

Green Sustainability and New Social Media

Kaylene C. Williams
California State University, Stanislaus

Robert A. Page
Southern Connecticut State University

Alfred R. Petrosky
California State University, Stanislaus

Many organizations are adopting “green” initiatives in order to meet public demand and to draw positive market attention and results. While these different types of green strategic initiatives can be categorized using a competing values framework, there is more controversy over how to operationalize these strategies, how to measure them, and what standards to set to determine when a product/service can be certifiably “green.” Standards vary widely by the source, product lifecycle stage, and whether indirect effects from the supply chain are assessed. Further, the selective nature of streamlined lifecycle studies often results in the neglect of important environmental impacts. When criteria exclude environmentally destructive direct or indirect effects, accusations of greenwashing undermine the drive for green sustainability and for positive marketing results. New social media channels are analyzed as possible alternatives to traditional and overly simplified news channels as a means to inform the interested public concerning the complex nature of true green before greenwashing has a chance to create cynicism and disengagement. Thereafter, the benefits to an organization from using social media for their green initiatives are presented, followed by how to increase positive social media results. In addition, the implications are discussed.

CONCEPTUALIZING “GREEN SUSTAINABILITY”

As society has become increasingly aware of the extent of damage human activity is having on our planet’s environment it has become clear to many that “business as usual” is not compatible with a thriving future for humanity. By the end of the 20th century the consensus in the scientific community was that several alarming global trends are in dire need of remediation including: plummeting biodiversity levels, increasing deforestation, loss of arable farmland, disappearing aquifers, increasing desertification, growing oceanic dead zones, increasing numbers of species becoming endangered and/or extinct, and overconsumption of non-renewable resources (Black & Phillips, 2010). Both within and without the business world, the overall effect of this is an increased pressure for businesses to “go green” and take on sustainability initiatives. In particular, it is predicted that annual investment in renewable energy will “triple between now and 2030, according to a report by Bloomberg New Energy Finance. In an analysis of several factors shaping the global energy future - including economic conditions, market

demands, and the evolution of technologies - the group predicted that annual spending may increase from \$190 billion last year to \$630 billion by 2030.” (*e360 Digest*, 2013, p. 1)

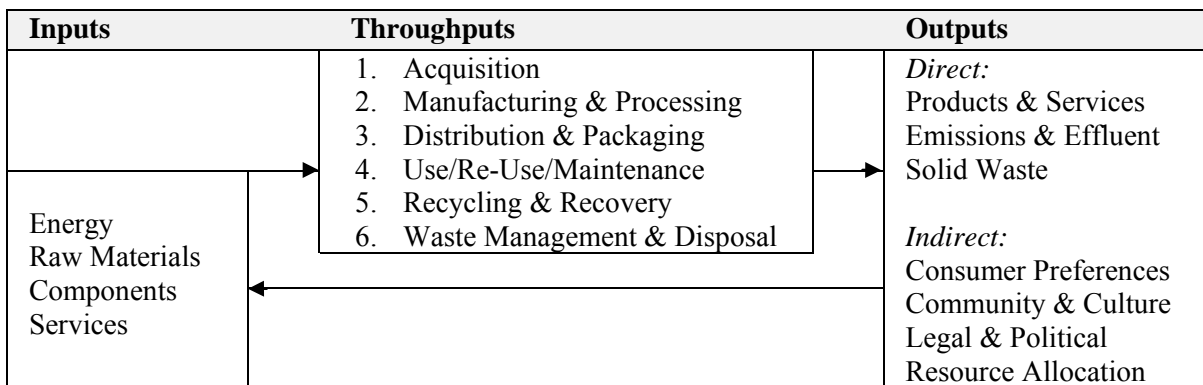
Powerful external coalitions are emerging to champion sustainability. Today’s environmental movement is gaining the support of many groups who, in the past, did not show public support for environmental issues including republicans, religious groups, conservatives, and laborers (Price, 2006; Hirsch, 2006). As Hazell (2009, p. 11) explains, “Sudden dramatic and catastrophic events are expected to become increasingly frequent, so the transformation to a sustainable, green-jobs economy may need to be non-linear.” Yet, even as organizations have changed their activities they have come under criticism for the supposed mismatch between the magnitude of the problem and the perceived inadequacies of their initiatives.

One contributing factor to this mismatch is the lack of a universal definition of sustainability. For the purposes of this paper, one popular definition of sustainability is “meeting the social and environmental, as well as the economic needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). However, the operationalization of this general concept often remains both confusing and controversial, which seems almost inevitable because of its breadth - from industrial to societal to ecological (Sikdar, et al., 2010).

LIFECYCLE COMPLICATIONS

Regardless of the model being used, complexity intensifies when the entire product or service lifecycle is examined. That is, in many green strategic models, clear distinctions across quadrants and along continua often depend on which phase of the lifecycle is being examined. Product lifecycle management (PLM) and assessment (LCA) literatures provide a comprehensive inventory to identify the factors which complicate assessing whether a product or service is truly "green" using both lifecycle and systems theory (Rosselot & Allen, 2000; Trotta, 2010). This inventory is illustrated and adapted in Figure 1 below.

**FIGURE 1
LIFECYCLE INVENTORY**



The variables in this comprehensive inventory have resulted in a variety of assessments from national and international organizations, including:

- Environmental lifecycle assessments [(LCA, ISO 14000)] which tend to be product-related and focus on energy, resources, and waste.
- Economic lifecycle assessments, also known as lifecycle costing (LCC), full cost accounting (FCA), and total cost assessment (TCA), which explicitly factor in the impact of raw and intermediate materials in the supply chain.

- Social lifecycle assessments (SLCA), the least developed aspects of sustainability, primarily because they are difficult to quantify (Hendrickson, et al., 1998; Klopffer, 2003; Trotta, 2010).

Honestly, the comprehensive scope of environmental assessment remains more ideal than real for the foreseeable future. Rosselot and Allen (2000, p. 323) note:

“The use of life-cycle studies falls along a spectrum from a complete spatial and temporal assessment of all the inputs and outputs due to the entire life-cycle (which may never be accomplished in practice, both because of a lack of information and because it would require a tremendous amount of effort and expense) to an informal consideration of the environmental stresses that occur over a product or process life-cycle.”

Given the resource intensive nature of comprehensive lifecycle assessments, these assessments are seldom conducted. Far more common are "streamlined" lifecycle assessments, under the premise that the most important lifecycle stages or types of inputs and outputs causing the most significant environmental issues can be identified for more detailed study. Streamlined lifecycle assessment reduces the resource intensive nature of data collection choosing among the following assessment strategies (Bansal & Hoffman, 2012; Rosselot & Allen, 2000):

- Building extensively on previously completed lifecycle assessments
- Using pre-existing data on energy use
- Focusing on toxicity
- Omitting certain product components or materials as insignificant
- Omitting certain lifecycle stages
- Using economic value to assess resource scarcity and ease of manufacturing

STREAMLINING GREEN

Clearly, the strategy of going "green" represents a somewhat moving target. Sustainability varies widely depending upon the product lifecycle stage being analyzed, as well as indirect effects from the supply chain (Ny, et al., 2006; Sikdar, et al., 2010). Further, environmental impact categories are sometimes neglected or manipulated in streamlined lifecycle studies through (Bansal & Hoffman, 2012; Ny, et al., 2006; Rosselot & Allen, 2000):

- Over-reliance on previously completed lifecycle assessments that often ignore their limitations and blind spots.
- Using pre-existing data on energy use depends on the problematic assumption that products which require little energy do not create serious process wastes.
- Focusing on toxicity ignores a host of environmental issues involving the bulk and composition of non-toxic wastes, particularly fine particulates.
- Omitting certain product components or materials as insignificant due to the small relative weight of the discharge masks the impact of small amounts of highly toxic material.
- Omitting certain lifecycle stages, particularly the direct and indirect effects of the supply chain and disposal activities.
- Using economic value to assess resource scarcity and ease of manufacturing.

Unfortunately, the selective nature of streamlined lifecycle studies means that potentially important environmental impact categories are sometimes neglected. When streamlined lifecycle criteria exclude environmentally destructive direct or indirect effects of the supply chain or production or disposal, accusations of deliberate manipulation surface. This social negotiation naturally creates the possibility of marketing manipulation, commonly referred to as "greenwashing" (Greer & Bruno, 1997; Orange, 2010; Ramus & Montiel, 2005). When products and services "promise more environmental benefit than they deliver," this promotion is an example of "greenwashing" (Dahl, 2010, p. 246).

Greenwashing has become common in recent years, primarily due to a lack of regulation, oversight, and monitoring of green marketing claims (Dahl, 2010; Ramus & Montiel, 2005). In the United States and Canada, a total of 2,219 products making 4,996 green claims were tested by TerraChoice Environmental Marketing (2010) against best practices, mainly the guidelines of the U.S. Federal Trade Commission, the Competition Bureau of Canada, the Australian Consumer and Competition Commission, and the ISO 14021 standard for environmental labeling. The sampled companies increased advertising claims of green products by 79 percent in a 2 year period, while only 2% of those 2,219 products had the eco-friendly design features and production changes needed to justify their claims. This research identified the “seven sins of greenwashing” (adapted by Dahl, 2010, from TerraChoice Environmental Marketing, 2010, p. 5-6):

1. The hidden trade-off: Suggesting a product is “green” based on an unreasonably narrow set of attributes without attention to other important environmental issues (e.g., paper produced from a sustainably harvested forest may still yield significant energy and pollution costs).
2. No proof: An environmental claim that cannot be substantiated by easily accessible supporting information or by a reliable third-party certification (e.g., paper products that claim various percentages of postconsumer recycled content without providing any evidence).
3. Vagueness: Every claim that is so poorly defined or broad that its real meaning is likely to be misunderstood by the consumer (e.g., “all-natural”).
4. Irrelevance: Making an environmental claim that may be truthful but is unimportant or unhelpful for consumers seeking environmentally preferable products (e.g., “CFC-free” is meaningless given that chlorofluorocarbons are already banned by law).
5. Lesser of two evils: Committed by claims that may be true within the product category, but that risk distracting the consumer from the greater health or environmental impacts of the category as a whole (e.g., organic cigarettes).
6. Fibbing: Committed by making environmental claims that are simply false (e.g., products falsely claiming to be Energy Star certified).
7. False labels: Committed by exploiting consumers’ demand for third-party certification with fake labels or claims of third-party endorsement (e.g., certification-like images with green jargon such as “eco-preferred”).

This makes the definition of "green" a socially constructed as much as empirically based assessment. It is no longer enough to develop green products and processes; they also require the support of a public relations campaign to make a credible claim on a green reputation. In addition, standards and regulations will be socially negotiated political mandates arising from crisis management and environmental brinksmanship. Because green is negotiable, most strategies explicitly include marketing campaigns to build competitive advantage (Ginsberg & Bloom, 2004). This is illustrated in Figure 2 below (Ginsberg & Bloom, 2004, p. 81).

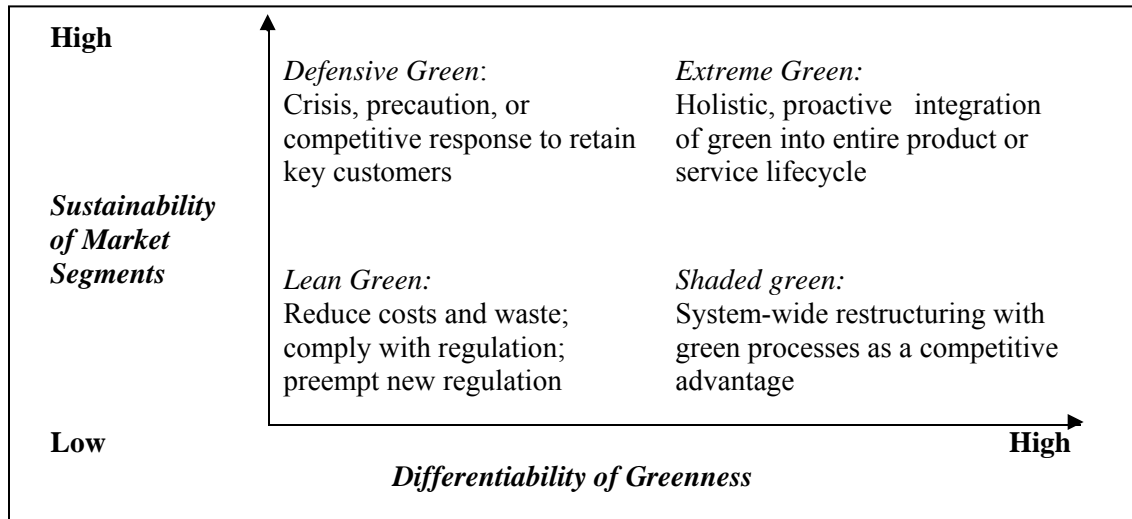
However, notice that the focus of these strategies, with the exception of holistic green, primarily focus on the throughput (production) and output (consumer usage and direct effects). Other lifecycle stages, most conspicuously the supply chain and disposal stages, as well as their indirect environmental effects, are overlooked or ignored.

Defensive Green

Green strategies in this quadrant are often characterized by a defensive and/or public relations focus. Due to a crisis, political/legal trends, or competitive threats, these green efforts reflect leveraging green features of the product/service line more than any fundamental commitment to environmental sustainability. By reaching out to involve a variety of stakeholders, and listening to their feedback, executives hope to placate eco-concerns and either build goodwill or at least minimize future criticism. Large corporations with strong political networks and allies in local, state, and federal government can even receive incentives to adopt green alternatives. These strategies are often reactive or precautionary

moves to either mitigate damage or protect organizational legitimacy in the minds of consumer segments that executives feel they cannot afford to lose (Ginsberg & Bloom, 2004; Stuart & Millstein, 2003). Organizations in this quadrant often publicize their efforts to build a greener reputation and consumer goodwill, and may minimize those efforts when they no longer command public attention (Orsato, 2006).

**FIGURE 2
GREEN MARKETING STRATEGY MATRIX**



These products and processes continue business as usual but in a cleaner way. This includes both tools for “cleaning up the mess” more effectively and, if waste cannot be avoided, at least it can be contained. One of the most widely used containment measures is the containment pond. For example, in the mining industry, tailing ponds isolate enormous quantities of fine rock and mineral particles generated from mining activity, particularly when working with lower-grade ore deposits. Historically, these tailings were flushed into local rivers and streams, causing ecological disasters. Modern tailing impoundments were designed to permanently dispose of tailings created by mining and milling (Lottermoser, 2010; Siemens Industry Solutions Division Press Release, 2010).

Unintended Lifecycle Complications

Many managers in pollution intensive industries view and deal with issues of sustainability using this defensive perspective. While endeavoring to reduce toxic by-products and looking for ways to manage the waste they do create, they overlook strategies in other lifecycle stages. Often cleaning and containment solutions are not permanent.

For example, mine-tailing impounds can have tailing embankments as high as several hundred feet and cover several square miles. Many concerns over the stability and environmental performance of tailing dams and impoundments have arisen, because they occasionally fail. The problems are compounded when they are abandoned, due to the long-term effects of windblown dispersal, ground water contamination, and acid drainage. The associated cost of remediation of impoundment failures in the disposal stage often can be prohibitive and usually far exceed the costs of both the original design and operation of the tailings impoundment (Lottermoser, 2010).

Lean Green

These strategies target preventing some of the pollution in the first place, and are very popular among organizations with high processing costs and/or high waste (Orsato, 2006; Stuart & Millstein, 2003). This

eco-efficient strategic focus is both reactive and precautionary, complying with regulations and finding pre-emptive long term solutions to avoid further regulation and restriction (Ginsberg & Bloom, 2004). In particular, efficient processes such as "lean" manufacturing initiatives minimize waste through continuous innovation (Wilson, 2009). Within the business press, this quadrant has received much attention. Much of the sustainability effort to date has focused on making this "business case for sustainability," which in practice has meant arguing for the short to medium term profitability; and, there has been an explosion of books and articles advising managers on how to identify profitable environmental initiatives (Holliday, et al., 2002; Schmidheiny, 1992).

Possibly the most well-known example of lean green technology involves alternative fuels for motor vehicles, i.e., bio-fuels (ethanol, biodiesel, etc.), hydrogen fuel, electricity, or synthetic fuels such as those derived from biomass, coal, or gas, all of which feature less toxic emissions than petroleum products (Vliet, et al., 2011). Among eco-friendly bio-fuels, ethanol is the most widely used alternative. It has several advantages over other bio-fuels, including that it can be mixed with gasoline and used in conventional combustion engines with virtually no modifications. In addition, ethanol results in lower emissions of particulates, sulfur, nitrous oxide, and other greenhouse gases when incorporated with conventional fuels and it has no net release of carbon dioxide when burned alone (Balat & Balat, 2009). To top it off, its inputs - crops - are a renewable resource which can be sustainably developed for future use (Balat & Balat, 2009).

Unintended Lifecycle Complications

Unfortunately, the direct and indirect effects of ethanol production render its lifecycle eco-friendliness problematic, particularly in underdeveloped markets and third world nations (Balat & Balat, 2009; Singh, et al., 2011). Ethanol's primary claim to eco-fame, the environmental friendliness of the fuel's emissions, is tainted from a lifecycle perspective. Unfortunately, the supply chain is dirty due to:

- The increased nitrous oxide emissions caused by the enormous amounts of nitrogen fertilizer used to grow ethanol corn (Mosier, 2009; Scharleman & Laurance, 2008).
- Increased competition for water supplies, limiting drinking water, industry, and such uses as hydropower, fish habitat, and recreation (NRC, 2007).
- Increased soil erosion and runoff contamination, since corn production is fertilizer, herbicide, and pesticide intensive (Lore, 2007; NRC, 2007).
- Large scale production sequesters huge tracts of land, limiting food production (Davey, 2012; Walsh, 2012) and raising food prices (Pineiro, et al., 2009; Sharleman, 2008) and causing nutritional deficits among the poor (Hertel, et al., 2010).

Shaded Green

This quadrant involves significant, system-wide restructuring of product service with green processes as a sustainable competitive advantage (Ginsberg & Bloom, 2004). This represents a significant investment in clean technologies, with the goal of being perceived by eco-conscious consumers as a truly green organization with a distinctive, credible, and trustworthy green brand (Orsato, 2006; Stuart & Millstein, 2003). This commitment ranges from taking existing products and processes and altering them with as many eco-friendly components and green inputs as possible, to developing entirely new, more eco-friendly processes and production.

One widely used innovation is genetic modification. This involves "synthetic biology" where organisms are custom modified to maximize desired properties and compounds. Genetically modified organisms (GMOs) are touted as having the potential to:

- Improve the caloric, protein, and micro-nutrient content of staple crops, particularly rice and grains (Bouis, et al., 2003; Hoffman, 2012).
- Mitigate the effects of climate change (drought, salinity, etc.) (Azadi & Ho, 2010; Brookes & Barfoot, 2011; Hoffman, 2012).
- Reduce the need for pesticides, herbicides, and fertilizers by improving natural resistance and hardiness (Azadi & Ho, 2010; Brookes & Barfoot, 2011).

- Provide greater crop yields and faster growth rates (Azadi & Ho, 2010; Bouis, et al., 2003; Hoffman, 2012).
- Increase the availability of medicines and vaccines in a cost effective manner by "pharming" them (Marvier, 2007).

Unintended Lifecycle Complications

There are a host of worrisome indirect effects in a number of lifecycle stages, often due to unanticipated side effects. For example, in the supply chain stage, one set of troublesome indirect impacts involve the free flow of transgenic crop genes among plant relatives. Most seriously, many "pharming" crops are engineered so that vaccines and even some drugs can be delivered through the direct consumption of the crops leaves, fruits, or other plant parts without any processing whatsoever. In turn, contamination of nearby crops and livestock could result in consumers being unknowingly dosed (Marvier, 2007; Vogel, 2006). In the wild, contamination results in potential losses to the biodiversity of both crops and their wild counterparts as well as the contamination of both plants consumed by and areas inhabited by non-target organisms (Gepts & Papa, 2003).

Further, in the throughput (production) stage, GM crops have not lived up to their eco-potential, particularly in lowering pesticide use and higher crop yields. In recent studies it has been found that pesticide use has not in actuality been significantly reduced by GM crop utilization in that insects also are rapidly developing resistance and requiring more pesticides (Callahan, 2011). Unfortunately, minimizing one set of pests allows the rise of secondary pests which require secondary pesticides. In a study of GM Bt toxin cotton crops, there was no difference in the total number of insecticide applications between non-transgenic cotton and GM varieties (Azadi & Ho, 2010). Further, such genetic flow and limited biodiversity could result in increased numbers of "super weeds" with herbicide resistance. (Gepts & Papa, 2003; Hoffman, 2012) Furthermore, a greater part of GM crops do not actually result in the higher crop yields, which depend on optimal conditions simply not present in most farm locations (Marvier, 2007).

Extreme Green

Many managers are reluctant to adopt green innovation strategies unless there are clear cost benefits from doing so because such short term investments for long term returns are considered risky in corporate environments where performance is judged and based on short-term quarterly returns. However, for the adventurous, a holistic integration of green into entire product lifecycle is worth tackling because of the growth potential it offers. (Stuart & Millstein, 2003) Designing a business model around the needs of the environment, instead of retrofitting existing models to be more eco-friendly, is radically innovative, and holds the promise of both industry leadership, consumer goodwill, and premium pricing (Ginsberg & Bloom, 2004). These corporations use green innovation strategies as a competitive advantage and are the most likely to receive government support for their efforts (Orsato, 2006). The opportunity is matched by the risk. Siemens (2010) cautions that such models are strategically imbalanced, compromising productivity in favor of the environment, and may not be viable in the longer-term (Siemens, 2010; Trotta, 2010).

For example, one reason hybrid or electric cars are hailed as eco-friendly is because of their batteries. Unlike conventional batteries, they are now completely redesigned to use lithium as their main component. Lithium is much less toxic than any heavy metal (Majeau-Bettez, et al., 2011). Lithium batteries charge faster, provide better output, and last the life of the car. They appear to drastically reduce or eliminate two serious contaminants, that is, lead from conventional batteries in landfills, and GHGs from internal combustion engines relying on petroleum products instead of electricity as their main power source.

Unintended Lifecycle Complications

Unfortunately, their eco-friendliness is compromised in every stage of the product lifecycle. In the supply chain, lithium batteries depend on rare earth metals, which are extremely dirty to produce (Bradsher, 2012). In both the supply and production phases, lithium, as well as other light metals used in

hybrid and electric car production, are much more energy intensive than conventional materials. This makes the nature of their eco-impact dependent on the source of the energy utilized (Granovskii, Dincer, & Rosen, 2006). Similarly, lower greenhouse gas [GHG] emissions when in use also depend on the fuel source of the electricity provider that charges them (Stenquist, 2012). If the source of the electricity comes from renewable energy supplies such as wind, hydroelectric, solar, etc., then their GHG emissions are very much reduced. However, if the provider runs on oil, natural gas, or in the worst case coal, then the total GHG emissions are no better than regular cars (Stenquist, 2012; Vliet, et al., 2011). In short, these batteries are eco-friendly only if the grid is appropriately de-carbonized (Ma, et al., 2012; Stenquist, 2012). Finally, in the disposal phase, while lead and nickel are somewhat recyclable heavy metals, lithium is not. Recycling lithium does not cover its costs, nor are there recycling plants which currently offer the service on a large scale (Taylor, 2009).

Problematic Green

These unanticipated lifecycle challenges often significantly affect the calculation of what is or is not "green," leading to potential charges of greenwashing. Consequently, most consumers and organizations are somewhat confused about this topic and their responsibilities regarding it, and are likely to stay that way for a while because of the nature of traditional green media channels. As noted by Makower (2013, p. 4),

“Transparency is a fundamental building block of a green economy. It can build trust in companies, and ward off claims of greenwashing...Being transparent is no longer a question for consumer-facing companies. The only question is whether they do it themselves or have it done for them.

“There are several terrific examples of the latter: Greenpeace’s ranking of supermarkets on sustainable seafood; Climate Counts’ ranking of companies on their climate goals and performance (disclosure: I’m on Climate Counts’ board); the Electronics Takeback Coalition’s ranking of computer companies’ e-waste efforts; the Union of Concerned Scientists’ ranking of automakers; and Greenpeace’s (again) ranking of technology companies. Each of these (rankings) compares companies and brands using rigorous and consistent criteria, helping to illuminate who’s really walking the talk. They don’t just look at product attributes. They look at the whole enterprise. This isn’t market-speak; it’s accountability.”

Traditional media coverage of green issues tends to be woefully, even deceptively, simplistic (Downing, 2013, 2004). The sheer complexity of differentiating between true green and greenwashing lies in the choice of the metrics involved, particularly when the methods themselves are in dispute. As one researcher concludes, "some statistics get mangled because they are difficult to grasp, and are therefore easily confused" (Best, 2001, p. 14). Paraphrasing Oscar Wilde, "For every green problem, there is a simple solution - and it is wrong."

However, even if the metrics were simplified, their interpretation would remain obtuse. America has long held two deep, and often contradictory commitments, as summarized by Stephen Downing (2013, p. 1):

“Recently the sense of urgency for change has been fueled by politicians accepting scientific evidence of man-made climate change providing a massive threat to humanity, equal or greater than the threat posed by terrorism. The highly visual and emotional drama of unfolding 'climate chaos' and 'eco-doom' in reports of dangers to polar regions, glaciers, permafrost, fish stocks and other species has become a daily feature of media news and entertainment. But these stories co-exist with our over-riding commitment to business growth, GDP as a measure of progress and a consumerist culture. As the saying goes, ‘we live in interesting times.’”

Even though activists, community groups, government agencies, faith-based organizations, schools, scout troops, universities, and, of course, companies have been encouraging shoppers to make greener choices for years, Makower (2013, p. 1) contends that consumers have not been willing to vote with their dollars for well over 20 years, the result being that no green product has captured more than a tiny slice of the U.S. marketplace. He states that “even where green products do seem to be selling, it’s not primarily because of their environmental benefits.”

However, the greening of business-to-business (B2B) is a different story:

“A wide range of things companies buy - building products, industrial cleaners, IT equipment, paper and forest products, appliances and some industrial feedstocks - are being marketed effectively for their environmental attributes. Companies and other buyers (like government agencies, hospitals and universities) are more willing to change their buying habits, and their buying power can make for attractive economies of scale. Witness the continued market growth of green buildings, biobased packaging, alternative-fueled fleet vehicles and more.” (Makower, 2013, p. 2)

On the global level, the International Council for Science (ICSU) represents science groups in 140 countries including the U.S. National Academy of Science. Their starting point is that “stark increases in natural disasters, food and water security problems, and biodiversity loss are just part of the evidence that humanity may be crossing planetary boundaries and approaching dangerous tipping points” (Pearce, 2012, p. 2). However, there does not seem to be agreement on how to proceed in order to avoid this tipping point. Sadly, it is unlikely to be attained by world leaders alone; and, it probably should not be. Each of the world’s seven billion people will need to contribute in their own particular way (Pearce, 2012)

THE GREENING OF NEW SOCIAL MEDIA NETWORKS

The balance may shift as the importance of green issues, and the consequences of ignoring them, increase. However, disseminating the true picture of true green will likely have to transcend traditional media channels. Fortunately, increasing interest in environmental issues such as climate change, interest in sustainability, and "going green" has manifested itself in an unprecedented explosion of interest in new channels such as online social media (Fraser, 2011; Wenzel, 2009). “U.S. consumers tell researchers they want to buy environmentally friendly products, but so far they haven’t been doing that on a large scale. Now a host of companies and nonprofits are trying to use new technology - from smartphones to social networking- to make it easier for buyers to make the green choice.” (Gunther, 2012, p. 1)

Social media describes a set of tools that fosters interaction, discussion, and community, i.e., it allows people to build relationships and share information in virtual communities and networks. That is, social media is about conversations based in authenticity, honesty, and open dialogue. (*Tufts University Web Communications*, 2013) Some of the various tools of social media include social networks, bookmarking sites, social news, media sharing, microblogging, blog comments and forums, personalized homepages, personalized rich profiles, communities of action, photo sharing, video, wall postings, email, instant messaging, music sharing, wikis, location sharing, podcasts, and virtual worlds (Grahl, 2013; Herrera, 2013; Waters, 2013). Additionally, “social media relates to the technology and platforms that enable the interactive web’s content creation, collaboration, and exchange by participants and the public” (Cohen, 2011, p. 1). In 2009, Minneapolis-based Russell Herder and Ethos Business Law surveyed management, marketing, and human resources executives within companies across the US. Results revealed that the most popular social media channels are Facebook (80%), Twitter (66%), YouTube (55%), LinkedIn (49%), and Blogs (43%). (Matthews, 2011d)

With a plethora of online communities and apps to choose from there have been entire conferences organized for information, analysis, and evaluation of their offerings (Wenzel, 2009). Naturally this hyper-competition has led to periodic industry shakeouts, as even major players with accolades have

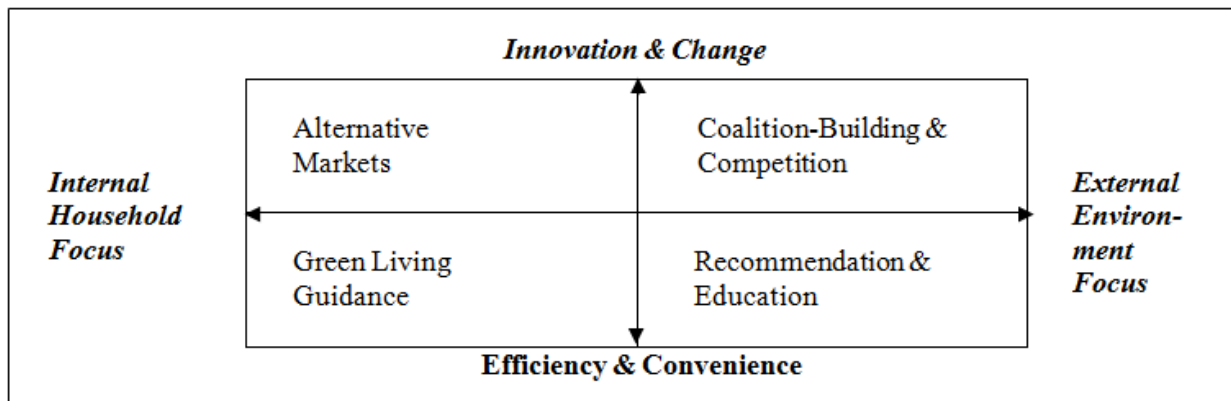
become dormant or failed entirely (Pierobon, 2012) when confronted by better designed and structured upstarts (Ridings & Wasko, 2010). Eco-blogger Lorna Li (2012) concludes:

“The Green web is growing. Rapidly. And it’s a good thing. Online communities, blogs, and social sites aimed at connecting well meaning people with great causes (and each other) have mushroomed. Nowadays, all it takes to rally around issues like climate change, clean energy, or health care reform is an Internet connection. At the same time, with all the Green social networks out there, it’s hard to know which online community is worth the time and investment. Because, face it, social networking takes time. Whether you are an individual activist seeking to meet other like-minded people or a social change organization trying to build community around your cause, choosing the right online community can ensure that you get the most impact for your efforts.” (Li, 2013)

In this section, green new social media is reviewed. Additionally, types of social media are analyzed that will most effectively communicate comprehensive lifecycle impact information so commonly neglected or over-simplified by traditional media channels. This analysis compiles and summaries other reviews, including Katie Fehrenbacher's *Green Social Networking* (2008), Elsa Wenzel's *The Social Media & Web Guide to Going Green* (2009), Richard Matthews' *Top Green Social Networks* (2011a, 2011b, 2011c, 2010), and Lorna Li's *10 Best Green Social Networks* (2012).

Sustainability initiatives can be clustered on two continua as proposed by Williams, et al., (2012): (1) an internal focus versus external focus, and (2) an innovation focus (big picture change) versus efficiency focus (convenient change). An internal versus external focus assesses whether social media networks emphasize individual consumers and their household needs. An external focus targets the broader social, environmental, and political aspects of going green. An innovation focus targets significant change and action, while an efficiency focus makes change and action more convenient and less disruptive. These continua are illustrated in Figure 3 below.

**FIGURE 3
GREEN SOCIAL NETWORKING**



Most green social networks specialize, but that may be an artifact of their relative immaturity. A few green social network sites have grown to the point of being truly comprehensive, with a presence in most of the quadrants listed above using a variety of social media channels. Three examples of the most well-established social networking sites are profiled below in Figure 4.

**FIGURE 4
PROFILES OF COMPREHENSIVE SOCIAL NETWORKS**

Communities:	<i>Care2.com</i> *	<i>TreeHugger.com</i> **	<i>Change.org</i> ***
Blogosphere:	care2 green living blog	TreeHugger, The Green Library	www.change.org/organizations/bloggers_united
Twitter Feeds:	Many feeds by topic	#treehugger	Many feeds by topic
Facebook:	/Care2 857849 likes 21814 talking about this	/TreeHugger 145769 likes 3911 talking about this	/change.org 205744 likes 37217 talking about this
<p>*<i>Care2.com</i>: An interactive online community with nearly 12M members. <i>Care2</i> is primarily interest groups and green living information with some opportunities to do more, such as support a wide variety of social causes in various ways.</p> <p>**<i>Treehugger.com</i>: A focus on design and living news covering technology, architecture, transportation, sustainable living commentary, features, and solutions.</p> <p>***<i>Change.org</i>: Activism connecting people by interests and providing change tools and activities, daily news, and information about important social issues, and links with nonprofits.</p>			

Coalition-Building & Competition

Many social media networks develop web communities that actually meet in-person for group events and for shared projects and partnerships. Their effectiveness in communicating the complexities of a comprehensive green lifecycle analysis is bounded by their expertise, their quality, and their agenda and motivations. These partnerships can even extend to incorporate businesses interested in a multi-stakeholder approach. For example, examine the mission of *The Green Group*:

“Network with both individuals and organizations. Green Group members are involved with companies and/or organizations that are socially conscious, promote recycling, healthy living, alternative energy, conservation, organic products, low impact alternatives, and other green initiatives.” (<http://the-green-group.com>)

Other social media networks are specialized, usually by industry or geographic region. For example *Greenbuilding* is a discussion forum for building professionals while *Cleanweb* focuses on overcoming resource constraints through information technology, and *GreenBiz* primarily focuses on networks of businesspeople and investors.

Others add contests and competitions to spur interest. For example, *Big Carrot* awards a prize to an eco-friendly initiative developed by users, such as recycling greywater or crafting a green generator. *CarbonRally* organizes competitive games with rival teams playing for points by reducing emissions. The GHG global warming niche may be saturated. *Carbonrally*, a well-established contest network, has faded into dormancy (Pierobon, 2012). Similar carbon footprint sites such as *WorldCoolers.org* and *2people.org* have failed. Major sites still use contests, such as *Facebook's* current collaboration with the Department of Energy to co-sponsor the *Cleantech Goes Social Contest*, where winners pitch to San Francisco investors.

Here is a specific example of a coalition building campaign on *Twitter* (e360 Digest, 2012, p. 1):

“A coalition of activists today launched a 24-hour campaign on the social media network Twitter to pressure global leaders attending the Rio+20 summit to slash fossil fuel subsidies. Beginning at 8 a.m. GMT, participants started posting messages on the social media site using the hashtag #EndFossilFuelSubsidies, a so-called ‘Twitterstorm’ that organizers hope will call attention to the issue at the global summit in Brazil. By mid-morning the hashtag was the leading trend on Twitter. The campaign comes as a new

report from Oil Change International estimates that fossil fuel industries receive as much as \$1 trillion in direct or indirect support from governments annually.”

Education and Recommendation

When it comes to sharing a complex, big-picture perspective on green, nothing trumps educational websites or blogs. Activist researchers, non-governmental organizations (think tanks), journalists, and environmental groups (Greenpeace, World Wildlife Fund, Nature Conservancy, Sierra Club, National Audubon Society, National Wild Life Federation, etc.) have all recognized this potential:

“Social media have become the latest, hottest tools in natural history circles as scientists confront a populace that knows laptops better than landscapes. In the quest to give communities a grasp on complex ecological systems - particularly as they face decisions imposed by climate change - social networking promises to link scientists with the public, empowering naturalist armies to act on their behalf: monitoring species, observing behavioral patterns, and reporting the presence of invasives and changes in climate, vegetation, and populations.” (Fraser, 2011, p. 1)

Consequently, there is such a plethora of green offerings; and, a host of online directories of the best green websites and blogs have sprung up to direct greenies to their chosen favorites which usually combine the established websites and new websites they want to promote. Despite this upswell of interest, green activism is not for the faint of heart. Many green websites collapsed after Congress did not pass a cap and trade legislation program in 2010-2011 (Pierobon, 2012). Subject to the ebb and flow of political priorities, sustaining interest in this niche is difficult.

Another set of websites take the need for education out of the equation through expert reviews of businesses and their products and processes. Rather than becoming an eco-expert themselves, these users rely on the expertise of others. These sites range from *Do The Right Thing* and *Sustainlane*, which provide analysis and peer reviews, to *Consumer Reports*, with a comprehensive list of green labels for a variety of products. Two additional organizations include *The Sustainability Coalition* and *GoodGuide*. *The Sustainability Consortium* is building scientific tools to measure and report on the lifecycle impact of thousands of products. It initially received money from Walmart but now includes retailers, consumer products companies, and universities. Still, progress has been slow.

“GoodGuide began with a mobile phone app that required consumers to photograph bar codes to get data on individual products. It then posted reams of information on its Web site. Now it offers a popular iPhone app, as well as software called a Transparency Toolbar that attaches to a Web browser. When shopping online at Amazon, Walmart, Target, and other sites, shoppers can see how products perform, according to GoodGuide, on issues they care about. A GoodGuide app can also ride atop Facebook, rating the products and companies in any ads that appear. GoodGuide intends to make money by providing specialized data to retailers or institutional buyers, such as hospitals; it currently generates revenues when consumers go through GoodGuide’s Web site or toolbar to make purchases on Amazon...The company’s goal is to ‘get into the flow of the shopping experience and try to provide the right information at the right moment.’ ” (Gunther, 2012, p. 3)

Alternative Markets

On the household level, websites do not focus on the big picture as much as smaller, incremental opportunities. The idea is to find alternative markets that do not require the production of new goods, and thus sidestep the environmental impact of that production. Not inconsequentially, these alternatives also tend to save their users money. There are four primary alternatives:

1. Renting everything from cars to fashion accessories (Shaheen & Cohen, 2007)
2. Repurposing through online sales and auction sites such as *eBay*, *Craigslist*, or *Freecycle*
3. Bartering, where goods are exchanged rather than purchased (e.g., *Eco Barter*, *Really Really Free Market*, or *SwapThing*)
4. Borrowing, where "transumers" temporarily borrow everything from equipment to clothing (e.g., *Neighborrow*)

Green Living Guidance

On the household level, websites tend to focus on smaller, incremental opportunities instead of the green "big picture." The idea is to find convenient incremental changes and enhancements to help a household become more environmentally sustainable. These sites often feature discussion communities on living "greener" through lifestyle changes. For example, *Greener People* is an online community "focused on ways for individuals to live greener lives through the choices they make every day." There are a variety of green tools websites to help calculate your environmental impact and reduce your footprint including *TerraPass*, *BeGreenNow*, *Low Impact Living*, and *Water Footprint Network*. This is a challenging niche market, in that *ZeroFootprint*, despite positive press and awards, has gone dormant (Pierobon, 2012).

WHY USE SOCIAL MEDIA FOR SUSTAINABLE GREEN INITIATIVES

As shown above, there are many options and degrees to which a company can differentiate itself as a good green, sustainable citizen; and, there are many constructive contributions that could be made by social media to get the green message(s) out with the desired result. But, is social media the route for an organization to take? Considering that the use of social media for green initiatives can have many positive benefits, it is definitely in the organization's best interest to consider it (*The Green Marketing Company*, 2011a, 2011b; Matthew, 2011d; Urlaub, 2012; Newman, 2012; Thurston, 2012; Ang, 2011):

- Extend and build your green brand (personal and company brand) - let partners, prospects, and customers get to know the person and professional personality behind your green company.
- Learn where your green customers are.
- Get to know your green clients' needs and concerns faster - that means you can respond faster and it ultimately compresses the sales cycle.
- Create enhanced green customer relationships based on trust and expertise - you can join conversations to add value.
- Social media is simple to use, and, even the smallest of things can go viral.
- Respond to customer concerns and complaints in real-time - get their feedback.
- Respond to an information request (regulatory or inquiry) or event.
- Learn what is being said about you throughout the web - monitor your competitive position.
- Social media can be joined with smartphones and other mobile technology – this means real-time connection and interaction anywhere, any time. Without a doubt, this is the wave of the future.
- Given the ongoing stream of new technologies, people now can quickly connect, converse, create, and collaborate with each other via social networks.
- The cost of getting started is minimal.
- Thought leadership can be established in your industry.
- Even though most leading companies employ social media, smaller and mid-sized companies are actually better candidates for social media because they are more agile than larger companies. Larger companies may benefit more in terms of being able to target niche markets.
- Individuals, organizations, and causes can network with others who share their interests.
- Use social media to communicate with your stakeholders - communicate your broader social responsibility agenda and engage your stakeholders.
- Social media can enhance reputation and be used to promote anything.

HOW TO USE SOCIAL MEDIA MORE EFFECTIVELY FOR SUSTAINABLE GREEN INITIATIVES

Social media can provide many useful benefits to the individual or organization growing and evolving its sustainable green identity and actions. In a positive, supportive spirit of sustainability and green initiatives, the following ideas are offered to ensure that the use of social media is increasingly successful and useful, in that, it contributes to strategic innovation and management including planning, implementation, and control:

1. Plan and set achievable goals for your social media green marketing campaigns. Measure outcomes for control purposes and to guarantee positive results (*The Green Marketing Company*, 2011a).
2. While video, social media, and mobile are transforming marketing forever, the challenge is to choose the right green marketing strategy and execute it well. A simple process to use for developing masterful green marketing strategy is (Hannam, 2010):
 - a. Develop a strategy based on rigorous research
 - b. Implement multiple streams of traffic to your website
 - c. Acquire subscribers and fans
 - d. Convert subscribers to buyers with an effective sales process
 - e. Test, evaluate, and optimize everything
3. Understand that the individual consumer is in charge on social media. That is, thousands of Tweets complaining about or making fun of product features, may bring about new features or even a company change. One day, maybe social media will even save the planet. (Howell, 2009; Vranica, 2012)
4. Social media is a conversation. That is, avoid over-selling, focus on organic content, and build your campaign step-by-step. Encourage dialog. Encourage participation by using a contest, incentive, or coupon offer. (Matthews, 2011d)
5. Communicate your good citizenship, communicate your environmentally sustainable activities and positions. Be sure and promote your brand and your environmental service, learning, collaboration, performance, and improvement. (Matthews, 2011d)
6. Be transparent and communicate openly and regularly with your audience about real topics (not marketing messages). (LeCompte, 2010)
7. Build a community of brand enthusiasts and even evangelists, 28% of bloggers post opinions on products and brands. This requires that you know who you are as a brand identity. (LeCompte, 2010)
8. Understand what issue(s) are most important to your audience. That way, you can focus on consumer persuadability relevant to your audience. (*Marketing Green*, 2012) “People often buy green products for the feel-good vibe that comes with the purchase. Events that enhance this vibe and create a memorable experience can generate a positive buzz around a brand. And when amplified through social networks, this buzz can generate significant financial rewards.” (Wexler, 2010, p. 24)
9. Identify microsegments through research and target these specific niche markets, e.g., target new visitors and influencers (*Marketing Green*, 2012; Powell, et al., 2011).
10. Target younger people. They have larger social circles and are more prone to take interest in and act on green initiatives. According to Mintel’s research, 14 percent of 18-24 year olds switched to a more environmentally friendly product because of a friend’s social networking post. Approximately, 12 percent of this group said they had liked a company on *Facebook* (these users often have more than 300 friends), followed a company of *Twitter*, or pinned the company to their *Pinterest* board because of the company’s green practices. (Smith, 2013)

11. While social media is providing many new means of acquiring and distributing information, its call to fame is in facilitating relationships based on mutual interest and mutual gain. These can be leveraged into customer loyalty. (Tsai, 2009)
12. Turn loyalists and supporters into influencers that motivate their friends.
13. In terms of social media, “marketers should find simple ways to change people’s behavior that appeal to emotions rather than rational logic if they want to succeed in making consumer lifestyles more environmentally friendly.” (*Marketing Week*, 2012)
14. Highlight the financial benefits of sustainable living that go to consumers rather than focusing on the benefits that go to the company for its sustainable efforts (Jeffries, 2012).
15. Help target consumers to try your brand, e.g., drive them to your website with discounts, special offers, and environmental information (Raymond, 2009).
16. Keep up your social presence. Once the social pressure that consumers feel to go green is reduced, it can be easy for them to backslide and do old, less green patterns (Smith, 2013).
17. Search for appropriate green keywords on *Twitter* and then follow the conversations to better understand the thinking and trends in the industry (Howell, 2009).
18. Study the top 10 and other successful green marketing and sustainability campaigns and websites (Kaplan, 2011; *B to B*, 2013).
19. Use blogging to find, encourage/advocate, and applaud forums and green marketing practices. It also can be used to boo and call out the greenwashers. Likewise, an individual or organization can help others by identifying resources. (Howell, 2009)
20. Administer a poll or host a green conversation to garner interest and action. (Howell, 2009)
21. Use podcasts and social networks to promote your green contribution. Webinars can help educate about green initiatives. (Howell, 2009)
22. Use and reuse content throughout your social network to give customers sustained value and usefulness, for example, write compelling, relevant, and engaging posts. (*The Green Marketing Company*, 2011b; *Tufts University Web Communications*, 2013).
23. Social media can be used to wage war on other less green companies, but keep in mind your basic principles of using comparative ads, i.e., always compare up and never down, consumers do not like it when you slam the competition, give value to the consumer in the comparison, etc. (Matthews, 2011d)
24. While posting articles, ads, updates, pictures, and videos on social media can generate traffic, it does not help search engine rankings. So, it is important to drive the traffic back to your website, which does impact search engine rankings (Matthews, 2011d).
25. Quality video is essential for all green marketing websites. A recent Forrester Research report claimed that videos are 53 times more likely than other Web pages to appear on page 1 of search results. So, add a video explaining your products and services. It can transform your online performance. (Hannam, 2010)
26. Integrate your online and traditional marketing, e.g., interactive technology and aspects of gaming are allowing brands to blend outdoor campaigns with experiential and new media activity (Raymond, 2009; *Marketing Week*, 2011).
27. Social media is still developing, so stay current and fresh.
28. Get top management and employee buy-in. Be sure to train them appropriately and continually. Strategic intent for green marketing and disclosure using social media must be maintained. (Newman, 2012)
29. Think differently about the cost, duration, and metrics of your social media campaign. It could take months for an interactive campaign to accomplish its goals. But, engaged consumers may mean that the program will run for a very long time with only modest maintenance. (Gillin, 2007)
30. Keep yourself protected legally. The broad categories include: “1) potential liability due to a breach of the organization's security as the result of an attack originating through the use of social

media; 2) potential legal risk associated with social engineering and spoofing attacks against users or 'fans' of an organization's social media presence, persona or application; and 3) legal consequences of leakage of third party confidential information as a result of social media use." (Ricci, 2012)

IMPLICATIONS

The need for the world's industrial companies to transform "from a dead end, eighteenth-century model into a new, sustainable model suitable for the twenty-first century, may well be the greatest business opportunity that industry and entrepreneurs have ever seen" (Anderson & White, 2009, p. 212). "Sustainability is now at the top of the marketing agenda" (Jeffries, 2012). There are, and will continue to be, an influx of companies hoping to differentiate themselves from conventional producers and cash in on increasing public interest in green products (Perman, 2006; Williams, et al., 2012). That is, the business world has accepted the business case for sustainability, where the environment should be treated as one of a number of stakeholders, whose legitimate needs and interests must be balanced against each other.

While there certainly is a case for other strategies, such as holistic green, they have higher costs and difficulties. However, due to their market potential and profit margins, they are an irresistible target for greenwashing. These efforts are epitomized by organic foods, where intense lobbying efforts are underway to relax "USDA Organic" federal standards, and with considerable success. For example, the USDA significantly expanded their list of non-organic ingredients acceptable in organic foods from 77 to 245 substances since it was created in 2002 (Kindy & Layton, 2009). Similarly, lobbying to improve yields has resulted in relaxed inorganic animal feed and pesticide standards (Kindy & Layton, 2009). In turn, this has allowed large corporations to take over a larger segment of the organic product market, simultaneously undermining the meaning of "organic" food labels (Strom, 2012). As witnessed, the concept is in danger of being marginalized (Orange, 2010).

Authentic environmental sustainability depends upon competitive advantage being linked with an accurately informed public that has the ability to distinguish between greenwashing and "true green." The challenge is complicated by a plethora of unregulated green claims in a context of an emerging market characterized by chronically imperfect information. True green requires sophisticated users in an information market where education and public relations spins can be difficult to distinguish:

- Conventional news is simply too simplistic to keep up with the challenge.
- Review site information quality depends on the independence of the expert reviewer.
- Social networking site information depends on the depth of the participants.
- Education websites - depend on the absence of educators' hidden agendas and conflicts of interest.

However, of the four, social networking sites may offer the most promise because the objective nature, or lack thereof, in the dialogue and participants is more difficult to mask. As seen in this paper, social media can be very useful to individuals and organizations committed to furthering the green cause. While it is worth it to invest in social media, it must be done correctly and consciously. Further research on this topic is clearly needed.

REFERENCES

----- (2011a). Why social media for your green marketing? *The Green Marketing Company*. Retrieved April 26, 2013, from <http://www.thegreenmarketingcompany.com/tips/why-social-media-green-marketing/>.

----- (2011b). 10 Green marketing strategies for social media. *The Green Marketing Company*. Retrieved April 26, 2013, from <http://www.thegreenmarketingcompany.com/tips/10-green-marketing-strategies-for-social-media-success/>.

- (2011). Smart media network enters great outdoors. *Marketing Week*, November 24, 1.
- (2012). Online Twitter campaign urges end to fossil fuel-subsidies. *e360 Digest*, June 18. Retrieved April 26, 2013, from http://e360.yale.edu/digest/online_twitter_campaign__urges_end_to_fossil_fuel_subsidies/3512/.
- (2012). Simple and emotive the way to trigger green behavior. *Marketing Week*, May 3, 1.
- (2012). What green businesses can learn from Obama's campaign. *Marketing Green*, December 14. Retrieved April 26, 2013, from <http://marketinggreen.wordpress.com/>.
- (2013). Green energy investments to triple by 2030, analysis predicts. *e360 Digest*, April 22. Retrieved April 26, 2013, from http://e360.yale.edu/digest/online_twitter_campaign__urges_end_to_fossil_fuel_subsidies/3512/.
- (2013). Social Media Marketing Awards 2013. *B to B*, 95(4), S4-S6.
- (2013). Social media overview. *Tufts University Web Communications*. Retrieved April 28, 2013, from <http://webcomm.tufts.edu/web-resources-tufts/social-media-overview/>.
- Anderson, R.C., & White, R. (2009). *Confessions of a Radical Industrialist: Profits, People, Purpose - Doing Business by Respecting the Earth*. New York: St. Martin's Press.
- Ang, L. (2011). Is SCRM really a good social media strategy? *Journal of Database Marketing & Customer Strategy Management*, 18(3), 149-153.
- Azadi, H., & Ho, P. (2010). Genetically modified and organic crops in developing countries: A review of options for food security. *Biotechnology Advance*, 28, 160–168.
- Balat, M., & Balat, H. (2009). Recent trends in global production and utilization of bio-ethanol fuel. *Applied Energy*, 86, 2273- 2282.
- Bansal, P., & Hoffman, A.J. (2012). *The Oxford Handbook of Business and the Natural Environment*. NY: Oxford University Press USA.
- Best, J. (2001). *Damned Lies and Statistics: Untangling Numbers from the Media, Politicians And Activists*. Berkley, CA: University of California Press.
- Black, J.T., & Phillips, D.T. (2010). The lean to green evolution. *Industrial Engineer*, 46-51.
- Bouis, H.E., Chassy, B.M., & Ochanda, J.O. (2003). Genetically modified food crops and their contribution to human nutrition and food quality. *Trends in Food Science & Technology*, 14(5–8), 191–193.
- Bradsher, K. (2012). China, citing errors, vows to overhaul rare earth industry. *The New York Times*, June 20. Retrieved April 24, 2013, from http://www.nytimes.com/2012/06/21/business/global/china-vows-tighter-controls-over-rare-earth-mining.html?_r=0.
- Brookes, G., & Barfoot, P. (2011). Global impact of biotech crops environmental effects 1996–2009. *Landes Bioscience*, 2(1), 34-46.

- Callahan, R. (2011). Major pest may be resistant to genetically modified corn. *The Huffington Post*, December 28. Retrieved April 24, 2013, from http://www.huffingtonpost.com/2011/12/28/pest-gmo-corn_n_1173321.html.
- Cohen, H. (2011). 30 social media definitions. *heidicohen.com*, May 9. Retrieved April 28, 2013, from <http://heidicohen.com/social-media-definition/>.
- Dahl, R. (2010). Green washing: Do you know what you're buying? *Environmental Health Perspectives*, 118(6), A246–A252.
- Davey, M. (2012). Searing sun and drought shrivel corn in Midwest. *The New York Times*, July 4, A9.
- Downing, S. (2004). 'Building sustainable strategic management' to whose profit? in Kemp, Stark, Tantram Eds., World Wide Wildlife Fund, *Evolution*, 63-71.
- Downing, S. (2013). Leading for sustainability. *TOPMBA.com*. Retrieved April 24, 2013, from <http://www.topmba.com/articles/emba/leading-sustainability>.
- Fehrenbacher, K. (2008). Green social networking. *Going Green Media*, April 11. Retrieved April 24, 2013, from <http://gigaom.com/2008/04/11/10-green-social-networks-you-should-know/>.
- Fraser, C. (2011). Tapping social media's potential to muster a vast green army. *Environment 360*, July 11. Retrieved April 24, 2013, from http://e360.yale.edu/feature/tapping_social_medias_potential_to_muster_a_vast_green_army/2424/.
- Gepts, P., & Papa, R. (2003). Possible effects of (trans)gene flow from crops on the genetic diversity from landraces and wild relatives. *Environmental Biosafety Research*, 2, 89–103.
- Gillin, P. (2007). Spoils of social media go to those who wait. *B to B*, 92(17), 11.
- Ginsberg, J., & Bloom, P. (2004). Choosing the right green marketing strategy. *Sloan Management Review*, 46(1), 79-84.
- Grahl, T. (2013). The 6 types of social media. *Out:think*. Retrieved April 28, 2013, from <http://outthinkgroup.com/tips/the-6-types-of-social-media>.
- Granovskii, M., Dincer, I., & Rosen, M.A. (2006). Economic and environmental comparison of conventional, hybrid, electric and hydrogen fuel cell vehicles. *Journal of Power Sources*, 159(2), 1186–1193.
- Greer, J., & Bruno K. (1997). *Greenwash: The Reality behind Corporate Environmentalism*. New York: The Apex Press.
- Gunther, M. (2012). Betting on technology to help turn consumers green. *Environment 360*, April 5. Retrieved April 26, 2013, from http://e360.yale.edu/feature/betting_on_technology_to_help_turn_consumers_green/2513/.
- Hannam, P. (2010). The big 3: How social media, video, and mobile are transforming green marketing. *TriplePundit.com*, June 10. Retrieved April 26, 2013, from <http://www.triplepundit.com/2010/06/how-social-media-video-and-mobile-are-transforming-green-marketing/>.

- Hart, S.L., & Milstein, M.B. (2003). Creating sustainable value. *Academy of Management Perspectives*, 17(2), 56-67.
- Hazell, S. (2009). Green collar revolution. *Alternatives Journal*, 35(6), 8-11. Retrieved from Education Research Complete database.
- Hendrickson, C., Horvath, A., Joshi S., & Lave, L. (1998). Economic input-output models for environmental life-cycle assessment. *Environmental Science and Technology*, 32 (7), 184A–191A.
- Herrera, F. (2013). Broad categories of enterprise social media tools. *enterprise-social-media.com*. Retrieved April 28, 2013, from <http://enterprise-social-media.com/broad-categories-of-enterprise-social-media-tools/>.
- Hertel, T.W., Golub, A.A., Jones, A.D., O'Hare, M., Plevin, R.J., & Kammen, D.M. (2010). Effects of US maize ethanol on global land use and greenhouse gas emissions: Estimating market-mediated responses. *BioScience*, 60(3), 229.
- Hirsch, M. (2006). Green is good: New college's green MBA program offers more than just business as usual. *San Francisco Bay Guardian*. Retrieved May 31, 2008, from http://www.greenmba.com/index.php?option=com_content&task=view&id=172&Itemid=67.
- Hoffman, B. (2012). Genetic engineering: A food fix? *Forbes Magazine*, August 30. Retrieved April 24, 2013, from <http://www.forbes.com/sites/bethhoffman/2012/08/30/genetic-engineering-a-food-fix/>.
- Holliday, C.O., Schmidheiny, S., & Watts, P. (2002). *Walking the Talk: The Business Case for Sustainable Development*. SF, CA: Berrett-Koehler Pub.
- Howell, P. (2009). The 12 faces of social media for sustainable green marketing. *parkhowell.com*, April 14. Retrieved April 26, 2013, from <http://parkhowell.com/green-advertising-and-marketing/the-dozen-faces-of-social-media-for-green-marketers-and-sustainability>.
- Jeffries, E. (2012). Transparently green. *Marketing*, March 14, 32-34.
- Kaplan, J. (2011). Top 10 green marketing campaigns. *Ecopreneurist*, October 26. Retrieved April 26, 2013, from <http://ecopreneurist.com/2011/10/26/top-10-green-marketing-campaigns/>.
- Kindy, K., & Layton, L. (2009). Purity of federal 'organic' label is questioned. *The Washington Post*, July 3. Retrieved April 26, 2013, from http://articles.washingtonpost.com/2009-07-03/news/36836942_1_organic-label-organic-products-usda-organic.
- Klopffer, W. (2003). Life-cycle based methods for sustainable project development. *International Journal of Lifecycle Assessment*, 8(3), 157-159.
- LeCompte, C. (2010). How to use social media for green marketing. *Revolutionary Grammar*, March 14. Retrieved April 26, 2013, from <http://revolutionarygrammar.com/2010/03/14/how-to-use-social-media-for-green-marketing/>.
- Li, L. (2013). 10 best green social networks. *lornali.com*. Retrieved April 24, 2013, from <http://lornali.com/10-best-green-social-networks/>.

- Lore, M.W. (2007). Subsidies for corn-derived ethanol may leave us thirsty. *Sustainable Development Law & Policy*, 8(1), 53-55.
- Lottermoser, B.G. (2010). *Mine Wastes: Characterization, Treatment and Environmental Impacts*, 3rd ed. New York: Springer.
- Majeau-Bettez, G., Hawkins, T.R., & Strømman, A.H. (2011). Life cycle environmental assessment of lithium-ion and nickel metal hydride batteries for plug-in hybrid and battery electric vehicles. *Environmental Science and Technology*, 45 (10), 4548–4554.
- Makower, J. (2013). 5 Reasons green marketing is going nowhere. *LinkedIn*, March 12. Retrieved April 26, 2013, from <http://www.linkedin.com/today/post/article/20130312180239-127714-5-reasons-green-marketing-is-going-nowhere>.
- Marvier, M. (2007). Pharmaceutical crops have a mixed outlook in California. *California Agriculture*, 61(2), 59-66.
- Matthews, R. (2010). Best green and sustainable business twitter feeds. *The Green Market Oracle*, December 30. Retrieved April 24, 2013, from <http://www.thegreenmarketoracle.com/2010/12/best-green-and-sustainable-business.html>.
- Matthews, R. (2011a). Top green social networks. *The Green Market Oracle*, March 5. Retrieved April 24, 2013, from <http://www.thegreenmarketoracle.com/2011/03/top-green-social-networks.html>.
- Matthews, R. (2011b). 50 best blogs for green business students. *The Green Market Oracle*, March 6. Retrieved April 24, 2013, from <http://www.thegreenmarketoracle.com/2011/03/50-best-blogs-for-green-business.html>.
- Matthews, R. (2011c). Top 20 green and sustainable business Facebook groups. *The Green Market Oracle*, January 6. Retrieved April 24, 2013, from <http://www.thegreenmarketoracle.com/2011/01/top-20-green-and-sustainable-business.html>.
- Matthews, R. (2011d). Social media marketing and environmental sustainability. *The Green Market Oracle*, February 28. Retrieved April 26, 2013, from <http://www.thegreenmarketoracle.com/2011/02/social-media-marketing-and.html>.
- Mosier, A.R., & Crutzen, P.J. (2009). Nitrous oxide's impact on net greenhouse gas savings from biofuels: Life-cycle analysis comparison. *International Journal of Biotechnology*, 11(1/2), 60-74.
- National Research Council [NRC] (2007). Increase in ethanol production from corn could significantly harm water quality. *Science Daily*, October 11. Retrieved April 24, 2013, from <http://www.sciencedaily.com/releases/2007/10/071010120538.htm>.
- Newman, W. (2012). Strategic intent for green marketing and disclosure using social media. *Sustainable Business Forum*, March 30. Retrieved April 26, 2013, from <http://sustainablebusinessforum.com/williamnewman/57188/strategic-intent-green-marketing-and-disclosure-using-social-media>.
- Ny, H., MacDonald, J.P., Broman, G., Yamamoto, R., & Robert, K.H. (2006). Sustainability constraints as system boundaries: An approach to making life-cycle management strategic. *Journal of Industrial Ecology*, 10(1-2), 61-77.

- Orange, E. (2010). From eco-friendly to eco-intelligent. *The Futurist*, Sept.-Oct., 28-29.
- Orsato, R. (2006). Competitive environmental strategies. *California Management Review*, 48(2), 127-143.
- Pearce, F. (2012). On the road back to Rio, green direction has been lost. *Environment* 360, February 9. Retrieved April 26, 2013, from http://e360.yale.edu/feature/rio_20_sustainability_conference_on_road_back_to_rio_green_direction_lost/2493/.
- Perman, S. (2006). From garbage to gold. *BusinessWeek Online*, 12. Retrieved from Academic Search Premier Database.
- Pierobon, J. (2012). Can any green social networks have staying power? *Social Media Today*, August 7. Retrieved April 24, 2013, from <http://socialmediatoday.com/node/689081>.
- Pineiro, G., Jobba, E.G., Baker, J., Murray, B.C., & Roberto B. J. (2009). Set-asides can be better climate investment than corn ethanol. *Ecological Applications*, (19)2, 277-281.
- Price, T. (2006). The new environmentalism. *CQ Researcher*, 16, 985-1008. Retrieved April 24, 2013, from CQ Researcher Online at <http://0-library.cqpress.com.www.consuls.org/cqresearcher/cqresrre2006120100>.
- Ramus, C., & Montiel, I. (2005). When are corporate environmental policies a form of greenwashing? *Business Society*, 44(4), 377-414.
- Raymond, E. (2009). Sustainable branding and marketing: Millennials to matures. *Packaging Digest*, 46(5), 40-42.
- Ricci, T. (2012). Mitigating the legal risks of social media. *American Society of Mechanical Engineers*, July. Retrieved April 28, 2013, from <http://www.asme.org/kb/news---articles/articles/legal-issues-for-engineers/mitigating-the-legal-risks-of-social-media>.
- Ridings, C., & Wasko, M.M. (2010). Online discussion group sustainability: Investigating the interplay between structural dynamics and social dynamics over time. *Journal of the Association for Information Systems*, 11(2), 5-23.
- Rosselot, K., & Allen, D.T. (2000). Life-cycle concepts, product stewardship and green engineering. *University of Texas, Austin Research*, November, 1-45. Retrieved April 24, 2013, from <http://www.utexas.edu/research/ceer/esm282/dfe/Chap13final.PDF>.
- Scharleman, J.P.W., & Laurance, W.F. (2008). How green are biofuels. *Science*, (319)43, 43-44.
- Schmidheiny, S. (1992). The business logic of sustainable development. *Columbia Journal of World Business*, doi:Article, 27(3/4), 18-24.
- Shaheen, S., & Cohen, A. (2007). Growth in worldwide car sharing: An international comparison. *Transportation Research Record*, doi:10.3141/1992-10, 1992(1), 81-89.

Siemens Industry Solutions Division (2010). Environmental solutions increase competitiveness in mining and steel industries. *Siemens Industry Solutions Division Press Release*, May 11. Retrieved April 24, 2013, from http://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2010/industry_solutions/iis201005406.htm.

Sikdar, S.K., Glavic, P., & Jain, R. (2010). *Technological Choices for Sustainability*. NY: Springer.

Singh, A., Singh, N.P., & Murphy, J.D. (2011). Renewable fuels from algae: An answer to Smith, N. (2013). Social media's green marketing works best on younger people, Trends company says. *Huffington Post*, April 23. Retrieved April 26, 2013, from http://www.huffingtonpost.com/2013/04/23/social-media-green-marketing_n_3138502.html.

Stenquist, P. (2012). How green are electric cars? Depends on where you plug in. *The New York Times*, April 13. Retrieved April 26, 2013, from http://www.nytimes.com/2012/04/15/automobiles/how-green-are-electric-cars-depends-on-where-you-plug-in.html?pagewanted=all&_r=0.

Strom, S. (2012). Has 'organic' been oversized? *The New York Times*, July 7. Retrieved April 26, 2013, from <http://www.nytimes.com/2012/07/08/business/organic-food-purists-worry-about-big-companies-influence.html?pagewanted=all>.

Taylor, P. (2009). When an electric car dies, What will happen to the battery? Can millions of lithium ion batteries be recycled? *Scientific American*, September 14. Retrieved April 24, 2013, from http://www.autogasforamerica.org/pdf/EV_fact_brief_11.25.pdf.

Thurston, B. (2012). The social media road map. *Fast Company*, 168, September, 69-80+.

Trotta, M.G. (2010). Product lifecycle management: Sustainability and knowledge management as keys in a complex system of product development. *Journal of Industrial Engineering and Management*, 3(2), 309-322.

Tsai, J. (2009). Marketing and social media: Everyone's social (already). *Customer Relationship Management*, 13(6), 34-38.

Urlaub, J. (2012). Why smart marketers use social media for green business branding. *Taiga Company*, September 28. Retrieved April 26, 2013, from <http://blog.taigacompany.com/blog/sustainability-business-life-environment/why-smart-marketers-use-social-media-for-green-business-branding>.

Vliet, O.V., Broek, M.V., Turkenburg, W., & Faai, A. (2011). Combining hybrid cars and synthetic fuels with electricity generation and carbon capture and storage. *Energy Policy*, 39(1), 248.

Vogel, G. (2006). Tracing the transatlantic spread of GM rice. *Science*, 313, 1714.

Vranica, S. (2012). Media: Tweets spawn ad campaigns - Chatter on social-media sites gives marketers direction for commercials. *The Wall Street Journal*, Eastern ed., October 22, B.5.

Walsh, B. (2012). When the rains stop. *Time*, 180, August 6, 36-37.

Waters, J.K. (2013). Social media. *netplaces.com*. Retrieved April 28, 2013, from <http://www.netplaces.com/social-media/>.

Wenzel, E. (2009). The Social Media & Web Guide to Going Green. *Mashable*, April 21. Retrieved April 24, 2013, from <http://mashable.com/2009/04/21/social-media-green-guide/>.

Wexler, E. (2010). Green. *Strategy*, September 1, 24.

Williams, K., Brooks, K., & Page, M.A. (2012). Biotechnology: Sustainability's silver bullet. *Journal of Sustainability and Green Business*, 1,103-114.

Wilson, Lonnie (2009). *How to Implement Lean Manufacturing*. New York: McGraw-Hill Professional.

World Commission on Environment and Development (1987). *Our Common Future*. New York: Oxford University Press.