadrennial Technology Review: Technology Assessments*. Washington, D.C.: U.S. Department of Energy.

U.S. Department of Energy. 2012b. "FY 2013 Congressional Budget Request". Vol. 3. Washington, D.C. http://energy.gov/sites/prod/files/FY13Volume3_0.pdf.

U.S. Department of Energy. 2013a. "Workshop Report: Light-Duty Vehicles Technical Requirements and Gaps for Lightweight and Propulsion Materials". Washington, D.C. https://www1.eere.energy.gov/vehiclesandfuels/pdfs/wr_ldvehicles.pdf.

U.S. Department of Energy. 2014. "FY 2014 Congressional Budget Request". Vol. 3. Washington, D.C. http://energy.gov/sites/prod/files/2013/04/f0/Volume3_1.pdf.

U.S. Department of Transportation. 2010. "Livability in Transportation Guidebook". Washington, D.C. http://www.fhwa.dot.gov/livability/case_studies/guidebook/livabilitygb10.pdf.

U.S. Energy Information Administration. "International Energy Statistics." http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm.

U.S. Energy Information Administration. 2013. "Monthly Energy Review." December. http://www.eia.gov/totalenergy/data/monthly/archive/00351312.pdf.

U.S. Energy Information Administration. 2014. "How Much Coal, Natural Gas, or Petroleum Is Used to Generate a Kilowatthour of Electricity?" http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=2.

U.S. Environmental Protection Agency. 2003a. "Protecting Water Quality from Urban Runoff". Washington, D.C.: US Environmental Protection Agency.

U.S. Environmental Protection Agency. 2009. "Essential Smart Growth Fixes for Urban and Suburban Zoning Codes". Washington, D.C. http://www.epa.gov/dced/pdf/2009_essential_fixes.pdf.

U.S. Environmental Protection Agency. 2013. "Essential Smart Growth Fixes for Communities." http://www.epa.gov/smartgrowth/essential_fixes.htm.

U.S. Green Building Council. 2009. *Green Neighborhood Development: LEED Reference Guide for Neighborhood Development*. Washington, D.C.: U.S. Green Building Council. http://www.usgbc.org/resources/leed-neighborhood-development-v2009-current-version.

Urban Land Institute. 1994. *Transit-Oriented Design*. Washington, D.C.: Urban Land Institute.

Urry, John. 2004. "The 'System' of Automobility." *Theory, Culture & Society* 21 (4-5) (October 1): 25–39.

Urry, John. 2006. "Inhabiting the Car." *The Sociological Review*. http://onlinelibrary.wiley.com/doi/10.1111/j.1467-954X.2006.00635.x/full.

Urry, John. 2013. *Societies beyond Oil: Oil Dregs and Social Futures*. London; New York: Zed Books.

Vanderbilt, Tom. 2008. *Traffic: Why We Drive the Way We Do (and What It Says about Us)*. New York: Alfred A. Knopf.

Virilio, Paul. 1986. *Speed and Politics: An Essay on Dromology*. New York, NY, USA: Columbia University.

Walker, Brian, and David Salt. 2006. *Resilience Thinking: Sustaining Ecosystems and People in Changing World*. Washington, D.C.: Island Press.

Walzer, Michael. 1988. *The Company of Critics: Social Criticism and Political Commitment in the Twentieth Century*. New York: Basic Books.

Wang, Herman. 2011. "DOE Aims to Sell Lawmakers, Others on Need for Innovative R&D Programs." *Inside Energy*, July 25.

White House. 1998. "Clinton-Gore Livability Agenda: Building Livable Communities for Livability Agenda". Washington, D.C. http://clinton4.nara.gov/CEQ/011499.html.

Whitelegg, J. 1996. *Critical Mass: Transport, Environment and Society in the Twenty-First Century*. London; Chicago, Ill.: Pluto Press in association with WWF.

Whyte, William. 1958. *The Exploding Metropolis*. Garden City, N.Y.: Doubleday.

Wittgenstein, Ludwig, and G. E. M. Anscombe. 2001. *Philosophical Investigations: The German Text, with a Revised English Translation*. Oxford; Malden, Mass.: Blackwell.

Wollen, Peter. 2002. *Autopia: Cars and Culture*. London: Reaktion Books.

World Commission on Environment and Development. 1987. *Our Common Future*. Oxford; New York: Oxford University Press.

World Health Organization. 2009. *Global Status Report on Road Safety*. World Health Organization.

Ye, Lin, Sumedha Mandpe, and Peter B. Meyer. 2005. "What Is 'Smart Growth?'--Really?" *Journal of Planning Literature* 19 (3) (February 1): 301–315.

Yergin, Daniel. 2011. "There Will Be Oil." *The Wall Street Journal*, September 17. http://online.wsj.com/news/articles/SB10001424053111904060604576572552998674340.

Zolno, Ben. Nd. "Why Transition." http://www.transitionus.org/why-transition.