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Pork, Place, and Planning

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Imagine two people, "Liz" and "Andre," sitting down for dinner in their favorite restaurant. The restaurant happens to be located in a charming older neighborhood in one of the nation's larger cities, but it could be almost anywhere.[1] "I really love this place," Liz says to Andre. "Yes," says Andre, "you can see signs of care and affection everywhere you look." Glancing around, they notice that many nearby people appear to be overweight, and this causes Andre to comment about a newspaper article he had recently read about the relationship between diet and health. Andre asks, "What are you going to have to eat?" "Maybe the pork dinner," Liz replies. "It's my favorite."

Imagine also agricultural producers in other parts of the world growing enormous amounts of corn, much of which is used to feed the hogs that become the pork that pleases consumers like Liz and Andre so much. Enormously productive and located a thousand or more miles away from Liz and Andre's charming neighborhood, these producers tell themselves and others that they are efficiently meeting market demand. As many people say in one of those highly productive areas, "Iowa feeds the world."

What ties consumers and producers in these two places together? The answer seems obvious: they are both embedded in a globalized market economy. But if one looks just a shade deeper one will find that they are also embedded in a complex web of relationships that are external to that economy.

It is this connection between pork consumers like Liz and Andre and agricultural producers—especially ones located in Iowa—that interests me. Are the globalized market economy and its associated web of "external" relationships enhancing long-term sustainability in the places of consumption, production, and the whole of which they are a part? If

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[1] Liz and Andre are a fictional couple who stand for the sixty-five percent of U.S. Americans who live in the nation's 100 largest metropolitan regions.

not, can greater awareness of the web of relationships be used to transform those places in a more sustainable direction?[2]

A fruitful way to begin mapping this web and envisioning how it might be transformed in the context of capitalist democracies is to consider what consumers like Liz and Andre are not thinking about while enjoying their pork dinner. As consumers they are not thinking about what economists call "negative externalities." Nor are they thinking about the variety of ways in which their places (and the negative externalities associated with pork consumption) are related to other places.

Consequently, I have three primary purposes in writing this paper. I seek first to put negative externalities in their place; that is, connect the spillovers of Liz and Andre's quite typical consumer behavior to contemporary urban theorizing concerning "space" and "place" in the emerging globalized "network society."[3] To explicate this connection and its implications for long-term sustainability, I will analyze Liz and Andre's remoteness from the costs of their food's production and transport in terms of "tenticular radiations," the "Environmental Kuznets Curve", and "ecological footprints." Second, I seek to document how consumer behavior in large U. S. metropolitan areas is linked to the industrialized agricultural system that produces corn-related products in the Midwest of the United States and distributes those products to distant markets, and to detail the complex ecology of effects associated with that agricultural system by using the Iowa River watershed in east-central Iowa as a paradigmatic example. And third, I will explore the merits of collaborative planning as a means of transforming the Iowa River watershed (and the larger systems of which it is a part) in a more sustainable direction.

Negative Externalities

In most respects Liz and Andre are typical food consumers: they like the fact that markets enable them to obtain a good pork dinner at a reasonable price. If they are like most other food consumers, they are also unaware of the extent to which these market prices reflect a significant market imperfection: they do not account for (internalize) the "negative externalities" associated with their food's production and transport, and

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[2] By asking these questions in relationship to "sustainability," I will be accepting the definition of sustainable development first offered by the World Commission on Environment and Development (better known as the Brundtland Commission) in 1987: "Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs (p. 263). I will also be assuming that sustainable places are ecologically healthy, economically vital, socially just, and guided by richly democratic practices (Beauregard, 2003; Throgmorton, 2003). Lastly, I will also be accepting urban planning scholar planning scholar Scott Campbell's (1996, 302) claim that "our sustainable future does not yet exist, either in reality or even in strategy. We do not yet know what it will look like; it is being socially constructed through a sustained period of conflict negotiation and resolution. This is a process of innovation, not of discovery and converting the nonbelievers."

[3] For an overview of these topics, see Albrecht and Mandelbaum (2005).

hence do not reflect the full costs of their pork dinner. (If, for example, Jim and Barbara suffer respiratory ailments as a result of living near a hog processing facility that emits harmful air pollutants, then they would be experiencing a negative externality of the market transaction between the pork producer and consumers.) Moreover, like most other food consumers Liz and Andre live in a large metropolitan region distantly removed from the sources of their food, and hence are quite unlikely to have any direct first-hand experience of their diets' environmental and social effects in other parts of the world. In the words of ecological anthropologist Laura Jackson (2008, 23), this distance creates for Liz, Andre, and other food consumers "the illusion of a limitless food supply devoid of ecological consequences."

In the context of capitalist democracies, the concept "negative externalities" is undeniably important. Because market prices do not include costs imposed on third parties, consumers like Liz and Andre demand more resources and produce more pollution than economists would consider optimal. If environmental economists are right, most environmental problems would wither away if we could simply "get the prices right"; that is, internalize those externalities into the prices of goods and services.

Although "getting the prices right" seems to be an eminently rational way of "internalizing negative externalities," actually getting them right presents a daunting challenge for policymakers in particular places. Public officials in the place where Liz and Andre live, for example, would not be able to "get the price of pork right" without putting their place's food producers and consumers in uncompetitive market positions relative to ones located in neighboring places, at least in the short run. If those officials imposed fees to ensure that prices reflected the true costs of pork production and transport, consumers like Liz and Andre would be likely to cross boundaries and purchase their pork dinners in nearby places that do not have such fees. Likewise, restaurant owners would have to sell their pork dinners at higher prices, and hence would be at a competitive disadvantage relative to producers who do not have to internalize the externalities.[4] Consequently, public officials who propose "internalizing" full costs into prices would be in serious trouble politically: they would be condemned for raising taxes and for increasing the costs of food to ordinary food consumers, especially low-to-moderate income ones. But until negative externalities are internalized in prices, consumers cannot account for the unpriced consequences of their choices. Worse perhaps, they might not even know that their choices are producing adverse effects. The political difficulties of internalizing negative externalities at the point of consumption are, therefore, formidable.

A further difficulty is that the concept "negative externalities" hides almost as much as it reveals. It implies that internalizing the monetizable physical and environmental costs of production and transport into the

[4] Capitalist markets require producers to be cost minimizers, which induces them to shift costs to others (i.e., to externalize costs). In this context, each producer would be at a competitive disadvantage if they did not externalize costs.

price of pork dinners (and other products) would make Liz and Andre's place more sustainable over the long run. As I will argue more thoroughly below, however, this limited understanding of negative externalities ignores or obscures social costs and the social justice component of sustainability; e.g., family disruptions associated with a product's production and transport.

Moreover, the concept—which simply indicates that costs are born by others outside the market exchange—presumes that it does not matter where the externalities are experienced, or who experiences them, and it transforms the relationship between consumer(s) and those who experience the negative externalities into merely a monetary one. Remarkably a-platial, the concept ignores the increasingly complex trans-place web of connections among environmental and social problems, and hence ignores the extent to which costs are shifted to other places and people. In brief, "internalizing negative externalities" into market prices is an important but insufficient ingredient for long-term sustainability.

If we want to help produce a more sustainable world in the context of a capitalist democracy, we need to alter the way urban food consumers such as Liz and Andre and food producers in distant agricultural areas relate to one another. This will require not just adjusting prices to internalize the negative externalities, but also enabling food consumers to become conscious of how their behavior affects distant places and the lives of people who live and work within them.

The Place of Negative Externalities

The charming older neighborhood in which my fictional couple is enjoying their pork dinner is one of the places upon which urban theorists have focused much attention. But, as geography scholar Tim Cresswell (2004) and others have observed, "place" is a slippery concept. When Liz says to Andre, "I really love this place," what does she mean? Answering this question will help us understand the web of relationships in which food producers and consumers are embedded.

To begin, place can loosely be defined as a space that people have made meaningful, a space to which people have become attached, a "space invested with meaning in the context of power" (Cresswell, p. 12). It has a geographic location, constitutes a material setting for social relations, and evokes a "sense of place" among its diverse users.

What then is "space"? According to Doreen Massey (2005), geography scholars have identified two competing ways of conceptualizing space. One is a world of separate bounded places (that is, a surface containing fixed, closed entities easily represented on a map), each of which has its own essentialized identity. Liz and Andre's charming older neighborhood might be a good example. The other is a world of flows, "a depthless horizontality of immediate connections" (Massey, 2005, p. 76) enabled by transportation and communication technologies and symbolized by the Internet. Massey rejects this dualistic way of conceiving space and argues instead that space can best be understood as

- "a meeting up of histories" (p. 4)

- "a simultaneity of stories-so-far" (p. 9)
- a "contemporaneous existence of a plurality of trajectories" (p. 12) in which "space unfolds as interaction" (p. 61).

In Massey's view, places can then be understood as "collections of those stories, articulations within the wider power-geometries of space" (p. 130); that is, as sites for the unfolding of "a power-geometry of intersecting trajectories" (p. 64). "[R]ather than being locations of coherence, [places] become the foci of the meeting [of potentially dissonant (or concordant) narratives]...and thus integral to the generation of novelty" (p. 71).

To comprehend a place as a site for the unfolding of a power-geometry of intersecting trajectories, one might begin by evoking the idea of home. The house in which Liz and Andre live had no meaning to them until they began inhabiting it, filling it with personal items, planting flowers in the garden, developing an emotional attachment to it, and transforming it into their home. So too they gradually began to inhabit their neighborhood: finding their favorite places to walk, discovering their favorite restaurant, seeing familiar faces, and looking for ways to improve it. Likewise—although with decreasing intimacy—they gradually began to inhabit the city and region in which they live. In this sense a place is where one can feel at home, where one can be oneself and live authentically.[5]

Thinking of a place as home often generates stories that elaborate on what we might call "the founders' tale" (Throgmorton, 2003). Such nostalgic tales typically focus on the families, institutions, and buildings that have long been familiar parts of the place. At their best such tales can help people inhabit places with care, affection, and a sense of belonging. But they can also be profoundly exclusionary. For instance, they often omit the people who live in the place for a few years and then move on. They disregard the multiple ways in which the place is (and has always been) connected with the external world. And they tend to gloss over the weird and the distasteful, the aspects of the place's history that old timers would like to forget. At the extreme, such stories presume a clear boundary between the place and its surroundings. Perhaps more important, they presume that the residents of the place share a common identity authentically rooted in history. In brief, such stories essentially claim, "this is our place" and around here "we" have always done things this way.

According to this "essentialist" way of thinking about platial identity, authentic places are under threat from a variety of forces, especially the homogenizing tendencies of global capital, mobile workers and tourists, and "dangerous outsiders." In response to this threat, some people celebrate the place's unique features and traditions as an act of resistance,

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[5] As Cresswell observes, however, feminist researchers have documented the many ways in which homes can be places of drudgery, abuse and neglect, and communities can stifle the spirit. Consequently they can also become sites of oppression and/or resistance to oppression.

whereas others strive to exclude or marginalize unwanted newcomers. Still others don't see a problem; they advertise the place's unique qualities as a way of attracting new visitors and investment. Contrary to the essentialist view, therefore, one can argue that the meaning of a place is never finished but always becoming; it is always being performed, reimagined, and produced in practical ways by the actually existing users of the place (Cresswell, 2004). Such performances are, however, always constrained by structures (material landscapes, laws, rules, cultural and social expectations) that users did not create.

In addition to thinking of a place as home, one can feel connected to a place in at least four other ways (see Figure 1). The five dimensions combine to form complex places and senses of place connection or, in Massey's terms, sites for the meeting up of "intersecting trajectories" (or "stories-so-far").

As has just been implied, the second type of connection relates to the fact that places have histories and are constantly changing. These changes superimpose upon the visible surface an unseen layer of usage, memory, and significance. Places can be saturated with a sense of the histories of previous inhabitants and

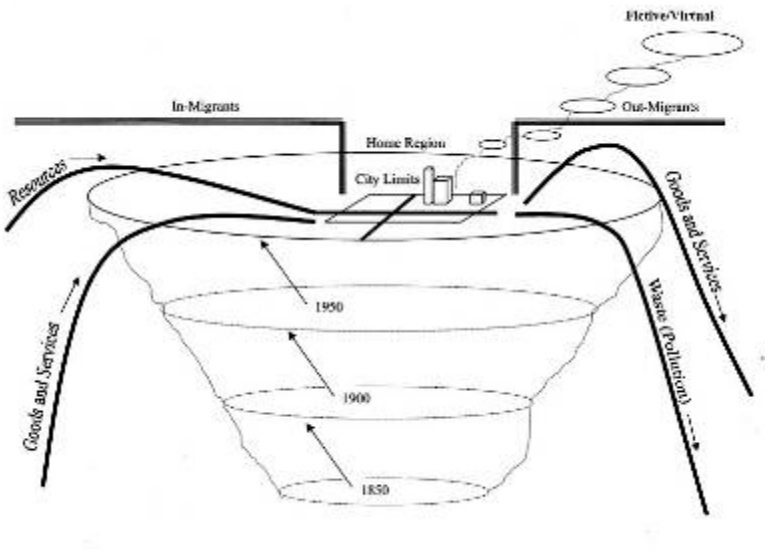

Figure 1. Five Dimensions of Place Connection

the events that have occurred in specific locations. If Liz and Andre have lived in their place for a long time, they are likely to be acutely conscious of that unseen layer of usage and memory. Even if they have not lived there for long, they will gradually become aware of the extent to which powerful emotions such as joy, anger, love, fear, and hope, circulate through the place via stories that people tell and the photographs they share. As these emotionally-resonant stories circulate, they help construct a psychogeographic "economy of spirit" that is at least as important as the economy of our pocketbooks (Coverly, 2006).

A third type of connection derives from the fact that people are constantly moving into or departing from places. Thus any one place

contains its residents' accumulated or composite memories of all places that have been significant to them over time. Having moved into their place from somewhere else, Liz and Andre would have brought with them memories of those other places and the pathways leading away from them.

Fourth, fictive or virtual (or cyber) places can also matter. In some cases, as with architectural renderings of a possible development, such imagined worlds can have direct and immediate effects on the physical features of a place. But even novels, poetry, sculpture, and scientifically-grounded projections and scenarios can exert a powerful influence on people both consciously and subconsciously and thereby affect expectations, hopes, fears, and choices about how people invest their time, energy, and resources in the here and now.

We can imagine, for example, that Liz and Andre might have seen Alfonso Cuaron's 2006 film Children of Men.[6] Set 18 years from now in the city of London, it portrays the collapse of society following a devastating flu pandemic. No children have been born since 2008, most governments have collapsed, technological innovation has ceased, there might have been a nuclear attack on Washington, and millions of illegal immigrant refugees have flooded into the United Kingdom seeking asylum. In fearful response, the U.K. has been transformed into a militarized police state, which terrorists resist. The lead character undertakes a heroic journey that leads him and the film's viewers from despair to hope. After seeing the film, Andre might express his worry to Liz: "Where might such a global pandemic emerge? Is there anything we can do to avoid it?" "Not to worry," Liz might respond. "It's only a movie. It has nothing to do with us. Let's have dinner."

Tenticular Radiations, the Environmental Kuznets Curve, and Environmental Footprints

Although each type of place connection is important, it is the fifth that I want to emphasize here. All places are, to one degree or another, embedded in complex technosystems and environmental pathways that tie distant places to one another in something like an archipelago of locales (Buell, 2001; Throgmorton, 2005). Consequently Liz and Andre's

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[6] Anticipation of a dystopian future seems to be in the very air that we breathe these days. The contemporary fictional world is certainly full of such scenarios. Cormac McCarthy's 2006 Pulitzer Prize-winning novel The Road, James Howard Kunstler's 2008 novel A World Made by Hand, and James Cameron's 2009 film Terminator Salvation come to mind. Raymond Kurzweil's 2005 book, The Singularity is Near, offers a rejoinder that some would consider techno-utopian. It predicts a "technological post-humanist" world in which computers become so powerful, numerous, and cheap that by 2029 at least one of them will display a level of intelligence, self-awareness, and emotional richness indistinguishable from a human's. Inevitably the line between humans and machines will blur, and AIs will become far smarter and more powerful than ordinary (natural) humans. Once the human/machine race of AIs has converted all the matter in the universe into a giant, sentient supercomputer (or "cybernetic organism"), it will have created a supremely powerful and intelligent being.

home, restaurant and neighborhood are tied to other locales via "tenticular radiations" or "paths out of town." Happily for the quality of their immediate neighborhood, for example, the pork in Liz and Andre's dinner would not have been produced in their neighborhood. It would instead have been produced in some distant locale and then transported to their favorite restaurant via a complicated network of tenticular radiations. At the risk of belaboring the obvious, large urbanized areas such as the one in which Liz and Andre live could not exist in their current form without having the ability to import key goods and services and to export negative externalities.

That Liz, Andre and other urban residents export the negative externalities associated with their consumption of pork has, indirectly, been the subject of a considerable amount of research over the past twenty years. Briefly summarized and critiqued below, this body of research has focused on the Environmental Kuznets Curve (EKC), environmental load displacement, and Environmental Footprints (EF).

Conventional economic wisdom has long claimed that consumer demand in wealthier "developed" countries can benefit "developing" countries and hence enable "sustainable development" even if this demand also entails the displacement of negative externalities to those "developing" countries. The Environmental Kuznets Curve (EKC) has played a prominent part in this claim (Kahn 2006; Stern 2004). According to the EKC, the relationship between economic growth and environmental harm takes the form of an inverted U-shaped curve: economic development initially causes environmental quality to decline, but over time development produces a middle-income population that pressures the country's government to solve many pollution related problems; as income grows, consumption and production patterns become increasingly "green" and the prospects for greener governance improve. Consequently the EKC claims that economic growth has already benefited the environment in developed countries and can be a powerful way of improving environmental quality in developing ones.

Critics have challenged the validity of the EKC on many grounds, however, including EKC researchers' tendency to use narrow indicators that are well understood, well documented, and easy to solve as measures of environmental harm (e.g., sulfur dioxide emissions from coal-fired power plants using nation-based cross-sectional air pollution data from publicly available sources) and to ignore environmental harm that is displaced to other parts of the world or is more difficult to measure (Dinda, 2004). By having such narrow indicators metonymically stand for environmental harm, for instance, EKC analysts ignore the loss of biodiversity associated with the transformation of ecosystems and thereby understate the magnitude and risks of environmental transformation quite dramatically.

A few researchers have substituted Ecological Footprints (EFs) for those narrow indicators (Bagliani et al. 2008).[7] Doing so has led them to

[7] As Wackernagle and Rees (1996) define it, the EF "accounts for the flows of energy and matter to and from any defined economy and converts these into the

conclude that economic growth does not lead to environmental improvement. While using EFs as the measure of environmental harm has produced more valid results, even this has not accounted for where the footprint falls. What is more, it limits attention to the flow of energy and materials, and hence ignores the non-material consequences of environmental load displacement; that is, upon whom the footprint falls.

To better understand the complex web of "external" relations between urban consumers like Liz and Andre and food producers in other parts of the world, therefore, the critique of the Environmental Kuznets Curve needs to be taken even deeper.

One striking feature of EKC analyses is their disregard for history. Proponents of the EKC naturalize changes that occurred within countries of the North and ignore the historical contexts within which those transformations occurred. An historically-informed assessment would argue instead that a certain pattern of transformation in one place at one moment does not necessarily mean that the same pattern will be replicated at any other place and time. Furthermore, to claim that environmental degradation will increase as the structure of an economy changes from agricultural to industrial, but then will decrease as the economy becomes more service- or knowledge-based, is to presume that the meaning of those concepts (e.g., agricultural) does not vary over time or by place. But this presumption ignores the extent to which agricultural economies have industrialized over the past thirty years, at least in the United States.

The EKC also presumes an identity between countries and economies; that is, it uses nation-states as the spatial/platial unit of analysis. This inevitably implies that environmental and economic data can be aggregated for individual nation-states without losing important information about variations within countries. And yet there is nothing about the EKC itself that requires using nation-states as the platial unit. If the EKC is valid, one should be able to document it using other spatial units, especially regions within nation-states.[8]

Lastly, the EKC implicitly reduces human existence to just two dimensions: economic wealth and environmental harm, and suggests that one can be traded for the other within any spatial unit (Bell and Morse 2008). In this sense, the EKC can be understood as part of the story of neoliberal capitalist globalization, a story that transforms existence within places to bi-variate data points on a graph and transforms relationships between places into what Massey (2005, 76) calls a "depthless horizontality of immediate connections," wherein underdeveloped places are catching up with developed ones.[9] By reducing human existence to

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corresponding land/water area required from nature to support these flows" (p. 3).

[8] Which raises an interesting albeit peripheral question: would the EKC be valid for internal poverty "pockets" such as Detroit, which has lost half its population and become a much poorer place since its peak in the 1960s?

[9] As Joyce Appleby (2010) emphasizes in The Relentless Revolution, capitalist economies incessantly revolutionize the economic structure from within,

economic wealth and environmental harm (even if expanded by using the EF data), the EKC omits the social justice component of sustainability.

In brief, even the best EKC analyses are a-historical, a-platial, and silent about social justice.

> With these observations and conclusions in mind, we are now in a position to ask: To what places are the negative externalities associated with Liz's and Andre's pork consumption displaced? How does that displacement occur? What social, economic, and environmental costs and benefits derive from this displacement, and who experiences them?

Industrialized Agriculture in the Iowa River Watershed

Not produced in their neighborhood or city, Liz and Andre's pork had to be produced in some distant place and then transported to their restaurant. Data about how that pork is transported and how far it would have to travel is hard to find. In 2001 Rich Pirog and others at Iowa State University's Leopold Center provided a first approximation. They estimated that conventional food traveled a weighted average of 1,546 miles from the point of production to the point of purchase for consumption. In a later analysis Weber and Matthews (2008) estimated that the total life-cycle food supply chain requires movement of 6,760 kilometers for the average household, with final delivery of food accounting for 1,640 of the total. Food groups vary in these distances, with red meat being the highest at 1,800 km delivery and 20,400 km total.[10]

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incessantly destroying the old one, incessantly creating a new one. Driven by waves of entrepreneurial innovation, this system creates what Joseph Schumpeter famously called a "perennial wave of creative destruction." It is an old story that has taken an important new twist over the past three decades or more as places have become deeply intertwined with an increasingly competitive globalized economy. In The Imagined Economies of Globalization, Angus Cameron and Ronen Palen (2003) argue this globalization is not simply an empirical phenomenon. It is also a type of communal storytelling dominated by business interests that has become a self-fulfilling prophecy. As Laura Tate writes in her 2006 review of Cameron and Palen's book, "Aspects of globalization stories become 'real' by virtue of their degree of credibility; and people craft them through careful selection of actors and events, not unlike a riveting novel, to ensure credibility. As such narratives elicit concrete reactions from business leaders, politicians, and other actors, the reactions further shape society's experiences of globalizations" (p. 132). As modified by economic globalization, this narrative presumes that the central challenge is to design dynamic, diverse, and culturally rich cities that will attract new high technology businesses and creative, knowledge-based workers with lots of disposable income.

[10] Weber and Matthews are particularly interested in estimating the relative "carbon footprints" of food-miles and food choices. They find that the greenhouse gas (GHG) emissions associated with food are dominated by the production phase, with it contributing 83 percent of the average U. S. household's carbon footprint for food consumption. Again, on average red meat is more GHG- intensive than all other forms of food. They conclude, "dietary shift can be a more

For reasons elaborated below, Liz and Andre's pork probably would have come from the Midwest of the U. S. There its production constitutes an important part of an industrialized agricultural system that efficiently provides inexpensive food for the national and international markets within which Liz and Andre are embedded. For the past thirty years or so, however, many critics have been claiming that this industrialized agricultural system has also been imposing a set of interconnected costs that are causing rural parts of the region to be failing ecologically, economically and socially (e.g., Kimbrell, 2002; Pollan, 2006; The Pew Commission on Industrial Farm Animal Production, 2008; Jackson, 2008). In brief, they have been claiming that the economy and way of life engendered by the industrial agricultural system and sustained by pork consumers like Liz and Andre is not sustainable. In the following sections I will summarize the key features of that system and the web of negative externalities that leads critics to make that claim.

Pork Is Produced Efficiently in Iowa, Resulting in Lower Market Prices for Consumers

The vast majority of hogs in the U. S. reside in the upper Midwest, with additional clusters being found in North Carolina and the Texas-Oklahoma panhandle region. The three largest counties in terms of pig population are located in North Carolina and Texas/Oklahoma, but ten of the 20 largest counties are located in Iowa.[11]

Hog processing plants locate near these hog populations. In 2007 9.96 million metric tons of pork were produced in the United States, with about 14 percent of it being exported to other countries and the remainder being consumed in the U. S. Five firms accounted for 73.6 percent of the daily slaughter capacity (424,835 hogs): Smithfield (27.9 percent), Tyson Foods (17.4 percent), Swift (11.1 percent), Hormel (8.7 percent), and Excel (8.5 percent). New technologies have allowed larger breeding farms to become possible. Consequently the number of hog operations decreased by 90 percent from 647,000 in 1977 to 65,640 in 2007, the percent of operations in excess of 50,000 hogs increased from 7 percent in 1988 to 43 percent in 2006, and the average number of hogs per operation increased from 87.4 in 1977 to 991.9 in 2007.

These and other changes in production have greatly increased the market efficiency of pork production and have thereby contributed to lower-priced pork for consumers like Liz and Andre. As the "Stats" section of the National Pork Board's web site proudly proclaims, "U. S. pork producers are among the most efficient in the world. ...[T]he nation's pork producers continue to make great strides in production efficiencies while at the same time producing a higher-quality product for consumers. These improvements are due to genetic selection, new technologies, advanced nutrition and new management techniques. The results of these

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effective means of lowering an average household's food-related climate footprint than 'buying local'" (p. 3508).

[11] The data contained in this and the two next paragraphs come from The National Pork Board's The Pork Story (Pork. Org, 2009).

changes are more and lower-cost lean pork for U. S. and world consumers" (Pork. Org, 2009, p. 78)

Much of Iowa's Pork Is Produced at Three Large Slaughter Facilities in the Iowa River Watershed

One place pork comes from is the part of eastern Iowa drained by the Iowa River. Approximately 800,000 humans live in this 12,500 square mile watershed (see Figure 2).[12] It actually consists of two major watersheds, the Iowa and Cedar, but when they merge shortly before entering the Mississippi the conjoined rivers are known as the Iowa. Three large meatpacking plants are located within this watershed: Tyson Foods' plants in Waterloo and Columbus Junction, and Swift Foods' facility in Marshalltown.

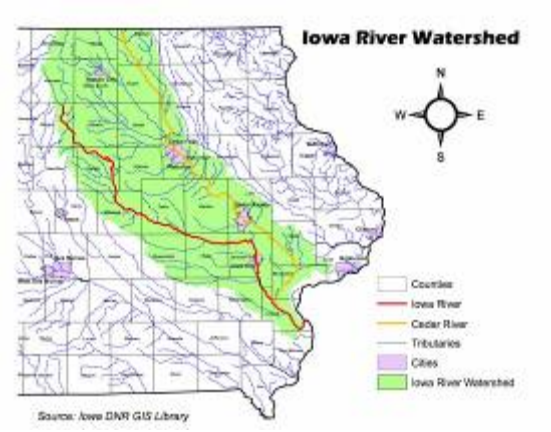

Figure 2. The Iowa River Watershed

Swift and Company is the world's third largest processor of fresh beef and pork, with nearly $10 billion in annual sales as of 2007. In July 2007 it was purchased by JBS S.A., the largest beef processor in South America and one of the largest worldwide beef exporters. According to anthropologists Mark Grey and Anne Woodrick (2002), Swift Food's Marshalltown facility is "the third largest pork plant in the world, slaughtering and processing approximately 3.6 million hogs each year—as many as 16,000 each day. It produces nearly 100 million pounds of pork products each year, and annual sales approached $800 million [in] 1999. It employs about 1,900, with roughly 1,600 of these jobs in production. Swift is the community's largest employer, with a payroll of about $51 million in 1998" (p. 368).[13]

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[12] To focus on the regional scale is consistent with what some planning scholars have termed "progressive regionalism." It promotes "equitable and sustainable development at the scale of city-regions by trying to integrate civically engaged research, critical theory, and collective action" (Pezzoli et al., 2009, p. 337).

[13] Information about Swift & Company in relation to JBS S.A. can be found at JBS S. A (2011) and at http://en.wikipedia.org/wiki/Swift_&_Company. Information

Tyson Foods is the world's largest processor and marketer of chicken, beef and pork, and annually exports the largest percentage of beef out of the U. S.[14] With 2005 sales of $26 billion, it is the second-largest meat producer in the world, and one of the 100 largest companies in the U. S. It employs approximately 107,000 people at its 123 food processing plants throughout the world. It supplies all of the Yum! Brands chains that use chicken (including KFC and Taco Bell), as well as McDonald's, Burger King, Wendy's, Wal-Mart, Kroger, Costco, IGA, and others. Every week its six pork plants process 348,000 hogs. Its Columbus Junction facility is located just north of the confluence of the Iowa and Cedar Rivers. In 2007 that facility's slaughter capacity was about half that of Swift's Marshalltown plant, or about 9,500 hogs per day.

Hogs Are Fattened at Concentrated Agricultural Feeding Operations (CAFOs)

The hogs processed in these plants come from Concentrated Agricultural Feeding Operations (CAFO's). Nationwide, the 110 largest hog operations, each of which contains over 50,000 hogs, now constitute 55 percent of the total national inventory. Iowa leads the nation in hog production, much of which takes place in the state's 742 hog-producing CAFOs. As Figure 3 shows, the watershed's CAFOs are most densely concentrated in Hardin, Franklin, and other counties in the upper reaches of the Iowa and Cedar Rivers, but there is also a significant cluster in the lower reaches of the river in Washington and Louisa Counties.

Daniel Imhoff's (2010) edited collection, The CAFO Reader, presents a comprehensive and deeply troubling critique of these "factory farms." "Our domesticated livestock have never been as cruelly confined or slaughtered in such massive quantities in all of history," Imhoff writes in his introduction.[15] Moreover, he reports that an increasing number of observers argue that the extraordinarily high concentration of animals in these feeding operations "has arisen as a direct result of intentional U.S. government policies that have allowed CAFOs to avoid paying the true costs of their operations."

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about Marshalltown and its location relative to the meat processing plant can be obtained at: http://en.wikipedia.org/wiki/Marshalltown,_Iowa.

[14] Additional information about Tyson Foods can be obtained at http://www.tyson.com/Corporate/ and at http://en.wikipedia.org/wiki/Tyson_Foods. For an assessment of the sustainability of its practices, see Tyson Foods (2007). In an insightful critique of corporate risk management practices, Anderson (2005) argues that corporations need to establish sound sustainability risk management systems in order to survive potentially major financial and professional damages.

[15] David Kirby's (2010) The Animal Factory presents a similar critique.

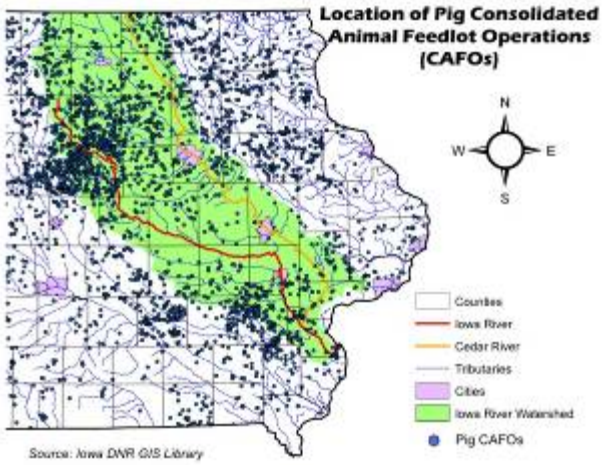

Figure 3. Location of Hog CAFOS in the Iowa River Watershed

Not surprisingly, CAFO operators do not agree with this critique. Working within the context of the existing agricultural system, some (perhaps most) of them believe they are producing quality pork in a manner that is safe for workers and the environment. A good example might be Heidi Vittitoe who, with her husband Jerome, operates Vittetoe Pork, Ltd., near Washington in the southeast part of Iowa. Their firm produces roughly 150,000 hogs per year, and Vittitoe considers environmental stewardship an important part of the firm's operation (Caldwell 2005). It is difficult to know, however, whether this sense of stewardship is more verbal than real. While witnessing Vittitoe defend her operations during a small public forum early in 2010, I was persuaded that she is committed to complying with existing regulations concerning the environment and workplace safety. But this did not convince me that those standards are sufficient. Nor was I able to judge whether other CAFO operators share Vittitoe's stated commitment to complying with those standards.

Whether real or merely verbal, Vittitoe's expressed desire to comply with existing standards takes place in the context of a market economy that systematically externalizes costs. According to Robert P. Martin, executive director of the Pew Charitable Trust's Commission on Farm Animal Production, "[t]he present system of producing food animals in the United States is not sustainable and presents an unacceptable level of risk to public health and damage to the environment, as well as unnecessary harm to the animals we raise for food" (2008, viii).

Major Employee and Public Health Risks Are Associated with CAFOs

In a comprehensive recent synthesis of the human health threats associated with CAFOS, researchers at Plains Justice (2010) reported that ammonia, hydrogen sulfide, and airborne particle emissions from CAFOs can contribute to human respiratory problems such as asthma and chronic bronchitis. Ammonia and hydrogen sulfide (which are related to the strong odors found in and near CAFOs) can result in serious health effects on the employees who work in these facilities, and particulate emissions (such as fecal matter, fur, feathers, and dust) can increase the

incidence of heart problems. Plains Justice's researchers also reported that manure pollution produced by CAFOs can impair water quality. Bacteria originating in CAFOs can get into recreational waters and thereby increase the public health risks associated with water recreation. High levels of ammonia and the hypoxia it produces can also impair fishing and other recreational activities. Lastly, when manure spills occur at CAFOS, the resulting bacteria or chemical contamination of surface and ground waters have produced large numbers of fish kills and can also negatively affect drinking water supplies for people who live near or downstream from the CAFOs that cause the spills.

Public health researchers have raised many other worrisome concerns about CAFOs, especially with regard to (1) the role of intensive livestock production in influenza outbreaks; (2) contaminated air, flies, and vermin migrating into the neighborhoods surrounding the CAFOs; (3) the emergence of antibiotic resistant organisms; and (4) the specter of a global pandemic arising from new strains of avian influenza incubated in swine and transmitted to humans.

In his introductory article for a series that appeared in Environmental Health Perspectives in 2007, for example, public health researcher Peter Thorne writes: "Dramatic changes in livestock production have occurred over the past two decades...The state of Iowa, which produces one-fourth of U.S. pork, exemplifies this trend. The number of farms in Iowa raising hogs decreased from 64,000 in 1980 to 10,500 in 2000—an 84% decrease—while the average number of hogs per farm increased from 250 to 1,430 over this same period" (p. 296). The increasing intensity of livestock operations has increased problems associated with air and water contamination, and to fears of communities and neighbors about the potential adverse human health effects. The National Institute of Environmental Health Sciences joined with the University of Iowa's Environmental Health Sciences Research Center to sponsor a "town meeting" in Des Moines to "bring stakeholders together to seek common ground" (p. 296). The results of the town meeting prompted the Center to organize a conference and workshop in 2004 to consider the major topics, assess the state of the science, identify areas in which further research is needed, and suggest opportunities to "translate science to policy initiatives that would advance public and environmental health" (p. 296).

The second article in the series (Gilchrist et al., 2007) summarized the finding of the workshop focusing on the potential role of CAFOs in infectious disease epidemics and antibiotic resistance. Liz, Andre, and other consumers might have been frightened to learn that this workshop "raised concerns about the practice of co-locating swine and poultry facilities and the specter of a global pandemic arising from new strains of avian influenza incubated in swine and transmitted to humans" (p. 297). They recommended the establishment of minimum separation distances between facilities and the adoption of specific management practices. They also strongly endorsed phasing out the use of antimicrobial agents as growth promotants in the U. S. And they identified the need to establish national surveillance programs to track the transmission of antimicrobial-resistant organisms from livestock to humans.

Another article in the series (Donham et al., 2007) summarized the findings of the workshop focusing on community health and socioeconomic issues surrounding CAFOs, especially the impacts of industrialization of livestock production on rural communities in terms of economics, social capital, and quality of life. They recommended that comprehensive studies of community health be undertaken. They also noted, "much of the research funding for agriculture is directed toward nonsustainable production and recommended that funds be reoriented to sustainable systems" (p. 297). They indicated that "a more measured approach to siting and permitting of facilities and waste management is needed" and that "[d]ecisions concerning the issuance of permits should...include greater involvement of communities through public hearings and open meetings" (p. 297).[16]

Thorne concluded his introductory article by stating: "Expansion of large CAFOs into central and eastern Europe and South America is occurring without attention to lessons learned from health and environmental problems in the United States and western Europe. Major concerns exist over the role of intensive livestock production in influenza outbreaks and the emergence of antibiotic resistance organisms" (p. 297).[17]

What, one might wonder, would be the cost of a global pandemic that originated at co-located swine and poultry CAFOs in Iowa or elsewhere?

Latino Employees in CAFOs and Meat Processing Plants Are Doubly at Risk

A large proportion of the workers in these CAFOs and meat processing plants are Latino immigrants from Mexico and Central America. This fact, and others directly related to it, constitutes one of the key set of social costs embedded in the web of "negative external relationships" associated with Liz and Andre's pork consumption.

According to anthropologists Grey and Woodrick, for example, Swift Foods' Marshalltown plant employs approximately 900 Mexican workers,

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[16] According to Section 335.2 of the Iowa Code, county zoning ordinances in the State of Iowa do not apply "to land, farm houses, farm barns, farm outbuildings or other buildings or structures which are primarily adapted, by reason of the nature and area, for use for agricultural purposes, while so used." However, county zoning ordinances "may apply to any structure, building, dam, obstruction, deposit or excavation in or on the flood plains of any river or stream." In Thompson v. Hancock County (1995), the Iowa Supreme Court held that hog confinement buildings were agricultural buildings and thus exempt from county zoning ordinance. Defining agriculture as "the art or science of cultivating the ground, including harvesting of crops and rearing and management of livestock," the Court had previously held in Decoster v. Franklin County (1993) that the agricultural exemption "extends to facilities to be used in connection with agricultural functions." In that same ruling, however, the Court declined to expand the definition of "feedlot" to include an indoor confinement facility. For a thorough discussion of these court cases, see Barnes (2008).

[17] See also Spellberg (2009).

a large percentage of which come from a single small town in Mexico, Villachuato. According to them, Marshalltown and its pork processing plant are part of a "global labor market"; it's a new "destination community" for Latino migrants in the U. S.[18] Moreover, "[t]he plant would shut down without a continued supply of workers from this community—documented and undocumented—and the workers, their families, and their home town would suffer without the plant" (p. 364).

As Grey and Woodrick see it, hiring Latinos solves a number of important problems for Marshalltown's meatpacking plant. First, it provides people to replace rural Anglos who left during the farm crisis of the 1980s and subsequent years. (In 1990 25,178 people lived in Marshalltown, 0.9 percent of whom were Latino. Ten years later, 12.6 percent of the city's 26,009 people were Latino.) It also helped the plant overcome a shortage of applicants during the thriving economy of the 1990s. Most important, it provides workers who are willing to do unpleasant, physically difficult, low-skill, and risky labor for the wages provided. Common ailments among slaughterhouse workers include back problems, torn muscles and pinched nerves, as well as more dramatic injuries such as broken bones, deep cuts and amputated fingers and limbs (Bhushan 2011.) Turnover at the plant is high, which benefits the company by lowering aggregate wages and health benefit costs.

About half of the Marshalltown plant's Latino workers come from Villachuato. The Latino workers frequently migrate between Marshalltown and Mexico (or other meatpacking plants), which results in high turnover rates at local schools. The ability to leave gives the workers a little bit of advantage in the global labor market. But the turnover also means that Latino employees "are not interested in settling down in Marshalltown because they have obligations to families, homes, and a community, which just happens to be 3,000 miles away" (p. 369).

Latino in-migrants bring economic vitality and social change to small towns, but they are also exposed to considerable risks. As recent events at Agriprocessors, Inc., in Postville reveal, meat processing plants require employees to do hazardous and distasteful work that most Iowans will not do (Preston 2008). Because Iowans won't do the work at the wages offered, while distant consumers (such as Liz and Andre) demand the meat, meat processing companies hire new residents from Mexico and other Central American countries. Moreover, the undocumented workers' illegal status makes them vulnerable to employer exploitation and

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[18] Grey and Woodrick discuss three theoretical approaches to explaining the start of migration flows: the "push-pull" theory, segmented labor-market theory, and world-systems theory. (Packing plants need to be located near sources of livestock to assure production and to minimize losses in transport. They also must be strategically located to assure delivery to primary markets [in urban areas] in a timely fashion.) Recruitment is one important way that flows of migrants to jobs start, but migration flows should also be understood as part of a global economic and political system. Thus poor, rural Mexican communities, like Villachuato, are—like Marshalltown—part of one global economic system. Social capital theory helps to explain how migration flows sustain themselves after they get started.

deportation if they complain about low wages or poor working conditions. Meanwhile, Anglo residents and local media in places like Marshalltown tend to focus on problems such as higher crime rates and growing enrollments of non-English-speaking students.

Language differences and the workers' tendency to move relatively frequently also create significant educational challenges within K-12 school systems. Consequently a relatively small but important number of towns and school districts in Iowa are being dramatically affected by the presence of Latino in-migrants who are employed at meat processing plants. Although only 3.8 percent of Iowa's population is Hispanic or Latino, the school districts in Columbus Junction, Postville, Denison and other towns and cities display much higher percentages; for example, 620 of Columbus Junction's 992 K-12 students (62.6%) were Latino in 2009-10 (Columbus Community Schools, 2010). Given contemporary pressures to crack down on "undocumented workers" and "illegal aliens," these school districts and towns risk economic and social disruption that could prove quite traumatic.[19]

How does the presence of these Latino newcomers affect the towns in which their plants are located, and what effect will living in these old Iowa towns have on them? According to Grey and Woodrick, "What this new reality will look like is unknown" "It is reasonable to speculate, however, that given current conditions and relations between Latino workers and Anglo residents, both communities will never look the same. Marshalltown itself will continue to look more and more like Mexico...But...Latinos are also changing....The cultural and social consequences are striking. The result is a Marshalltown, born of the postnational age, that is not its old self, nor is it a new transplanted Villachuato—it is something in between" (p. 373). As shown in the photograph at right, Columbus Junction's downtown streetscape looks much as it did years ago, but now many of its stores cater to Latinos and include signs written in Spanish.

Iowa's Corn Feeds Hogs, Not the World.

"Iowa feeds the world" is a claim that proponents of the existing agricultural system frequently make, but careful scrutiny engenders many doubts about the claim.

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[19] See Belz (2008). Such realities draw attention to the social justice component of sustainability, or to what Julian Agyeman (2005) has called "just sustainability." However, the low density rural character of most of the region and state makes it very difficult to organize such people. In economic terms, the transaction costs are quite high.

As shown in Figure 5, roughly 78 percent of the land in the Iowa River watershed is used for growing corn and soybeans. Hogs in Iowa's and other states' CAFOs feed on the corn. According to ecological anthropologist Laura Jackson (2008, p. 24), about 54 percent of U. S. corn and soybeans is fed to livestock, approximately 18 percent is exported to other countries (primarily for consumption by livestock), 14 percent is made into ethanol, and the remaining 14 is made into vegetable oil, or food products such as starch, high fructose corn syrup, and food additives. "In reality," therefore, "corn and soybeans feed livestock to produce meat for the US and other wealthy industrialized countries" (Jackson 2008, 31).

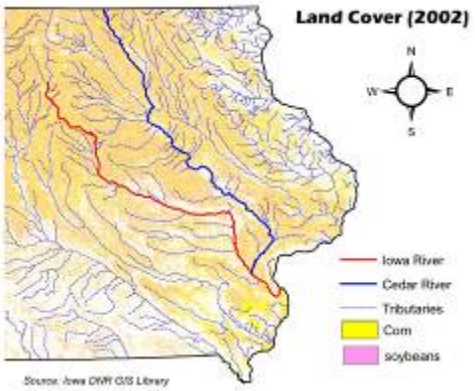

Figure 5. Corn and Soybean Production in the Iowa River Watershed

Humans cannot eat the corn produced for livestock. That fact notwithstanding, production of these crops is heavily subsidized. During the period from 1995 to 2006, Iowa received $16 billion in farm subsidies—more than any state other than Texas—including $1.2 billion in 2006 (Environmental Working Group). Jackson (2008) writes, "Meter (2005) has calculated farm-related income and expenses for a nine-county area of northeastern Iowa between 1999 and 2003. On average, the region's farmers produce $1.08 billion of food per year, but spent $1.14 billion to raise it. Over the five-year period of the study, production costs exceeded farm receipts by $308 million. Over 30 percent of the farms lost money in 2002. This region survived only because of an average of $173 million in federal subsidies and $72 million in off-farm income each year" (p. 29).

If these and other subsidies were removed, then surely Liz, Andre, and other consumers of corn-based products would encounter significantly higher market prices at the supermarket and in the restaurant, at least in the short run. And they might not be happy to see their prices rise. But in the meantime others bear substantial costs that do not appear in market prices.

Figure 6 shows a farmer in central Iowa. He, Jerry Peckumn, grows corn and soybeans on 2,000 acres in the standard way, but he thinks that way is not sustainable. Still, he feels he has no real choice because that's where the money is; federal farm policy promotes it.[20] The policy needs to be changed, he believes, but farmers can't change it by themselves. Part of Peckumn's farm is more experimental, and he is involved in native prairie restoration and river/wetland protection. Birds and butterflies are returning to a restored prairie plot on his land. Peckumn is not just a farmer; he also the Chair of Iowa Rivers Revival, a member of Practical Farmers of Iowa, a former chair of the State's Environmental Protection Commission, and a member of the Iowa Environmental Council's Board of Directors.

Figure 6. A Farmer in Central Iowa

The Federal Government Massively Subsidizes the State's Agricultural Economy

Is the industrial agricultural system a free market without government intervention, and do food prices reflect the true costs of production? According to researchers at the conservative Cato Institute (Edwards, 2007), it is not:

> The USDA [U. S. Department of Agriculture] distributes between $10 billion and $30 billion in cash subsidies to farmers and owners of farmland each year. The particular amount depends on market prices for crops, the level of disaster payments, and other factors. More than 90 percent of agriculture subsidies go to farmers of five crops—wheat, corn, soybeans, rice, and cotton. Roughly a million farmers and landowners receive subsidies, but the payments are heavily tilted toward the largest producers. In addition to routine cash subsidies, the USDA provides subsidized

[20] Other pervasive forces limit farmers' options, including the intrinsic ecological flaws of corn-soybean monocropping and the structure of the food system as a whole. Alternatives to the industrialized agricultural system are risky, and large capital investments must be repaid. Moreover, agribusiness corporations (e.g., Cargill, ConAgra, Archer Daniels Midland, Monsanto, Tyson Foods, and Smithfield) and trade associations (especially the Farm Bureau Federation) exert enormous political and market power. According to Jackson (2008, 35), farmers face concentrated markets in farm inputs, basic processing, and secondary processing and food retailing. According to her, "[c]onservation policy will move forward only when consumers and taxpayers shrug off the myth of the farmer as designer and pressure agribusiness interests to take responsibility for a healthy agricultural landscape and healthy food" (p. 24).

> crop insurance, marketing support, and other services for farm businesses. The USDA also performs extensive agricultural research and generates statistical data for the industry. These indirect subsidies and services cost taxpayers about $5 billion each year, putting total farm support at between $15 billion and $35 billion annually...Agriculture subsidies have never made economic sense, but since the 1930s farmers have resisted changes to subsidy programs, and they have generally held sway in Congress. While farmers comprise a smaller share of the population today than in the 1930s, the farm lobby is perhaps as strong as ever. One reason is that farm-state legislators have co-opted the support of urban legislators, who seek increased subsidies in agriculture bills for programs such as food stamps. Legislators interesting [sic] in rural environmental subsidies have also been co-opted as supporters of farm bills. Thus many legislators have an interest in increasing the USDA's budget, but there are few opposing them on behalf of the taxpayer.

In brief, it's not really an either/or choice; governments are always already involved in markets.[21] So the real question is, to what extent and in what ways should governments shape markets? And to what ends?

Major Public Health Risks Are Associated with Consumption of Corn-based Products

This industrialized system for providing food requires/creates consumers who demand corn-based products in the market. The sixty-five percent of U.S. Americans (including "Liz" and "Andre") who live in the nation's 100 largest metropolitan areas consume corn-based products, ignorant of the costs and consequences of their production, while also experiencing adverse health effects, especially obesity, heart disease, and Type II diabetes (Brownell et al., 2009).

The incidence of obesity and heart disease among U.S. Americans has reached near-epidemic proportions. According to the Center for Disease Control (2009), there has been a dramatic increase in obesity in the U.S. over the past twenty years, and the proportion of U. S. adults who are obese increased from 25.6 percent in 2007 to 26.1 percent in 2008. Moreover, obese Americans spend about 42 percent more on health care than do normal-weight Americans, most of the excess of which is spent on prescription drugs needed to manage obesity-related conditions (Finkelstein et al., 2009).

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[21] That federal and state governments subsidize farming is not new. Beginning with the 1862 Homestead Act and subsequent legislation encouraged western settlement by providing land to farmers for virtually nothing. In the late 19th and early 20th Centuries, the federal government further subsidized farming with below-market rents on grazing and timber lands, below-market charges for water from federal dams and other water projects, support for farm experiment stations and land-grant schools, and subsidies for railroads, canals and roads that facilitated the transport of farm products.

While the increases in obesity and heart disease cannot be solely attributed to the consumption of corn-fed meat and poultry and other corn-based products, especially in fast-food restaurants, the evidence does seem clear that it would be possible to improve the health of our land, water, and selves by shifting the farm economy away from corn and soybean for cows and hogs and sweeteners – as Michael Pollan (2006) argues in The Omnivore's Dilemma – toward more diversified "grass farms," and by shifting consumers' diets away from meat (and corn-based sweeteners) and more toward fruits and vegetables.[22]

Industrialized Crop Production Contaminates Rivers and the Gulf of Mexico

The Iowa River is home to beavers, raptors, water snakes, a large array of warm water fish, and several endangered species including the Indiana bat. Humans use the river for power boating, paddle sports, fishing, hunting, and swimming, and (in Iowa City and Cedar Rapid) for drinking water. Largely because of the industrialization of crop production in Iowa, however, many of the State's and the watershed's stream segments have become "impaired"; i.e, do not support drinking, fishing or swimming. (Figure 7 shows the locations of impaired stream segments in 2008.) This impairment results from low biological diversity, siltation and turbidity, habitat and flow alteration, nutrients, pesticides, bacteria and low dissolved oxygen.

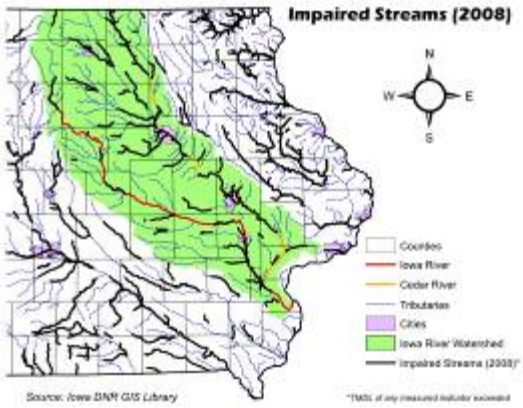

Figure 7. Impaired Streams in the Iowa River Watershed, 2008

In 2007 the public interest organization American Rivers listed the Iowa River as one of the nation's ten most endangered rivers.[23] According to it,

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[22] For background concerning the relationship between obesity and active living, see Day (2006).

[23] American Rivers' report does not claim toidentify the most polluted or most degraded rivers; rather it highlights rivers that are, in the organization's view, facing major decisions in the forthcoming years that will "dramatically and drastically affect the health or the river and the ability of people to enjoy it" (2007, p. 6).

the health of the Iowa River...is in serious jeopardy. The Iowa and Cedar Rivers have fifteen river segments included on the state's list of impaired waters. The main pollutants causing these impairments are nitrates, fecal bacteria, and sediment that originate from farm fields, livestock farms, industries and town sewer systems, among others. Iowa is far behind in implementing and enforcing the Clean Water Act to reduce and eliminate pollution being discharged into the rivers. Although it would seem like common sense to at least maintain current water quality levels where considering new or expanded pollution sources, Iowa has yet to adopt a key provision of the Clean Water Act that triggers such a review. More than 30 years after Congress passed the Clean Water Act, Iowa has still not adopted these anti-degradation rules. As a result, state agencies routinely issue permits allowing new or increased pollution loads to be discharged into rivers without the required review of the impacts on river water quality (2007, p. 14).

In an analysis for the Iowa Policy Project, Jan Flora and others (2007) found that manure production from hog CAFOs is strongly and positively related to manure spills, fish kills and impaired waters, and that CAFOs may well be the largest agricultural polluter of Iowa's streams and lakes. Moreover, "[i]t is possible that their growth has hampered rural tourism, recreation, and destination retirement development, particularly in certain counties of northeast and southeast Iowa that have natural amenities as well as a high density of hogs" (p. 21).

Long-term nitrate data on the Iowa River shows a slow increase in nitrate concentrations over the past thirty years, due to farming. The changes are so slow that they cannot be easily be observed by current residents, and the quality of river waters slowly degrades without anyone noticing.

Nitrogen in fertilizers and manure also significantly contributes to the hypoxic "dead zone" in the Gulf (Committee on Environment and Natural Resources, 2000). (Figure 8 displays nitrogen loads in the Iowa River and nearby watersheds.) According to many analysts, resolution of the hypoxia problem in the Gulf depends on changing farming practices in the Midwestern corn belt (Nassauer et al., 2007; Turner et al., 2007; Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, 2001). This negative externality exemplifies "environmental load displacement" and can be thought of as a major part of the Iowa River watershed's (and ultimately Liz and Andre's) "ecological footprint."

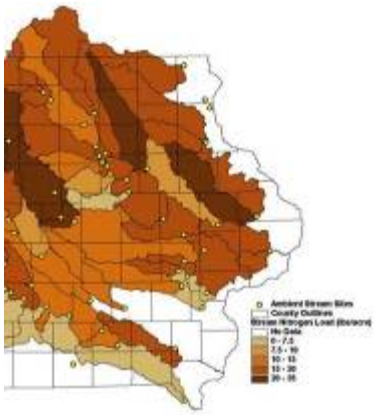

Figure 8. Nitrogen Stream Loads in Eastern Iowa

Industrialized Agriculture Contributes to (and Is Influenced by) Climate Change

Industrialized agriculture in the region both contributes to and is influenced by global climate change. According to Iowa State University climate scientist Eugene Takle (2009), Iowa's climate has been changing "in ways, at rates, and for reasons that require analysis for future planning and risk management" (p. 1). Some of the key trends include the following: precipitation has been trending upward, with wetter springs, drier autumns, more intense rain events, and an increase in absolute humidity; the state now has longer frost-free periods than in the past, with winter temperatures increasing more than summer ones; surface wind speeds have been declining, as has surface solar radiation; and levels of streamflow have been amplified.

When projected into the future, these and related changes are likely to have significant effects on the agricultural economy, including: the possibility of more water-logging of soils and delayed planting in the spring but better dry-down conditions in the fall; a higher probability of crop disease and pathogens; increased drainage tile flow from agricultural fields; and increased incidences of flooding affecting larger areas; (in a counter trend) enhanced crop growth in "C3" plants, such as soybeans and many "weeds"; and a northward migration of weeds accompanied by greater resistance to herbicides. Takle (p. 6) also reports that the North American Regional Climate Change Assessment Program is using "four AR4 [Fourth Assessment Report] ... global climate models of contemporary and future climates to provide input to six regional climate models for assessing climate change between the end of the 20th C[entury] and the period 2040-2070 for the A2 SRES emissions scenario."

The Iowa River watershed is not simply experiencing the effects of global climate change; as documented by the Iowa Climate Change Advisory Council (2008), it is also contributing to it. According to the Advisory Council, Iowa's gross greenhouse gas (GHG) emissions continue to grow steadily and are now 52 percent above 1990 levels. The agricultural sector was directly responsible for 23 percent of total emissions in 2005, but the Council projects that share will decline to 17

percent by 2025. Electrical power production accounts for 31 percent of the state's GHG emissions in 2005, with an undefined fraction of that power production being used within the agricultural sector. As is the case with nitrogen loads in streams, these greenhouse gas emissions are negative externalities that contribute to "environmental load displacement" and can be thought of as indirect manifestations of Liz and Andre's "ecological footprint."

The Advisory Council recommended adoption of a comprehensive package of multi-sector policy options to reduce GHG emissions. It also evaluated the direct costs and cost savings of these policy options, and reported: "Although the total net cost associated with the 37 policies analyzed is estimated at about $4.8 billion between 2009 and 2020, the weighted-average cost-effectiveness of the 37 policies is estimated to be approximately $8.80/t$CO_2$e [tons of carbon dioxide equivalent] reduced," and hence to yield significant cost-saving opportunities for Iowans. The Council also developed two greenhouse gas emission reduction scenarios, which would achieve 50 and 90 percent reductions of 2005 emissions by 2050.

During the 2010 session, the Iowa Legislature chose not to act on any of the Council's recommendations.[24]

Industrialized Agriculture Depends on Risky Imported Oil and Polluting Coal-fired Electric Power Plants

According to the Iowa Office of Energy Independence (OEI), the total amount of energy used in Iowa grew by 22.7 percent from 1980 to 2007.[25]

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[24] Climate change (or global warming) has been an enormously controversial topic in the United States. As detailed in James Hansen's (2010), Storms of My Grandchildren, virtually all climate change scientists agree that the global average temperature is warming, that the warning will continue, and that the long-term consequences are likely to be severe. How severe is a matter of considerable technical uncertainty and debate. In the view of these scientists, "the science is in" and the need to act now is clear. And yet the requisite steps are not being taken. Why the evident disconnect between the scientists' recommendations and policy making in Iowa and the U. S. as a whole? One part of the explanation has to do with rhetoric. My sense is that climate change scientists find themselves in the awkward position of advocating policies that would reduce greenhouse gas emissions, which undercuts their scientific ethos and leaves them open to charges that they are politically motivated promulgators of "junk science" (Walsh, 2009). Arguably, better progress might be made if climate change policy-making contained four key features. First, good policy-making would encourage public discussion and debate both about "what is" (the empirical) and "what should be" (the normative). Second, public discussion and debate should provide space for ordinary people to influence policy-making and action, while also being influenced by what scientists have learned. Third, proposed policies must make sense to ordinary people in terms they understand. And last, effective policy-making has to engage the sense of uncertainty, anxiety and fear that many people feel in the present moment. In sum, policy-making requires a collective enactment of "practical wisdom" rather than scientific guidance.

Perhaps more important, Iowa is almost completely reliant on energy imported from other states and nations.[26] Although the share of energy consumption produced by "homegrown" sources, especially wind, has increased slowly over the past few years, the state still imports 93.7 percent of the energy it uses. The industrial sector, which includes agriculture, accounts for 39.9 percent of all primary energy consumed in the state, which makes it considerably larger than transportation (25.6 percent) and the other two economic sectors (residential and commercial). (This report does not specify where Iowa's imported energy comes from, nor does it enable readers to determine how much energy use in these four sectors is directly or indirectly attributable to agriculture.)

Coal, petroleum, and electric power are crucial components of Iowa's energy mix. Between 1980 and 2007 the amount of primary energy provided by coal nearly doubled from 234.4 to 464.4 trillion Btu (and from 23.3 to 37.6 percent of the total). The use of petroleum grew by 17.2 percent over that same time period, although its share of the total remained essentially constant at 35 percent. In 2007 electric power generation accounted for about 41 percent of the total amount of energy consumed in the state, a figure that is considerably larger than the 24.5 percent share it had in 1980. Coal provided the fuel (primary energy) for 76.3 percent of that electric power generation in 2007, but roughly two-thirds of that primary energy was dissipated as waste heat. Electric power consumption has been growing at a rate of approximately 3.4 percent per year. One glimmer of good news is that wind turbines are providing an

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[25] Created in 2007, the OEI is charged with creating an Iowa Energy Plan every year to establish Iowa's path toward a reliance on energy that does not depend on outside sources of fuel and electricity and to distribute $25 million a year for four years in grants and loans that will go towards projects to help the state reach its goal towards independence.

[26] Iowa's current and future energy use are both tightly linked to the nation's as a whole. John Randolph and Gilbert Masters provide a comprehensive analysis of the nation's energy use and alternatives for the future in their 2008 book, Energy for Sustainability. They report that the U.S. accounted for 22 percent of world's energy consumption in 2005 even though the country contains less than five percent of the world's population, Moreover, the nation's total consumption of energy increased by 16 percent (from 84.6 to 98.16 quadrillion Btu) from 1991 to 2003, whereas domestic production of energy remained essentially constant and, by 2005, provided only 70 percent of the energy consumed. Some good news is that the national economy became considerably more efficient, as measured in terms of energy use per $GDP: energy intensity declined by roughly 50 percent between 1973 and 2006. But the economy has also become far more reliant on electric power: energy used to generate electricity more than doubled between 1975 and 2005. Much of this energy used to generate electricity goes completely wasted: roughly sixty nine percent of the energy used to generate electricity disappears in the form of waste heat and transmission losses. And oil imports have risen dramatically due to rising consumption for transportation and declining domestic oil production; the U.S. now imports roughly two-thirds of its demand for oil from other countries, 51 percent of it from Canada, Mexico, Saudi Arabia, and Venezuela as of 2005.

increasing share of electric power generated in the state: 5.5 percent of the total in 2007 and nearly 20 percent in 2010.

What is the solution to this energy problem? According to Randolph and Masters (2008) and many other analysts, we need to: (1) improve efficiency of energy use to reduce growth in demand, (2) replace oil with other sources to avoid the economic and security consequences of depending on risky sources of imported oil, and (3) increase the use of carbon-free source, reduce use of fossil fuels, and trap carbon emissions before they enter the atmosphere.

In Iowa the emphasis has been placed on generating more electric power from wind and replacing some imported petroleum with biofuels. Some analysts and advocates claim that ethanol from corn can alleviate the demand for imported oil. Between 2001 and 2007 (largely because of incentives and mandates included in the national Energy Policy Acts of 2005 and 2007) the fraction of the U.S.'s corn supply used to produce ethanol grew from seven to 27 percent. Is this a good trend? David Pimental and Tad Patzek (2005) have rigorously argued that it takes more energy to produce corn-based ethanol that one gets out of it. Others have disputed this claim.

In brief, industrialized agriculture and other parts of the Iowa River watershed's economy are profoundly dependent on imported petroleum and coal. The first poses enormous environmental and security risks, which are apparent in the wars currently being fought in Iraq and Afghanistan and in the tragic oil spill that occurred in the Gulf of Mexico in mid-2010. The second (coal for electricity) makes the state profoundly dependent on the major greenhouse gas emitter. All can be thought of as part of the web of "negative external relationships" in which Liz, Andre, and Iowa's pork producers are embedded.

Industrialized Agriculture Increases the Risk of Damage from Floods

In June 2008, the upper Midwest – especially the Iowa/Cedar River part of eastern Iowa – was hit with a massive flood that far exceeded the "Great Flood of 1993" (Mutel 2010a; Connerly et al. 2009). Until that event occurred, common wisdom was that the 1993 event had been a "100-year flood" (Changnon 1996), a flood so extreme that there would not be another one like it in our lifetimes. Consequently, when the 2008 flood struck, many people who thought they lived in safe areas were caught off guard. Although the flood's severity varied considerably within the Iowa River watershed, it inundated some areas that were thought to be well outside the 500-year flood plain (Mutel, 2010a, p. 64). As can be seen in Figure 9, the University of Iowa in Iowa City was hit very hard by this extreme event: 22 buildings were affected, especially the Arts Campus, at an immediate monetary cost of roughly $220 million. The city of Cedar Rapids was hit even harder, especially in its downtown and several nearby neighborhoods.

A series of questions flowed out of the Great Flood of 2008, especially in light of the earlier event. Very broadly speaking, the core question was:

how shall we humans live with "nature" (the river) now, when the "natural" has already been modified by humans; i.e., when there is no longer any such thing as a "natural" disaster (Hartman and Squires, 2006; Birch and Wachter, 2006; Achenbach, 2008)? This challenge can be expressed in planning theoretic terms: embedded in a humanly-transformed and –managed natural river basin ecosystem, the residents and other users of the Iowa River watershed confront a "wicked problem" (Rittel and Webber, 1973) when trying to figure out how to recover from the flood in a sustainable and resilient way.[27]

Figure 9. The University of Iowa's Flooded Arts Campus, June 2008.

The flood itself resulted from the confluence of three extreme events: heavy winter snow, which produced significant flooding in April; extremely moist soils; and heavy rains in June. Many observers have also suggested that the industrialization of crop production contributed

[27] This particular "wicked problem" might have rather deep implications that link back to the ideas expressed in Ray Kurzweil's The Singularity Is Near. If, following Donna Haraway (1991), the radically transformed and managed ecosystem can be characterized as a "cyborg" or "cybernetic organism," then one could ask what would constitute a good (or at least better) cyborg? And what theory of decision-making could people who have a stake in the watershed's health most fruitfully draw upon to enable the cyborg (of which they are a part) to thrive? Alternatively, one could characterize the Iowa River and watershed as an "organic machine" (White, 1995) or "technological landscape" (Nye, 1999). As a "technological landscape," the Iowa River watershed has been socially constructed in two senses: first, people have left their mark on the land itself, whether intentionally or inadvertently; and second, humans see and interpret the landscape through the cultural arts of storytelling, painting, and photography, as well as through the technologies of mapping, analyzing, and modeling, Consequently, "the question of who is making the narrative of a place is just as important as who constructs the physical landscape" (Nye, 1999, p. 7). At the limit, one could also couch humanities' relationship to the watershed in terms of post- or transhumanism (e.g., Kurzweil, 2005). While transhumanists promote the use of science and technology to improve human mental and physical characteristics and capacities, and thereby to dramatically reduce the incidence of disability, suffering, disease, aging, and involuntary death among humans, their argument can easily be extended to larger "natural" ecosystems as well, as in "technogaianism."

significantly to the intensity of the June 2008 flood (Achenbach, 2008; Mute, 2010a). Heavy spring rains fell on a landscape that had been radically reengineered: in the years since European settlers first arrived in the 1830s, tallgrass prairies have been replaced by plowed fields, fields have been tiled and drained so as to speed the run off of precipitation, streams and creeks have been channeled and straightened, wetlands have been drained and filled, cultivated land has been extended closer to creeks, floodplains have been filled and developed, floodwalls and levees were built, stream gauges and monitoring systems were established[28], integrated basin-wide system modeling has been initiated, and—in the case of the Iowa River—the Coralville Dam was built to provide a measure of flood control.[29] Moreover, conventional farming practices left fields compacted and without vegetation to absorb late winter precipitation. Many observers speculate that global climate change might also be altering precipitation patterns in such a way as to produce more severe storms. Consequently, one can argue that the severity of the 2008 flood was not a "natural" event but instead—at least in significant part—a consequence of human action.[30]

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[28] Flood researchers at the University of Iowa have, for example, recently proposed to develop an integrated model that simulates the entire (Iowa River) basin-wide system, including hydrology, ecosystem services, social acceptability, and economics of land-use decisions, and which can provide the basis for policy decisions (Krajewski et al., 2009). Their proposal emphasizes the importance of developing a network of sensors in order to model, predict, and ultimately transform the basin-wide system: "The scientific underpinnings of public policy must have strong roots in empirical and technologically-advanced research. Consequently, the [proposed] Center [for Flood Research and Education] will develop field-scale sensor networks and other instrumentation and will organize its studies in a real-time system that includes natural, developed, and human components. The technological foundation will incorporate state-of-the-art computing, modern communication, and recent advances in social networks" (p. 10). Although this research team emphasizes the value of collaboration, it presumes that there will be a one-way flow of knowledge from scientific researchers to decision-makers and the public. Central to their approach is the idea of "knowledge transfer," and they claim that "[t]he most effective means to transfer knowledge is to make the information easy to access, clear, and valuable to the end user" (p. 23).

[29] The U. S. Army Corps of Engineers manages the Coralville Dam and Reservoir in accord with Emergency Plan for Coralville Dam and Lake, Regulation Manual for Coralville Lake, and Water Control Manual, Coralville Lake. The local manager simply administers the manuals. When complications arise, as with the flood of 2008, the manager turns to the Corps' office in Rock Island, Illinois, for guidance. The Rock Island officials might in turn solicit guidance from the Corps' office in Vicksburg, Mississippi.

[30] This is not to say that the 2008 floods would not have occurred in a prairie landscape, for there was just too much water falling in the "right" place at the "right" time. But the floods would almost certainly have been smaller in a healthier (pre-settlement) landscape. It's the flood's magnitude and the damage it produced, not its occurrence as such, that was a consequence of human activity. For a similar argument with regard to Hurricane Katrina's flooding of New Orleans, see Hartman and Squires 2006.

It would be easy to follow the familiar path and focus exclusively on flood management without taking into account the multiple connections between floods and the many other issue areas discussed in this paper. But, as Swedish water scientist Malin Falkenmark (2004, 279) argues, "the challenge is how to advance from today's single-component approaches...to integrated approaches to catchments [or river basins] keeping both biophysical and societal processes in focus."

Industrialized Agriculture Is Hollowing out the Heartland

Industrialization of the farm economy has also driven people (especially young people) off the land and out of small towns, generating a strong sense of grief and loss, of disappearing economic opportunity, a shortage of doctors and other professionals, and increasing social problems, such as rising rates of poverty, nonmarital childbearing, divorce, welfare dependency, and in many cases a turn to drugs such as methamphetamines for solace (Carr and Kefalas, 2009; Reding, 2009). In Patrick Carr's and Maria Kefalas' (2009) evocative phrase, it has contributed to a "hollowing out" of the Heartland in which small, isolated, homogenous (white/Christian) towns and cities are being forced to change. At the risk of oversimplifying a complex reality, the Jeffersonian ideal of agrarian democracy and the idealized image of the small town as a place of safety, comfort, security, stability, and authentic American values are being replaced by anxiety, fear of change, and hostility toward unfamiliar newcomers from Mexico and Central America. The small town and agricultural economy so effectively idealized in paintings such as Grant Wood's "American Gothic" and "Stone City" is fast disappearing.[31] In Carr and Kefalas' only slightly hyperbolic words, "Everything from the mom-and-pop stores on the old Main Street to the family farms that defined the pattern of the countryside have disappeared, devoured by megamalls, megafarms, and factories where robotic systems perform the tasks once assigned to human beings" (2009, p. 53).[32]

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[31] For insight into the role of "American Gothic" in American and Iowan culture, see Biel (2005) and Sasha Waters Freyer's (2008) documentary film, "This American Gothic."

[32] Carr and Kefalas focus on the decision young small town Iowans must make about whether to stay or go. Their research posits five categories of response: Leavers (which they subdivide into Achievers and Seekers), Stayers, and Returners (which they subdivide into Boomerangs and High-Flyers). The irony is that, by encouraging their best students to leave town and make their mark on the wider world, teachers and parents are undermining the ability of small towns to survive and thrive. What is required, they argue, for small towns to thrive is nothing less than "Reimagining the Heartland." This would entail: (1) investing more in Stayers; i.e., equalize investment across different groups of young people and tie education and training for Stayers more closely to the demands of the modern global economy; (2) linking a national call for sustainable agriculture and green energy technologies to transformations in rural economies and education; (3) managing immigration in ways that promote local growth and reduce intergroup tensions; and (4) using federal stimulus funds and incentives for innovation to reform farm policy in such a ways as to reorganize the food production system and thereby give a boost to small farms.

Partly because of the influx of Latino residents but also because of transformations in the agricultural economy, what it means to be an "Iowan" or to have "Iowa values" has been undergoing a profound transformation.

To read Schweider's (2006) Iowa: The Middle Land; to explore the gorgeous courthouses and town squares in Sioux City, Red Oak, and Ottumwa; to experience Decorah's Hotel Winneshiek, Dubuque's Julien Inn, and the Hotel Ottumwa; to hear a staff employee at Pella's Windmill and Historical Village Museum narrate the story of the town's founding; to visit the Vesterheim Norweigian-American Museum in Decorah and the Midwest Old Threshers Heritage Museum in Mt. Pleasant; and to see the lovely old homes in Red Oak's "Heritage Hill" neighborhood, is to become immersed in a nostalgic sense of Iowa as it both was and is currently imagined to have been, an Iowa that some would like to hold onto or restore. That desire notwithstanding, the Iowa that is being created at the present moment bears very little resemblance to that past (whether real or imagined); a new sense of place and identity is being constructed right before our eyes, one that is being influenced by "power geometries" that extend well beyond the state's boundaries.

The new Iowa that is being created draws upon words that are very familiar—farming, farmers, small towns, etc.—but which now have very different meanings. Jerry Peckumn is a successful farmer, but he knows that farming is not the same as it used to be and he senses that the new way is not sustainable; the Rubbermaid plant in Centerville closed five years ago, taking 500 jobs with it; younger people are leaving the "Historic Hills Region" and other parts of the state because the old farm economy is dead and an insufficient number of new opportunities has arisen; while jobs are disappearing, a new Bioprocessing Center in Eddyville is experimenting with capital-intensive ways of converting corn by-products into consumer products; community leaders in Denison express pride in their town's bilingual, Latino-infused growth without commenting on the extent to which anti-immigrant sentiment places that growth at risk; and community colleges—Western Iowa Tech, Iowa Western and Indian Hills, for example—are growing rapidly with the mission of preparing their graduates to fit into the state's increasingly industrialized economy.

The fact that Iowans' contemporary sense of place and identity are being dramatically influenced by federal policies and transnational corporations such as Swift, Tyson Foods, and Monsanto might be concisely symbolized by J. Seward Johnson's version of Grant Wood's "American Gothic" which now stands near the Tribune Building in downtown Chicago (see Figure 10). Iowa "feeds the world," but it does so in a way that is tightly connected to globalized food markets without much thought being given to the complex web of social and environmental effects.

Conventional Agriculture Has Radically Transformed the Natural Landscape

Figure 10. J. Seward Johnson's "God Bless America" in Chicago

Last, in The Emerald Horizon Cornelia Mutel (2008) amply documents how extensively Iowa's landscape has been changed over time. In it she implicitly defines eastern Iowa as a primarily rural "working landscape" sustained by natural ecosystems that have been shaped by millions of years of natural evolution and a few thousands of years of human activity. Prior to the coming of humans, she says, the landscape was a self-sustaining whole. But its sustainability has been undermined or endangered by human activity. The first humans did not alter it much: "on the whole," she writes, "Native Americans were part of a sustainable, stable, and self-sufficient system, one where the rivers ran clean, the prairie soils grew thicker and richer, and thousands of plants and animals continued their reproduction and massive annual migrations" (p. 11). The arrival of large numbers of European settlers after 1834 initiated dramatic change: "While agricultural productivity soared and towns coalesced, the state's game was depleted, large trees were cleared, native pastures were decimated, waters were sullied, and soils were washed downslope and downstream" (p. 16). "[A]s dramatic as that transformation was," she continues, "it resulted in small, diversified farms that were far more economically and ecologically sustainable than today's industrial-style operations" (p. 27). "Current agricultural practices have been justified primarily through their increased efficiency, productivity, and short-term profit, without consideration of their long-term costs. However, for decades some voices expressed concern about the long-term sustainability of highly mechanized, high-input, industrialized, chemically-based corporate farming" (p. 33).

Regardless of its depth and extent, this transformation in the landscape of eastern Iowa would be invisible to empirical analysts who want to test the validity of the Environmental Kuznets Curve. And yet it too can be considered part of the long-term displacement of environmental costs from points of consumption to other parts of the world.

Mutel's book is part of a call for sustainable and re-diversified agriculture. Her criteria for success in the region would center upon long-term ecological integrity and stability, and long-term economic and cultural vitality. But what of the social costs? Mutel (2010b) believes that Emerald Horizon addresses social justice at its very roots, for in her view

a healthy and sustaining environment is the most elementary form of social justice that we can conceive; "Nature" is the one entity that does not discriminate among different races or cultures or economic classes. Nor for that matter does it discriminate among different species, for humans are just one of tens of thousands of species within it. She believes that working for a sustainable natural environment and stable ecosystem services is a way of supporting all life – and if anything, favoring the economic or social underdogs. Despite her strong beliefs, Mutel does not explicitly acknowledge and respond to the desire of lower-income, working class, and historically-disadvantaged minority groups to have access to inexpensive food and jobs that will pay reasonable wages and provide an opportunity to get ahead in life. Ultimately, therefore, there is a significant gap between Mutel's admirable vision and the likelihood that those groups would support it.

In his 2008 book In Defense of Food, Michael Pollan recommends that we should "Eat food. Not too much. Mostly plants" (p. 1). Combine this with the data about corn being fed to hogs and cattle, and you have a scenario for transforming the landscape of Iowa in a more sustainable direction. But the agricultural industry is extraordinarily powerful, and is part of a global marketplace that efficiently provides pork and other agricultural products to consumers like Liz and Andre while simultaneously producing a complex web of harmful social and environmental effects.

The system is not sustainable, but effective change seems impossible to imagine. What should be done? What can be?

What Can Be Done?

This paper began with two urban food consumers, Liz and Andre. Using them to stand for urban consumers as a whole, the paper has tried to articulate how pork consumption in their home place is related to pork production in someone else's home place (the Iowa River watershed), and to suggest ways in which the pattern of consumption and production can be transformed in a more sustainable direction.

I have just made a pretty strong case that the present pattern is not sustainable. This is a pretty strong negative claim, and maybe it's not right or sufficiently well stated. A more positive and hopeful version of the claim would be: Everyone who lives and works in the Iowa River watershed, and everyone who consumes food produced in it, has a stake in ensuring that their ways of life do not undermine the quality of life for future generations or for people who live in other parts of the world. It seems, therefore, that a mutual transformation in places of production and places of consumption is required. How can such a mutual transformation best be accomplished?

These two distant places, Liz and Andre's urban home and the Iowa River watershed, are tied together by consumer demand, a pork product chain, and a complex web of negative externalities." Neither of these places is a fixed, closed entity with an essential identity. Nor are they mere "spaces of flows" swirling in "a depthless horizontality of immediate connections." Both are instead what Massey calls spaces "invested with

meaning in the context of power," sites for the "meeting up" of "stories-so-far" and for the unfolding of a "power-geometry of intersecting trajectories."

Consumers like Liz and Andre are consuming excessive amounts of pork because many of the environmental and social costs associated with its production and transport are not internalized into the prices that they pay. The Environmental Kuznets Curve treats this as unproblematic. It predicts that consumer demand in wealthier places can stimulate economic growth in poorer ones, which will harm the environment in those poorer places in the short run but lead to environmental improvement over the longer term. However, critics have challenged the validity of the EKC on many grounds, including EKC researchers' tendency to use narrow indicators as measures of environmental harm and to ignore environmental harm that is displaced to other parts of the world. A few researchers have substituted ecological footprints for those narrow indicators. Doing so leads them to conclude that economic growth does not lead to environmental improvement. Although using EFs as the measure of environmental harm has produced more valid results, doing so has not accounted for where the footprint falls, or upon whom it falls. In brief, even the best EKC analyses are a-historical, a-platial, and silent about social justice.

By linking urban pork consumption to a particular place of production, the 12,500 square mile Iowa River watershed, this paper has sought to overcome some of these defects. Let us now briefly recall what we have found.

First, the Iowa River watershed is a major site of pork production in the United States. Much of that pork is produced at three large meat-processing plants located in Marshalltown and Columbus Junction and owned by two very large transnational firms, Tyson Foods and Swift and Company. These meat-processing plants primarily rely on Latino immigrants from Mexico and Central America for labor. These Latino immigrants find themselves doubly at risk. As employees in those plants they must do hazardous work at low pay. As newcomers in the communities in which the plants are located, they often face fearful reactions from long-time residents of European descent. Since the school systems in these towns have become more filled with Spanish-speaking Latino students, the school systems and towns also risk experiencing traumatic effects similar to the ones that resulted from the raid on Agriprocessors in Postville.

The hogs are fattened at several hundred CAFOs, many of which are clustered in the upper reaches of the Iowa River watershed and in the lower reaches near the confluence of the Iowa and Cedar Rivers. Public health researchers have raised several worrisome concerns about CAFOs, especially with regard to (1) the role of intensive livestock production in influenza outbreaks; (2) the emergence of antibiotic resistant organisms; and (3) the specter of a global pandemic arising from new strains of avian influenza incubated in swine and transmitted to humans, and (4) a range of adverse health effects on workers and people who live downwind or downstream from the CAFOs. Researchers have also noted a very strong

connection between the consumption of corn-based products and adverse health effects on consumers such as Liz and Andre, especially obesity, heart disease, and Type II diabetes.

Almost 80 percent of the land in the Iowa River watershed is dedicated to growing corn and soybeans. Despite local claims that "Iowa feeds the world," most of the corn actually feeds hogs and other livestock for subsequent consumption by humans like Liz and Andre. The federal and state government heavily subsidize the production of these crops, which pushes farmers and other agricultural operators into producing them in problematic industrialized ways. This industrialization of crop and hog production has caused many of the watershed's stream segments to be labeled as "impaired," meaning incapable of supporting drinking, fishing, or swimming. CAFOs may well be the largest agricultural polluter of the state's streams and lakes. Nitrogen applied to land in the watershed also contributes significantly to the hypoxic "dead zone" in the Gulf of Mexico.

Industrialized agriculture, indeed the entire economy of the Iowa River watershed, is profoundly dependent on imports of petroleum and coal, both of which pose enormous environmental and security risks. The agricultural sector of Iowa's economy contributes at least 23 percent of the state's total greenhouse gas emissions, and hence increases the likelihood of harmful changes in the global and regional climate. Human-caused changes in the climate are, in turn, likely to have significant effects on the existing industrial-agricultural economy. Industrialization of agricultural crop production in the Iowa River watershed also may well have contributed significantly to the severity of the June 2008 flood.

Industrialization of the farm economy has also contributed to a "hollowing out" of the Heartland: it has driven people (especially young people) off the land and out of small towns, generating a strong sense of grief and loss, of disappearing economic opportunity, a shortage of professionals, and increasing social problems. Partly because of this "hollowing out" but also because of the influx of Latino residents, what it means to be an "Iowan" or to have "Iowa values" has been undergoing a profound transformation. This new Iowa draws upon words that are very familiar (e.g., farmer) but which now have very different meanings.

Last, the natural ecosystem that existed prior to the arrival of European settlers in the 1840s has been changed dramatically. Tallgrass prairies have been replaced by plowed fields, the state's wildlife have been depleted, fields have been tiled and drained so as to speed the run off of precipitation, streams and creeks have been channeled and straightened, wetlands have been drained and filled, cultivated land has been extended closer to creeks, floodplains have been filled and developed, floodwalls and levees have been built, and—in the case of the Iowa River—the Coralville Dam has been built to provide a measure of flood control.

Given this history and context, what can be done? How can a transition to a more sustainable way of life be achieved? I struggle to devise an answer that makes sense. As one reviewer of an earlier draft of this paper observed, the local feels trumped in the essay by the geographies of corporations, consumers, chemical companies,

governments (local, state, national), and the deeply true, multi-layered, locally lived lives of humans which can never be reduced to rational or economic logic. I agree with this reviewer. Distant consumers (like Liz and Andre) and the corporations that link them to the Iowa River watershed shape what is possible and not possible, just as the actions of food producers in Iowa shape what is possible in the Gulf of Mexico. But this raises a very difficult question: given the power of distant consumers, corporations, and governments, what is the most viable means of intervention? When the necessary seems impossible, how can you make it possible?

Let us consider three general approaches:

- Complete reliance on "the free market."
- A science-driven, fact-based "rational-technical" approach to policy making.
- A "collaborative planning" approach involving all interested stakeholders.

Competitive markets work beautifully in many ways, but—for the many reasons that have already been articulated—they are clearly insufficient for guiding a transition to a more sustainable way of life. The pervasive presence of negative externalities coupled with massive public subsidies sustain an economic system that appears to be free and competitive but actually benefits a few while trapping people into practices that undermine their long-term livelihood, endanger public health around the world, and undermine ecological systems upon which economies depend. And yet the political support for sustaining this unsustainable system remains strong. At a forum in May 2010, for example, three Republican candidates for Governor of Iowa advocated cutting corporate income taxes and reducing commercial property taxes in order to stimulate job growth (Eller, 2010). None of the candidates displayed any sense of how market-led economic expansion might affect water quality, the risk of flood damage, public health, climate change, and related concerns.

Support for market-led expansion is not limited to Republican Party officials and candidates. It is strong among Democrats as well, with both parties being pressured by their constituents and by conventional economic development advocates. Proponents of economic growth in the Cedar Rapids and Iowa City area have, for example, formed a Technology Corridor Partnership that defines the region as a centrally-located four-county commodity or product to be marketed in a competitive global market. In an analysis prepared for the Partnership, Smart Solutions Inc. claims an effective regional economic development organization would "present and proactively market the economic region as 'one product'—one vision, one voice—and thus being able to compete more effectively for investments." Their criteria for success would include population growth, wage growth, capital investments, and jobs created. The issues discussed in the present paper literally disappear from Smart Solutions' analysis.

One could imagine that the price of pork could be adjusted at the national level to internalize the negative externalities highlighted in this paper. But surely it would be neither wise nor possible to internalize

negative externalities for pork production only, for that would leave the producers of beef, turkey, and other foodstuffs free to displace their environmental and social costs onto others while increasing the market prices of pork. Moreover, negative externalities are endemic to capitalist economies. Consequently, there would seem to be no end to the amount of calculating that would be required. A wiser approach, I suspect, would be to concentrate on one key variable, namely the energy required to produce and transport food and other products, and to adopt a carbon fee (or tax) at the national level.

An alternative to complete reliance on "the free market" would be to devise policies through a "fact-based" or "science-based" "rational-technical" approach. This approach to planning and policy-making works very well under certain conditions: when the problem and key related concepts are clearly defined; when cause-effect relationships are well-understood; when there is a decision-maker willing and able to act on technical advice; when the political-economic-institutional environment is stable; and when the public's values and interpretations are inconsequential. The kind of planning required to build a new bridge would be a good example. The U. S. Army Corps of Engineers' (2008) Upper Mississippi River Comprehensive Plan provides a perfect case of the rational-technical approach being applied to watersheds.[33]

But scientists following this approach are constrained by disciplinary, professional, and institutional boundaries that inhibit their ability to see or address the complex web of connections among sustainability-related issues.[34] Environmental scientists who focus on water pollution are, for example, in no position to analyze how pollution from CAFOs is related to the risk that school districts might be devastated by Postville-type raids

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[33] Proponents of the "rational-technical" approach to sustainability tend to see it as a highly technical and professional endeavor, which does not require large-scale public involvement. For these advocates, there is no question what needs to be accomplished, and there really is no difference of opinion about what environmental problems need to be addressed and how they should be addressed. But if it's purely a technical matter, why haven't the big environmental problems already been solved? There needs to be a political will to pursue sustainability and thereby give these technical experts the go-ahead to apply their skills. So, the question becomes, how can this political will be stimulated?

[34] "Sustainability science" has recently emerged as a field that seeks to incorporate dynamic interactions between human and environmental systems into emerging models and conceptualizations (Clark, 2007). A key question according to an associate editor of the Proceedings of the National Academy of Sciences is, "What systems of incentive structures can most effectively improve social capacity to guide interaction between nature and society toward more sustainable trajectories" (Clark, 2007, 1737). Although sustainability science is considerably more interdisciplinary than conventional science focusing on fragmented/specialized areas of investigation, it remains wedded to the idea of knowledge-driven policy making, and it continues the focus on science, methods, results, systems, models, guidance, management, and problem-solving, rather than on action. (For an analysis of the link between knowledge and action, see Kerkhoff and Lebel, 2006).

on meat packing plants. Moreover, scientists need to have terms precisely defined in order to do high-quality fundable research, but what sustainability means on the ground emerges from the practical challenges people face. The practical meaning of sustainability is not defined a priori; rather it is constructed socially in particular contexts.[35] Furthermore, good scientific work cannot tell people what choices people like Liz and Andre should make. What they should do is a normative question informed by science but not determined by it. Consequently, on sustainability and other major issues that the public cares about, the rational-technical approach typically slams into polarized politics, adversary science takes over, and puzzled scientists decry what they often call an "effectiveness gap."

The scientists' stress on "fact-based" policy making and worry about an "effectiveness gap" implies that the fundamental challenge is to overcome public ignorance. If the public were better informed about the issues, they believe, public officials would adopt the right policies. Seeking to overcome this gap, scientists look for better ways to "translate" scientific results into lay language and to transfer technologies to end users (van Kerkhoff and Lebel, 2006). To think in terms of educating the public, however, is to fall into a long-standing trap and to ignore a large body of literature about the nature, complexity, and importance of communication with regard to the role of scientists in democracies.[36] In brief, this literature argues that we create ways of conceiving and responding to environmental problems through discourse. From this point of view, flooding (for example) is a material reality that has real consequences for real people in real terrains, but there are many diverse ways of representing this flooding verbally and visually; i.e., flooding might be a material fact, but its meaning depends on how the fact of flooding fits into preexisting representations (or narrative frames). In turn, preconstructed narrative frames shape how people interpret and respond to the material reality of flooding. None of these representations or discourses is disinterested. From this point of view, therefore, it is a fundamental mistake to think of public communication as a means for conveying truth (or "disseminating knowledge") to ignorant or uninformed/poorly informed audiences, for doing so excludes input from diverse citizens who have alternate frameworks of understanding and forecloses consideration of other important value questions. In brief, it marginalizes or trivializes democratic processes.

George Lakoff (2010, 72-73) diagnoses this key limitation of the rational-technical approach quite fruitfully[37]:

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[35] Markusen (2003) offers a strong counter-argument. Although not explicitly addressing sustainability, she would probably object that it is a "fuzzy concept" that inhibits careful scientific research.

[36] See, for example: Cox (2006), Depoe et al. (2004), Fischer (2003), and Forester (1999).

[37] For insightful constructive critiques of Lakoff's cognitive linguistic idea of framing, see Brulle (2010), Lopez (2010), and Ivakhiv (2010).

> Folks trained in public policy, science, economics, and law...may believe that if you just tell people the facts, they will reason to the right conclusion. What actually happens [is?] that the facts must make sense in terms of their system of frames, or they will be ignored. The facts, to be communicated, must be framed properly. Furthermore, to understand something complex, a person must have a system of frames in place that can make sense of the facts.

In Iowa, the dominant frame is shaped by the widespread belief that "Iowa feeds the world" and by the political and economic power wielded by the Farm Bureau, Cargill, Tyson and the other major agricultural corporations. Elected officials either share this frame or else are leery of addressing major agricultural issues for fear that they will be booted out of office. Iowa State University is substantially funded by agricultural corporations, and administrators at The University of Iowa hesitate to promote research that might appear to threaten the state's agricultural interests. Woven together, these actors constitute and reproduce the network of power relations within which researchers must act.

Consequently the dominant "Iowa Feeds the World" frame cannot be changed though conventional political activity alone.[38] Cultural work is required as well; that is, changing the frame, altering perceptions, reshaping understandings, and changing the story. People well trained in the arts and the humanities could play a profoundly important role in this cultural work.[39] By collaborating with social scientists, natural scientists, and engineers, artists and humanists could construct persuasive stories that begin where people are (institutionally, politically, socially) and make sense to the daily lives of ordinary practitioners and people. By skillfully telling, interpreting, and interweaving stories, they could help real flesh and blood people learn how to act more wisely while being immersed in the flow of emotionally-charged action (Throgmorton, 2008).[40]

Important though it is, cultural work is also insufficient. Even if the dominant frame is successfully altered, differing interests will remain. Those diverse interests will require attention. Consequently, the challenge

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[38] Instead of repeating the refrain, "Iowa feeds the world," one could ask: Iowa produces what kinds of food, under what conditions, to what kinds of consumers, at what economic, social and environmental costs?

[39] The artist Buster Simpson's work provides insight into how "public art" can alter public perceptions and understandings. See his 2002 public art master plan for the San Lorenzo Riverway: "Levee as Armature: Toward Art, Ecology, and Community."

[40] Elsewhere (Throgmorton, 2000) I have argued that this form of planning practice takes place within an actual built environment and within a complex web of relationships. Consequently, a skillful practitioner must be able to navigate his or her way through all the actually-existing features of contemporary society and politics. This "skillful meandering" is also embodied; one acts as a skilled-voice-in-the-flow of persuasive argumentation in a place of five dimensions (height, width, depth, time, and habitus); that is, in the messy world instead of apart from it.

is to construct a process that provides space for each interested party (i.e., each group that has an interest in how pork is produced, transported, and consumed) to speak, and hence provides a means through which information can be exchanged and jointly constructed. It requires a more pragmatic interactive collaborative process.[41]

Collaborative planning differs substantially from a science-driven "rational-technical" approach. Collaborative planning assumes stakeholders have diverse interests and ways of framing the problem and interpreting "facts"; it enables stakeholders to jointly select indicators and criteria for evaluation, and engage in joint fact-finding; it values the "local knowledge" of stakeholders; it transforms interaction among problems into a strength and hence is better for "wicked problems" (Rittel and Weber, 1973); and it potentially bridges the "effectiveness gap" that bedevils scientists.

But this kind of collaborative planning will not take place so long as the major stakeholders can get what they want outside of negotiations. Thus skilled advocacy work and skilled cultural work are both required to alter each powerful stakeholders' "Best Alternative To Negotiated Agreement" (or BATNA). BATNAs altered, they would recognize that participation would be in their own self-interest.[42]

It has been a long journey from Liz and Andre's neighborhood to the Iowa River watershed and elsewhere. Let me end by returning to my hypothetical couple. If they could become fully conscious of the web of negative external relationships associated with their desire for a good pork dinner, would they "vote with their forks" and stop consuming pork? Maybe they would stop, or at least consume less, but not all consumers could become as fully conscious as they. A far simpler way to influence large numbers of consumers would be to internalize some of the social and environmental costs of pork production and transport into prices by adopting a carbon fee at the national level. Other social and environmental costs could be identified and addressed by interested stakeholders through collaborative planning at the regional scale in the Iowa River watershed. By engaging in such a collaborative effort, they could learn how their actions link to other people in other places. Remaining conscious of their own self-interest, they could discover ways in which they can work with other stakeholders to invent options for mutual gain.

This is a message of hope, perhaps a utopian one, but at least it addresses the complex reality of the world in which we live and eat.

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[41] For overviews of the pragmatic tradition in planning, see Healey (2009), Hoch (2007), and Harper and Stein (2006).

[42] For comprehensive overviews of collaborative planning and its relationship to negotiation and mediation, see Susskind et al. (1999) and Innes and Booher (2010).

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