A Flaw In The Design: American Sprawl and Climate Change

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A Flaw In The Design:

American Sprawl and Climate Change

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Abstract:

The physical landscape of the United States has developed to a point that it has become detrimental to the health of its citizens and the natural environment. Designed around abundant fossil fuels, the sprawling panorama Americans call home has significantly contributed to the decline in global ecosystem services. Using historical precedence as a guide for the constant improvement of surrounding environs has led to the nation’s exorbitant resource use and beyond sustainable emissions rates required by the physical design of the man-made landscape. These mandates, embodied in a physical design, further reinforce isolation and contribute to the psychological denial about the effects a citizen’s daily actions have unto the global arena of climate change. Continuing a tradition of collective blindness due to the geographic and economic positioning of the country is no longer a desirable option. This paper explores the multifaceted ways in which the design of the communities and infrastructure in the United States has evolved historically and how contemporary environmental issues, most notably climate change, necessitate a move towards a design theory that respects the role ecology has on the further maintenance of a prosperous humanity.

Introduction:

The need to reduce the level of greenhouse gases (GHG) in our atmosphere is an environmental issue of global proportions. A majority scientific consensus has been reached indicating that the time frame for effective mitigation of climate change, due to this atmospheric imbalance, needs to occur within the next 5-10 years. The United States is one of the biggest producers of pollution and it is in the design of our physical landscape, encouraged by the government, society and industry that encourages the inefficient use of resources that further exacerbates this problem. Recent historical precedence has led us to a modern lifestyle that is quantitatively and morally unsustainable.

Exploring the way in which the United States landscape has developed since the arrival of the first settlers to present day will give context to how we have arrived at the current state of affairs. Conceptions of abundance and independence figured greatly into the growth patterns of populations into disparate areas throughout the countryside. A
further acceleration of this phenomenon was enhanced with the discovery of fossil fuels and the increased mobility brought about by the invention of the combustible engine.

The social dimensions of our problems with design become reinforced and embedded within the culture to a point where homogenous solutions are applied and accepted. The modern world has been explicitly removed from nature in every possible way from our food and energy systems and residential lodgings to the modes of transportation and consumption patterns. The lack of fundamental science literacy and continual political rhetoric in the United States creates debate instead of action. Mutual denial permeates society and individual minds as the facts present a threat to contemporary traditions.

The economic systems currently in place measures progress as a compartmentalized entity. These monetary systems are ultimately tied to the natural resources that provided the inputs that run the machine. Without proper mitigation of the circumstances caused by human actions will soon lead to a full economic collapse if the system continues to operate autonomously from the natural world.

A reintroduction of local agrarian economies and a scaling back of the global marketplace is needed if the human race wishes to prosper into further generations. The future will look something like the past but nothing resembling the present and it is all within our own power to decide which path to follow. The longer society procrastinates in mandating any necessary changes the more difficult the implementation and the less efficacious these adaptations will be.
Chapter 1: Background- The Science and Numbers

Climate Change is the most pressing environmental issue of our time. Over a century has passed since Swedish scientist, Svante Arrhenius, first posited that the concentration of carbon dioxide in the atmosphere has a subsequent effect on surface air temperatures. G.S. Callendar furthered this theory in the mid 20th century by discovering a historical warming trend when comparing global temperature records. In 1953 Roger Revelle and Hans E. Suess were the first scientists to link higher atmospheric CO₂ levels with human activities. Presently, as the focus of a multi-national group that interprets data and receives reports from thousands of scientists, the Intergovernmental Panel on Climate Change (IPCC) has essentially confirmed that human activity is changing the chemical composition of the Earth’s atmosphere. The lack of attention and action towards this matter from those parties most responsible is deplorable.

According to the United Nations commissioned IPCC reports, the level of confidence that the contribution of man-made GHG’s (mainly Carbon Dioxide (CO₂) and Methane (CH₄)) is the cause of global warming has shifted since the study began. The first report in 1990 stated that “The observed increase [in surface air temperatures] could be largely due to this natural variability”, and then in 2013 ‘it is extremely likely’ (95% confidence) that the increase in global mean temperatures is directly linked to anthropogenic actions.¹ This international team of scientists has compiled evidence that leaves little doubt as to the human influence on the natural ecosystems of the Earth. Critics point out the margin of error, after all there is a 5% chance the IPCC could be wrong. If a doctor diagnosed a patient, with a 95% certainty, as having a treatable form of cancer, how many people would reasonably roll the dice, not change any of their actions

and see how it plays itself out? This is the margin of error we are gambling with for our entire species.

In the past the IPCC has stayed strictly neutral by providing the information for nations to make informed decisions about their emissions policies and subsequent controls. For the first time in 2013 the IPCC has recommended specific policy changes, something they had shied away from in the past. It is due to the overwhelming evidence of the need for mitigation of this ongoing issue that compelled the consortium to address the lack of concerted action from all nations.

The scientific community has accepted the IPCC’s recommendation that atmospheric CO₂ levels, currently just above 400ppm (parts per million), should reach no higher than 450ppm. More progressively, another group of scientists lead by Bill McKibben and Dr. James Hansen are focused on reducing atmospheric CO2 to a pre-industrial level of 350ppm so as to provide a ‘livable planet’ for Earth’s inhabitants. This level is deemed to be the maximum allowable amount in order to maintain the balance of natural ecosystems on the planet that sustain life. Current global energy consumption trends (growing at a rate of just under 3% every year since 2000) have hastened carbon emissions to rise 40% above levels from 1990. In order to achieve the optimal level of atmospheric CO₂ concentration there would need to be an 80% reduction in carbon emissions below 1990 levels. A goal such as this requires nothing less than a profound shift in the structure of society. Even though carbon intensity (the amount of CO₂

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2 IPCC ‘summary for policy makers’ 2007
Newest IPCC report released March 31, 2014. Much more emphasis on need for immediate action.

3 IPCC. 4th Assessment Report, 2007:

4 www.350.org

released per given activity) has decreased through efficiency, when coupled with a growing affluent population the net effects are an increase in overall GHG discharge. In order to meet carbon reduction goals many nations are looking to other fossil fuels to supplement their energy needs. The low-hanging fruit of fossil fuels has been picked clean; newer forms of energy can be even more environmentally destructive. Lignite coal and bitumen oil provide less energy per unit and burn dirtier than traditional fossil fuels, but are the only options available for maintaining the status quo. Natural gas is a growing energy provider and although it is a cleaner burning fuel, and promoted by the Natural Gas Industry as ‘greener’⁶, the amount of CH₄ released during extraction has the effect of causing much more heat trapping consequences over CO₂. CH₄ represents only 9% of United States GHG emissions but its chemical properties in relation to atmospheric warming are 20 times greater than CO₂.⁷ This represents an almost doubling of the warming produced by CO₂ and should be heavily considered when making policy proposals. In other words as opposed to focusing strictly on CO₂ emission outputs any proper mitigation schemes should include all types of GHG’s as well as address the extraction and delivery processes.

Naturally occurring positive feedback loops within the Earth’s ecosystem have the effect of amplifying the human contribution to global warming. With a warmer climate, areas of regional permafrost are beginning to melt, releasing CH₄ into the atmosphere and creating a possible juggernaut of imbalance that humans will be unable to stop. The eventual effect of these increased levels is a rising of global temperatures caused by this variance in the biosphere. The United Nations Framework Convention on Climate

⁶ http://www.originalgreener.com/whynaturalgas/
Change (UNFCC) has an agreed upon temperature rise threshold of 2°C over pre-industrial levels before serious climatic effects will appear, global mean is currently at .08°C. There is a strong possibility that even a 2°C rise in global mean temperatures may be too high, and evidence suggests we are on our way to this number very soon.\(^9\) The results of a warmer climate are not readily apparent but are likely to include various problems from changes in the jet stream, flooding, increased likelihood of drought and even national security issues.\(^10\)

Rising sea levels is one of the more immediate and tangible consequences of a warmer planet. The oceans compromise two thirds of the Earth’s surface and as this water becomes warmer it expands, thus becoming larger in volume.\(^11\) This combined with the accelerating Arctic glacial melt\(^12\) (currently 60 years ahead of worst case scenario projections\(^13\)) is causing an unprecedented increase in sea levels. This and other circumstances may be irreversible as most concentrations of atmospheric CO\(_2\) linger one hundred plus years, with some 25% staying forever.\(^14\) CH\(_4\), however, dissipates over a 12-year period and could provide a noticeable impact on climate sensitivity if these emissions are brought down significantly. Although specific weather events cannot be directly correlated to climate change, their severity and overall recurrence rates will be

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\(^8\) [https://unfccc.int/focus/mitigation/items/7169.php](https://unfccc.int/focus/mitigation/items/7169.php)


\(^a\) 1.5°C rise over pre-industrial temperature poses significant risks to many unique and threatened systems including many biodiversity hotspots poses significant risks to many unique and threatened systems including many biodiversity hotspots\(^9\)

\(^10\) IPCC 5th assessment report


\(^12\) [http://climatecrock.files.wordpress.com/2013/05/seaicemodels.jpg](http://climatecrock.files.wordpress.com/2013/05/seaicemodels.jpg)


exacerbated. To decisively pinpoint any weather occurrence to climate change is a fools errand, but as ecosystems go the slightest variance can have unforeseen ripple effects.\textsuperscript{15}

These environmental consequences of climate change are felt disproportionately by the poorest of nations, and in an unfortunate irony, befall those peoples contributing least to the overall causes. A report issued by the United States Council on Foreign Relations accepts climate change and sees it as an impending threat to National Security.\textsuperscript{16} As other nations face the consequences of the US’s actions and continue to suffer it may be only a matter of time before resource conflicts between territories may arise. Climate change is known a threat multiplier, making already tenuous diplomatic relations further strained when added to other nation’s domestic issues of food and energy scarcity that result from a modified natural environment.

Certain facts repeat over and over, but for good reason as these exemplify a point that needs reiterating. The United States represents 4.5% of the total global population yet contributes 17% of CO\textsubscript{2} and 11.5 % of CH\textsubscript{4} to worldwide emissions.\textsuperscript{17} Per capita the US is currently the 12\textsuperscript{th} and 3\textsuperscript{rd} highest contributor to global CO\textsubscript{2} and CH\textsubscript{4} emissions, respectively. This does not take into account the aggregate emissions released by mined resources or goods manufactured overseas for our consumption as well as the consequent environmental costs of transporting these materials to our shores. According to the United Nations Framework Convention on Climate Change (UNFCCC) a reported reduction in emissions of 6% is in actuality an 11% increase when emissions inherent to

\textsuperscript{15}In a recent TED talk Dr. James Hansen directly stated that weather occurrences are, with high confidence, due to global warming. (13:18 in video). Caution should be used when referencing weather in terms of climate. In chapter 3 we will see the correlation between public opinion and weather events. http://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change

\textsuperscript{16}http://www.cfr.org/climate-change/climate-change-national-security/p14862

\textsuperscript{17}http://cdiac.ornl.gov/ - Carbon Dioxide Information Analysis Center
trade are taken into account. Either way the numbers are configured, The United States consumes what constitutes an unfair share of the world’s resources and produces above average pollution commensurate with its population (see Fig 1.1).

The facts on hand should represent a clear reason for a committed global agreement on climate mitigation; unfortunately ‘climate change’ has become a loaded term in the political arena. This combination of words, for those who do not accept it elicits a knee-jerk reaction from ‘deniers’ who recite propagated rhetoric that obscures reality and inhibits any move towards amending our current condition. There are even those who straddle the middle ground accepting the anthropogenic causes of

(Fig 1.1) source: http://burnanenergyjournal.com
global warming yet claim that the consequences may be beneficial to humankind. Any proposed climate initiatives should be ironclad agreements not subject to the whims of whichever controlling party or election cycle promises. Arguing about the validity of climate change is time wasted debating established fact instead of dealing with the issue at hand. Stewardship of our natural environment necessitates a change in the way we live. Aside from the possible impending environmental disaster of a globally collapsing ecosystem, a better life may not be the one that follows the path of history but rather forges ahead with a more equitable and moral conscientiousness.

With affluence comes a moral and social responsibility and it is time for the United States to set a new model of living that respects the global environment and its peoples. Given that our current societal structure is nothing but a construct in and of itself it is entirely possible for the United States to develop a new reality for others to aspire towards. The world we live in was planned, organized and built, if we are to move towards a society with significantly reduced GHG emissions and fossil fuel dependence plans must be set forth immediately in order to avoid sudden shifts in societal structure, order and well-being. If the United States is considered a world leader among nations it is inexcusable that an issue (controllable and man-made) that poses a threat to the continued viability of the human species should be ignored. Ideally any reduction of the anthropogenic influence on the atmospheric carbon load needs to be done unilaterally, although multilaterally would be a nice starting point. Thus far the United States has refused to ratify any international carbon reductions treaty, such as the Kyoto Protocol [1999] which set the stage for the failed Copenhagen meeting of nations [2009], this failure to act within a reasonable timeframe will likely prove to be an historically missed
opportunity from future generations. The next international meeting for a proposed global climate initiative in Paris, 2015 will be a turning point whichever way the talks end.

With all the resources on hand the United States should take this challenge to become a leader in promoting a change that is ultimately necessary for the continued prosperity of humankind. If there is no planning for the future then when the check comes due the catastrophe could thrust the world into an epoch of unending misery. What can be done to slow the process set in motion since the discovery of fossil fuels over 150 years ago? It is going to necessitate an unprecedented need for psychological changes and basic contemporary societal structures, from a leveling down of the earth’s population to concerted maintenance of resources and shifting of economies to a more locally based composition. Not to place all the blame on the US, as there are a handful of other nations with worse total and per capita GHG emissions, but it is our model of living that has been idealized and replicated across borders with wasteful results. If emissions need to be reduced the proper (and slightly less painful) route would be through an easement into a far less carbon intensive economy.

The top three producers of GHG emissions in the United States are electricity, transportation and industry. These areas of production can be reconfigured through technology and efficiency planning to reduce their emissions outputs. These reductions alone will not be enough to meet the IPCC’s carbon reduction recommendations, due to the increasing demands from the population. A move to a carbon neutral society may be difficult but our nation has shown resilience in the face of crises before such as the wholesale restructuring of the manufacturing industry to accommodate the needs of

\[http://www.epa.gov/climatechange/ghgemissions/gases/co2.html\]

\[Tim Jackson. Prosperity Without Growth. Routledge 2011, p11\]
World War II. If we can break through the psychological barrier of complacence and see that this is a war for the immediate future perhaps the call to action will be heeded.

In an effort to move the discussion away from arguments about scientific fact, since this line of discussion seems to be getting us nowhere fast, we will also look at all the other positive gains for society that would develop in tandem with a less carbon intensive culture. A significant positive impact on living could be had through a marked reduction in carbon discharging activities and a more conscientious planning of our environs. Our physical geographic structure was established through the influence of government and industry that promoted the belief in individual freedom. It is this notion of independence that has stretched our resources and provided an excuse for all kinds of environmental and cultural degradation. A more comprehensive planning strategy to reverse the trends of the past 60 odd years will provide much more than a means to mitigate climate change effects, but will also transform the social, physical and mental health of the citizens of the United States. In economic terms the increased affluence of the US has resulted in diminishing returns. The country is so successful it is detrimental to the health of its citizens; about one-third of the US population is classified obese\(^20\) and automobile accidents are the number one cause of death for those ages 5-34.\(^{21}\) Our current state of isolation (as a consequence of the pioneer spirit and sense of independence) has resulted in a host of psychological problems as well, with the United States consuming 80% of the world’s pain medication\(^22\) and 15% of the country’s

\(^{20}\) http://www.cdc.gov/obesity/data/adult.html
\(^{21}\) http://www.cdc.gov/injury/overview/data.html
population on anti-depressant pharmaceuticals. Hence the above normal emissions discharged by Americans create a double edge effect of creating misery at home and abroad. These are all problems created by a design that was predicated on the existence of cheap fossil fuels. The discoverable amount of fossil fuels is rapidly declining and the newer extraction methods of harder to get to resources can be more environmentally degrading beyond emission counts, most notably on local water supplies and air quality. Digging further down for dirtier Lignite coal and positioning oil platforms way out in the oceans is an example of the desperate grasp of the old guard to keep the status quo chugging along. Following recent historical tenets as a guide for the continued use of fossil fuels appears to be the only way to continue the life-as-we-know-it paradigm. The move to a significantly reduced carbon based society can exemplify how planning for a more resilient future would benefit all.

Chapter 2: The U.S.A.’s Influence on Global Climate Change

The movement of peoples across the United States countryside from the first settlers to the present day follows a pathology based on the notion of independence. Early American settlements were based upon a sustainable agrarian model carried over from the Old World of Europe and initially followed (comparatively by today’s standards) an equitable distribution of land and resources. The rapid ecological changes that occurred first in New England from the time of early European exploration and into the eventual fixed landscape of the interior United States in the 19th Century was unprecedented in human history. The causes of this modified landscape were indebted to

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Old World economic ideals and notions of scarcity combined with a confluence of biological and social agendas that, once begun, became a force that could not be stopped.

There were essentially two types of newcomers who traveled across the ocean to the Americas, settlers and merchants, traveling in tandem and sponsored by various companies of their respective homelands. It was the limits of the Old World landscape, related to scarce commodities, which sent expeditions across the Atlantic. This truly was a New World that had been discovered and everything in site was viewed through the predetermined lens of the first settlers. It was with a cold precision that the merchant explorers described the resources that lay before them. An inventory list of tree types, for example, gives no indication any ecological link that may have existed or even what the landscape may have actually looked like. The pre-colonial records of the North American ecosystem are incomplete due to the significance given to what would eventually be deemed commodious resources by the Europeans.

The primary need of the settlers was survival, to find a way to thrive and gain wealth off these new lands was a distant luxury that an empty stomach could not afford. This lasted for a brief period though, as once the settlers had created their communities and learned to live within this new environment did their focus turn to the abundant resources all around them. To think of the extant features of a terrain as a resource is an idea of humans, it does not exist outside the utility that can be derived from any given raw material. These now quantifiable naturally derived resources are then at the mercy of the subjective whims of the ‘owner’.

To the Europeans the land of the Americas seemed incomprehensibly infinite, many accounts, even given their dubious subjectivity, were in complete awe of what they
saw, an inspired vision that would not be possible had it not been relative to what was previously experienced. For the Europeans, the surroundings that they left behind were of an Old World, a second-hand landscape with known limits versus the relatively virgin countryside of North America. This sheer abundance is itself what led to the waste, with short-term needs more than adequately met there was no need to conserve anything as one could just move onward into the limitless wild. A more prescient factor here is the labor and land equation. In Europe land was expensive and labor was cheap, the opposite held true for the New World. It was the scarcity of land in Europe that made it so valuable. Beyond New England there appeared to be no discernable end to the land and for this reason there was little need to conserve something so readily replaceable. This reversal of traditional land resource management contributed to the rapid decline of the land as a productive resource. Europe and its nations had existed for such a significant period of human history that it gave their populations insight as to the limits of the land in supporting exponential growth. Well before expeditions set out across the oceans England had enacted guidelines and protections amidst declining timber production. It is this scarcity in an economic system that lead to the controlled maintenance of a natural resource, not for the sake of the environment but ultimately for human needs.

Since the view of the land was now for acquisition of private wealth rather than for public need the ambiguous boundaries and de facto uses that had sustained the Native Americans for so many centuries were being torn apart through the ‘bounding of the land [with the] alienation of the land as a commodity, with important ecological

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New England’s move from subsistence to capitalism in between the 17th-19th centuries is a result of market demands; this motive for profit is pivotal in the negative environmental consequences brought upon by economic forces.

Land use was eventually transformed beyond subsistence through the European notion of fixity. There were limiting ecological factors raised through the partitioning of land, a semi-permanent permanence closely followed the land use patterns of Europe. A move away from agricultural villages into a sparse farm system was the consequence of the land division and ownership brought forth by a United States federal land survey. The Land Ordinance Act of 1785 neatly divided land west of Ohio, regardless of topography, into ordered six square-mile sections consisting of 640 acres. This grid system was a governmental regulation that further gave ‘physical expression to the powerful myth that only lone individuals mattered’. It is this very notion of independence that has become detrimental to the society as a whole that, as Tocqueville noted on a tour of America, ‘[independence] is at length absorbed in selfishness’.

Rather than lack of knowledge it was more so that the easier path to short term gains was through the disregard of Old World standards towards the maintenance of the natural landscape. Once land became viewed as a resource, one of almost endless supply, then there was be no need to conserve it. The colonialists believed that the land was being used to its fullest economic advantage, rather than being a giver of sustenance it was purely a tool to create wealth. This perceived limitless land mass combined with the

28 Alexis de Tocqueville. *Democracy in America*. 1831
creation of land as capital further exacerbated the ecological downward spiral of the land throughout the future United States.

With all the opportunities available for newcomers the population of the Americas exploded, especially pronounced in the northeastern industrial cities. In New York City alone the number of citizens quadrupled between 1821-1855\(^29\), a growth which created a density of humans living in close quarters as never before seen in any city on Earth. With ample land reserves the wealthy class retreated to the countryside to escape the chaos of urban living in a newly industrialized society. This model of residing in a rural setting outside the areas of commerce became the common ‘American Dream’. All the bucolic advantages of living in nature and conveniences of modern life seemed perfectly ideal. These early railroad suburbs were considered the ultimate expression of civilized living, and surely may have been for the two generations before the automobile came to dominate the landscape. It is this segregation of uses that eventually lead to modern day zoning codes, arcane and sometimes arbitrary guidelines that promoted expansive physical geographic growth using an unprecedented amount of natural resources to support it.

With the discovery of oil, an easy to obtain and energy dense fossil fuel, came the combustible engine and its subsequently unprecedented influence on the development of the American landscape. With the innovative assembly line production perfected at the dawn of the 20\(^{th}\) century by Henry Ford, the automobile came to symbolize a new form of sovereignty; mobility. This freedom of movement dispersed populations and has dictated land use development patterns ever since. This had profound psychological effects as well; it was an exhilarating means of physical self-determination that further extended the

\(^{29}\)http://physics.bu.edu/~redner/projects/population/cities/newyork.html
American frontier and ideas of independence. The rise of the automobile and the United States’ emergence as a world power after World War II positioned the suburban lifestyle within reach for the average middle-class American. Not only was this way of living now easily achievable, the government actively promoted it in concert with the various profiting industries that were tied to the expansive physical and economic growth of the nation. The government played a major role in influencing the development of modern society. Through Federal Housing Authority (FHA) loans and exceptional domestic economic growth (brought about through the global restructuring needed after the war) new parcels of land and a better life were advertised to returning soldiers. Traditional mortgages had a life span of 10 years with a significant down payment. The opening of longer term mortgages for new housing built on inexpensive expanses of land (with a lower population density than that of traditional cities) combined with the increased mobility afforded by automobiles became a personal choice that in economic terms was a no-brainer. The alternative was to reside in a pre-existing building, more likely to need repairs, in a denser urban environment. In most instances these buildings would be more costly to upgrade and maintain then a piece of the good life out in the country. Nothing for Americans exemplifies success like owning something shiny and new to boost social standing and perceived feelings of happiness.

The image of cities in the late 18th century was that of filthy living conditions which were unhealthy for the human body and mind. These became visually imbedded in the collective American psyche when reporter/photographer Jacob Riis documented these conditions of urban living in NYC’s tenements (see Fig 2.1).
Many cities legislated design mandates in order to make living conditions better for the populace. NYC introduced the Floor Area Ratio scheme to provide residents with more air and light in their domiciles. Unfortunately the public consensus on urban areas had been solidified, cities were dirty, industrial, crowded areas filled with crime and therefore undesirable places to live. The ‘white flight’ exodus in the mid 20th century only hastened the decline of the city. It is worth noting the racial divide that this change in living arrangements fostered. Caucasians were guaranteed in a wink-wink, nudge-nudge way that brown folks would not be residing in their new suburban communities.
Organizationally a process known as ‘redlining’\textsuperscript{30} was a systematic means of denying financing to people of color, regardless of their financial circumstances. During this time the torn fabric of cities existed only as a conduit of industry and commerce to be occupied by the poorer citizens (read: brown) amidst an ignored and crumbling infrastructure. The mid 20\textsuperscript{th} Century United States was fraught with racial tensions, which begat what can only be speculated. Was the ‘white flight’ out of the cities caused by racist attitudes, or did these ideas flourish out of the city as homogenous groups in their subsequent enclaves wanted to protect a new way of living? This fragmenting of society away from the city further exacerbated social inequality as urban centers were left as an afterthought and dumping ground for the upwardly mobile middle-class commuters. Purposeful or not racial segregation was built into the suburban landscape. As chief proponent and designer of highway systems in the greater New York area, Robert Moses limited overpasses on parkways at such a height as to prevent commercial traffic. Although some debate\textsuperscript{31} whether this limitation was set in place in order to prevent public transportation (overwhelmingly used by the poorer segments of society) in the form of buses, to reach the newly created enclaves of suburbia. This design element had the effect of racially segregating urban areas from the newer outlying communities.

In 1954 President Dwight Eisenhower, inspired by the Autobahn in Germany, appointed a commission to study the need to expand Americas highways system. The committee, which included chairman Lucius D. Clay (concurrently on the board of directors at General Motors), avidly endorsed the President’s agenda. The legislation of


the Interstate Highway Act of 1956 advanced the course of sprawling development further out from established communities. With 41,000 miles of new roads and subsidies for the improving (in actuality widening) of local roads the Federal government provided 90% of the funding with individual states picking up the remainder of the tab. No other piece of legislation since has so defined the landscape of America. Beyond the physical reconfiguration of the landscape were the subsequent social and cultural changes brought about by this newly assigned positioning of the populace, not to mention the degradation of the natural environment. This rapid pace of development had essentially skipped over the ways in which traditional communities had organically grown throughout human history.

Within 20 years the suburbanization that began in the late 1940’s had left once great cities in disarray. The result was a sprawling collection of communities dotting the American landscape further out into remote areas away from established urban centers. A broad design mandate was replicated throughout the country, as it was desirable and economically efficient. A now car dependent society emerged where individual movement through a combustible engine evolved from a luxury to a necessity. With the increased mobility of the American citizen, population centers dispersed and fragmented, away from the dirty urban centers and into the ‘wilderness’ of bucolic landscapes. In a short period of about 200 years humans had reshaped the countryside further pushing the boundaries of what could be considered progress.

Chapter 3: Contemporary Society and Ethical Obligations

How do individual actions factor into the global climate arena, and what is the moral imperative to change these behaviors? There is a deep psychological disconnect
wherein individuals may be susceptible to what is termed implicatory denial.\footnote{Kari Marie Norgaard. \textit{Climate of Denial}. MIT Press, 2011} It is not for lack of knowledge that there is nothing being done about climate change, it is the unknown consequences that will be brought about by mitigating these causes. If the notion of the self is derived through society then this type of denial instinctively causes a failure to act since it undermines the fundamental concept of reality.\footnote{Eviatar Zerubavel. \textit{Social Mindscapes}. Harvard University Press, 1999} Contemporary generations of humans live in a created world of artifice, to think of another way to live is deeply troubling and depressing. The human mind cannot get out of the rut of using the recent past as a gauge for what is normal; using historical precedence as a tool of measurement enables humankind to believe they are progressing towards a better goal. This could be why we continue to develop the majority of our infrastructure around an outdated and unsustainable model, one that further increases excessive consumption on all levels.

The Western conceptualization of climate change is inhibited two-fold; the impacts of daily actions on the environment are far away in both time and space. Immediate needs and short-term gains are, through evolution, hardwired into our species survival instincts. For the human mind to think of something so far into the future does not correlate to any physical stimuli, it is all conceptual and not what is happening to an individual, tangibly, in the present. Surveys on attitudes towards climate change indicate the primitiveness in which we perceive our surroundings. Opinions literally shift with the weather, according to a recent survey conducted by Yale Project on Climate Change Communication (YPCCC) the colder than average winter of 2013-14 across much of the US resulted in a 7% increase in respondents that don’t believe climate change is
happening (this brings the total of Americans who do not believe in Climate Change at all to 23%). This comes mere weeks after the IPCC’s most recent report in September 2013 that confirms the overwhelming scientific consensus on the matter. This ‘collective blindness’ combined with a lack of basic science literacy further puts the perceived and actual threat out of mind. According to the YPCCC only 42% of Americans believe correctly that there is a majority scientific consensus on climate change, the other 58% still see the issue as an ongoing debate with much uncertainty among scientists. The Untied States population has a 97% awareness of climate change yet just shy of 50% believe is its caused by humans. Of those aware of this issue the current structure of society prevents any formative action from occurring. Species respond to changes in the environment, in affluent countries those multi-generationally removed from the effects of even normal weather patterns are ultimately disconnected from the need for concern. The lack of immediate physical evidence of the effects of climate change further widens the mental gap of issue salience since the contemporary effects are being felt in disparate locations far removed from our shores. Flooding and disappearing islands in the South Pacific are as far away from the melting Artic regions as are the climate controlled living rooms of the average American. All this comfort has lulled our nation into a dangerously ignorant complacency.

Acknowledgement of scientific conclusions about climate change scenarios leaves those with the most to lose with a feeling of vulnerability. It is in individual as well as

36 http://environment.yale.edu/climate-communication/files/Climate-Beliefs-April-2013.pdf
societal interest to agree upon a ‘collective maintenance of reality’.

The thought of losing all the modern amenities, be it gadgets in the kitchen or any other array of conspicuously consumable material goods, will cause stress and anxiety as this questions the whole notion of self. Such conveniences have become so ingrained into our daily activities that they become part of the collective who-we-are. Sigmund Freud introduced the idea of cathexis as related to objects, in which he noted an observed sense of mourning that humans may develop over the loss of a material good, or as the old aphorism goes ‘you don’t know what you got ‘til it’s gone’. This further leads to the ideas of novelty as related to consumption and the societal cues that reinforce these actions. Psychologists Philip Cushman posits that powerful social forces are at work to help fill the empty spaces the ego creates to maintain a life wherein there is a constant social comparison being played out in the minds of individuals.

Imagine a toddler getting a lollipop everyday, an unlimited amount whenever they want, then one day when that customary treat is no longer provided the result would surely be an epic tantrum. This is how modern day adults will react if their ‘treats’ are no longer available to them. Not to diminish the uses of technology in medicine, living conditions, physical safety and decreased mortality rate but a majority of material goods that are consumed in developed countries are in excess of what is necessary to live a prosperous existence. It would be as though once someone has tasted the collectively agreed upon good life anything less becomes an affront to personal liberties.

This strong sense of independence is also imbedded in the mentality of the nations leaders; former US President George H.W. Bush, during the Rio Earth Summit of 1992,

stated ‘the American way of life is non-negotiable’. In other words we as a nation will not change our actions no matter what the external consequences for the rest of the planet. Shortly after the attacks of September 11, 2001 amidst national mourning and upheaval George W. Bush appealed to Americans not to let the acts of terrorism create such fear as to stifle business to a point where ‘people don’t shop’. In essence a means of returning to normalcy in society would be through the collective identity of consumption. Our modern society has become so engendered to the idea of consumption that it is even considered the solution to our environmental issues. New goods have been introduced to the marketplace as ‘environmentally friendly’ and represent a growing industry in the economy. It is the resource intensive lifestyle that needs to be changed, not just which products are purchased.

The moral imperative to deal with the issue of how the contemporary way of living is affecting the rest of the globe must be addressed. The lack of action by the United States has impacts far beyond its own territories. As a world leader, other nations see the United States’ inaction on addressing climate change as providing an example to help further their own justification for sidestepping responsibility.

The structuring of our living environment has created an increasingly insular mindset amongst Americans. We are as removed from global events as we are from one another. A sprawling collection of houses, termed developments, does not a community make. In the constant competition to ‘keep up with the Jonses’ Americans work longer hours to keep up the façade of an accomplished life. With longer commutes, as roads become more congested and living quarters geographically becoming further dispersed,

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39 http://www.huffingtonpost.com/kelly-rigg/its-climate-change-that-t_b_1444167.html
neighbors do not know each other in the traditional sense of a community. A lack of trust in a locale makes individuals look increasingly inward for satisfaction. Our apathy is enforced by the design of our physical landscape. With low-density populations spread out over a wider area and a majority of all outside activity taking place in an automobile, how could it not be? Consequently there is also major lack of civil engagement in these dispersed neighborhoods, a majority of citizens do not even know their local representatives names, too caught upon with a created narrative for life, the larger world is out of context with their needs. This indifference coupled with a disillusionment of politics in general has created a society wherein the ‘American rates of participation in political parties and elections…are notoriously lower than their counterparts around the world’. With current communications technologies one can further escape into a land of preferred interests, innovations such as the Internet create only more reclusion. All these layers of removal from a truer reality make one less likely to have empathy for their fellow humans. USC Associate professor of Sociology Nina Eliasoph’s study of apathy in the United States reveals some uncomfortable results. An oft-cited reasoning for lack of civic engagement is that an event or policy has to hit ‘close-to-home’ in order for an individual to become involved in the political process. The author further purports that it takes an active conscious decision to avoid politics, as opposed to being merely ignorant of the issues.

Individuals feel that alone they cannot change the course of society. There is a sense of general hopelessness when it comes to something as enormously impacting as

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climate change. This emotion combined with frustration has the effect of reducing concern, as the public feels powerless in the face of climate change. It is only through both a concerted policy change and individual actions that a course towards a more equitable living situation can be achieved; one cannot be decoupled from the other. When groups of people come together they then become constituents, who in turn need to be pleased by the policy makers. It is a classic conundrum; the structure of society makes one feel politically alienated; yet the democratic process is no less than a composition of individuals. It is here that citizens must move beyond awareness and into a mutually shared consensus for action. With all the available information about the direct consequences of our activities it is difficult for this nation to ethically reconcile our deleterious conspicuous consumption habits.

Chapter 4: Inefficient Design and the Unsustainable Economy

Quite a bit of our current environmental problems and social ills can be attributed to the ineffective design of our physical landscape. These mandates are also bound to the current economic system, so we must address the issues in these terms as well.

Progress and improvement are linked together as an accepted means of measuring prosperity across societies. These ideas are difficult to measure quantitatively so the default has been to link the overall success of a nation with its GDP (Gross Domestic Product). Unfortunately all that a GDP measures is the exchange of goods and monies through the economy. There is no accounting for throughput, or environmental effects associated with the processes that comprise this measurement. It has been a long held consensus that a rising GDP and overall economic health are all that matters to society.

This notion has become increasingly dubious as a measure of success based on improvement. The common definition of improvement has a very malleable way of appearing across the American idiom. Early settlers were continuously ‘improving’ their land to the point of collapse. 45 One can argue that progress has been achieved though our comprehensive system of mobility provided by the network of highways and roads as being an improvement from the days of horse drawn carriages, but to what extent? As stated previously death rates from auto accidents are a leading cause of death for the youngest segment of our society. How do we reconcile progress with the effects of increased pollution from not just automobiles but the whole fossil fuel industrial complex? The WHO (World Health Organization) recently concluded that 1 out of 8 deaths globally could be linked to air pollution46. Progress on balance sheets does not correlate to progress for humanity. A case could be made that the human rights of all citizens of the planet has been compromised by destruction of our natural environment.

The sprawling landscape of America has made the growing income disparity a force of the market as well as design. With communities designed in a pattern of dispersal the cards have become stacked against those on the bottom. It now holds true that ‘the poorest fifth of American families pour more than 40% of their income into owning and maintain cars’. 47 With real estate prices out of step with wage increases of the past few decades some of the poorer members of society are left on the fringes. This is an issue of environmental injustice as well, since the economic inertia created by the built landscape

forces low-income residents to live in undesirable areas. Land values are relatively low in these districts, hence the increased likelihood of industries being located in close proximity to low-income residential properties and the subsequent discharge of their outputs. Economists deem these polluted outputs ‘externalities’, which in essence are detrimental environmental social costs put upon an unwitting populace.

The unsustainable design with which the United States’ physical landscape developed was in tandem with the very inexpensive fossil fuel source of oil. This source of energy was the primary driver in the development of scattered communities throughout the country. As a growing domestic and global population put strains on these resources that were once considered abundant, only then does the wastefulness becomes apparent. For every sprawling development built the amount of resources needed rises dramatically. Public infrastructure, including but not limited to, power lines, sewer pipes and roads have initial setup costs that double those in denser areas. These costs are amplified further along in time as well since the maintenance of more materials requires more labor and resources. The typical suburban household requires a public infrastructure cost of up to three times that of an urban building. Add to this the amounts of water wasted on maintaining lawns and the chemicals needed to keep them green, and we see the environmental costs as well. These areas of sprawl are not only environmentally unsustainable but economically as well since there exists a lower tax base to fund infrastructure costs since there are fewer households per municipality. An ultimately inefficient system has been set in concrete, which appropriately enough is the most carbon intensive building material used in construction.
As the number of households per acre decreases there is a direct correlation to the increased amount of GHG produced per household. One of the most obvious factors contributing to this increased pollution is the amount of automobile driving necessary in order to meet the needs of daily life. With zoning regulations that separate residential and commercial activities, there is no other option for a household to obtain its goods. All this driving has a direct and measurable environmental impact (Fig 4.1). Another component of this arrangement is the increased resources needed to maintain these homes. The average household size in the US increased from 1,000 Square Feet in the 1960’s to maxing out at 2,200 Square Feet in the early 2000’s. These larger households demand higher levels of energy for electricity and heating and general maintenance. With more space to keep lighted and warm, bigger lawns requiring a lion’s share of domestic water use, these structures are at odds with what society needs to fulfill its obligation towards environmental stewardship. Housing that is bigger and farther apart from each other creates the perfect formula for a marked increase in energy consumption levels which leads to a measurably larger ‘carbon footprint’.

Economic theory has it that increased efficiency helps stabilize resource use, when in fact it actually causes an increase in consumption habits. For example, a constant dilemma that faces highway transportation planners is to reduce congestion, traditional planning consensus has required the widening roads and increasing traffic lanes to meet this demand. This solution is short lived since the phenomenon of induced demand dictates that any gains in efficiency achieved fall away in time, as more drivers move further out with the justification of a shorter commute provided by these improved
As the above four maps indicate there is a correlation between density, automobile use and the GHG emissions per household directed by the built physical landscape. As Residential Population Density decreases away from the city center [C] the less likely an individual is to use (or have available) Public Transit [D] leading to an increase in Automobile Miles Driven per year [B] essentially doubling the GHG Emissions per Household [A] for those residing in less dense neighborhoods.

Map Source: http://htaindex.cnt.org/- Housing + Transportation Affordability Index
roadways. The same holds true with hybrid cars as the increase in the miles provided per gallon of gasoline gives an individual the economic reasoning to drive more.

The bottom line is that the costs of our design are unacceptably expensive and concurrent with negative environmental impacts. This is creating a different type of feedback loop since the economic costs of climate change are expected to rise with global temperatures. The International Energy Agency (IEA) estimates that it will cost $500 billion to the global economy for every year that climate change mitigation goes unaddressed. It has been estimated that climate change cost the US taxpayers $96 billion in 2012 alone. The longer we wait the more it is going to cost as well. Using the model set forth by Economist Tim Jackson, an immediate investment of $5 billion per year towards reducing carbon emissions in the United States will increase to $10 billion for every year these measures are put off. Driving the costs higher is the resource scarcity that occurs with the increasing affluence of the world’s population. If trends continue unabated the demand for energy is projected to grow 45% by the year 2030 which correlates to an 80% hike in carbon emissions (IEA). For the sake of future generations GDP must be decoupled from progress towards a new era that will contain the traditional economic growth that encourages long-term prosperity over short-term financial gains.

The global economy also effects local communities, as corporate interests move in to provide services at lower costs to the consumer this money is never re-invested back into the locality. These global entities have only the profits for shareholders in mind, as that is their stated goal and purpose. This is due to the need for immediate returns on investments that are a consequence of rapid economic growth. They move to the

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periphery of communities where land is less expensive and zoning regulations are more liberal.\textsuperscript{50} This siphoning away of local economic activities further degrades the community away from traditional modes of sustainable living.

\section*{Chapter 5: Prosperity and Transition}

In the most precautionary scenario a reduction of fossil fuel emissions on the order of 6\% per year is needed in order to stabilize the Earth’s climate. The longer we wait the more extreme the transition and the more difficult it will be to implement, as a business-as-usual scenario would necessitate a emissions reduction of 15\% year if begun in 2020. The urgency for change can no longer be put off into the future; emission reductions must be initiated immediately. The most recent IPCC Report (AR5) has given a window of 5-15 years for mitigation to achieve any results; otherwise climate change will become unstoppable due to inertia created by feedback loops. By the year 2050 the entire planet needs to reduce its carbon output by up to 70\% to stay below the 2\ºC threshold of warming. Considering that emissions have been rising an average of 2.5\% per year since 2000 and that low carbon energy will have to provide 60\% of energy production by mid-century, means the US will need to quadruple its sustainable energy yield in tandem with reducing consumption levels across the board. A difficult but not impossible task lies ahead with innovation, technology and resilience in greater supply than time; a ramping up in modifying our social and physical infrastructure is in order.

In order to comply with any emissions treaty that may (hopefully) be ratified in Paris 2015, there needs to be an accurate measurement of these goals. This means

\textsuperscript{50} Orr, David W. \textit{The Nature of Design}. Oxford University Press, 2002, 46.
wealthier nations can no longer outsource their pollution; any calculation of GHG emissions must take into account the aggregate from overseas production and transport. Secondly, we must not only measure outputs in order to skew the numbers in favor of claiming a reduction in emissions. As mentioned earlier the amount of CH₄ currently being released is only a fraction of CO₂ emissions but in effect may actually increase the amount of climate warming due to its chemical composition. The same for claiming that putting ethanol in our gas tanks has any benefit, it has been proven that these types of bio-fuels are actually a net-energy loser; more fossil fuel energy is put into processing these forms of cleaner energy than is received. The need for a unified true measurement system of all emissions needs to account for all these variations in order to maintain accountability.

FIG 4.2 Energy Use Coupled With Economic Growth
The policymakers in the United States can no longer claim ignorance. The release of the 3rd National Climate Assessment Report (NCAR) has just been released (May 2014), and the conclusions follow closely with those of recent IPCC findings. Among the recommendations that highlights the design implications and the need for engineers to heavily consider the sustainability of their projects in regards to the environment. The 2nd NCAR (2013) states: The American Society of Civil Engineers (ASCE) defines sustainability as a set of economic, environmental and social conditions in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality or the availability of natural, economic and social resources. Sustainable development is the application of these resources to enhance the safety, welfare, and quality of life for all of society.

Land use is ultimately tied with carbon and energy; it is only by changing the current demanded usage that we can meet the goals of significantly cutting back GHG emissions. It will take a concerted effort by government, industries and individual communities to affect a change. Increasing economic expansion based upon increasing consumption levels, is bound to increased energy use, it is impossible to have one without the other. (See Fig 4.2 previous page)

An example of forward thinking environmental policy in regards to design can be seen in the city of Portland, Oregon. While the rest of the country was increasing the amount of freeway space for vehicles and expanding outwardly Portland created a Urban Growth Boundary of development and was one of the first cities to introduce freeway removal. It is not as simple as tearing down a highway and then all is better, there needs to be a concerted effort in public transit development and urban renewal to go along with
re-intergrating communities that had asphalt laid will-nilly through their neighborhoods. The success of the design principles laid forth by Portland can be a great starting point for other cities to replicate. The results are a strong economy, greater public health and stronger sense of community lacking in the sprawl that has developed nationally over the past half a century.

On an individual level a significant portion of energy use should be correctly identified as energy waste. If every citizen was thoughtful of reducing their energy usage and consumption patterns then small gains would, in the aggregate, have a greater impact. When one becomes cognizant that their personal actions have larger consequences then behavioral changes may come forth. In some ways industry is leading the way on this front, the energy efficiency company OPower has reported an average 20% reduction in energy use with its innovative ‘Behavioral Energy Efficiency Program’ simply by showing customers how they can save money by reducing their energy use.\textsuperscript{51} The solution for the environmental resilience of our planet must move beyond technological efficiencies, it is just one part of the equation. Everything one does is whole or in part influenced by outside forces, whether known or unknown. As Edward Bernays, the pioneer of public relations who used psychology to develop advertising tactics, noted: ‘\textit{In almost every act of our daily lives... in our social conduct or our ethical thinking, we are dominated by the relatively small number of persons...who understand the mental processes and social patterns of the masses. It is they who pull the wires which control the public mind’.}\textsuperscript{52} Behavioral changes have been made in the past through subtle methods and must be used as a tool in furthering an environmentally positive agenda. The

\textsuperscript{51} \url{http://opower.com/solutions/energy-efficiency}
time for claiming that the rights for one trump those of the many is over. There should be
a limit to what are deemed ‘rights’ when these actions eventually have negative
consequences for the greater populace. It is a fine line that is rarely discussed in public
because it makes people feel uncomfortable but the reality of our actions will hit
everyone eventually. We should not rely solely on individuals though; there should be
structural accommodations in place to assist people to make these choices. Well-designed
neighborhoods that encourage walking and provide public transit options that are useful
are the basic tenets of a sustainable community.

Providing market-based solutions would have the unfortunate result of creating
more social inequality. This is why cap-and-trade and carbon tax is ultimately useless, it
does not change behaviors and can only increase inequality between and within nations
as one gets bloated on its largesse and the other scraps by and ruins its local
environments for the sake of money. It would also be difficult to justify a carbon tax on
individuals when certain segments of the population are wholly dependent upon the
systems already in place. Increasing the tax on gasoline, for example, burdens the poor
more so as the only transportation options available in certain places mandate the use of
an automobile. A cap-and-trade policy of mitigation is based on the assumption that
everything in our society can remain the same, we are still holding on to the vestiges of
an outdated model based on the historical precedence of inexpensive (both monetarily
and environmentally) fossil fuels. It is the design of how modern society is structured that
needs to change.

A congestion-pricing scenario is one of the tools municipalities have used to have
a marked impact on pollution. Changing behavior through economics is the quickest way
to have the biggest impact. When this policy was implemented in London there was an initial outcry, one that faded quickly once people adjusted to the new reality. Using this kind of system not only reduced emissions but also provided the funding for public transit needed within this new system. We cannot expect to reduce our emissions if we do not have an infrastructure in place to replace the traditional modes of mobility and living. If the government could provide alternatives this would ease the burden on the average citizen.

Most instances of new government regulations in environmental policies are met with an outcry that jobs will be lost. In essence these critics favor the economy over the environment, but it actually would not play out this way. An investment of $100 billion in ‘green’ technologies would provide 2 million new jobs whereas the same amount directed towards the oil industry would provide only 600,000 jobs.\(^{53}\) Relying too heavily on traditional wisdom is detrimental to society as a whole. The old guard is stuck in a perpetual loop of trying to maintain wealth as it was customarily created. Using criteria set forth by the United Nations Environment Programme’s (UNEP) Green Economy Initiative, economist Pavan Sukdhev has illustrated how investments in a ‘green’ infrastructure will eventually pour back into the economy.\(^{54}\) If the public sector thoughtfully invests in low-carbon infrastructures, environmental protection and energy security as a sort of ‘green’ stimulus package the benefits would follow. Natural ecosystem services already provide trillions of dollars towards the global economy; it would only make sense to protect these resources in the form of conservancy and effective usage. Introducing better connectivity and planning in public transit could

\(^{53}\) (PERI 2008 p10)(109)
further assist in reaching these goals. This shifting towards a stable economy is by no means in line with the status quo and is nothing short of a transformative change that will be necessary to continue a life worth living. A new era that will contain economic growth and that encourages long-term prosperity over short-term financial gains is the path to less carbon intensive society.

Elements of design can have significant impacts on the natural environment. As stated in chapter 3 the more dense an area the lower the GHG emissions per household. Retrofitting the current built landscape and its wasted space through the implementation of in-fill (see Fig 5.1) can help achieve the goals of drawing down the carbon intensity needed in our automobile-centric society. One need not confuse high density with crowding or even large cities, it is about more people living within a given area, whether it is a town of 10,000 or a city of 8 million.

Fig 5.1- the process of in-fill design as developed through a reconfiguration of zoning codes has enabled a higher density of persons per acre. Here in Vancouver, Canada localities have allowed the retrofitting of alleyways and garages to be converted to living space. This has the positive effect of reducing carbon intensity used by the larger infrastructure needs of a building further out as well as the automobile use (and subsequent emissions) these dispersed residences would require. (Diagram source: Charles Montgomery, Happy City)
The current economic system of infinite growth is at odds with what can be supported ecologically. There will be a need to have an established de-carbonized society by the end of this century; if there is no plan put in place the more difficult it will be when an abrupt shift occurs. The long-established wisdom of expanding economic growth that has guided our society is being challenged on many levels. A decoupling of economic growth from its throughput is possible if society makes the transition back to a locally based providence. A well thought out plan for comprehensive community development is part of a fundamental shift needed in society for the future viability of humans to prosper beyond material goods. A form of quantitative easing, such as the energy descent programs that are being initiated in communities around the world, can help to stave off the ‘pain’ of moving towards a less carbon intense lifestyle. Through these programs municipalities decrease their carbon energy usage by certain percentages every year in order to meet goals they have set. Here we are seeing action on a local level, one that engages citizens and provides a sense of responsibility towards the environment. There are a number of ‘Transition Towns’ throughout the United States who follow a model of decreasing fossil fuel use and bring back their local economies. This is the kind of direct action on a local level that can achieve results regardless of what international climate treaties remain unsigned.

There is no need to start from scratch; many universities and organizations have been laying the groundwork towards a different future. Stanford scientist Mark Jacobson has already presented a detailed plan for every state in the nation to move over to renewable energy sources.55 This and many other plans are ready to be implemented but first we need to overcome the psychological barriers to make these changes possible. Not

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55 [http://thesolutionsproject.org/infographic/](http://thesolutionsproject.org/infographic/)
to be confused with nostalgia or romanticism but society may need to scale back a bit on its ambitions. The foundations for traditional communities exist, if we could peel back the layers enforced by zoning codes and the era of cheap oil. The move towards a stable economy that takes into account ecological factors is a necessary one if America is to change its course towards a sustainable future.
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