

Ecopreneurship as a Solution to Environmental Problems: Implications for College Level Entrepreneurship Education

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Abstract

Given the present environmental problems facing the world, it is clear that past strategies used to address these challenges have failed to prevent environmental degradation. It is therefore time to pay attention to the role that entrepreneurs can play in solving our environmental problems. Scholars agree that entrepreneurs can help preserve our ecosystems, counteract climate change, improve fresh water supply, maintain biodiversity, and reduce environmental degradation and deforestation (Cohen and Winn, 2007; Dean and McMullen, 2007).

This paper focuses on how to harness the innovative potential of environmentally conscious entrepreneurs, called ecopreneurs, to encourage more startups that would create the environmental technologies needed to address our environmental problems. It also discussed the role of entrepreneurship education in promoting ecopreneurial behavior and presented an outline for a possible ecopreneurship course that could be integrated into college-level entrepreneurship education.

Keywords: Ecopreneurship, Environmental Problems, Environmental degradation, Entrepreneurship Education

Introduction

Environmental degradation is perhaps the most prominent global issue of the 21st century. Academics, policymakers, nongovernmental agencies and governments are all concerned about the increasing levels of land degradation, soil erosion, deforestation, and industrial toxins (Volery, 2002). In addition, there are very serious concerns about the negative consequences of ozone depletion, climate change, nuclear radiation, and the destruction of biodiversity (Intergovernmental Panel on Climate Change (IPCC), 2007; United Nations Environment Program (UNEP), 2004, World Resources Institute, 2004). A recent joint report by the World Resources Institute, the World Bank, and the United Nations show the diminishing capacity of five of earth's most critical ecosystems (Table 1).

Table 1: Diminishing Capacity of Critical Global Ecosystems

Ecosystem	Diminishing Capacity
Agriculture	40% of agricultural lands worldwide have been severely degraded through erosion, salinization, nutrient depletion, biological degradation, and pollution.
Costal	<ul style="list-style-type: none"> • 20% of fish and shellfish has been diminished due to overfishing, destructive trawling techniques, and destruction of nursery habitat. • Pollution problems have plagued coastal lands because of use of synthetic chemicals and fertilizers. • Global warming impacts ecosystem through rising sea levels, warming of the ocean temperatures and changing storm frequency.
Forest	<ul style="list-style-type: none"> • More than 20% of global forest cover has been removed due to logging and conversion to other land uses. • Deforestation has significant impact on biodiversity, e.g., loss of unique plant and animal species.
Fresh Water	Humans currently use more than 50% of all accessible fresh water; by 2025 demand will reach 70%.
Grassland	Road building, land conservation, and human induced fires have caused significant loss of grassland and thus loss of biodiversity.

(World Resources Institute (2000) and Cohen and Winn (2007, pg. 34).

“Environmental degradation is a serious threat to the lives of people, plant, and animals” (SEEN Environmental Learning, n.d. p.1). It has not only brought natural disasters, such as storms, heat waves, droughts, etc., but it has also diminished the vitality and sustainability of the economy. The long term economic and financial impact of environmental degradation, therefore, may be very substantial because a large amount of the world’s economic output depends on the sustainability of the natural systems (Costanza, et al, Kainrath, 2009).

According to the International Panel on Climate Change (2007) and the United Nations (2005), economic development is one of the main causes of environmental degradation in the economy. Georgescu-Roegan (1971) and Meadows, Meadows, Randis, and Beahrens (1972) explained that economic activity requires large inputs of energy and materials and it generates a large quantities of waste which results in the degradation of environmental quality. It is not surprising that “business and industry are often viewed as one of the largest contributors to environmental degradation” (Cohen & Winn, 2007, p. 29). Volery (2002) noted that for the past decade economic growth was done without considering the protection of the environment. Several scholars also agree that despite the decades of economic growth and increase in the quality of life, the period of industrial expansion has had substantial negative effect on the environment (Boulding, 1966; Dean & McMullen, 2007; Schmidheiny, 1992; World Resources Institute, 2004).

Traditionally, efforts to address this problem have focused on how and why existing firms can become greener (Cohen & Winn, 2007; Hart & Milstein, 2003; Porter & van der Linde, 1995; Reinhart, 2000; York & Venkataraman, 2010). According to York and Venkataraman (2010) these efforts have not led to solving our environmental problems. Schaper (2002) suggested that it is now time to pay attention to the role that entrepreneurs can play in solving environmental problems (p. 26). Entrepreneurs can contribute to solving environmental problems by creating new, more environmentally sustainable products and services (Cohen & Winn, 2007; Dean & McMullen, 2007; York & Venkataraman, 2010). According to Haal, Deneke & Lenox's (2010) panacea hypothesis, entrepreneurship may be the solution to many of our social and environmental problems and could be the action needed to put us on the path to a more sustainable future (Brown, 2006; Brugmann & Prahalad, 2007). Cohen and Winn (2007) support the need for entrepreneurial action to solve our environmental problems and agreed that "the real gains will only be made by harnessing the innovative potential of entrepreneurs who will develop the innovative business solutions to deal with the environmental challenges" (p. 30).

Purpose

The purpose of this paper is to contribute to the discussion that proposes entrepreneurship as a solution to the environmental problem. The focus here is on how to harness the innovative potential of ecopreneurs to take advantage of the entrepreneurial opportunities within environmental degradation and to explain the role of entrepreneurship education in environmental sustainability. According to Cohen and Winn (2007), "ecopreneurs have the potential to resolve our environmental problems and to gradually improve the earth's ecosystem," (p. 30). The paper began by reviewing the major environmental challenges facing the earth's ecosystems and the need for entrepreneurial action to deal with the challenges. Next, the meaning of ecopreneurship and the various typologies of ecopreneurs are presented. The next section discussed the theoretical rationale, and the evolution and growth of ecopreneurship. It then examined how to harness the innovative potential of ecopreneurs to develop the environmental technologies needed to solve the environmental problems. And, finally, the paper discussed the role of entrepreneurship education in promoting ecopreneurship and suggested an outline for a possible foundation course in ecopreneurship. The paper contributes to the literature by adding to our theoretical understanding of how entrepreneurial action can help solve environmental problems, and by emphasizing the important role of entrepreneurship education in developing the current and potential ecopreneurs. The overarching purpose of the paper is to provide insights for policymakers and educators into ways to foster ecopreneurship.

Meaning of Ecopreneurship

The term "ecopreneurship: sometimes referred to as "green entrepreneurship" (Schaper, 2002; Taylor & Walley, 2003) "ethical entrepreneurship" (Taylor & Walley, 2003) "enviropreneurship" (Keogh & Polonsky, 1998) and "environmental entrepreneurship" is a combination of two words 'ecological (eco) and entrepreneurship which implies the creation of an innovative

company that supplies environmentally friendly products and services i.e., “entrepreneurship through environmental lens” (Schaltegger, 2005). Eco-entrepreneurs enter these eco-friendly markets, not only to make profits, but also because they have strong, underlying, green values. They are the combination of strong environmental and social values with an energetic entrepreneurial attitude (Anderson, 1998; Gibbs, 2009). Volery (2002) defined ecopreneurship as environmental responsibility in entrepreneurship, while for Isaak (2002), it is an “existential form of business behavior committed to sustainability” (pg. 81).

For the purposes of this paper, ecopreneurship means entrepreneurial action that contributes to preserving the natural environment (Pastakia, 1998a; Schaper, 2005). Ecopreneurs are therefore entrepreneurs who found their businesses based on the principle of sustainability (Kirkwood and Walton, 2010). They are a new breed of eco-conscious change agents who are redefining the way business is conducted and are introducing eco-friendly ideas and innovations in the marketplace (Pastakia, 1998b). Ecopreneurship is distinguished from social entrepreneurship which focuses on enhancing the social wellbeing of the society (Zahra, Gedajlovic, Neubaum, Shulman, 2009). Ecopreneurship is also different from sustainability entrepreneurship which integrates the three strands of the triple bottom line (economic, social and environmental). Tilley and Young (2009) argues that sustainability entrepreneurship goes further than “environmental” or “social” entrepreneurship as it encompasses a more comprehensive range of the triple bottom line.

Typologies of Ecopreneurs

Most researchers agree that there are two categories of environmental entrepreneurs –those who have a profit or economic orientation and those who have the sustainability orientation and want to help change or improve the environment (Taylor & Walley, 2003; Isaak, 2002; Koester, 2011). Schnick, Marxen & Freiman, (2002) refer to the categories as the two ends of the ecological orientation continuum. At one end are ecopreneurs who constantly adopt environmentally-friendly practices and at the other end are entrepreneurs who give no ecological consideration to the businesses at all. In other words, environmental entrepreneurs are either starting green businesses or making their businesses green (OECD, 2011). Table 2 presents the different types of ecopreneurs related to each category.

Table 2: Typologies of Ecopreneurs

Reference	Types of Ecopreneur
Volery, T. (2002)	<ul style="list-style-type: none"> ● Environmental Conscious <ul style="list-style-type: none"> - Develops innovations that either reduces resource and impact or improve cost efficiencies. ● Green Entrepreneurs <ul style="list-style-type: none"> - Aware of environmental issues and have their businesses in the environmental marketplace
Walley and Taylor (2002)	<ul style="list-style-type: none"> ● Innovative Opportunist <ul style="list-style-type: none"> - Financially oriented entrepreneur who spots a green niche or business opportunity that happens to be green ● Ad hoc or accidental entrepreneur <ul style="list-style-type: none"> - Spots opportunities that are green, rather than seek out a niche in green spaces ● Visionary Entrepreneur <ul style="list-style-type: none"> - Built their businesses based on sustainability principles ● Ethical Maverick <ul style="list-style-type: none"> - Sets up alternative style business on the fringes of society
Linnanen (2002)	<ul style="list-style-type: none"> ● Self-Employer <ul style="list-style-type: none"> - Advocates nature-oriented enterprises e.g. wild life habitat preservation, eco-tourism etc; low desire to change the world and low financial drive ● Opportunist <ul style="list-style-type: none"> - Involved in environmental technology to help businesses and communities reduce environmental load on water, air and soil. They have a low desire to change the world and high financial drive ● Non-profit Business <ul style="list-style-type: none"> - Entrepreneurs have high desire to change the world and low financial drive ● Successful Idealist <ul style="list-style-type: none"> - Entrepreneurs have high desire to change the world and high financial drive
Isaak (2002)	<ul style="list-style-type: none"> ● Green Business <ul style="list-style-type: none"> - Entrepreneur did not start green business from scratch, but later discovered the advantages of greening their existing businesses ● Green-Green Business <ul style="list-style-type: none"> - Entrepreneurs designed business to be green in its products and processes from scratch
Schick, Marxen, Freiman (2002)	<ul style="list-style-type: none"> ● Eco-dedicated <ul style="list-style-type: none"> - Consistently adopts environmentally friendly business practices ● Eco-open <ul style="list-style-type: none"> - Partially adopts environmentally friendly business practice

Reference	Types of Ecopreneur
	<ul style="list-style-type: none"> • Eco-reluctant <ul style="list-style-type: none"> - Adopts environmentally friendly business practices only when they are forced by regulations
Schaltegger (2002)	<ul style="list-style-type: none"> • Alternative Actors <ul style="list-style-type: none"> - Businesses exist to support alternative lifestyle e.g. type of counter culture • Bioneers <ul style="list-style-type: none"> - Inventors with strong R&D focus in high technology sectors e.g. alternative energy sources

One criticism of the ecopreneurship typologies is that they do not account for the changes that might occur among entrepreneurs, e.g., could ecopreneurs move between different typologies, and which drivers mainly guide their behavior (deBruin & Lewis, 2005 cited in Gibbs, 2007). In response, Isaak (1998) argued that the various types of ecopreneurs are not pure forms, but represent reference points for broad changes within businesses. The process theory of entrepreneurship supports Isaak's "viewpoint, which emphasizes the fact that "you can't pin people down to one type, because entrepreneurs are always in the process of 'becoming'" (Steyaert, 2004, p. 6).

Theoretical Rationale

Schumpeterian theory provides the theoretical basis for environmental entrepreneurship. According to Schumpeter (1942), entrepreneurs are the innovators and as society's needs evolve the entrepreneur provides the innovation or "creative destruction" that gives society a new way of addressing problems. He argued that "environmental problems are inherently calls for innovation, as most of them are caused by the outdated applications of old, polluting and inefficient technology" (p.9). Given that the current solutions to our environmental problems are inadequate for sustainability, there is need for entrepreneurial action to develop something new, whether it is a production method, technological development, product/service distribution system, or even a new organizational form. (Lennox & York, 2011, p. 9; Tillery & Young, 2009).

Ecological Modernization Theory also provides the rationale for environmental entrepreneurship (Hajer, 1995; Mol, 1995). According to the theory, it is possible to promote economic growth by giving higher priority to the environment. It is no longer necessary to trade off economic growth for environmental quality (Tillery & Young, 2009, p. 82). The capitalist system is seen as having the capacity to develop sustainable solutions to environmental problems; that capitalist drive for innovation can be harnessed to produce environmental improvements (Beveridge & Guy, 2005).

According to the Ecological modernization theorists, "the environmental problems facing the world today, act as a driving force for future industrial activity and economic development" (Murphy, 2000, p.3). The theory calls for the progressive modernization of the institutions of

modern society. And as Joseph Huber (Mol, 1995) the father of Ecological Modernization Theory sees it, entrepreneurs are the central agents of change in that process of transformation to avoid an ecological crisis (Gibbs, 2009; Mol & Spaargaren, 1993; Tillery & Young, 2009). Entrepreneurial action, therefore, is the best solution to our environmental problems because this new generation of ecopreneurs is seeking to combine environmental awareness and conventional entrepreneurial activity to achieve entrepreneurial success. (Anderson, 1998). Ecopreneurs have the potential to be a major force in the overall transition towards a more sustainable business paradigm (Schaper, 2002).

Ecopreneurship is also important because eco-innovations, according to Klimova & Zlek, 2011) will be the future competitive advantage of companies and countries. They argued that if companies and countries want to be successful in the international market, they cannot rely on having low cost as their competitive advantage; but rather on new and innovative environmental technologies, services and processes which will be the more important sources of competitive advantage. The long term sustainability of our economic system does not depend only on quantitative growth, but also on the ecological aspects of the growth and sustainable development (Klimova & Zitek, 2011, p.2).

In addition, there are also some practical business reasons that justify the need for ecopreneurship to solve our environmental problems. First, our finite resources, for example fish, minerals or gas are limited in their supply. Once consumed, many of them cannot be recreated and we will be left with diminishing or no natural resources, if we do not sustain them. Also, because of economic activity and consumption, most of our resources become waste. As a result, we have the problem of pollution, which seriously affects humans and the ecosystem and could lead to greenhouse gas accumulation and potential climate change (Volery, 2002, p. 542). To sustain them, ecopreneurship is important to constantly look for alternatives, e.g. recycling or new sources of energy, such as wind, water, and solar. (Arber & Speich, 1992; Barnes, 1994;).

Second, the global population growth is also influencing ecopreneurship. The world population is expected to increase by 50% by 2050 and with it will come an increase in consumption (World Business Council for Sustainable Development, 2002). Although part of this consumption is important for relieving poverty in many emerging countries, most it will be done by affluent consumers and can have a negative impact on the ecosystems (Volery, 2002, p. 542). Ecopreneurship is therefore important to find the new technologies to protect the environment, and to ensure that there are enough resources to fill the needs of both the current population and future generations (Volery, 2002).

Third, biodiversity loss also justifies entrepreneurial action to solve environmental problems. According to Volery (2002), "the rates of takeover of wild life habitat, and of species extinction are the fastest they have ever been in human history and are accelerating."(p. 542). Goodland (1991) also reported that the tropical forest, the world's richest species habitat, has already been 55% destroyed and the loss is continuing. Given the need for environmental

sustainability, there is need for a new kind of entrepreneur who will incorporate environmental concerns into the consideration of their bottomline (Volery, 2002, pg. 542).

Evolution and Growth of Ecopreneurship

The relationship between business and the environment is not new. There was an upsurge of interests in environmental degradation during the 1960s, in Western Europe and North America because of the incidents of heavy smog in London caused by business activities. At that time, people became more aware of the negative environmental consequences of business activities. Business response to the environmental concerns was antagonistic, with little care about the cost of business activities to the environment (Utting, 2000). They saw the environmental concerns as a nuisance to their businesses and opposed any effort to control performance (Tillery, 1999). Table 3 shows the evolution and growth of ecopreneurship between 1960s and the 2000s.

Table 3: Evolution and Growth of Ecopreneurship

Year	Activities from Selected Literature Review
1960s and 1970s	<ul style="list-style-type: none"> • Upsurge of interest in environmental degradation • Increased awareness of the negative environmental impact of business activities • Publication of pioneering article in Harvard Business Review suggesting the ecology movement could provide new markets for businesses (Quinn, 1971). • Passage of environment-related legislation e.g., Clear Air Act, etc.
1980s	<ul style="list-style-type: none"> • Publication of articles arguing that innovative business solutions improve the environment and provide a basis for new business prospects (Elkington & Burke, 1989).
1990s and 2000s	<ul style="list-style-type: none"> • Introduction of terms, such as, environmental entrepreneur, green entrepreneur, eco-entrepreneur, ecopreneur (Bennett, 1991; Berle, 1991; Blue, 1990). • Focus by scholars on environmentally-friendly innovations and stressing the profit potential of ecopreneurship (Isaak, 1998; Kyro, 2001; Larson, 2000; Schaltegger & Wagner, 2011). • Publication of special issues in the Journal of Organizational Change Management and Greener Management International (Krueger, 1998; Schaper, 2002; Tillery & Parrish, 2009). • Publication of Book of collected works in 2005 and updated in 2009 (Schaper, 2002). • Incorporation of environmental and sustainability issues into some entrepreneurship texts (Kao, Kao. & Kao, 2002; Kuratko & Hodgets, 2001) • Integrating ecopreneurship units and courses into the entrepreneurship curriculum (Schaper 2002) • Appointment of Endowed Chair in Sustainability Entrepreneurship in one European University (WRI, 2001 cited in Ndedi, 2011). • Introduction of micro-finance and other funding programs to provide startup and growth capital for green businesses.

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| <ul style="list-style-type: none">• Introduction of business incubators and advisory services to encourage ecoventures and sustainability entrepreneurs (Ndedi, 2011; Schaper 2010). |
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Ecopreneurship literature is still comparatively young (Linnanen, 2002; Pastakia, 1998a; Schaltegger, 2002). The growth so far has been supported by various consumer groups as well as the strong demand for green products, especially in the developed countries (Schaper, 2002). Ecopreneurship has thus become a market-based approach for identifying opportunities for improving the quality of life through sound environmental practices.

Harnessing Innovative Potential of Ecopreneurs

Given the growth of ecopreneurship, the question now is, how do we harness the innovative potential of ecopreneurs to exploit the opportunities within environmental degradation? In other words, how do we foster the development of new entrepreneurial firms that will create the innovations necessary to solve environmental problems? According to Shane and Venkataraman (2000), “entrepreneurial action is created at the nexus of two phenomena: the presence of enterprising individuals and the presence of lucrative opportunities” (p. 218). Ecopreneurs are the enterprising individuals. Some are motivated by profit and start businesses that happen to be green, while others have a sustainability orientation and are motivated by environmental needs. Their businesses are founded on the principle of sustainability and they seek to combine environmental awareness with conventional entrepreneurship (Schnick, et al. 2002). Lucrative entrepreneurial opportunities exist within the environmental degradation e.g. the problems of climate change, pollution, energy, etc.

According to Shane (2003), the nexus is the place where the entrepreneur interacts with the environment, e.g. environmental degradation, to identify opportunities. How they interact and whether opportunity recognition and exploitation takes place depends on the resources the entrepreneur has at his or her disposal and the resources available in the environment (pg.8). Given that the entrepreneur-environment interaction is so critical to creating entrepreneurial action necessary for developing environmental innovations, what should be done to stimulate ecopreneurship?

1. Provide high quality and reliable information to ecopreneurs.

Lack of quality information is a major barrier to ecopreneurship. Because environmental innovations involve highly technical operations very little can be accomplished without reliable information about the nature and extent of the problems, the range of solutions available, the costs, and how to minimize them (Banks & Heaton, 1995). According to Cohen and Levinthal (1990), successful ecopreneurs recognize opportunities that others do not see because they have better access to information about the existence of the opportunities. Hermann (2011) also states that information availability and management help the entrepreneur or ecopreneur get closer to the opportunity i.e., where the market changes are and what is needed to access them. Clearly, the provision of reliable

information directly to the potential business founders is a key factor in helping them make the decision to invest in an eco-innovation startup (Schnick, et al. 2002).

2. Facilitate collaboration and networking among ecopreneurs and innovation intermediaries.

“An innovation intermediary is an organization or body, which acts as an agent or broker in any aspect of the innovation process between two or more parties.” (Howells 2006, p. 172). They help the ecopreneur acquire knowledge outside their own organizational boundaries (Clarke & Roome, 1999), and as such the ecopreneur gain access to and exchange relevant ecology and sustainability-related information. Some of the different types of intermediaries are government and local authorities, NGOs, universities, industry associations and consultants. Collaboration between ecopreneurs and innovation intermediaries also provide access to direct assistance, e.g., advice on funding sources, advice on business operations, identification of potential collaborators, etc., which supplement the ecopreneurs resources and can lead to a startup involved with eco-innovations (Klewitz, Zeyen & Hansen (2012).

3. Refocus the publicly funded environmental technologies (Research & Development)

First, attracting more private sector funds for environmental technologies should be an important policy. In doing so, efforts should be made to reduce the risk for the private investors, while making sure that public money is used effectively and does not crowd out private initiatives (OECD, 2008).

Secondly, publicly funded environmental technologies needs to be refocused. Presently, most of the funding are allocated to agencies that have very little to do with environmental technology (Department of Energy 44%, National Aeronautics and Space Association 23% and Department of Defense 11%), while a small percentage is directed to technologies that improve the environment, e.g. Department of commerce 6.2% and the Environmental Protection Agency 2% (Banks and Heaton, 1995). According to an OECD report, over 100 billion dollars are spent annually to support and conduct R&D in twenty-two agencies, but six agencies control 95 percent of the funds (OECD, 2008). If we are serious about attracting the innovative potential of entrepreneurs to develop environmental technologies, we need to refocus publicly funded R&D. This could be done by including improved environmental performance as a criterion for current R&D programs and also making environmentally relevant R&D a subcomponent of current programs (Banks & Heaton, 1995, p. 4).

4. Increase the speed of commercialization of environmental technologies

Many available environmental technologies have not been successfully introduced into the market because of market, infrastructure, production and consumption obstacles (OECD, 2009). One way to accelerate the commercialization of new technologies and the development of startups that will create clean technologies and green jobs is to establish a business incubator, e.g., cleantech business incubator. The incubator will offer flexible

ready-to-go office space, lab facilities, and a supportive environment, where starting teams can share ideas with other entrepreneurs and fuel innovators. It will also give each startup the chance to work with a dedicated mentor, as well as access to a growing network of cleantech and business experts and introductions to prospective investors (Walti, 2011).

Another way to speed up commercialization of new environmental technologies is technology certifications or validations. Quasi public bodies e.g. standards institutes will evaluate the effectiveness of the new technology and certifies its compliance with the standards. It is a one time scientific and technical performance evaluation, as well as a regulatory certification of environmental technology. This certification will reduce uncertainty around the new technologies and increase their acceptance, by offering third party information on technologies, which is critical to the EPA, other government agencies, and purchasers of innovative environmental technologies. Certifications and validations are other effective ways to foster diffusion and therefore speed up commercialization (Banks & Heaton, 1995; OECD, 2008).

5. Increase access to financing

Availability of funding and other incentives are critical for environmental innovation. Access to funding is necessary to help ecopreneurs meet the cost of technical development and to win recognition of new products and services (Schick, et al. 2002).

Access to financing is extremely difficult for entrepreneurs in green innovation because of the immaturity of the market, the difficulty associated with accurately pricing the relative risk of the investment and the lack of history or track record of success. All of these make it more difficult for new entrants to innovation to obtain reasonable costs financing, than it is for established firms (OECD, 2011). To harness the innovative potential of entrepreneurs for environmental technologies, there is need to improve access to financing through strengthening financial support with loan guarantees, grants, revolving loan funds, tax credits, etc., developing relationships with the early-stage investment community, and provide information on the various financial incentives, subsidies, tax credits and grants available to encourage investments in environmental technologies (OECD, 2008; OECD, 2011).

6. Improve access to markets

A strong demand for new products, processes and services is the most important driver of environmental innovation. Strengthening demand could be done through regulatory policies that reward new technologies and greater use of economic incentives (Banks & Heaton, 1995).

Regulatory signals that are strong, predictable and clear will spur environmental innovation. It is essential that the regulations discriminate in favor of new technologies rather than prolong the status quo. For example, reducing the reliance on available technology as the measure by which pollution control standards are set and looking instead to improve future capabilities (Banks & Heaton, 1995, p. 3).

Greater use of economic and financial incentives will also stimulate demand. Presently, incentives, such as, tradable credits and charges have been used only in the context of air pollution. There is need to expand these incentives to other areas, such as, water pollution and beyond to strengthen demand and stimulate innovation (Banks & Heaton, 1995, pg.3).

7. Establish clear policy on government procurement of green products

The biggest challenge green businesses face is going from research to production and distribution, and government can help companies make this transition successfully by procuring green products (p. 12). Government, at all levels, must play a more important role in terms of purchasing green products and services and in showing other consumers the benefits of purchasing green products. Through the introduction of sustainability criteria into public procurement decisions, the government can stimulate the development and use of more environmentally-friendly technologies. The strategy should address responsibilities, resources and monitoring and evaluation procedures. The key goal should be to develop standards and create momentum towards significantly increasing the amount of green products and services purchase by the government. (Ambachtsheer, Charest, Kowski, Mitschele, & Nielson, 2007).

8. Provide incentives for customers

Consumers also have an important role to play in fostering green innovation. They account for more than 60% of the final consumption in the OECD area. The purchasing decisions that they make therefore have major impact on the extent to which markets can work to provide innovation in green growth. Providing incentives to consumers will stimulate the market and encourage investment in environmental R&D and environmental technologies. This is vital, because the development of environmental technologies depends on having a strong local market that allows entrepreneurs to successfully get off the ground (OECD, 2011).

Consumers form a significant part of the market, offering incentives to encourage greener purchases will be beneficial to the cleantech sector. Although some incentives such as rebates through the Energy Star Program are currently offered to consumers, more still needs to be done to create a solid market for green products. Also, there is need to simplify and centralize existing incentives by developing a website that lists the incentives and eligible products by region and jurisdiction (Ambachtsheer, et al. 2007).

Subsidies, such as reduced taxes or tax credits have been used to increase the attractiveness of more fuel efficient vehicles. In addition to taxes, governments can also use grants and subsidies to influence consumer behavior and to protect the environment, while at the same time creating opportunities for environmental innovation, investment, employment and green growth. The Japanese "ecoprint" system aimed at rewarding purchases of energy-saving home appliances and vehicles is a case in point (OECD, 2010).

9. Promote flexible labor market policies and support worker skills training programs

The transition towards a low carbon economy requires workers with new competencies to exploit the potential of the new technologies. Labor markets and training policies can play a key role in facilitating the adjustment necessary for the transition to green growth (OECD, 2010).

The government and economic development agencies should promote and support flexible labor market policies to facilitate the movement of workers and resources from declining to innovative firms and regions. Too much rigidity in labor markets has been shown to reduce innovations (Cotis, Serres, and Duval, 2010). Having the right people is a driver for innovation, but it requires relevant education as well as the development of skills to complement the formal education (OECD, 2011).

Role of Entrepreneurship Education in Stimulating Ecopreneurship

How can we stimulate future ecopreneurial behavior? Currently the eco-entrepreneurial capacity of our students is limited. Entrepreneurship education with a specific focus on sustainability, energy conservation, and renewable energy is one of the mechanisms that can be used to stimulate future entrepreneurial behavior in energy related “green” sectors. (Fletcher, Knol, & Jamicki, 2012). Entrepreneurship education has “the profound moral responsibility to increase students’ environmental awareness, knowledge and skills, and values needed to create a just and sustainable future” (p. 17) (Cortese, 2003). The goal is to expose students to ecopreneurship and sustainability issues so they will know “how to operate on renewable energy and to eliminate the concept of waste by making every waste product a raw material or nutrient for another species or activity or return it into the cycle of nature” (McDonough & Braungart, 2002, p. 18).

Current Sustainability and Ecopreneurship Education Initiatives

Several universities are incorporating sustainability into their undergraduate curricula. This has led to the establishment of an international group of University leaders (University Leaders for Sustainable Future, 2007) and national groups of universities and colleges (Association for the Advancement of Sustainability in Higher Education, 2007).

In addition to the courses, there are also programs and multidisciplinary centers at the university level focusing on sustainability, e.g., the Arizona State University’s School of Sustainability and the Cornell’s Center for Global Sustainable Enterprise, among others. The following are selected examples obtained from the literature (Table 4).

Table 4: Selected examples of ecopreneurship and sustainability entrepreneurship education activities at the college level

Activity	Description	Location
Sustainability Entrepreneurship Course	The course addresses various aspects of SE and the opportunities available to startups and large businesses to establish sustainable businesses. It explores the opportunities entrepreneurs create, the challenges they encounter and the ways they exploit opportunities. (http://nciia.org/conf08/assets/pub/basu1.pdf)	San Jose State University
Green Entrepreneurship	The course addresses various aspects of environmentally sustainable entrepreneurship and the opportunities available to startups. (http://entrepreneurship.okstate.edu/academics/undergraduate/courses/)	Oklahoma State University
Sustainability Business Program	The program includes sustainable business courses, sustainable business incubator (the Hatchery), and several sustainable business partners. The main principle is to leverage sustainable business practices as a means of building financial environmental and social capital. (http://www.coa.edu/susbizcourses.htm).	College of the Atlantic, Bar Harbor, Maine
Business Accelerator for Sustainable Businesses (BASE)	BASE is a cross-disciplinary program. Its goal is to speed the growth and impact of green businesses. The program connects sustainable ventures to a range of business development resources with the goal of accelerating their growth and impact. It provides workshops, mentoring, networking, etc. (http://www.kenan-flagler.unc.edu/sustainable-enterprise/sustainability-in-practice/base).	University of North Carolina, Chapel Hill
Center for Entrepreneurship: Sustainability Entrepreneurship	The Center supports faculty in the College of Arts and Sciences and the School of Business in teaching sustainable entrepreneurship. It infuses sustainability into the Entrepreneurship Scholars Program. Sustainability is also included into a variety of courses, e.g., Entrepreneurship and Apprenticeship and Global Entrepreneurship.	University of Portland
Sustainable Entrepreneurship and Innovation Alliance	The alliance includes programs, organizations, students, faculty, community entrepreneurs and supporters committed to building a community of successful, visionary entrepreneurs dedicated to making an impact in the community. (http://seialliance.com/about/)	University of South Florida, St. Petersburg
School of Sustainability	The School of Sustainability is a comprehensive degree granting program with transdisciplinary focus on finding solutions to environmental, social, and economic problems. It	Arizona State University

	is a part of the Global Institute of Sustainability. The program includes experiential learning, faculty research, corporate and k-12 work, community service, and leadership development. (http://sustainability.asu.edu/education/school-of-sustainability.php)	
Johnson Center for Sustainable Global Enterprise	The Center’s program focuses on market enterprise creation, clean technology commercialization and innovation and finance + sustainability. The program includes applied research, partnerships, and innovative curriculum and extracurricular programming to cultivate business leaders who seek competitive advantage through sustainable global strategies (http://www.johnson.cornell.edu/Center-for-Sustainable-Global-Enterprise/About.aspx).	Cornell University

Integrating Ecopreneurship into Entrepreneurship Education

Entrepreneurship students are an important target group for the expansion of innovation and entrepreneurial activities in the field of sustainability. However, the entrepreneurial capacity of our students and the number of courses focusing on ecopreneurship and sustainability are still limited (Fletcher, Knol, & Jamicki (2012). In response to the need for more courses in ecopreneurship and sustainability entrepreneurship, this section describes integrating ecopreneurship into the entrepreneurship curriculum.

According to Bridges and Wilhelm (2008), one of the challenging curriculum issues is whether to have a course entirely devoted to ecopreneurship or to integrate ecopreneurship into current course offering. They argued that if the second option is chosen, there is still the question of whether to infuse sustainability into the various topics within a traditional course or to include it as a separate, stand-a-alone module within a course. The particular pedagogical approach selected, they suggested, will depend on the resources of the department and the university, faculty interest and expertise, and student interest in the topic, among other factors. Regardless of the approach that is selected, “the curriculum must cause students to challenge the following common assumptions: (1) Humans are the dominant species and separate from the rest of nature, (2) Resources are free and inexhaustible (3) Earth’s ecosystems can assimilate all human impacts (4) Technology will solve most of society’s problems, (5). All human needs and wants can be met through material means, 6. Individual success is independent of the health and wellbeing of community’s cultures, and the life support system” (Cortese, 2003, pg. 17).

According to Richardson, Irwin and Sherwin (2005), the knowledge base and skills sets needed to become an ecopreneur are very broad. The list includes awareness of both local and global issues, awareness of future trends, acquisition environmental values, and engagement in ecological or systems thinking (p. 87).

SustainAbility (2008) also identified additional skills sets needed by the sustainability student: the ability to seek new ways to address needs, the ability to identify new business models that support the resulting innovative products and services, ability to develop buy-in and to gain support of a senior champion. In addition, ecopreneurship knowledge and skills must help graduates understand the critical challenge of ecopreneurs, i.e. producing goods that can be distributed, consumed, and disposed of in a manner that does not affect the environmental quality of the lives of future generations. Above all, ecopreneurship programs need to graduate students who understand environmental entrepreneurship and who can apply sustainability frameworks to design new products, services, and processes. Table 5 presents an outline of a foundation course that may be used to integrate ecopreneurship into the entrepreneurship curriculum.

Table 5: Suggested Content for Ecopreneurship Course

Topics	Description
Meaning and Importance of Ecopreneurship	<ul style="list-style-type: none"> • What is ecopreneurship, distinguish ecopreneurship from social entrepreneurship, economic entrepreneurship and sustainability entrepreneurship • Principles of eco-design
Environmental Trends/ Problems	<ul style="list-style-type: none"> • Environmental problems facing local and global communities and opportunities that arise from these problems • Trends in consumption of different forms of energy to determine magnitude of environmental problems • Identify and evaluate alternative sources of energy or ways to enhance energy efficiency
Sustainability in Corporations	<ul style="list-style-type: none"> • Review of sustainability practices in corporations • Evaluation corporate behavior in the context of sustainability
Ecopreneurship Process and Entrepreneurial Opportunities	<ul style="list-style-type: none"> • Overview of the entrepreneurial process • Identifying opportunities derived from environmental trends and problems e.g. methods for cleaner use of coal, alternative sources of energy (wind, solar, geothermal, etc.) • Evaluate entrepreneurial opportunities
Funding	<ul style="list-style-type: none"> • Different sources of funding, e.g., venture capital, angels, entrepreneur team, etc. • Determining financing needs • Financial incentive to encourage ecopreneurship
Risks and Rewards	<ul style="list-style-type: none"> • Types of risks, e.g., technology, market, financial, strategic, etc. • Measure and compare social, economic and environmental risks and rewards of the venture • Short term risks and returns vs. long term expected benefits • Evaluation of SE benefits of the venture
Business Planning	<ul style="list-style-type: none"> • Components of Business Plan • Purpose and uses of business plan • Evaluation of Business Plan • Pitching the plan to investors

Adapted from Basu, Osland and Solt (2008).

Students will do assigned readings, cases, as well as present current event articles from the business press related to the ecopreneurship topic under discussion. Working in groups, students will propose entrepreneurial solutions to pressing environmental problems. Some examples of topics would include products or services that will contribute towards reducing energy consumption, conserving energy and water, improving water purification and filtration, improving waste management systems, and exploring alternative energy sources. Other activities might be a written paper and presentation that will include an industry study, a market study, and a description of the business concept. Also, students might be asked to present a sustainability plan/report for a given company or government entity (Basu, Osland, & Solt, 2008).

The pedagogy for the course will emphasize active, experiential, inquiry-based learning and real world problem solving in the classroom, on the campus and in the local community. We all know from the conventional wisdom and from educational research, that students retain 80% of what they do and only 10 to 20% of what they hear or read. Therefore, to ensure long term retention of the knowledge, skills and values, the curriculum will provide learning experiences for students to work on actual, real-world problems facing their campus, community, government, and industry. According to McDonough and Braungart (2002) the educational experience must be aligned with the principles of sustainability. It should help students to understand the ecological services that are critical for human existence and how to make the ecological and social footprint of human activity visible (Chambers, Simmons, & Wackernagel, 2000; Ryan & Durning, 1997).

Summary and Conclusions

The focus of this paper was how to harness the innovative potential of ecopreneurs to take the advantage of the entrepreneurial opportunities within the environmental degradation and to explain the role of education in environmental sustainability. Based on our review of the literature, most researchers agree that environmental problems do represent entrepreneurial opportunities. Despite the changes in legislation and regulations to protect the environment, the United States and various other countries are still facing many environmental problems, e.g., climate change, population growth, overflowing landfills, water scarcity, fuel shortages, and water and air pollution (Oskamp 2000). If we are to solve these problems, entrepreneurship is a major part of the answer. According to Shepherd and Pratzelt (2011) "entrepreneurial action can preserve the ecosystem, counteract climate change, reduce environmental degradation and deforestation, improve agricultural practices and freshwater supply, and maintain biodiversity." (p. 137).

Secondly, ecopreneurs are not all the same. Some are environmentally oriented and start green businesses, some are partially environmentally oriented, and others only deal with environmental issues when they are forced to by external factors (Schick, et al 2002) The difference, they suggested, is the attitude of the entrepreneurs. One possible reason, they contended, is that for most of these ecopreneurs, environmental awareness was developed since childhood and has continued to be an integral part of their businesses.

Thirdly, the field of ecopreneurship is still in its infancy, but the number of ecopreneurs is growing. There is also a solid theoretical rationale for ecopreneurship. Both the Schumpeterian and the ecological modernization theories clearly explain why ecopreneurship is one of the best solutions for environmental problems. The implication is that academics, entrepreneurs, and government entities should work together to expand research, publications, and other initiatives to promote ecopreneurship.

Fourthly, most scholars and practitioners agree that businesses are and have been a part of the environmental problem, and that entrepreneurs should be a part of the solution. Today, more than ever before, there is need to abandon the old human exceptional paradigm (i.e. being master of the environment) and embracing the new paradigm of creative destruction. Environmental entrepreneurs must destroy the old practices and create new products, technologies, etc., to solve our environmental problems (Grant, 2011).

Finally, entrepreneurship education plays a critical role in harnessing the innovative potential of ecopreneurs and in improving the environmental performance of small firms. Also, entrepreneurship education helps to develop a greater sense of environmental awareness among students and encourage them to apply their ecopreneurship knowledge to improve processes within their own firms (Van Berkel, 2000). The implication therefore is that academics and other trainers should identify the new competencies needed for the new environmental technologies, develop the necessary curriculum, and then assess the impact of the courses on the environmental performance of graduates (Schaper, 2002).

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