Earth Common Journal
Vol. 1, No. 1, September 2011

Preface

Lucille Mazo*
Grant MacEwan University, Canada

Communicating about the Earth has always been an obvious choice for undergraduate students who care deeply about the state of their planet. Over the 17 years that I have taught at Grant MacEwan University, I have heard the passion and the need for students to express and share their ideas regarding the relationship between humans and the Earth. I have been privileged to listen to students' voices and their unrelenting desire to know, as well as their insatiable curiosity to learn about the impact that humans have on the Earth. Recognizing the importance of providing a venue where undergraduate students have an opportunity to share their research and ideas about planet and human interaction, *Earth Common Journal* was created.

Earth Common Journal is an online peer-reviewed, undergraduate annual publication that focuses on three critically important and globally reaching topics: *conservation, sustainability, and global warming*. It was created and shaped by a group of dedicated and compassionate editors, reviewers, and authors who understood the need and the importance of sharing research and creative work in these three areas. Its mandate is to provide a communication instrument for undergraduate students from Grant MacEwan University to convey their research ideas with the intent on informing others about conservation practices, sustainable processes, and issues that affect global warming. In addition, *Earth Common Journal* includes an international section where undergraduate students, faculty, and community leaders exchange the research and work that they are doing in their educational and community institutions.

This inaugural issue, "What students are saying,…", strives to continue the ongoing local, national, and international dialogue, discussion, and conversation that is occurring between student and student, student and faculty, and student and community. There is

a plethora of knowledge that students offer through their deeply reflective thoughts, their innovative perspectives on issues and concerns about our planet, and their original ideas on current societal patterns of behaviour.

I invite you to listen to the voices of undergraduate students who care profoundly about the Earth. Listen to what the students are saying…

Lucille Mazo, Faculty
Managing Editor, *Earth Common Journal*
Bachelor of Communication Studies
School of Communications
Centre for the Arts and Communications
Grant MacEwan University
Edmonton, Alberta, Canada
mazol@macewan.ca

Acknowledgements

There were many dedicated, skilled, and creative individuals who helped to develop the inaugural issue of *Earth Common Journal – What students are saying…* I would like to extend my deep and heartfelt thanks to all those who participated in the process of making this journal a reality for undergraduate students, faculty, and international authors. Please accept my genuine and sincere thanks for the opportunity to work with you who share the same passion—to communicate your knowledge, understanding, and research about Earth. It has indeed been a journey of exploration. In contrast to Ryan Sims' original music composition "We Arrived Safely Because We Stayed Too Close to Shore," we chose to travel far from the shore in order to achieve our dream.

Peer-review Committee:	Dr. Rick Lewis, Biology, Conservation, Grant MacEwan University Donald E. MacDonald, Climate Change, Grant MacEwan University Pamela Wight, Conservation, Edmonton Area Land Trust (EALT) Dana Schmidt, Sustainability Officer, Grant MacEwan University Jennifer Wright, Communication student, Grant MacEwan University
Editorial Board:	Andrea Church, Melissa Cloutier, Talicia Dutchin, Danielle Paradis, Davin Robertson, Courtney Rupertus (communication students)
Website and Cover Designer:	Nicholas Chen (Design Studies student)
Authors:	Kolbie Calverley, David Campbell, Andrea Church, Yancey Corden Dawn Doell, Adriianne Foss, James Harden, Darren Joneson Donald MacDonald, Eric Outram, Danielle Paradis, Holli-Anne Passmore, Courtney Rupertus
Other Contributors and Supporters:	*Netherlands*—Drs. Rob de Vrind, Ms. Gonnie van Aggelen, Mrs. Verbruggen, and five students from the Business Academy *United Kingdom*—James Harden *Canada*—Denise Roy, Leslie Vermeer, Karen Zypchyn Marc Brisbourne, Allan Gilliland, Ryan Sims Brian Jackson, Eva Revitt Darci Mallon, Kassandra Harvey, Susan Winters Research Office, Student Association, Sustainability Advisory Committee

Earth Common Journal
Vol. 1, No. 1, September 2011

Champion of Nature, Sustainability, and Education

Lucille Mazo*
Grant MacEwan University, Canada

ABSTRACT

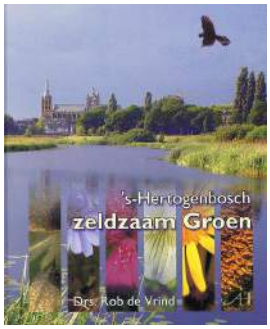
Drs. Rob de Vrind has been an advocate for nature and sustainability throughout his life. His need to be in nature is only slightly greater than his need to educate those around him about the importance of living a sustainable life. As the Senior Advisor for Sustainability, de Vrind provides critical information about sustainable choices and works collaboratively with the administrators, faculty, and students at the Koning Willem I College in 's-Hertogenbosch, Netherlands. His knowledge about sustainability is informed by his research in his field of biology. It is this combined knowledge base that has made him an intuitive champion of nature and a genuine leader in promoting sustainability in life, education, and industry.

Nature's Researcher

"Nature, the mirror of humankind" is Drs. Rob de Vrind's message when he talks about nature to those who listen to and read about his work. As a biologist, he understands the importance of doing research that produces original results and that adds to the body of knowledge within a discipline. After a

decade of discovery and field research, de Vrind (2002) published his book *'s-Hertogenbosch Zeldzaam Groen*, which contained a detailed account of the plants and vegetation located within and around his city of 's-Hertogenbosch. More specifically, de Vrind provided critical information on the landscape and nature in and around the city, on the city's flora in 1848, and on the city's current flora and fauna.

Plant Species Research



With a focus on the plant life surrounding 's-Hertogenbosch, de Vrind (2002) conducted numerous field excursions where he gathered and recorded data and information regarding the different species that grow in the region. As he walked the perimeter of the city, de Vrind applied his scientific knowledge and abilities to accurately identify and record the many plant varieties found in the immediate district. His in-depth attention to detail also resulted in the discovery and identification of some rare and new species. With countless hours of dedicated observation and rigorous notations, de Vrind documented many types of species that were entered into a database for current and future reference. This crucial information culminated in the development of a comprehensive table that listed 739 species of the current flora and fauna growing around the city, and resulted in the creation of a permanent record for the city (pp.119-125).

Historical Research

Along with his dedicated interest in the plant species of the region, de Vrind also developed a committed interest in his city's history. More specifically, his focus regarding historical research concentrated on the 1629 Siege of 's-Hertogenbosch. Supported by his detailed knowledge of the city's terrain obtained from his in-depth research of the regional plant life, de Vrind conducted numerous field trips into the area, noting the various historical landmarks that identified where and how the siege took place. Using a variety of observations, pictures, field notations, and mapping techniques, de Vrind depicted the layout of the city that was conquered in 1629 by Frederick Henry, Prince of Orange (van der Heijden, 2004, p.152).

De Vrind's (2002) research resulted in the creation of a new map of the region that compared the city's landscape and demographics of 1629 with that of 2002. His map comprised two caches of information: 1) landmarks of 2002, and 2) historical landmarks of the 1629 Siege. To establish his comparison, de Vrind first created the base of his map by depicting the city's landmarks of 2002 which included forests, highways, streets, roads, water routes, and development areas. He then imposed the 1629 historic landmarks onto 's-Hertogenbosch's landmarks of 2002. The locations of the three critical forts that existed within this stronghold of 1629 were also positioned and illustrated: Fort Isabella, Fort Anthonie, and Fort Dieze. Also included on this map were accurate details of the locations of dikes, trenches, waterways, military companies, monasteries, churches, and windmills that were present during 1629 (pp.152-188).

A comprehensive explanation of the siege in relation to the map is included in a dedicated section of Peter-Jan van der Heijden's (2004) book *Dagboek 1629: Ooggetuigen van het beleg van 's-Hertogenbosch* (Diary 1629: Eyewitnesses to the siege of 's-Hertogenbosch). De Vrind's historical information and map is also showcased in the *Noordbrabants Museum* where the public has access to this knowledge.

With his deep understanding and connection to nature and his strong scientific curiosity, de Vrind's need to demonstrate how humans should live on the planet and his need to determine how this goal should best be accomplished has naturally and intuitively brought him to the important areas of sustainable living, resources, and education.

A Collaborative and Sustainable Voice in Education

As the Senior Advisor of Sustainability at the Koning Willem I College in 's-Hertogenbosch, Netherlands, de Vrind epitomizes the role of an educator who champions and teaches sustainability within his institute. With a critical mandate to share his knowledge and experience, he is responsible for working with and advising the administrators, faculty, and students on the principles, approaches, and

Koning Willem I College, 's-Hertogenbosch, Netherlands

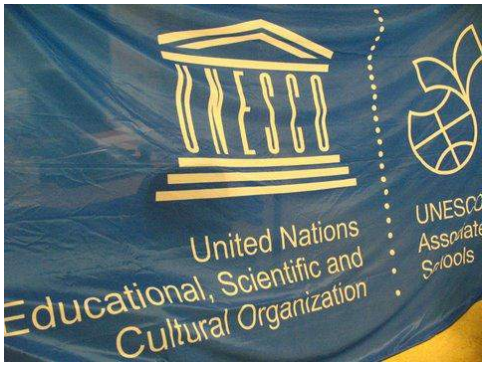
applications of sustainable living and how they can be integrated into the College's curriculum.

With a goal to integrate sustainability into the programs offered by the College, de Vrind works collaboratively with the faculty members and the students by advising them on innovative projects, by teaching sustainability as a guest lecturer in various classes, and by facilitating local, national, and international learning opportunities for students so that they can discuss, create, and disseminate information about sustainable living. An example of the College's commitment to sustainability is its annual *Community Week* where many students are engaged in creating and delivering sustainable projects within the local community.

This year's *Community Week* culminated on April 21, 2011, with Dr. Coen Free, Director of the College, joining the community in congratulating the student group that won the award for the most innovative and sustainable project. The long term success of the *Community Week* is a result of the College establishing fundamental partnerships between administrators, faculty, students, and community. The collaboration between these groups enables the College to uphold and implement the important learning objectives and goals of teaching students about sustainable principles and practices. In consultation with faculty, these goals and objectives continue to be reinforced throughout the year by de Vrind who promotes and teaches sustainability within various programs and courses throughout the College. With de Vrind at the forefront of these initiatives, it is little surprise that his dedication in promoting the education and implementation of sustainability won him a sustainability prize in the Netherlands. De Vrind received the prestigious Franc Houben Sustainability Award in 2007, recognizing him for his excellent work in this area.

De Vrind's ongoing work and research in education and sustainability is threefold: 1) he works with UNESCO to bring students and faculty together to discuss sustainable topics; 2) he works with a team of educators to present projects that support the framework of *Cradle to Cradle* (C2C); 3) he acts as a member of the Steering Committee for the DMBO (Duurzaam Middelbaar Beroepsonderwijs), whose mission is to ensure that sustainability is entrenched within all levels of an institution—the mission and vision statements, the curriculum, the management.

UNESCO



During the academic year of 2010-2011, de Vrind worked with a team to host an important and critical sustainability event supported by the international organization of United Nations Educational, Scientific and Cultural Organization (UNESCO). The Koning Willem I College is a designated UNESCO educational institute in the Netherlands and is a member of its Education for Sustainable Development (ESD) division. ESD is dedicated to integrating the concept of sustainability into all levels of education with a focus on promoting teaching and learning "that are environmentally sound, socially equitable, culturally sensitive and economically just" (UNESCO, 2011). ESD also ascribes to creating learning experiences that are hands-on in their approaches and that are related to local, national, and international communities focused on solving real and critical societal problems.

Using his skilful organizational abilities and his experience and knowledge in education and sustainability, de Vrind worked with a dedicated team to bring students and faculty together to discuss the important issue of water management and sustainability. The team's vision was supported by the *UNESCO-IHE Institute for Water Education*, an organization that was established in 2003 by the Netherlands' government in partnership with UNESCO. This Institute's mandate is focused on "strengthening and mobilizing the global educational and knowledge base for integrated water resources management, and on contributing to meeting the water-related capacity building needs of developing countries and countries in transition" (UNESCO, 2011).

On April 1, 2011, the Koning Willem I College hosted a conference on water and sustainability: *HBO-MBO UNESCO Meeting on Water*. The keynote speaker was Anke van Kampen, a representative of UNESCO. Students and faculty from various educational institutes across the Netherlands presented research projects that they had undertaken with respect to

water and sustainability. Sharing and discussing these projects provided students, faculty, industry, and UNESCO with an opportunity to witness how educational institutes sanction, support, and promote sustainability through education and partnership. This conference also demonstrated how these institutes collaborated to ensure that students learned about sustainability so that they could transfer this knowledge into living more sustainably within their communities. De Vrind explained that this conference was only one of the ways that students could be taught about sustainability; *Cradle to Cradle* (C2C) was another.

Cradle to Cradle (C2C)

"*Cradle to Cradle* (C2C) is about innovation, quality, and beauty" (Braungart, 2011, p. 2). Based on award-winning research that began in the 1980's, the framework of *Cradle to Cradle* was developed by Dr. Michael Braungart and Dr. William McDonough who helped to establish the Environmental Protection Encouragement Agency (EPEA) in Hamburg, Germany. Since that time, this concept has been manifested and transformed into various forms, including implementation and practice within all levels of education.

In May 2011, the book *Inspired by Cradle to Cradle (C2C)* was published which included a mixed collection of both business and educational cases from C2C leading countries. As a contributor to this book, de Vrind provided a relevant example of how the C2C initiative has been integrated into the Koning Willem I College. Using the areas of construction, energy, and climate as a basis for his example, he explained how the three basic principles of the C2C framework were present: 1) "waste=food (everything is a nutrient for something else)", 2) use current solar power income, 3) celebrate diversity (conceptual, bio, cultural) (p. 10).

To demonstrate how these C2C principles were implemented within a classroom environment, de Vrind described how groups of four students were instructed to design a house in twenty minutes based on these three principles. Each student group was then directed to present the final design of their house and to explain how the C2C principles influenced the group's design decisions. During these presentations, students were asked to consider the importance of re-thinking, re-organizing, re-planning, and re-scheduling resources so that they were more sustainable. Throughout this project, the framework of C2C was reinforced—that everyone needed to start being sustainable in their choices at some point, even if these choices began as minor changes. By implementing these minor, more positive lifestyle decisions, the sum total of these smaller but important changes could then culminate in significant changes over a period of time. De Vrind further

explained that "C2C was about thinking creatively and innovatively. Students who participated in this project were incredibly enthusiastic and were keen to follow it up in their educational programme. A first taste that promised more" (p. 34).

Duurzaam Middelbaar Beroepsonderwijs (DMBO)

De Vrind's involvement in sustainable education within his College is significant; therefore, it is with understanding that he continues his contribution to the knowledge of sustainability in other areas of his life. Constantly vigilant in finding ways to educate people on the importance of sustainable living, de Vrind applies his research, knowledge, and experience as a member of the Steering Committee for the *Duurzaam Middelbaar Beroepsonderwijs (DMBO)* which is a nation-wide organization that is focused on promoting the teaching and integration of sustainability in educational programs. The DMBO is composed of a steering committee, a working group, and an advisory group.

The organization's mission is to ensure that sustainable development informs an institution's strategic decisions, curriculum creation and implementation, and management operations. As such, DMBO believes that strategic decisions need to include sustainable choices that are related to an institution's mission and vision statements; that the concept of sustainability needs to be integrated in curriculum development at all levels of education; and that sustainable management practices need to be considered in daily operations. Ultimately, DMBO believes that sustainability is achievable when management, supervisors, trainers, teachers, and students work collectively and collaboratively to ensure that sustainable practices are understood and promoted.

The DMBO provides assistance to all stakeholders by offering a support network, by ensuring that existing knowledge and understanding (including teaching materials) are available at the right time and place, by developing concrete products that are sustainable, and by providing follow up to educational institutions' requests for training, workshops, and materials. Examples of how DMBO promotes sustainable education and management include customized teaching materials, organized competitions for students, and awards and certificates. To learn more about DMBO and the work that they are collaborating on, visit http://www.duurzaammbo.nl/dmbo/web/

A Champion Who Perseveres

De Vrind's dedication to sharing his research knowledge and experience on sustainable living is evident. His insight into the interrelationship between education and real-world situations enables him to seek locally, nationally, and internationally those institutes, communities, and businesses that also believe in and promote sustainability. Innovative research, teaching, and implementation of sustainable projects are processes that he has and continues to provide for the students at the Koning Willem I College. The students, faculty, and businesses that collaborate with him are fortunate to have access to his deeply enduring commitment and belief in maintaining a sustainable planet.

---

*Author: *Lucille Mazo is a faculty member who teaches at Grant MacEwan University in the Bachelor of Communication Studies degree program. She is the Managing Editor of Earth Common Journal and works with the Editorial Board and the Peer-Review Committee to select, edit, and publish the journal. She is a naturalist, has a passion for bird-watching, and the Netherlands is her favourite place to visit.*

References

Braungart, M. (2011). *Inspired by Cradle to Cradle: C2C Practice in Education*. Hiteq, Hilversum, the Netherlands.

De Vrind, R. (2002). *'s-Hertogenbosch Zeldzaam Groen.* Adr.Heinen Uitgevers, 's-Hertogenbosch.

Duurzaam Middelbaar Beroepsonderwijs (DMBO) (2011). Retrieved July 5, 2011, from http://www.duurzaammbo.nl/dmbo/web/

UNESCO (2011). Education for Sustainable Development (ESD). Retrieved June 30, 2011, from http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/

Van der Heijden, P. (2004). *Dagboek 1629: Ooggetuigen van het beleg van 's-Hertogenbosch.* Adr.Heinen Uitgevers, 's-Hertogenbosch.

Earth Common Journal
Vol. 1, No. 1, September 2011

Sustainable Learning in 's-Hertogenbosch, Netherlands

Andrea Church*
Grant MacEwan University, Canada

ABSTRACT

This article is a case scenario with interviews from students in 's-Hertogenbosch, Netherlands. The students are enrolled in a business or "Entrepreneur's" program at Koning Willem I College. Part of their program involves a sales initiative project during which they are responsible for designing a campaign to sell umbrellas. The students receive lessons from Drs. Rob de Vrind, an expert on sustainability and resource management. De Vrind teaches sustainability to the students under the heading of "citizenship," which is taught by two program instructors. Five students participated in the interview process. While their project is in the beginning stages, they are enthusiastic about learning more about the connection between good business practices and sustainability. Background information about the educational system in the Netherlands, as well as information about the College's business program is provided.

Background

Education and learning are lifelong pursuits. Formal and informal learning shape and support the acquisition of knowledge by students. Integrating critical information into the curriculum can be challenging for most universities and colleges. The topic of sustainability is one such area of human understanding that has warranted considerable

discussion regarding teaching and learning approaches. Incorporating the topic of sustainability within curriculum requires innovative, creative, and unique methods to develop a deeper context of this complex subject. This is precisely what the administrators and faculty have successfully accomplished at the Koning Willem I College in 's-Hertogenbosch, Netherlands. Sustainability has been integrated into the College programs by Drs. Rob de Vrind – "who works collaboratively with the faculty members and the students by advising them on innovative projects, by teaching sustainability as a guest lecturer in various classes, and by facilitating local, national, and international learning opportunities for students so that they can discuss, create, and disseminate information about sustainable living" (Mazo, 2011).

Purpose

In May 2011, Andrea Church (4th-year student) and Lucille Mazo, (faculty) from the communication program at Grant MacEwan University, Canada travelled to 's-Hertogenbosch, Netherlands to speak with faculty and students at the Koning Willem I College about their approach to integrating sustainability within their curriculum, as well as to gain an understanding regarding the students' perspectives on the topic of sustainability. With permission from faculty and students, individual and small focus group interviews were organized and conducted. Their time and resource commitment to this project were appreciated. This article provides information about the College, as well as a summary of the student interviews.

This research focused on sustainable learning in students from the Koning Willem I College (Figure 1) who currently study in the Business Academy (Ondernemersacademie) and who have completed their first year of an International Business Studies (Bol) program entitled Entrepreneur International Trade/Wholesale, BTEC: National Diploma in Business. Students learn management, marketing, human resources, and English. "The program uses projects, e-learning, international visiting professors, guest speakers, and company visits as innovative approaches to the educational process" (Koning Willem I College, 2011). Sustainability is one of their topics, situated under the category of Citizenship. According to the Brundtland

Figure 1: Koning Willem I College

Report (1987), Sustainable Development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Angelique Lansu, 2010). Koning Willem I College is an excellent example of how a new generation of students are being introduced to the important principles of sustainable development.

The Educational System and the College

The Netherlands' post-secondary system is similar to Canada's in that both consist of a Bachelor Degree, Master Degree, and Ph.D., or Doctorate degree. "The Netherlands has a binary system of higher education, which means there are two types of programmes: research-oriented education (*wetenschappelijk onderwijs, wo*), traditionally offered by research universities, and professional higher education (*hoger beroepsonderwijs, hbo*), traditionally offered by *hogescholen*, or universities of applied sciences" (Nuffic, 2009). Canada's system of universities, colleges, and trade schools is similar, though may be less arbitrary for the students. Koning Willem I is the first community college in the country. "It provides a wide variety of occupational programs and courses, ranging from technical IT and business programs, to courses in economics, healthcare, welfare, sports, architecture, design, fashion, theatre, and multimedia" (Koning Willem I College, 2011).

Campus Sustainable Initiatives

Koning Willem I is a sustainable campus in downtown 's-Hertogenbosch. "The College is a member of UNESCO's Education for Sustainable Development (ESD) Division" (Mazo, 2011), and participates in a variety of sustainable initiatives including an organic garden, composting, recycling program, unique water system, and power reduction system. The garden consists of rows of herbs that run parallel to lettuce, peas, carrots, and various root vegetables. The produce is used on the menu by the school's cafeteria. Waste from the cafeteria is composted and used on the garden. The students learn about the importance of using and buying locally grown produce, and enjoy the healthier food they eat as a result. The cafeteria is run by the Restaurateur's students. They are studying to learn how to open their own restaurants. The program allows them to learn about all aspects; the cooking, the planning, and the financial details. They create the menus, prepare the food, and use the experience they gain as they move on to start their own businesses or restaurants after they graduate (de Vrind, 2011).

The College also boasts a recycling program for cans and bottles as well as glass. There are initiatives concerned with power consumption, and the lights are turned off when a room is not in use. The bathrooms only have one tap, cold water; so, the College does not pay to heat hot water for every bathroom. Natural lighting is used whenever possible, and de Vrind is researching the idea of placing a cover over the windows to help regulate temperature in the summer and prevent heat loss in the winter.

But, it takes a lifetime to educate, understand, and apply sustainability within one's environment. The College recognizes this continuous journey of learning and responds to the need to educate a new generation of students by ensuring that sustainability is integrated within its curriculum. "Lifelong learning is especially relevant in the context of learning for sustainable development. The high complexity of the professional field and the quick turnover of knowledge and insights make learning on a continual basis necessary" (Angelique Lansu, 2010). A current example of how sustainability is part of the College's curriculum and teaching is described in the next section.

A Case Scenario of Sustainability in Action with Students and Faculty —a collaborative learning approach

Students stream into the Koning Willem I College in 's-Hertogenbosch. Some are arriving for a nine o'clock lecture from Drs. de Vrind. He is a well-known figure in 's-Hertogenbosch and the Netherlands; he teaches sustainability to the students at the College and is recognized for his books, projects, and government work in sustainability and resource management.

The lecture is the second in a series of lessons that the students will receive on sustainability; it falls under the branch of "citizenship" within the Business Academy. Ms. Gonnie van Aggelen and Mrs. Verbruggen are principle instructors within this program and are responsible for teaching, guiding, and working with the students. Both are dedicated to their students' success. Twelve males and eight females fill this first year class. De Vrind lectures briefly about the basics of sustainability employing a dynamic teaching style and an interesting slideshow, and then divides the class into male and female teams. He administers an evaluation in the form of a competition to test the knowledge base of the students on the topic of sustainability. The competition ends with a draw because class has finished.

Afterwards, a meeting is arranged with Mrs. Verbruggen to join her class from 2:00-3:30 p.m. to interview the students about their program and their thoughts on sustainability. Five students agree to participate in the focus groups.

The Students' First Year Program Project

The students are eager to participate in the focus groups and to explain the details of their major project in the first year of their Entrepreneur International Trade/ Wholesale program. It is impressive that they have decided to become entrepreneurs. The project for their first year is to learn the basics of running a business. This is a significant challenge and commitment for the students; they have used their own money to purchase merchandise for a project where they must make a profit. Umbrellas are not the first products to think about when one is talking about sustainability, but this is what the students are expected to sell. They buy the umbrellas wholesale for twenty Euros each, and then must sell them for thirty. Profits are divided between the students, the College, and a charity of the students' choice. KiKa is the chosen beneficiary; it is a children's charity organization. "KiKa (children with cancer) raises funds that benefit the seven paediatric cancer centers in the Netherlands" (KIKA, 2007). Forty percent of the profits go to the school, forty to the students' groups, and twenty to the charity.

There are three different types of umbrellas from which the students can select: one has flowers that appear when the material gets wet. One student figures that they will market that one to women. The second one has a specially-designed flexible frame so that it will not break in heavy winds, and the third is very strong. This one is going to be marketed to golfers. It sounds like a challenge, but will be a good test for the students. Success in the project demonstrates their commitment to the program and their ability to assess marketability and to find clients. Success is also measured by their ability to consider and apply the principles of sustainability as they plan their marketing strategies for their project. One student explains that the Netherlands has advanced ideas for sales and business – they are looking for bulk sales, and have some interesting ideas about marketing to car companies, and supermarkets.

Students' Perspectives on Sustainability and Learning

The students all agreed that sustainability was an important aspect of living. When asked what sustainability meant to them, the answers varied ranging from personal responsibility to the environment, to adhering to the child labour laws that promote a

more sustainable marketplace and lifestyle in other parts of the world, to finding solutions that reduce energy consumption. Summaries of their perspectives, ideas, and understandings of how and why sustainability needs to be part of learning, living, and business are included below.

What does sustainability mean to you?

The concept of "sustainability" varied among the students. One of the students believed that it meant there was no child labour in the world. This student also saw sustainability as a process that allowed one to look and think about the future. Four of the students agreed that people needed to pay attention to the use of natural resources such as gas and water. Two of these four students also believed that it was about being mindful of the gas, energy, and water that people consumed. A final student added to this description of sustainability, explaining that it was about finding new solutions to do everyday tasks. He further explained that society needed to look at bio industries for mass production, solar power, and wind energy.

How do you include sustainability in your everyday and school life?

Two students listed several sustainable life choices that they integrate into their daily routines including recycling, separating waste, turning off lights and power, taking short showers, eating organic eggs and meat, and using local products. Initially, one student explained that she didn't do anything really that was sustainable, but then she realized that things like separating plastics, taking the bus, and being vegetarian counted. One of the five students explained that he separates plastics, takes the bus, and also eats more vegetables than meat, while a second one believed that people should care more about what products they use and the waste they leave behind. He wants them to be aware of water, gas, and electricity consumption. He personally uses a lower power setting for his laptop screen, rides his bike, takes the train, and walks.

What sustainable initiatives exist on your campus?

Two of the students identified solar panels, energy mirror, and a windmill for school, as well as recognized public transport, educational courses, and the separation of plastics as other initiatives that are being implemented on their campus. Two of the five students added to this list by identifying the plastic separation bins on the campus that help to reduce the amount of waste found in the trash cans. One student explained that "You can turn off the lights, the cafeteria has cheaper healthy food, and there are no snacks before 10 a.m."

What sustainable projects have you been involved in this year?

Two of the students have both learned from their classes on sustainability and have incorporated their new knowledge into their umbrella project. This sustainability initiative is supported by one of the student's father who owns a sustainable shop that sells green products such as solar panels, solar toys, kitchen products, and environmentally friendly makeup. The three other students also cited their work at school – the umbrella project—as a project that considers sustainability as an important part of their planning process.

What research was involved in developing and shaping your project? What methods have you used to gather information for your project?

One student explained, "It's a first year business project that was assigned to us, in the third year we will set up as entrepreneurs. We meet every week and change positions every week until we find out who works best in each role." While another student added that they have spoken to some big companies, supermarkets, and car dealerships to see if they want to carry the umbrellas. One other student cited the internet, producers, experts, and books on marketing as resources she used to research her project. Two of the students also added business and sustainability classes to this list of sources that inform them about their project.

Do you see your project going beyond this initial stage?

Two of the students explained that if the project was very successful they would go further with it since they are excited about working on it. Another student would like to see the results of the project before deciding on the next stage. The two other students are not considering any future extension of the project, with other options being considered.

The students were approachable and honest in their responses, as they explained how sustainability affected their lives and their learning. It was clear that they were well-versed in and highly aware of the impact that sustainable campus initiatives had on their learning at the Koning Willem I College.

Conclusion

Education is a very individual experience. "Because each learner will start from his or her own unique perspective – having different prior knowledge, in different learning domains, and from different professional experience – the actual learning trajectories will vary among students" (Angelique Lansu, 2010). The students who are studying in the Business Academy have two years in which to learn about sustainability in business, marketing, and in their own lives. De Vrind, as a representative of UNESCO at Koning Willem I College uses his knowledge and experience to bring forward projects and initiatives for the students at the College. The *Meeting on Water HBO-MBO UNESCO* conference in April 2011 showcased various research projects from students in different educational institutes across the Netherlands; some of those projects were undertaken by the College's students (Mazo, 2011). It is more than likely by the second year of their program that some of these students will also go on to focus their work and futures on sustainable business.

---

*Author: *Andrea Church is completing her fourth year in the Bachelor of Applied Communications in Professional Writing Program at Grant MacEwan University, Canada. She loves the outdoors and recently managed a two-day bike trip down the Rhine while vacationing in Germany. She is an avid scuba diver and loves to photograph marine life in situ.*

References

Angelique Lansu, J. B.-M. (2010). Learning in Networks for Sustainable Development. *7th International Conference on Networked Learning*, (pp. 249-256).

KIKA. (2007). *Home*. Retrieved July 29, 2011, from http://www.kika.nl/

Koning Willem I College. (n.d.). *Visie op Onderwijs*. Retrieved May 24, 2011, from Koning Willem I College 's-Hertogenbosch: http://www.kw1c.nl/Organisatie%20&%20Visie/visieoponderwijs.htm

Mazo, L. (2011). Champion of Nature, Sustainability, and Education. *Earth Common* , 1-8.

Nuffic (2009). Higher education system in the Netherlands. Retrieved August 7, 2011, from http://www.nuffic.nl/international-students/dutch-education/education-system

Earth Common Journal
Vol. 1, No. 1, September 2011

The London Wetland Centre: An urban conservation project that is making a splash

James Harden*
London Wetland Centre, London, U.K.

ABSTRACT

In the eleven years since it opened in 2000, the London Wetland Centre has become an exemplar of an urban conservation project that has turned heads throughout the world. As we shall explore, a site has been created that now has international recognition for its scientific interest, and which provides an ideal case study for how biodiversity and sustainability can be achieved, even in the challenging economic landscapes that are associated with the twenty-first century.

The Vision

The London Wetland Centre (Centre) is based in south-west London, less than 8 miles from Westminster Abbey, and adjacent to the River Thames. It is a 105 acre site managed by the Wildfowl and Wetlands Trust, a charity with the specific and vital remit of conserving wetlands.

The Trust was established in 1946 by Sir Peter Scott, and now manages nine wetland sites in the UK, which receive over a million visitors *per annum*. The Trust also has a membership totalling 200,000 and is able to significantly influence the conservation agenda.

London Wetland Centre

Sir Peter Scott himself was the son of Captain Robert Falcon Scott or "Scott of the Antarctic," and it is interesting to observe that the will of the polar explorer insisted that an interest in wildlife should be fostered in his one and only child.

The creation of an urban wetland site had long been the aspiration of Sir Peter, and in the 1980s he recognised the potential of the site then known as Barn Elms Reservoirs. The reservoirs had been created in the late nineteenth century, at the time of the industrial revolution, to provide drinking water to the rapidly growing population of London. However, due to their non-compliance with European Union (EU) regulations, they had become redundant, and were ostensibly a financial burden to the Water Company (Thames Water), as the site had to be kept secure. Furthermore, as the site had already been recognised as a Site of Special Scientific Interest (SSSI) on account of its importance to diving ducks, legislation dictated that the site would have to be maintained as a water body.

Securing the Financial Backing

Having identified a site that could be developed, it is testament to Sir Peter's skills in negotiation that he was able to secure it for free from Thames Water, but of course there was still a need to source the funds to transform the site into the bio-diverse habitat that represented his vision. This was enabled by selling a small section of the site to a property developer, Berkeley Homes, for the sum of £11 million, whilst the remaining £5 million was obtained through a series of donations and grants. It is a story which nicely illustrates the need for conservation to be married to pragmatism: the sacrificing

of even a small part of the site would have been a difficult decision, yet the funds raised by the sale no doubt leveraged the support from funders and private donors.

Whilst £16 million is not an insignificant investment, it compares very favourably with the £789 million associated with the establishment of the 'Dome' – the UK's Millennium Experience - that was funded in no small part by the taxpayer. The London Wetland Centre perfectly illustrates, therefore, that well managed conservation projects can have genuine 'added value'.

Development of the Site

Site construction began in 1995 and tight planning regulations ensured that sustainability remained at the forefront of the minds of the project team. Recycling was necessitated by the planning regulation that insisted that no spoil (with the exception of basic building materials) was to be allowed to be removed from the site. On that basis, the concrete lining to the reservoir was broken up and used to create paths and the car park. Some 1.6 million cubic feet of soil was sorted and re-mixed, the water bodies were contoured, and islands and other landscape features were created. Meanwhile, some 300,000 aquatic plants were introduced and the key vegetation communities were established. No opportunity to increase the space for wildlife was wasted, and many of the bird hides were constructed with a roof upon which vegetation was planted.

In May 2000, the Centre was opened: a habitat had been created that was fit for Reed Warblers to breed, where the exceptionally rare Bittern could over-winter, where butterflies and bees could obtain nectar, and with a richness of insect-life that now supports up to eight species of bat.

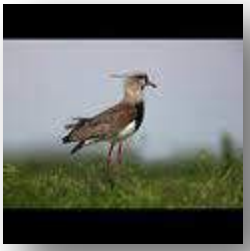
In 2001, the Centre received the accolade of being a winner of a British Airways Global Award for sustainable ecotourism.

Since that time, the Centre has continued to adopt a pro-active stance towards promoting sustainability, as can be demonstrated by the opening of its Rain Garden in 2010. Water conservation will become increasingly important as the climate changes, and the garden emphasises the importance of harnessing rain water, as opposed to allowing it to run-off from impermeable surfaces and potentially contribute to flooding and erosion. Recycling is another theme that is promoted, as the centrepiece of the garden is an old shipping container planted with a green roof, providing an elevated wildlife habitat.

Education

It is recognised by the Centre that engaging with future generations at an early stage in their development is key if conservation and sustainability are to be concepts that are understood and embraced. The Centre has a dedicated team to promote this agenda and strives to be innovative: it has a conservation-themed adventure playground, a pond-dipping zone, interactive exhibits, and boasts a captive collection of wildfowl that reflects the diversity of ducks, geese, and swans. There are also special events on a daily basis that help make the Centre a lively and educational day out for even the younger members of the family.

Has it been a success?



The Lapwing

In a word, yes. The wildlife of the site could form the contents of a publication in its own right, but it is worth reflecting on some of the key species that have colonised the site. The Lapwing is a bird that has experienced a national decline in recent years and has not bred in London since before the War; yet several pairs now raise their young each year. The site is now one of the top sites in south-east England to view over-wintering Bitterns and some six individuals were present in winter 2010/11; prior to the establishment of the Centre, it would have been over 100 years since this rare heron-like species had been recorded so close to the centre of London. Duck species such as Shoveler and Gadwall are present in numbers of national significance.

The Shoveler

Meanwhile the site is in the top 5% in London for observing bats, and hosts about twenty dragonfly and damselfly species.

Furthermore, the Centre has played a key role in some successful reintroduction programmes. The Water Vole population in the UK had declined by some 90% since the 1960s, primarily due to the unsympathetic management of watercourses, but also as a result of predation by the American Mink. A population of 250 Water Voles was released into the Centre in 2001, which has now established and flourished to between

300-400 individuals. Other reintroduction projects involve a species of legless lizard known as the slow worm, and the Tower Mustard plant.

The Future

At only 11 years old, the site is still a young one, and careful management should ensure that it continues to attract new animal and plant species. It is a model for urban conservation which has been recognised around the world, and earlier this year, I had the privilege of introducing the site to a conservationist from Finland, who has been tasked with the creation of a comparable site in Helsinki. As per the old adage: "imitation is the sincerest form of flattery."

*Author: *James Harden received training in Biology with Environmental Studies at the University of London, and works for a biomedical research charity in London. At the weekend, he likes to escape the stresses of his day job by serving as a volunteer at the London Wetland Centre, where he uses his knowledge of the site and wildlife to conduct tours. James has been a birdwatcher for over 20 years, and was a visitor to the site in its previous life as a complex of reservoirs. (email: jamesharden@tiscali.co.uk)*

Earth Common Journal
Vol. 1, No. 1, September 2011

Living off the Grid

Eric Outram*
Grant MacEwan University, Canada

ABSTRACT

Living in the city most people take for granted the convenience of flicking on a light switch or plugging in an appliance. They also expect to be able to call the utility company if there is no heat for the house. Now imagine being responsible for providing all of your survival needs from electricity through waste management. This is off-grid living.

The settlers who came here to Canada lived off-grid. Homes were often built of sod, heated with wood-fired stoves, and lit with candles they made themselves. The majority of twenty-first century Canadians would perish in similar living conditions. The Canadian Encyclopaedia in its history of Western and Northwest Canada describes the lives of the pioneer homesteaders who purchased 160 acres of land for $10 and struggled to survive. "Homesteaders and their families were often separated from friends and relatives, and many suffered years of hardship and loneliness. One of the greatest difficulties was the absence of roads and bridges. Most trails were impassable when wet. Medical care was scarce and farm injuries were often crippling or fatal, and many simple ailments caused prolonged hardship. For many settlers the price of homesteading was too high, they cancelled their claims and moved away" (McCracken, 2011). Today, off-grid living is sought out for different reasons.

People who decide to live off-grid are often looking for a way to live in harmony with and lessen their impact on the environment. They enjoy a physical challenge, and/or appreciate some solitude. It is possible to lessen reliance on the grid and still live in the city, but it is expensive and more difficult due mainly to regulatory requirements. Since regulations vary widely among municipal jurisdictions the focus of this article is development of an off-grid living facility where municipal services are unavailable.

Off-grid living in its simplest form involves finding ways to provide for basic human comforts. "Off-grid also means not using or depending on public utilities, especially the supply of electricity," (Oxford Dictionary, 2011). For many people who are living this lifestyle it also involves growing food, raising chickens for eggs and meat, goats or cows for milk, and pigs for pork, bacon and ham. Off-grid living also means changing lifestyle to suit the season. Spring is planting season and that is the focus of activity. Summer means long days and a chance to build and do maintenance and time to cut, split and stack next year's firewood if the primary source of heat is wood-burning stoves. Fall is harvest time with its many hours of work preserving the food. Winter is for cocooning and making plans for the next growing season. If power generation is solar based, it probably means going to bed early and sleeping later to conserve energy.

A Personal Choice to Live Sustainably

The author and some of his family are in the process of developing a multigenerational home site on ten acres of forested property on the North Sunshine Coast of British Columbia, Canada. This article presents information that a family needs to consider when deciding to live off-grid. It then presents a case study of the decisions, considerations, and expectations that the author's family encountered when building the home site; including real-world suggestions and solutions based on primary research done by the family members. It also gives some site-specific details of that ongoing work.

Design Considerations

When deliberating about off-grid living, the main areas of functional consideration are power, heat, water supply, and waste disposal. Power can come from three main sources: solar, wind, or water. Wind and water sources are used to turn some form of turbine or generator that can be hooked up to battery storage. Solar panels, or photovoltaic units are mounted on the house and convert the sun's energy into power that is then stored in batteries for ongoing use. Site parameters will determine the best power source for a particular project (Oke & Oke, 2008b, p. 78). If the site has a reliable flowing source of water, then installing a micro-hydro system is a very efficient way to generate power. Solar panels need a good open southern exposure to best take advantage of the sun, and wind power requires a very open space in the direction of the prevailing winds.

Power

"The average Canadian household consumes in excess of 8,500 kilowatt hours (KWh) of electricity in a year where the heat source is something other than electricity" (Canada N. R., 2009). To put that in perspective, one 60 watt light bulb burning for one thousand hours uses 60 kilowatt hours of electricity. A modern micro-hydro system using one turbine can produce up to 8,400 KWh. The definition of a micro-hydro

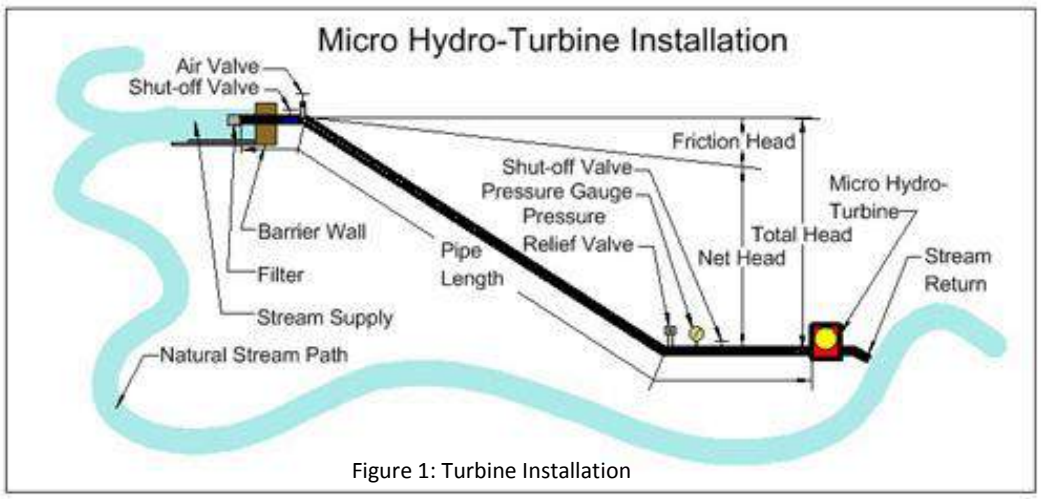


Figure 1: Turbine Installation

system is the use of flowing water to turn a water turbine that generates electricity in an alternator (Figure 1). It can also be described as a "run of river" system. Sizing a micro-hydro system is fairly simple and there are many online resources to assist in this. Lifestyle is the major factor in determining electrical requirements. Every light and additional appliance adds to the load on the system. Micro-hydro systems are relatively simple to install. They require an intake, usually built into a dam or weir, a penstock, which is the pipe between the intake and the turbine, and the turbine itself.

Micro Hydro Systems follow the same basic design parameters. The elevation difference between the intake and the turbine, or head, is a major factor in determining how much power will be generated. The other critical factor is flow. Any combination of high head and low flow, or low head and high flow will work to produce power. This means that micro-hydro systems can be used under a wide range of conditions. Micro-hydro system components are readily available from Canadian sources. One supplier is Energy Alternatives Ltd. a Vancouver, British Columbia company that sells packages to suit most off-grid users. Packages include the turbine, charge controller, instrumentation and inverter. Systems can be designed to operate at 12, 24, or 48 volts.

Before the advent of the modern Micro-hydro system and its adoption by many off-grid users, people built a version based on the Pelton Wheel, a very efficient variation of

the more traditional water wheel. "In Pelton's impulse wheel, water pressure is turned into kinetic energy by pushing the water through a nozzle. The resulting water jet impacts the curved turbine blades, reversing the water's flow and causing the runner to spin. This proved to be a more effective design for converting the energy in water flow to useful work than previous convertors. The impulse turbine was especially well-adapted for high head sites" (Cleveland, 2008).

Wind power generation is less reliable in many locations than either solar or micro-hydro. In heavily treed areas, it is very difficult to take advantage of wind flow unless the unit is constructed above the trees or a very large clearing is available. The biggest disadvantage in most locations is that the wind just does not blow constantly enough, or with sufficient velocity (Oke & Oke, 2008).

Utilities for an average home vary, but even a conservative user will pay hundreds of dollars a month and the cost will continue to escalate. Living off-grid means an initial outlay for equipment, but monthly payments become a thing of the past. Improved technology has given battery and photovoltaic panels a fifteen to twenty-year useful life expectancy.

Construction

Constructing an off-grid home means looking very carefully at the location and orientation of the house to take advantage of the site's natural attributes. One technique or method that can be helpful is to use passive solar gain as a design parameter. "Solar energy is a radiant heat source that causes natural processes upon which all life depends. Some of the natural processes can be managed through building design in a manner that helps heat and cool the building. The basic natural processes that are used in passive solar energy are the thermal energy flows associated with radiation, conduction, and natural convection. When sunlight strikes a building, the building materials can reflect, transmit, or absorb the solar radiation. Additionally, the heat produced by the sun causes air movement that can be predictable in designed spaces. These basic responses to solar heat lead to design elements, material choices and placements that can provide heating and cooling effects in a home. Passive solar energy means that mechanical means are not employed to utilize solar energy" (Passive Solar Design, 2011).

Passive solar gain is a combination of taking advantage of the heating effects of the sun, using thermal mass to store heat to be dissipated later, and using the relative location of windows, walls, and trees to assist in cooling during hot weather (Oke &

Oke, 2008). South and west exposures are great for taking advantage of sun warming. Using the best windows for the job means triple pane, low emissivity glass that will slow the heat loss or gain.

Active solar heating requires the use of fans and pumps to distribute the heat acquired through passive solar gain. This type of system can be effective provided the gain outstrips the need for power to operate it. Active solar heating is usually accomplished using a sealed piped water system that is exposed to the sun from behind glass. A combination of gravity and pumps then circulates the warmed water through heat exchangers to release the energy in the form of heat. The process is complete when the cooled water returns to be reheated (Oke & Oke, 2008).

Construction standards vary from location to location due mainly to climatic differences. Building an off-grid house to the minimum prevailing standards is an approach that will be counter-productive in the long run. Paying a small premium at the construction phase returns large dividends over the life of the building. Taking care to make the building envelope as tight and well insulated as possible reduces the energy required to heat or cool interior spaces throughout the changing seasons.

From first-hand experience and research, it is strongly recommended that proper insulating materials and techniques be used. "R values and their metric equivalent, RSI values, are a way of labelling the effectiveness of insulating materials. The higher the R value or RSI value, the more resistance the material has to the movement of heat. Insulation products sold in Canada are labelled with R and RSI values. Provincial building codes specify minimum R (or RSI) values for new construction. Different values are used for different applications" (Canada Mortgage and Housing Corporation, 2011). The higher the number, the better the material slows heat loss. Using R45 insulation in the roof and R25 in the walls, as well as inserts in all the electrical outlets and switchboxes ensures maximum heat retention. Using a heavy-duty vapour barrier sealed to the framing helps prevent heat loss. All joins and gaps are sealed with tape, and the plastic is sealed to the framing. The compound for sealing the vapour barrier is extremely sticky and designed to remain flexible for a very long time. The problem with handling it is that if you get any on you it is almost impossible to get it off. Don't get the black gunk on you!

This level of insulation and the air tightness of the house envelope give the opportunity to heat with efficient, smaller wood-burning stoves and to use less fuel than many size-comparable houses. This is important when considering the amount of work to put up a year's supply of fuel.

Figure 2 - Split firewood stacked to dry.

The amount of fuel required for a wood stove in a year will vary greatly depending on local climatic conditions. On the British Columbia coast, winters are mild and dwellings only require added heat for about six months out of the year, and for many of those months it is only partial days. Living in the interior or more northern parts of the province might require supplies for up to eight months for full time heating (Figure 2). Stoves are generally more efficient than fireplaces. Modern stoves with catalytic converters can be banked up at night with a full firebox of fuel and will burn all night.

Water

A reliable water supply is essential to living anywhere, and living off-grid means ensuring that a safe and reliable source of potable water is available. It is possible to use a lake, stream, or river for supply if one is available, but in many cases a drilled well is the most likely source. The downside of a drilled well, other than the cost, is the need for power to pump the water to the house for use. Depending on location, it is possible to supplement water supply by collecting and storing rain or melt water.

Sewage treatment and disposal options have to be carefully considered due to the possibility of contamination to water sources. Smaller dwelling units can be equipped with compostable toilets. These are environmental units that treat the waste and make it possible to use it for adding to growing areas. Larger houses with more than a couple of occupants will require a septic system because the loading is too great for a composting unit. The septic system would either be the evaporation mound type or a piped field. The nature of the land it is installed on will determine the final design. Septic drainage fields require about five feet of material above bedrock in order to filter properly while evaporation mounds are constructed above grade using fill (Ministry of Health, 2006).

Challenges and Dangers

Living off-grid in a forested environment presents some challenges that urban dwellers will likely never face. Fire! The threat of a forest fire destroying a home in this

setting is very real. The choice of construction materials is influenced by this reality. The roof of choice is metal, and under no circumstances should a vinyl siding be used as it melts when heated and releases dioxins that are poisonous if inhaled. Non-flammable fibre cement siding is a great choice as it is a greener product both in production and disposal. Insurance against fire is either impossible to get or prohibitively expensive so off-grid dwellers generally have to take what precautions they can when there is no hydrant within ten kilometres. Clearing the underbrush from the immediate vicinity of the house is the simplest solution to keeping fire at bay. Forest fires often flash through the tops of trees and the metal roof means fire has no way to get a hold as it might if it is constructed with shingles or shakes.

A Case Study: Living Research (primary field research)

Our Dream

The following is a case study of the author and his family's collective and conscious decision to live off-grid. Given that the family members live within the research environment, primary research approaches in the form of family discussions and decision-making, experimental research through trial and error practices during development of the home site and construction of the buildings, and critical information from various sources including local businesses and dwellers are explained and described in this section. Comprehensive explanations of the author's first-hand account of living off-grid, as well as his reflections on the choices that were made to live off-grid are described below.

In our family, it has long been contended that earth's population is consuming resources faster than they can be replenished. I have been forbidden to instigate discussions on this topic at parties because of the negative reaction of many people to the suggestion that we will eventually be in dire straits caused by our excessive consumption.

Currently a resident of St. Albert, Alberta, I was appalled to read some of the statistics in the City of St. Albert's recently published report on the environment and its progress towards meeting environmental standards previously put into place. For me the most disturbing statistic was related to St. Albert's ecological footprint. *"The earth is finite. There are only 1.8 hectares of land and sea resources available to support each person on the planet. The*

average person on the planet has an ecological footprint of 2.8 hectares. The Canadian average is 7.8 hectares per person, while St. Alberta's is 11.7 hectares" (St. Albert Gazette, 2011). This means that each citizen in St. Albert is using more than six times his or her share of the planet's available resources.

Researching Property Site for Off-Grid Living

When our family started looking for a property to develop as a three generational, self-sustaining retreat for our large extended, blended family, we had not considered off-grid living. The decision to buy a property with no connection to the grid was decided for us after an extensive search for serviced land meeting our basic requirements came up with nothing affordable.

Our criteria was for about ten acres of land with minimal or no restrictions on the type or amount of buildings, oceanfront or ocean view, and a chance to grow and raise much of our own food. We never seriously considered the East coast of Canada due to its remote relationship to our long-time home and friends and family in Alberta. British Columbia beckoned.

Figure 3 - Inspecting the land before the purchase

We found the land by chance on the Internet the day it went on the market. It was not serviced, but as yet we had no idea what that would mean in terms of building and living on the property. We made an offer subject to inspecting the property. The property is ten kilometres from the highway along a gravel forestry service road. The nearest power line is eight kilometres away and there are no municipal services available. The inspection consisted of walking, a relative term as the property is steep and the underbrush thick; perhaps clambering would be a better description, across the property

from different directions and trying to picture the overall shape (Figure 3). I have a background in municipal engineering from a twenty-five year stint with various companies and my son-in-law is a qualified building construction supervisor and inspector, so we felt confident in assessing the potential of the land. If you do not have that kind of expertise, then I would recommend hiring someone qualified to provide you with a report on the possibilities for the land, and to get an honest assessment of the associated problems. Our probing identified a number of bedrock outcroppings that would make great home sites and discovered areas that could be opened up for cultivation.

The climatic conditions for the North Sunshine Coast show a microclimate capable of sustaining a Growing Zone 8 designation. By comparison, Edmonton, Alberta is a Growing Zone 3 to 4. "The Plant Hardiness Zones map outlines the different zones in Canada where various types of trees, shrubs and flowers will most likely survive. It is based on the average climatic conditions of each area. The first such map for North America, released by the United States Department of Agriculture in 1960, was based only on minimum winter temperatures. In 1967, Agriculture Canada scientists created a plant hardiness map using Canadian plant survival data and a wider range of climatic variables, including minimum winter temperatures, length of the frost-free period, summer rainfall, maximum temperatures, snow cover, January rainfall and maximum wind speed" (Canada N. R., 2003).

"Natural Resources Canada's Canadian Forest Service scientists have now updated the plant hardiness zones using the same variables and more recent climate data (1961-90). They have used modern climate mapping techniques and incorporated the effect of elevation. The new map indicates that there have been changes in the hardiness zones that are generally consistent with what is known about climate change. These changes are most pronounced in western Canada" (Canada N. R., 2003).

The property that we inspected is capable of growing many varieties of fruits and nuts that will not grow on the northern prairies. A quick survey of the area revealed that walnuts, kiwis, peaches and, of course, the more mundane apples, pears, and plums grow in the immediate vicinity. Blackberries are so common and plentiful that many people treat them as a nuisance.

Based on our thorough inspection, we decided to purchase the land.

Building Off-Grid Structures

My son-in-law and I started the construction with a dwelling unit we affectionately call "the cabin." It is a one-thousand square-foot, two-bedroom home with a loft, heated by a wood burning stove. Our daughter, son-in-law, and four grandchildren ranging in age from two to ten years of age currently live there.

As we spend more time around the property a development plan is evolving. From the beginning, the plan has been to develop a house on the site that would be home to three generations living together, but in separate wings, with a communal kitchen, and a shared great hall. The first cabin will become guest accommodation once the main house is habitable. The big house is now framed, roofed, and it has the windows and doors in place. This fall will see the installation of the plumbing, electrical, and the heating. By spring, the insulating and drywall will be complete and we will be close to moving in. Not bad for a dream that started only five years ago!

We found a site close to the main entrance of the property to build our workshop and garage. We only needed to clear brush before starting to build, and it is screened from the road by a stand of trees affording plenty of privacy and security. The workshop is topped off with a two-bedroom apartment that another family member will live in.

Researching a Plan

In opening up the land to build the first dwelling, we optimized a sixty-year-old skidder trail. Skidders are heavy hauling equipment used in rough terrain to pull felled trees out to a collection site. The trail had been used to remove old-growth timber from the property. It was overgrown but distinct enough to follow and linked three of our potential building sites. No trees were sacrificed. For the first couple of years, it was only suitable for the quad or foot traffic. The first dwelling unit, a thousand square foot, two-bedroom cabin with a loft was constructed furthest from the entrance to the property with all the materials transported on the quad or carried (Figure 4).

Figure 4 - Using the Quad to transport building materials

People often assume that since the property is treed, isolated, and off-grid that the dwelling units are going to be log construction. We chose traditional wood framing methods for this project because we have no experience in log home building. Also, there is a definite downside when it comes to insulating, installing plumbing and electrical, and interior finishing in a log house. We do have a mill and use it to cut lumber for posts and beams, interior and exterior trim, and hardwood floors (Figure 5).

Figure 5 - Milling a Cedar beam from a tree felled by the Forestry

We considered trying to incorporate recycled materials into our construction in order to lower our environmental footprint, but practical considerations took precedence. There was no readily available source for most of the material we needed in the quantities we required. The best we could hope to achieve through careful planning was to avoid waste.

Deciding the Power Source

Power supply is not a major problem for this development. Fortunately, there is a creek that runs through our property that is considered seasonal, and therefore not subject to the same degree of regulation as a permanent or a fish-spawning watercourse. We can rely on sufficient flow in the creek to drive our turbines for nine months of the year. The other three months are in late summer and the increased hours of sunshine provide adequate power for our solar panels. Summer also means that our power load is greatly reduced. The elevation change across our site is approximately 65 meters (200 feet), which is sufficient head to generate all the power we require.

Figure 6 - Turbine installed in turbine house. Water enters through the two clear pipes and drains out under the turbine.

Our particular system is designed so that we can power all of our buildings with our own electrical grid, albeit a small one. This means we have to take into account distribution losses as well as loading. The turbine house at the lower end of the system needed to be situated on a flat surface above the turbulent flow of the creek with easy access to the turbine and its electrical connections for servicing purposes. Since the banks of the creek are steep at the lower end, sites were few (Figures 6 and 7).

Figure 7 - Turbine house built on rock ledge and protected from washout by a tree.

The intake site was determined by two factors: 1) calculating the height of head required to maximize output from the turbine, and 2) working up the creek until we found a suitable spot to build the intake dam.

The fun part was wrestling four hundred feet of semi-rigid pipe up the steep, rocky, and obstructed creek bed. It was impossible to get enough access to join the pipe in place; so, we pre-joined it into two, two-hundred foot lengths and hauled it into place using rope, pulleys, and in one instance the quad. Physics and applied mechanics are wonderful tools.

We installed a six-inch diameter pipe that would ensure enough flow to power two turbines, giving us the potential to produce 16,800 KWh. Our current system produces 24-volt direct current to battery storage, which is then inverted to a household 120-volt alternating current. This allows for the use of regular appliances as opposed to more expensive specialized equipment.

The micro-hydro setup installed on our property requires that all the power is used as it is produced, or stored. The system runs twenty-four hours a day unless the flow of water to the turbine is physically stopped. Once the batteries are fully charged, the system can be designed to automatically direct the excess power to a hot water heater. When both of the batteries are charged, and the water heated, then the power needs to be directed to a space heater or some other device for dissipation. *Nothing is wasted.*

Heating and Cooling

Figure 8 - A cord of firewood

The houses all have great south and west exposures to take advantage of passive solar gain. Finishing of floors, fireplace hearths, and chimneys is designed to add thermal mass which will store heat during the day and release it back into the rooms as the outside air cools. This natural phenomenon means that fires will need to be used less and we will use significantly less firewood.

Wood burning stoves in the smaller dwelling units, and a wood burning boiler in the big house provide all the heating. This means cutting and stacking approximately three cords of wood each year for fuel. A cord of wood is a stack of split logs measuring eight feet long by four feet wide by four feet high (Figure 8).

Our practice is to clear out deadfall on the property first and supplement that with trees from Crown land. The forestry service issues free "own use" permits for taking wood from Crown land. For best results wood needs to be split and left for a year before

Figure 9 - A wind felled tree cut in sections for transport

Figure 10 - Spiral staircase made from downed tree and installed in the cabin.

burning, so we need to have a two-year supply stockpiled at all times. A high windstorm downed a one hundred foot tree across the entrance to the property and we had to clear it before we could drive out (Figure 9). Cutting it into ten-foot lengths allowed us to manhandle it to the side. Before leaving, we cut five sections forty inches long and transported them back to St. Albert where, in our garage, they were made into a spiral staircase for the cabin (Figure 10). *Nothing is wasted.* Tall trees within one hundred and fifty feet of the house pose a problem if fire occurs or during high winds, but we have decided that taking them all down would defeat the purpose of living in the forest. Clearing out the underbrush to prevent ground fires seems like a reasonable compromise.

Water Sustainability

The creek is our primary source of water, but due to intermittent flow in the summer and our lack of historical data, we have some reservations.

The metal roof, because it remains relatively clean, will be used to collect rainwater into a fifteen hundred gallon cistern buried under the garage slab. This water is designated for firefighting or irrigation, but in an emergency and with additional filtration it could also be used for domestic purposes. There is a similar tank that will hold treated creek water for domestic use.

The possibility of drilling a well is still under consideration, although this means drilling into bedrock. "Witching" for water is a process that looks and feels like a dark art form. Witching or divining for water is accomplished by walking around the property with some form of divining rod, old-timers prefer a forked Hazel branch that will pull towards the ground if water exists in quantity below the surface. I prefer to use two metal rods bent at right angles and held loosely in my fists that indicate the presence of water by rotating to cross each other. Drilling into rock is expensive. Local companies are capable of reaching depths of seven hundred feet, but well drilling does not come with a guarantee of finding water and it is possible to invest as much as twenty thousand dollars into a well and come up dry. Some serious thought has gone into trying to sustain us using alternative sources of water to meet our potable water needs.

Waste Disposal

Waste disposal will be accomplished using a variety of methods. The smaller dwelling units are equipped with compostable toilets. These are environmental units that treat the waste and make it possible to use it for adding to growing areas. The main house will have a septic system because the loading is too great for a composting unit. The type of septic system is still to be determined. We have located two possible sites and now have to test the ground to decide whether we can use a field, our first choice, or if we need to go to an evaporation mound.

The plumbing in all the buildings is separated so that the grey water can be reused for irrigation. Grey water gardens are a feature on the downhill side of each building. There are a great variety of plants that thrive with constant watering. The greatest advantage gained from separating grey water is the reduction in size of the septic system. In our case with the sloping rocky terrain, we might not have found a suitable site for a field or mound to treat all our wastewater.

Resources

Plans for the west-facing courtyard include, amongst other things, a wood-fired clay oven, raised planters, multi-level decks, and an outdoor kitchen. These ovens have been used for hundreds, if not thousands, of years by people worldwide. They are cheap to construct from locally found materials, and designs can be as varied as the individuals who build them. A clay oven, if properly utilized, is an amazing energy saver. One firing

using a handful, well maybe an armful, of wood and proper preparation make it possible to cook a large variety of foods, and the last thing you do is to dry the wood for the next firing.

We are recycling the metal framework of a commercial greenhouse from a site in Edmonton. Keeping in mind that we will have to heat the greenhouse during the winter, the working surfaces will be poured concrete slabs to provide thermal mass that will absorb heat when the sun is shining, store it, and release it back into the air as the ambient temperature drops. Design and layout are being carefully planned to make best use of passive solar gain.

Planning for garden spaces involves not only deciding what to grow and where to grow it, but also ensuring that crops, animals, and small children are protected from deer, bears, raccoons, eagles, cougars, and a myriad of other creatures and bugs. The science of growing certain crops together for their mutual protection is the subject for a different article. Fences, both natural and human-made – that's where the pesky blackberries will come in handy, are necessary if we are to enjoy the fruits of our labour.

Although we are not able to significantly reduce our environmental footprint during the construction phase of this development, we are confident that what we have done is to ensure that the nine of us who will initially live on the property will significantly contribute in the future. Our lifestyle choice has made us acutely aware of our power and water usage, and our connection to the environment. Our commitment to growing more of our own food will bond us more closely to the land. The best outcome from these choices, beside the incredible enjoyment we derive from working and living in the forest, is the environmental awareness that our grandchildren are exhibiting. The future of our little corner of the world will be in good hands.

---

*Author: *Eric Outram is a graduate from the Bachelor of Applied Communications in Professional Writing degree program at Grant MacEwan University, Canada. He has published in various publications, including Conservation (Alberta, Canada). He now writes with the beauty of his familial land and the Pacific Ocean as his inspirations.*

Earth Common Journal
Vol. 1, No. 1, September 2011

Climate Change Policy 101

Donald E. MacDonald*
Grant MacEwan University, Canada

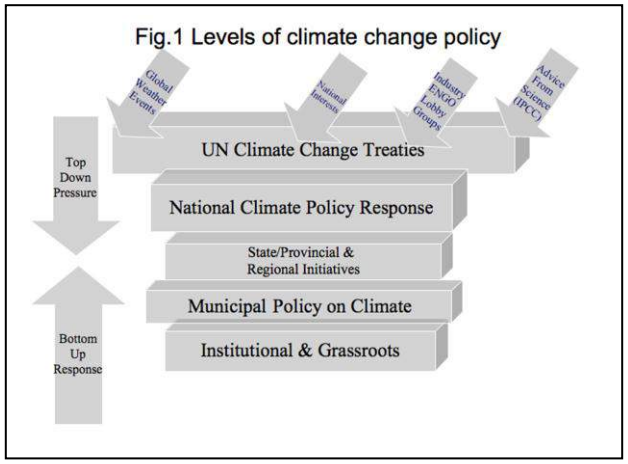
ABSTRACT

Similar to other policy issues, climate change policy proceeds in a cyclical fashion that proceeds from agenda setting, to policy development, to implementation, and finally to monitoring and review. Agenda setting involves politicians becoming convinced, usually by the science but also by politics and public opinion, that the climate issue deserves a policy response. Policy development involves a great deal of economic and policy option assessments that are winnowed down to a few options that may have "political traction" (i.e. those politicians think might succeed). Policy implementation involves turning policies into law and regulations that industry and individuals will act upon. Policy review, especially monitoring outcomes, is perhaps the most important phase, and for the climate change issue, the ongoing conclusion to date seems to be that more needs to be done, leading to the policy cycle starting over again. But there are also disturbing signs that this "top-down" approach is no longer working, and more "bottom-up" approaches, linked to the energy sector and clean technology, may become important new forces in forging action on climate change.

Introduction

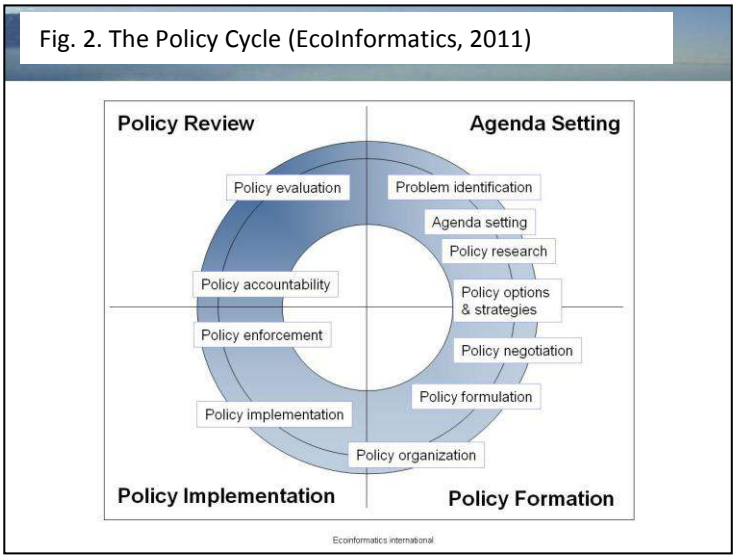
Policies can be political, financial, and administrative; by their nature, they are arranged to reach explicit or specific goals. Public policy can be generally defined as" . . . *the broad framework of ideas and values within which decisions are taken and action, or inaction, is pursued by governments in relation to some issue or problem* (Brooks, 1989). Public policy is

commonly embodied in constitutions, legislative acts, and judicial decisions. More specifically, climate change policy is simply the result of governments', private sector operations', or institutions' responses to an issue like climate change. Climate policies have been adopted by governments at the international (UN), national, provincial/state, municipal, and institutional levels (e.g. Universities, Fig. 1). The climate change issue has become highly politicized and policy approaches are almost always a derivative of politics. Private sector corporations have internal operational policies, but in the past at least, they have tended to have "positional" stances on government climate change policy (i.e. what they think of them). Climate policies are often set out in high-level political strategic documents, while details concerning their actual implementation tend to be found in action plans or similar documents. However, most critically, policy implementation is often expressed as legislation, regulations, or the announcement of approved funding for various incentive schemes. Serious action on the climate change issue does not begin until this policy implementation commitment is put in place



Results: The Climate Change Policy Cycle

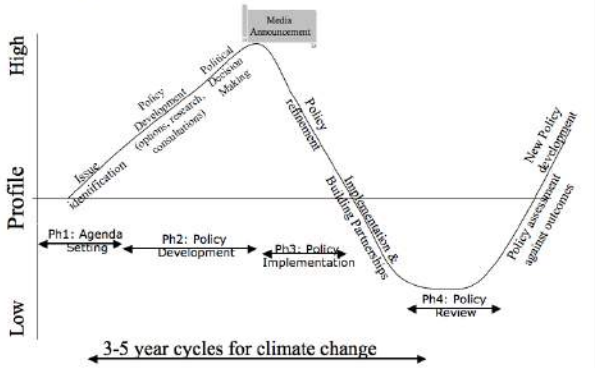
The last 20 years have demonstrated that climate change policy is an ongoing exercise and, similar to other policy issues, often follows a cyclical pattern (Fig.2) or a "wave function" over time (Fig. 3). Policy tends to start with "Agenda Setting" and moves clock-wise around this diagram through roughly four



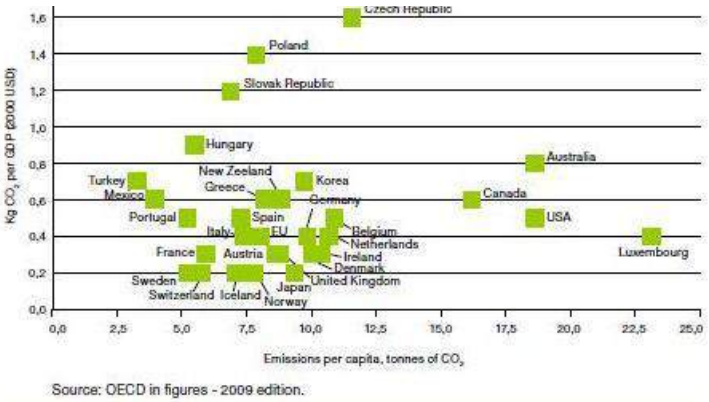
phases, including a number of sub-phases.

Agenda Setting – at the problem identification sub-phase of Agenda Setting, governing bodies need to be convinced that climate change represents a real threat or risk and that they should do something about, or will be expected by the public, shareholders or stakeholders to do something about it (i.e. adopt a climate policy). Being convinced of the seriousness of the issue usually starts with the basic science of climate change as periodically summarized by the Intergovernmental Panel on Climate Change (IPCC, 2007) since 1990. The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and the UN Environment Program in 1988 and is charged with summarizing the science of climate change for policy makers on a regular basis. Thousands of IPCC scientists are drawn from the leading scientific experts from around the world and their publications go through extensive peer review prior to publication. Although not all jurisdictions were convinced of the science during the 1990s, it can safely be stated that, at least at the national level, no countries today question the basic scientific conclusion that human burning of fossil fuels and land-use changes, related to commercial logging and expanding agricultural areas, are changing the climate.

Fig. 3. The policy cycle over time



Fig, 4, GDP per capita and carbon emissions, all countries (OECD, 2009)



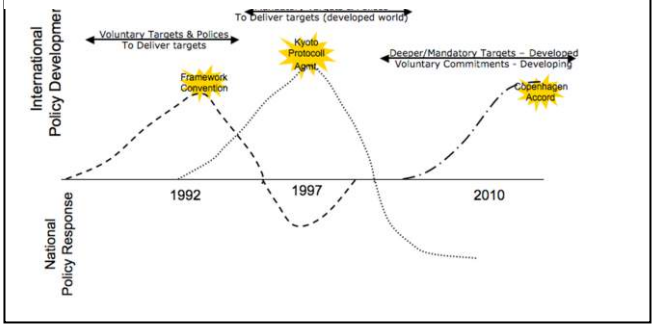
However, since 1992 when the first UN climate treaty was agreed to, the United Nations Framework Convention on Climate Change (UNFCCC, 1992), the agenda and pace of policy development at the national level tends to be

driven by the international United Nations initiatives. Agenda-setting also includes a strong measure of politics and, in some cases is the main driver, irrespective of the scientific evidence. Governments need to seek internal agreement within their caucuses that having been convinced of the science, or that the politics is pressing and seeing that international movements are in play, that the time is ripe to take some climate policy action. Governments need to weigh the climate issue against numerous other policy issues clamouring for attention and make a timing decision.

Policy Formation – is without question one of the most difficult parts of the policy cycle. For most western governments, it is also accompanied by considerable stakeholder engagement and input (not indicated in Fig. 2). Because most developed world economies are tightly linked with economic growth, a key part of policy formation is economic assessment of targets and options under consideration and their potential impact to a country's Gross Domestic Product (GDP, see Fig. 4, OECD, 2009). In the 1990s, western governments mostly elected to undertake "no-regrets" voluntary actions that would not hinder their economies (i.e. actions with positive economic benefits). However, at least for most developed countries in 2010, this kind of voluntary action is no longer credible and binding targets backed up by domestic legislation are now the norm. At this point in the policy cycle in Western governments, both industry and non-governmental groups play a strong role in lobbying for their preferred policy approaches and options.

Policy formation during the past two decades has been driven "top-down" internationally by the UNFCCC. Broad agreement is generally reached on an international framework, protocol or accord in which countries agree to both common and increasingly individual policies they will undertake. Current examples include the Framework Convention on Climate Change (1992), the Kyoto Protocol (1997), and the still incomplete, Copenhagen Accord (2010). These international commitments usually lead to national or sub-national policy development to demonstrate that the member countries (or "parties" as they are called) are taking serious action to meet their international obligations. This has led to an international/national policy cycle that can be likened to a physics sine wave function analogy (Fig. 5). At the beginning of this climate cycle, policy makers are

Fig. 5. International and National climate policy cycles



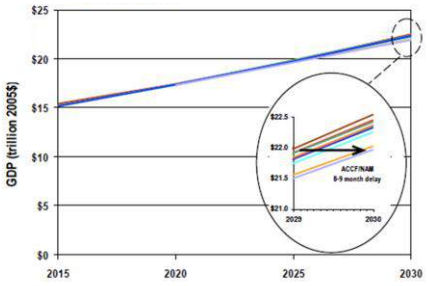
pressured to do something about climate change, often driven by the latest scientific reports from the IPCC. The sine wave of policy action is also driven by public concerns over climate changes, which tend to wax and wane over time, but are often driven by the release of scientific reports and/or lobbying efforts by the environmental community. Some have called public interest in climate change a "submarine issue" – it comes up every now and then, creates some panic and then sinks below the ocean of issues (McDermott, 2009). At this point, policymakers' attention is focused on top-down international negotiations until an agreement is reached and then attention shifts to domestic/national climate policy development that effectively implements these international commitments. The centerpiece of these international agreements is usually a schedule of greenhouse gas (GHG) reduction targets that countries pledge to meet.

At the national or sub-national level, climate policy usually begins with a media announcement that the government in question is planning on taking some action on climate change, which may include any international commitment they have made. This announcement may also include a consultation schedule and possibly a few options that the government is considering. The announcement provides an early warning to industry and environmental groups that the government is serious about developing policy on climate. At this time, industry usually begins a lobby effort to resist this direction or diminish its scope and/or depth while the environmental non-governmental (ENGO) community does the opposite. Prior to, or in step with these announcements, an internal government policy analysis exercise gets underway. The focal point of climate policy in the 21st century is the development of international and domestic GHG reduction targets. The first step is usually to quantify the jurisdiction's emissions over time and, if possible, to forecast where emission trends may be headed in the next 10-20 years assuming continued economic growth. This is an absolute must before attempting to develop a GHG reduction target, which often becomes the main policy outcome.

Developing a suite of potential GHG mitigation actions and their related costs is often the next step (e.g. incentives for new green technologies, consumer grants, regulating industrial emissions, etc.). This is usually followed by macro and micro economic analysis that compares various combinations of mitigation options to economic growth and hopefully a reduced GHG emissions trajectory. Broadly speaking, the deeper and more aggressive a GHG target, the greater reduction in GDP a jurisdiction can expect. Important metrics for assessing the potential impact of a proposed GHG reduction target include: overall reduction (or improvement) in GDP, economic impact to key industrial sectors (microeconomics), and impact to key commodities important to consumers/voters (price of gasoline, home heating, etc.). This analysis is then usually discussed internally at the political level. The analysis usually

indicates or assumes a variety of levels of carbon pricing that must be put in place to drive a suite of GHG reduction curves (Fig. 6). This almost invariably means developing a policy option that puts a price on carbon emissions, with emissions trading and carbon taxes being the most touted options. A carbon pricing mechanism often becomes a "center-piece" of a climate strategy or policy package.

Fig. 6. Carbon price & impact to GDP (USCAP, 2009) Climate policy cycles



Some governments may choose to present these initial findings to stakeholders (industry, environmentalists, civil society in general) for feedback and input. Typically, industry tends to argue for reduced targets, pointing out how their corporate or sector profitability may be impacted, while ENGO groups tend to argue for more stringent targets. A second round of internal-to-government deliberations must in the end decide on what kind of policy trade-offs are to be made between depth of GHG target, economic impacts, political considerations, and views of stakeholders. Climate change impacts and adaptation are usually a secondary consideration for most western governments in the development of their climate policies, but are front and centre for developing countries. The final climate strategy or plan usually does not make anyone happy. At this point, government officials put together a draft climate change strategy that outlines what targets and policy actions the government intends to take. A back–and-forth iteration between politicians and officials continues to refine the draft document before its final approval by a cabinet or legislative branch. In jurisdictions with strong political views on climate, the political arm will take the lead on this refinement. Some governments may let officials lead on policy refinement. In either case, most importantly, Ministers championing the climate strategy must undertake a great deal of internal lobbying to convince their colleagues of the merit of the plan. If funding is part of the plan for private sector or public carbon reduction incentives, finance ministries must also approve a budget for the plan. Once approved internally, the timing and venue for public release of the climate change strategy is given careful consideration to optimize its political impact. A recent example of this is the City of Wellington, New Zealand and its announced Climate Change Action Plan (City of Wellington, 2010).

Policy Implementation is the point where either a climate strategy is really made to work towards the promised GHG emission reductions or remains an ineffectual political document that gathers dust. This is the point where a government must pass a

law or regulations or make a firm budget commitment to some program or research effort. Strategically, some governments (or corporations) may have no intention of actually moving to the implementation phase and might only wish to have a climate strategy for "optics" purposes. For example, Simpson et al. (2007) describe how Canada has had multiple (>5) climate change strategies since the early 1990s and how only small portions of these plans have actually been implemented. However, for governments serious about moving to implementation, this represents another significant amount of work. Any legislative and/or regulatory requirements in the strategy need to be worked out in detail and this can take 2-5 years in itself. In particular, legislation related to the introduction of carbon taxes or carbon trading can involve lengthy detailed discussions with industry on a myriad of technical details. Strategically, it is often in industry's best interest to drag these detailed discussions out for as long as possible, as every financial quarter that does not have a regulatory carbon constraint on it, improves or maintains the company's bottom-line. This is what essentially happened in Canada in the mid-2000s. The Liberal government at the time held up to 5 years of detailed technical discussions with provinces and industry on a "cap and trade" program, which eventually was dropped as a policy option when the new Conservative government came into power in 2006. "The new government started all over with their own policy development cycle" (MacDonald, 2009). Some progressive companies that are genuinely committed to climate change in the context of sustainable development have made considerable voluntary efforts beyond what government policy has dictated. Consequently, these progressive companies are often called upon by government to provide assistance and advice during policy formation stages. The private sector usually wants some kind of policy certainty so that they can make prudent future investments.

Details surrounding climate friendly incentive programs also need to be worked out at this stage and this can also take many years to ensure that "cheaters" or "defectors" cannot exploit weaknesses and thereby take unfair advantage of these programs.

Policy Review - constitutes the last stage of the policy cycle and for really serious efforts, is perhaps the most crucial. This stage assesses whether or not a policy that has been developed and implemented is actually achieving the anticipated outcomes it was designed around. Ongoing measuring and monitoring of emissions trends is a key sub-component of a policy review. This stage may also determine that policies need to be adjusted, re-crafted, or in some cases, scrapped altogether. Compliance with climate regulations and mitigation mechanisms such as emissions trading is an important aspect of policy review. The EU cap and trade system has tough compliance measures and penalties for non-compliance and this is likely a key reason as to why this emissions trading system seems to be working. However, in the early phase of the EU's cap and

trade system it was found to contain policy weaknesses that allowed some companies to obtain windfall profits by gaming the system (PEW Center, 2009). Alberta's "cap and technology" program has a provision for industry to pay into a green technology development fund if they know they are going to be out of compliance with this regulation. To date, the Climate Change Emission Management fund has taken in over $257 million in non-compliance penalties (Hanneke Brooyman, 2011).

Discussion

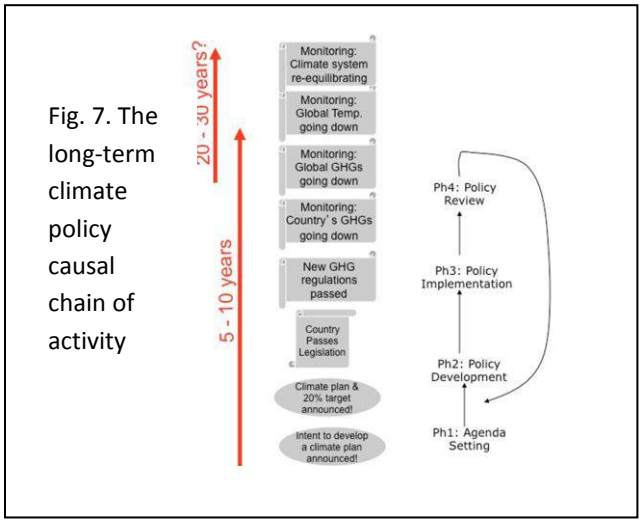


Fig. 7. The long-term climate policy causal chain of activity

Efficacious climate change policy involves a complex chain of causality that is currently taking decades to achieve (Fig. 7). The challenge with even achieving a reduction in GHG emissions is that there must be a critical mass of countries that are achieving reductions that add up to a global reduction in emissions. This is not happening as yet. Unlike reductions in regional air pollutants that bring immediate health and ecosystem benefits, achieving GHG reductions in one area of the globe is generally insufficient to bring about global benefits. The ultimate metric of policy success is not simply declining GHG levels, but an indication that the risks related to global warming and resulting climate changes are actually starting to go down. Figure 7 illustrates the various stages of policy development and the very long timelines that are needed before real long-term climate risks are reduced. To date, most policy reviews at the international UN level, coupled with the periodic IPCC scientific assessments, have concluded that the existing policies are insufficient. The global community, made up of individual countries, inevitably needs to return to Phase 1 or 2 of the policy cycle and start again, about every 5-10 years (Fig. 5). This trend is likely to continue for decades to come.

But there are also disturbing signs that this top-down, cyclical climate change policy process is not working anymore, nor will it necessarily be the paradigm of the future. The 3rd UN policy cycle (Fig. 5) has for the past three years failed to reach agreement on a new omnibus climate change protocol. Climate policy is also facing a new intersection

of energy security issues (e.g. rising prices of gasoline linked to peak oil and the move to more GHG intensive non-conventional hydrocarbons like the Alberta Oilsands) and market-driven interest in capturing a share of the emerging clean energy (wind, carbon capture and storage - CCS, solar, many others) technology sector. The role of serendipity and unknown global events cannot be underestimated either as an accelerant or retardant of climate change policy progress – for example, the 9/11 event in the United States effectively stalled climate progress in that country for nearly a decade as their focus was on fighting terrorism. It is possible that future progress on climate change may come from more "bottom-up" initiatives (e.g. government and/or industry targeted R&D in things like CCS or solar installations that produce climate benefits as a secondary effect) than by top-down UN climate policy. Another option that is emerging might be to more closely link climate policy to energy policy. Such a combined energy/climate policy could work towards a radical transformation away from fossil fuels towards renewable energy and thereby gradually reduce greenhouse gas emissions over the next 100 years.

---

*Author: *Donald E. Macdonald is an earth scientist, and former climate change policy advisor, currently teaching at Grant MacEwan University in Edmonton, Alberta, Canada. In the past, he served as a senior climate change policy advisor for the Alberta Government and represented the province in many of the United Nations Framework Convention on Climate Change negotiating sessions. He was also involved in national and provincial climate change policy developments.*

Acknowledgements: Thanks are extended to Chris McDermott (carbon and renewable energy financier and former climate change negotiator for Canada), an anonymous reviewer, and Andrea Church (Earth Common Journal editor) who all helped strengthen this paper.

References

Brooks, S. (1989). *Public Policy in Canada: An Introduction*. McClelland and Stewart, pp. viii, 378.

Hanneke Brooyman. (2011, May 4). Alberta industry cut 6.5M tonnes in carbon emissions in 2010. Retrieved June 2011, from *Edmonton Journal* http://www.edmontonjournal.com/technology/Alberta+industry+tonnes+carbon+emissions+2010/4722885/story.html

City of Wellington, (2010). *Wellington City's 2010 Climate Action Plan*. Retrieved May 2011, from http://www.wellington.govt.nz/plans/policies/climatechange/pdfs/climatechange2010.pdf

EcoInformatics International Inc, (2011). Policy Cycle Graphic. Retrieved May 2011, from http://www.geostrategis.com/p_policy.htm

Intergovernmental Panel on Climate Change (2007). *Fourth Assessment Report*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

OECD (2009). OECD in Figures 2009. OECD Publishing.

PEW Center (2009). *Emissions Trading in the European Union: Its Brief History*. Retrieved May 2011, from http://www.hss.caltech.edu/~pbs/ec131/EUCapTrade.pdf

Simpson, J, Jaccard, M and N. Rivers. (2007). *Hot Air: Meeting Canada's Climate Change Challenge*, McClelland and Stewart, 281pp.

UNFCCC (1992). *The Framework Convention on Climate Change*. Retrieved May 2011, from http://unfccc.int/resource/docs/convkp/conveng.pdf

United States Climate Action Partnership, (2009). *A Blueprint for Legislative Action: Consensus Recommendations for U.S. Climate Protection Legislation.* Economic analysis of the USCAP Blueprint for Legislative Action.

References

Canada Mortgage and Housing Corporation. (2011). *Insulating Your House*. Retrieved August 18, 2011, from Canada Mortgage and Housing Corporation: http://www.cmhc-schl.gc.ca/en/co/maho/enefcosa/enefcosa_002.cfm

Canada, N. R. (2000). *Personal: Residential*. Retrieved August 2011, from Office of Energy Efficiency: http://oee.nrcan.gc.ca/publications/infosource/pub/energy_use/sheu_e/index.cfm

Canada, N. R. (2003). Plant Hardiness Zones. Retrieved July 23, 2011, from *The Atlas of Canada:* http://atlas.nrcan.gc.ca/site/english/maps/environment/land/planthardi

Cleveland, C. S. (2008). Pelton, Lester Allan. Retrieved July 24, 2011, from *Encyclopedia of Earth*: http://www.eoearth.org/article/Pelton,_Lester_Allan

McCracken, J. (2011). History of Western and Northwest Canada. Retrieved August 10, 2011, from *Canadian Encyclopedia:* http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0003824

Ministry of Health. (2000). *Sewerage System Standard Practice Manual*. Retrieved August 10, 2011, from Health Protection - Province of British Columbia: http://www.health.gov.bc.ca/protect/SPM20(Sept2006)consolidated.pdf

Oke, L. & Oke (2008). *Build Your Own Home. Home and Garden*. Retrieved July 20, 2011, from Lulu: http://www.lulu.com/product/file-download/build-your-own-home/2656464?productTrackingContext=search_results/search_shelf/centre/5

Oke, L. & Oke (2008). *Living off the Grid in 2008*. Retrieved July 20, 2011, from Lulu: http://www.lulu.com/product/file-download/build-your-own-home/2395428?productTrackingContext=search_results/search_shelf/centre/3#detailsSection

Passive Solar Design. (2011). Retrieved August 10, 2011, from Sustainable Sources: http://passivesolar.sustainablesources.com/

St. Albert Gazette. (2011). City of St. Albert - 2010 Report on the Environment. *St. Albert Gazette* . St. Albert, Alberta, Canada: St. Albert Gazette.

Earth Common Journal
Vol. 1, No. 1, September 2011

Composing a Better World

Andrea Church*
Grant MacEwan University, Canada

ABSTRACT

This article is a study of the musical composition, *We Arrived Safely Because We Sailed Too Close to Shore*, by Ryan Sims. Some of the research techniques are discussed, as well as the inspiration for the piece, the tools he used, and the technical details of production. Ryan did not learn to read music until he attended Grant MacEwan University's music program – a year is a short time to transition from learning how to read and write music to being able to compose a multi-instrument piece. He was inspired by a journey and felt that it reflected his own life's path. Ryan's piece is only the beginning for his career. He finds inspiration in everything and brings that talent to his work.

The Composer

As children, we dream about fame, fortune, and notoriety. Many of us envision being stars and playing to a crowd of thousands; not many of us dream of composing that music. Neither did Ryan Sims. It wasn't until age sixteen that Ryan learned to play the guitar; on a twelve-string his dad had tucked away in a back closet. Even then music was a hobby, not a career. Ryan completed a Bachelor of Political

Figure 1: Composer Ryan Sims

Sciences at Saskatoon, Saskatchewan's Eston College and spent years working a variety of jobs, one of which was teaching guitar lessons. He wrote songs, but did not learn to write music until his first year in the Music Program at Grant MacEwan University in Edmonton, Alberta, Canada. A skill Ryan says opened a new world for him. He could finally express the sounds he heard in his head.

The Project

In support of student creativity and imagination, each spring the Music Program hosts several live performance concerts designed to showcase student work. The Composers' Concert provides a musical forum where students who study music composition are able to present, play, and/or conduct their musical pieces on stage at the university's performing arts theatre. As part of a Capstone Project in his final year, Ryan Sims composed and conducted his original musical piece: *We Arrived Safely* Because *We Sailed Too Close to Shore*. The notes within his music tell a story; a different version for each person who listens. For example, someone may envision woodland fairies dancing in a sunny clearing, or someone else may imagine rain and high winds. As for Ryan, when he listens to his piece, he visualizes a sailboat skimming along the coast, hit by a storm and riding out the wild winds and torrential waves. But how did Ryan approach his composition? From where did he draw his inspiration to write these musical notes?

The Composition

The process of composing an original piece of music requires concentration, inner focus, musical knowledge, creativity, and persistence. The act of composing is complex; one only needs to read a musical score to appreciate the in-depth first-hand knowledge that a composer requires to be successful at creating music. Such is the case regarding Ryan's musical piece. Five instruments can be heard within his composition: piano, flute, marimba, glockenspiel, and bassoon. In order for him to integrate and enmesh the intricate sounds that comprise his piece, Ryan needed to know what effect each instrument created. Knowing the different sounds, ranges, and limitations of the instruments allowed Ryan to carefully select them as part of his orchestral arrangement. Such knowledge informed his choices and ensured that they were the right instruments that would accurately produce the sounds he sought to express within his piece. For example, "the modern

Figure 2: Marimba

marimba (Figure 2) has wooden bars laid out in two rows like the keyboard on a piano. These bars are struck with medium-hard mallets or sticks often made of wound yarn to produce the sound. The bars are usually made of rosewood, and the shorter and narrower the bar is the higher the pitch of the note will be" (Associated Board of the Royal Schools of Music, 2006). "The Glockenspiel – Figure 3, (which literally means 'playing bells') has tuned metal bars, usually made of steel, arranged in two rows like the black and white notes on a piano keyboard. These metal bars are hit by mallets or beaters, which have playing ends made of hard materials such as wood, nylon, plastic, or rubber. The sound produced is bell-like and high-pitched. This is the kind of instrument commonly found in the Western classical orchestra" (Associate Board of the Royal Schools of Music, 2006).

Figure 3: Glockenspiel

Instrument range and technical musicality are just two areas of knowledge that are applied by a composer when creating a piece. Timing is another. A key signature refers to the key that the piece is played in, and can change with each staff. "In musical notation, the musical staff or stave is a set of five horizontal lines on which musical note symbols are placed to indicate pitch and time. The staff is read left to right and the higher a position on the staff, the higher the pitch of the note to be played. If a note appears above or below the 5 lines, ledger lines are used to indicate the exact note. The musical staff on its own does not help you to represent any specific notes; that is without a musical clef. The two main clefs are Treble clef and Bass clef - if these are combined it is called a grand staff. When reading music you will have a Clef Type, a Key Signature and a Time Signature" (Macdonald, 2011).

The time signature is placed at the beginning of the music AFTER the key signature, "The upper figure [number 3] tells us how many beats are in each bar, and the lower figure [number 4] tells us what kind of a note is to get one beat" (Wharram, 1969) (Figure 4). This refers to "simple time". *We Arrived Safely Because We Sailed Too Close to Shore*, changes from twelve-eight time to three-quarter time. The tempo builds, becoming frantic, and then calms and returns to its beginning. Ryan describes it as a mirror for his schooling. Challenged with significant demands from life, work, and relationships while going to school, Ryan believes that life experiences can feel like a storm, but then you finish, and life rolls on in much the same way. "Everything has irrevocably changed, but is still the same." It is about a change in

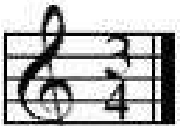


Figure 4: Key and Timing Signatures

perspective, which also influences the inspiration and research that supports his creative work.

Inspirational Research

Ryan describes his style as a folksy, jazzy, acoustic blend of sounds. His inspiration comes from many sources, but this piece stemmed from a story he heard on the "Q" radio show on CBC (740) which is broadcast throughout Canada and parts of the United States. A band called "Tennis," consisting of a husband and wife team with a background (and degrees) in philosophy decided to buy a boat and sail around the world. Limited space meant that they couldn't bring musical instruments with them, but while they were in the Florida Keys they experienced the sounds of some amazing music. Ryan describes the music that these two travellers heard as a blend of 50s rock music and surfer rock. While the husband and wife team were in the Florida Keys, a local band inspired them so much that as they continued their voyage around the world, they created an album note by note without the use of musical instruments. When listening to the interview of these two travellers, Ryan learned that because they were inexperienced sailors, they stayed close to shore throughout their journey. "People going for their dreams are my inspiration," Ryan reflects, "I write without knowing what the end will be."

The title of his piece was also inspired by Sir *Francis Drake's Prayer* from 1577: *Disturb us Lord, when we are too pleased with ourselves, when our dreams have come true because we dreamed too little, when we arrived safely because we sailed too close to the shore*…" (Berry, 2011).

However, being inspired to create a musical piece is only the first step to composing. Hard work and persistence, accompanied by technology all played roles in the successful creation of Ryan's piece. He used a program called Logic Pro to write his piece. Each instrument's sounds were programmed into Logic Pro's memory, and every note was handpicked. "Sound is a colour palette of feeling," explained Ryan, "I write what is rolling around in my head." One-on-one consults with Allen Gilliland, the Head of Composition in the Music Program at Grant MacEwan University, helped polish the piece to its finished form.

Ryan's research approach to his composition combined with his creative inspiration is a common approach that composers use when creating a musical piece. Similar to creating a chemical formula for a new drug, many versions of Ryan's musical score were attempted and discarded before the desired blend of notes and sounds were achieved, resulting in his original piece: *We Arrived Safely Because We Sailed Too Close to Shore*.

Music and Conservation

The connection between music and conservation is an important one. Many musical composers are inspired by the sounds of nature, which in turn also inspire others to understand and appreciate nature's power and vulnerability. For example, Vivaldi's composition of the *Four Seasons* resonates with the sounds of nature; its gentleness, its playfulness, and its fury (Everett, 1996).

While a composer will never know all the ways in which his or her musical piece inspires others, it is rewarding and surprising to learn about some of them. When he wrote his piece, Ryan had no idea that it would be showcased in *Earth Common Journal*. He is excited and impressed by the existence of an undergraduate journal devoted to sustainability, conservation, and global warming. "I wouldn't call myself an activist," he says, "but a step on the road to sustainability is important to me." He believes that people are basically reasonable, and if they are given easy, convenient ways to adapt their lifestyles to be more environmentally friendly, they will do it. Ryan explains that he has started taking small steps in improving his own lifestyle by recycling and using less water.

Ryan Sims' original musical piece can be heard by clicking on the "Musical Composition" link located to the right of the article's name in the Table of Contents list of *Earth Common Journal*.

**Author*: *Andrea Church is a Features Editor for the Earth Common Journal, and is currently completing her fourth year in the Bachelor of Applied Communications in Professional Writing degree program at Grant MacEwan University, Canada.*

References

Berry, S. (n.d.). *Grace - Fresh Vital Worship*. Retrieved April 30, 2011, from Prayer of Sir Francis Drake: http://www.freshworship.org/node/248

Everett, P. (1996). *Vivaldi*: *The Four Seasons and Other Concertos*. Cambridge, U.K.: Cambridge University Press.

Shane McDonald. (n.d.). *Music Section of Shane McDonald*. Retrieved April 30, 2011, from Learning to Read Key and Time Signatures: Music References: http://www.shanemcdonald.org/music/learn-to-read-notes.html

Wharram, B. (1969). *Elementary Rudiments of Music*. Oakville, Ontario: The Frederick Harris Music Co. Limited.

Earth Common Journal
Vol. 1, No. 1, September 2011

The Cost of Sustainable Development:

Canadian Physical and Social Environmental Valuation

Kolbie Calverley*
University of Alberta, Canada

ABSTRACT

In 1987 the Brundtland Commission declared that *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." Historically, environmental conservation has been independent of economic growth, but this definition allows the two ideas to integrate together.

A proposed method of sustainable evaluation is to consider the total capital of an environment, including the human-made capital, natural-asset capital, and critical capital. The sum of these capitals is the total capital, and the total must be carried forward for future generations. The first step is to classify both the physical and social environments of concern. The physical environment can be ranked based on its total useful life while the social environment can be ranked based on its priority to society. The second step is to classify them as either human-made, natural-asset, or critical capital using the chart developed in this paper. If the asset falls within the first two categories, it can be developed at a cost. The cost of this substitution is the cost of sustainable development and should be set aside in a compensation fund for future generations. Environments deemed as critical capital cannot be developed due to the irreparable impact it would have on future generations.

The third and final step is to assess the appropriate costs. A dollar value is assigned to a year of existence for the physical environment, and multiplied over its useful life. The social environment's value can be found by using the excess earnings method to create an intangible asset value. The maximum between these two values is the total cost of developing sustainably. The final cost consideration is an additional compensation for developing a physical environment faster than its useful life would normally have

suggested. This can be done by using the difference between the expected value at the current useful life stage and the rapidly depreciated value of the physical environment. The sum of these costs should be set aside for future generations in a compensation fund so they will be able to meet their own needs as we have met ours.

1.0 Introduction

In 1987 the World Commission gave sustainability an injection of life by defining it in terms that every person could understand. The Brundtland report proposed that *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs,"* (World Commission on Environment and Development, 1987). This new definition of sustainable development allowed for two things that were previously thought to be at odds with sustainability. First, that there is opportunity for economic growth in a sustainable environment, so long as that growth does not compromise future generations' abilities to meet their needs. Second, this definition gave a new opportunity for exploitative, resource based industries to be a part of the environmental movement and take part in sustainable development.

Historically, projects have not been developed in accordance with this sustainable platform primarily due to the inability to quantify the costs of sustainable development. The author has attempted to define the operating environments of proposed projects in Canada. Each of those environments was then given an economic value and assigned to a capital asset class.

Each of the asset classes helps to determine the associated costs for proceeding with project development. These costs can then be collected from the developer and submitted to a fund that will allow future generations to compensate for the altered environment and still meet their own needs.

2.0 Background

The concept of sustainability was developed out of a social shift towards environmental conservation. Much of the western world has begun to adapt to this new attitude. As a result, developed nations now have an obligation to lead by example and

prevent currently developing nations from making the same mistake of compromising environmental integrity for economic growth, as has been the historical practice. Pearce describes sustainability as the loosening of the ties between economic growth and environmental degradation (Pearce & Warford, 1993).

The error in the association between economic growth and environmental degradation can be traced to an inherent error in the concept of economic growth. Economic importance and financial importance do not necessarily mean the same thing; economic importance is defined by having a significant impact on human welfare (Pearce & Warford, 1993). The environment needs to be considered in this context. If the environment is compromised, humans would suffer direct losses of useful and habitable land, as well as indirect losses from health effects and productivity from the land.

The economic growth of a nation can be greatly inhibited by environmental degradation. This is caused by either direct or indirect effects on human welfare and is especially prevalent in developing nations that do not have the ability to substitute technologies for naturally occurring resources. A rough example is laid out by Pearce based on the GNP of Burkina Faso. Burkina Faso is a nation of 16.7 million people and is a very basic example of the kind of developing nation that could benefit from environmental protection, rather than exploitation due to its already limited number of natural resources (Central Intelligence Agency, 2011).

The analysis looked at the loss of biomass each year due to fuelwood for household energy and vegetation. Figure 0-1 - Burkina Faso Lost Biomass shows the losses reported in each category, where livestock is the potential yield lost due to decreased fodder available and cereal is the lost crop productivity due to vegetation. Each loss is accompanied by its respective market value. This estimate shows that biomass losses could be costing the nation nine percent of its GNP, and almost two percent of that can be attributed to lost crop productivity (Pearce & Warford, 1993).

Region	Fuelwood (*cubic meters*)	Livestock (*UGB*)[a]	Cereal (*tons*)
Sahel	0	175,000	19,000
Plateau Central	900,000	26,000	260,000
Sudano-Guinean	1,200,000	0	27,360
Total	2,100,000	201,000	306,360
Price per unit (CFAFS)[b]	22,258	50,000	50,000
Total losses (billions of CFAFS)	46.7	10.0	15.3

Note: The total cost of damage equaled CFAF 72 billion, or 8.8 percent of GNP.
a. UGB, Unités de Gros Bétail, are a standardized unit for measuring livestock.
b. CFAFs are a currency union of several countries linked to the French franc.
Source: Adapted with corrections from Lallement (1990).

Figure 0-1 - Burkina Faso Lost Biomass (Pearce & Warford, 1993)

It is estimated that in industrialized nations, environmental degradation can cost anywhere between one and five percent, with a cost to the US of approximately 1.2 percent of GNP (Pearce & Warford, 1993). In developing nations the losses associated with environmental degradation are much higher, starting at five percent of GNP and going up from there. In developing nations, these losses represent lost resource flows that will affect future GNP growth, whereas in developed countries, these losses generally do not show up in areas directly connected to the GNP, such as changes to human welfare not directly captured by national accounting methods (Pearce & Warford, 1993). In either case, it is evident that environmental degradation is costing nations, and by association, the people and businesses operating within it, a significant amount of money.

2.1 Current Methods

There are several factors to consider when evaluating a project for development. Generally, valuation is based on a simple cost-benefit analysis whereby the benefits minus the costs discounted over time must be greater than zero for the project to advance. Pearce proposes that "…in order to secure an efficient use of resources, outputs should be priced at their marginal social cost, which comprises the marginal costs of production and the external costs of the pollution or resource degradation caused by producing the good," (Pearce & Warford, 1993). This means taking the basic

cost-benefit analysis further, by incorporating the costs of pollution and resource degradation or depletion that occur during production.

2.2 Project Valuation

Sustainable development takes the traditional framework of project valuation and ties in environmental factors. Equation 0-1 shows the traditional cost-benefit analysis after incorporating environmental costs as well.

$$Value\ of\ Project = \frac{\Sigma(B - C \pm E)}{(1 - r)^t}$$

Equation 0-1

Where B = Benefits
C = Costs
E = Environmental loss or gain
r = Discount rate
t = time

Any given resource will have a Total Economic Value (TEV) as a sum of its Total Use Value (TUV) from indirect and direct use, as well as a Total Existence Value (TEXV) (Pearce & Warford, 1993). If the Total Economic Value of a resource is equal to the Environmental gain or loss, then it can be substituted into Equation 0-1 .

$$Value\ of\ Project = \frac{\Sigma(B - C - (TUV + TEXV))}{(1 - r)^t}$$

Equation 0-2

There is also an option price associated with a resource. The option price is the price that people would put on a resource for the option to preserve it for future use. The Option Value (OV) is then the difference between the option price and the expected consumer surplus that the resource would produce if it was exploited (E(CS)). The expected consumer surplus, if the resource was exploited, is the same as the total use value (TUV) of a resource. By substituting in E(CS) for TUV and adding OV the equation reflects the uncertainty of the resources use (Pearce & Warford, 1993).

$$Value\ of\ Project = \frac{\Sigma(B - C - (E(CS) + OV + TEXV))}{(1 - r)^t}$$

Equation 0-3

The last thing that needs to be accounted for in the project valuation is the cost of any environmental damage. If the project results in a net environmental benefit, such as a sewage treatment plant for discharge, the term then becomes a positive (TEC) (Pearce & Warford, 1993).

$$Value\ of\ Project = \frac{\Sigma(B - C - (E(CS) + OV + TEXV) - TEC)}{(1 - r)^t}$$

Equation 0-4

The total project valuation accounts for uncertainty in the resource's use, the option for preservation and the environmental damage associated with exploitation, as well as the standard financial costs and benefits.

2.3 The Economic Value of the Environment

In order to determine the total project value, a value first needs to be put on the environment and the associated degradation from resource exploitation. A natural environment generally serves three main economic functions. The first is direct use to society, such as recreational activities, landscape appreciation, and photography. The second is to provide inputs to industry such as forestry, oil and gas, and mining. The third economic function of the environment is to support life. This can be done through watersheds, wetlands, ozone, oceans and many other areas, and is arguably the most economically important in terms of human welfare (Pearce & Warford, 1993).

The value of these economic functions can be determined using three different methods. The first is by applying surrogate markets. Using this method means to indirectly associate an environmental impact with a financial one, such as the impact of air pollution on property values, or the impact of health hazards by examining the cost of premiums in the labour market (Pearce & Warford, 1993). The second method is to ask people what value they place on the environment. This is known as the Direct Questioning method and is the basis of the Option Value calculation (Equation 0-3). The final method for evaluating the financial value of the environment is to use physical dose response functions. This method is based on the physical response elicited by an

exposure to an environmental problem, such as the effect of air pollution on health. A value is then associated with this response based on the market. In this example, the costs of health care to treat any diseases caused by the air pollution could be the associated value (Pearce & Warford, 1993). Each new project that proposes a change to the surrounding environment should determine which kind of economic environment the project lies within and how to evaluate its resulting values. These values can then, theoretically, be input into the cost benefit analysis discussed in Section 0 to determine whether the project can proceed (Pearce & Warford, 1993). Unfortunately, the real world application means that there are still negative environmental costs that cannot be replaced by the benefits.

3.0 Methodology

The primary idea behind a cost benefit analysis is that the costs and benefits are weighed and if benefits outweigh costs the project can proceed. Cost-benefit analysis proposes that the positive benefits can compensate for the negative results. However, the benefits and costs including environmental, occur independently and one does not actually compensate for the other. This concept is in direct competition with the Brundtland definition of sustainability because there are still environmental costs imposed on future generations (Pearce & Warford, 1993).

3.1 Total Capital

Pearce proposes an intergenerational fund that will compensate future generations for the environmental degradation of today by accounting for all lost or changed capital. Equation 0-1 demonstrates the total capital of a project that must be carried forward for future generations (Pearce & Warford, 1993).

$$K = K_m + K_n + K_{n'}$$

Equation 0-1

Where K_m = Human-made capital

K_n = Natural-Asset capital

$K_{n'}$ = Critical capital

Human-made capital refers to things like roads, machinery and factories, while natural-asset capital refers to things like oil, gas, minerals and ozone. Critical capital is the most important term in this equation as it refers to things that are hard or impossible to substitute with another type of capital, such as rainforests or unique water systems (Pearce & Warford, 1993). Each project must pass on the same amount of capital that it began with in order to create a sustainable operation. This is a much more effective way of valuing a project, by allowing real compensation for affected or lost environmental capital by the project, to maintain future generations' abilities to meet their needs

In order to ensure equal capital is passed on, there needs to be some substitution of capital, most likely, human-made for natural. However, problems arise not from substitution, but from the value of substitution required. Several methods were discussed in Section 0 for valuing the environment, though there are other considerations that need to be made as well. The first consideration is that human-made capital can be repaired or re-made, whereas natural-asset capital cannot be. The mining industry has demonstrated that it can indeed reclaim an area by returning it to its previous useful value, but it cannot put everything back exactly as it was, which is to restore it completely. This alone presents a differential in capital as the land has been modified through human interaction. The reclamation steps diminish the amount of capital required to compensate due to the rehabilitation of the land to its previous useful value. Second, when evaluating the capital of some environment, the uniqueness of the environment should be considered in its evaluation. A unique area of land should be valued higher than an area that has no unique qualities (Pearce & Warford, 1993). Finally, as Equation 0-1 suggests, the environment is a capital asset, and as such, some thought needs to be given as to how to appropriately depreciate its value over time. Pearce proposes that when nations depreciate their human-made capital, they must also account for depreciating environmental assets, such as depletion of ore reserves or forestry stocks (Pearce & Warford, 1993). This presents an opportunity for government to create an environmental protection system based on the rates of depreciation. A depreciation rate can be assigned to environmental assets based on whether or not there is human interference. Compensation for future generations could then be based on the difference in the rates of depreciation of.

3.2 The Cost of Sustainable Development

Section 0 suggests that a sustainable operating environment entails carrying forward the same amount of capital for each generation. In order to accommodate for economic

development, some human-made capital may be substituted for natural capital; however, critical capital is irreplaceable. The primary difference between human-made and natural capital is the amount of time required to regenerate the capital. A human-made asset is much more easily replicable than a natural asset that takes significantly more time and money, while critical capital would take almost infinite amounts of money and time to replace. The first step in determining capital to be carried forward, is classifying the capital in its current state.

3.3 Social and Environmental Classification

Industries operating in Canada can operate within approximately eight different physical environments, as well as eight different social environments. Table 0-1 - Social and Environmental Valuation shows the different environments for operation, as well as the associated values assigned that will be explained further in Sections 0 and 0.

Canadian Physical Environments	Useful Life	Social Environments	Personal Ranking Value	Associated Value
Coastal Forest	600	**Aboriginal Lands**	3	700
Oceans & Rivers w/Salmon	1500	**Burial Grounds**	4	500
Lakes & Rivers	750	**Natural Beauty**	8	50
Mountain Forest	500	**Historical Significance**	1	1500
Boreal Forest	350	**Uniqueness**	2	875
Arctic/Tundra	50	**Tourism**	6	200
Plains	200	**Significant Food Supply (fishing, hunting, agriculture)**	5	350
Desert	100	**Commercial Value**	7	100

Table 0-1 - Social and Environmental Valuation

The physical environments from the table were chosen as a broad representation of the majority of environments found within Canada. The social environments were chosen to represent a broad spectrum of social considerations, social and cultural values, and ideas of concern to the Canadian people based on the author's perceived interpretations. These represent not a physical environment, but items, aside from physical assets, that need to be considered and valued when considering project development.

Error! Reference source not found. is a graph of potential scenarios that could arise in Canada based on these sixteen environments, such as "Arctic Tourism", "Coastal Forest with Aboriginal Lands", and "Plains with a Significant Food Supply". The graph was then divided, based on the natural cluster of the scenarios, to represent the different capital that can be carried forward through generations. The bottom left corner is defined as human-made capital, the middle region represents natural-asset capital and the furthest outside region that lies beyond the 1000 boundary is classified as critical capital and cannot be compromised.

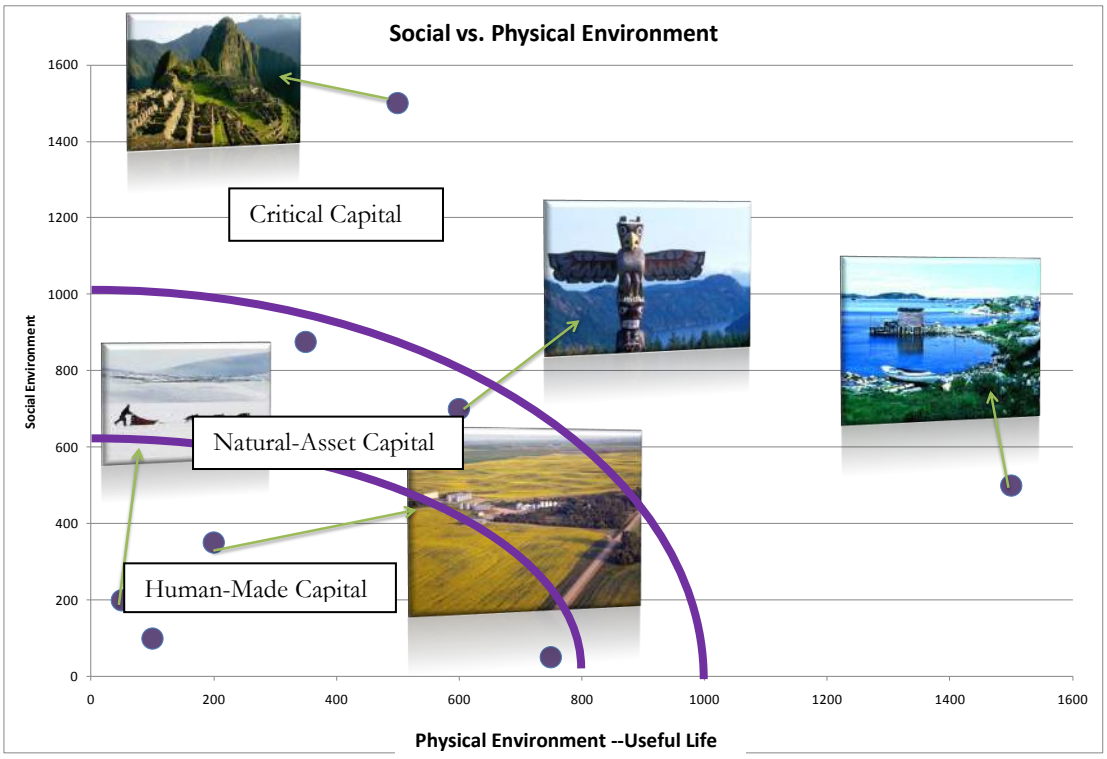


Figure 3-1 – Social and Physical Environment Classification

3.4 Social and Physical Environmental Valuation

Each environment shown above can be assigned an economic value to ascertain the sustainable development costs for any project that alters the existing environment.

3.4.1 Physical Environmental Valuation

The eight physical Canadian environments were assigned an arbitrary useful life. This number was assigned based on personal assumptions by the author, as well as the author's interpretation of the Canadian cultural importance of the environment. At the end of an environment's useful life, its value will be zero and then it can be physically or naturally replenished to re-start its useful life.

The total economic value of the environment can be determined by assigning a dollar value to each year in its useful life, and then summing the total. For the purposes of this paper, a standard value of $1 million per year was assigned to all the physical environments. In future work, each of the physical environments could be assigned a more accurate annual value based on which of the three economic functions the environment serves, as discussed in Section 0.

If the maximum useful life of any environment that can be exploited (that is, any environment that is not considered critical capital) is 1000 years, and there is an associated value of $1 million per year, the total maximum, un-depreciated, value of any physical environment would be $1 billion. It is likely that this value is too low based on the cultural value that society has placed on the environment; however, for the purposes of this paper, this is the assumed maximum.

Table 0-2 - Economic Values of Physical ***Environments*** outlines each of the physical environments and their associated economic values.

Physical Environment	Economic Value ($Million)
Coastal Forest	600
Oceans & Rivers w/Salmon	Infinite (Critical Capital)
Lakes & Rivers	750
Mountain Forest	500
Boreal Forest	350
Arctic/Tundra	50
Plains	200
Desert	100

Table 0-2 - Economic Values of Physical Environments

3.4.2 Social Valuation

Table 0-1 - Social and Environmental Valuation lists a personal ranking and an associated value for each of the eight social environments. These rankings have been assigned on the basis of the author's personal values and perceived Canadian cultural values. The associated economic value was determined by equating the rankings from the social environments to the physical ones, and using the equivalent economic value of the physical environment. This was done to simplify the process and compare the values on the same scale.

Assigning economic values to social environments and functions is considerably more difficult than doing the same for physical environments. There is rarely a distinct economic function, meaning a direct economic input or output, of a social environment. A comparison can be drawn between valuing social environments and a corporate intangible asset (Rasmussen, 2011). Neither has a direct economic function, but rather has some impact on the value of the environment, people or company. There are typically three different valuation methods for intangible assets, which are the market comparison approach, income capitalization and the cost approach (International Valuation Standards Council, 2009). In a social context, the most appropriate valuation method is the excess earnings method, which falls under an income capitalization method. This method was chosen by elimination processes as it does not require a comparison between similar environments like the market comparison approach does, and does not require depreciation and a replacement cost as the cost approach would.

For corporate purposes, the Excess Earnings Valuation method is based on forecasting cash flows for a company into the future, then subtracting all cash flows due to tangible, intangible and financial assets that are not the intangible asset of interest (International Valuation Standards Council, 2009). Using this method in a social environment would mean predicting the cash flows from the total environment, and then subtracting all factors other than the social ones, such as the physical environment and location. The resulting figure is the direct value that the social environment provides.

Due to the constraints of this paper, a simplified process of evaluation was used. Each social environment was ranked based on the predicted outcome of each environment's intangible asset valuation. The rankings range from 1 (most valuable) to 8 (least valuable). After a ranking was assigned to each of the social environments, an associated economic value was given to create an equivalent scale to the physical environment.

Table 0-3 - Social Environments Economic ***Value*** outlines the new rankings based on the economics of the social environments, and their associated dollar values.

Social Environments	Assumed Value Ranking	Associated Economic Value ($million)
Aboriginal Lands	5	500
Burial Grounds	8	125
Natural Beauty	7	250
Historical Significance	4	Infinite (Critical Capital)
Uniqueness	6	375
Tourism	1	1000
Significant Food Supply (fishing, hunting, agriculture)	3	750
Commercial Value	2	875

Table 0-3 - Social Environments Economic Value

3.5 Sustainable Development Costs

The total cost to the developer to maintain sustainability will be the maximum between the physical environment and social costs. **Error! Reference source not found.** is a two-dimensional chart. Each dimension represents the physical or social environments. In order to assess sustainable development costs, a third dimension could be added that would assign a cost to each situation.

3.5.1 Project Evaluation

In the future, during a project's evaluation stage, more emphasis will need to be placed on the value of sustainable development. **Error! Reference source not found.** provides a baseline chart for classifying a project. In order to evaluate the viability of a project being developed sustainably, it must first be assigned a physical environment and then be assigned a social environment. This would likely be done by the governing body that grants the permits and licenses for disturbing the environment. Once a physical and social environment has been assigned, the project can be plotted on the chart and placement will determine whether the project can be developed in a sustainable way. If

any project falls within the critical capital region, it should not be developed due to the inability to replicate such capital with human-made capital. If a project falls within the boundaries of natural-asset capital and human-made capital, there should be an associated cost to the developer for proceeding with the project in order to compensate for the change in capital.

The future generation compensation cost to the developer for proceeding with the project would be the maximum of either the social or physical economic values of the environment. A total economic compensation cost example can be given using the example environments created in **Error! Reference source not found.** and combining the values created in

Table 0-2 - Economic Values of Physical ***Environments*** and

Table 0-3 - Social Environments Economic ***Value***.

Table 0-4 - Total Compensation Costs for Example ***Environments*** shows each of the eight plotted environments and the suggested compensation cost to develop. Any environment that contained some form of critical capital as plotted in **Error! Reference source not found.** is considered to have an infinite value and cannot be changed due to the irreparable harm that would be carried forward to future generations.

Environment	Physical Value ($Million)	Social Value ($Million)	Total Compensation Cost ($Million)
Coastal Aboriginal Forest	600	500	1100
Oceanic Burial Grounds	Infinite (Critical Capital)	125	Infinite (Critical Capital)
Lakes & Rivers w/ Natural Beauty	750	250	750
Mountain Forest w/ Historical Significance	500	Infinite (Critical Capital)	Infinite (Critical Capital)
Unique Boreal Forest	350	375	375
Arctic Tourism	50	100	100
Plains w/Significant Food Supply	200	750	750
Desert w/ Commercial Value	100	875	875

Table 0-4 - Total Compensation Costs for Example Environments

3.5.2 Natural Asset Depreciation

As discussed in Section 2.4, a nation depreciates all physical assets, and in order to adequately value an environment, it should also depreciate its natural assets. In the context of this section, natural asset depreciation is referring to the physical environment, not the region in the chart defined as a natural asset.

A natural asset can be depreciated based on its useful life, and the useful life's associated value. Using a straight-line depreciation method, the total value of the physical environment divided by its useful life will give the depreciated amount each year. Based on the assumptions made in this paper, the annual depreciation would be $1 million. When determining the cost of developing a project sustainably, the project should be plotted on **Error! Reference source not found.** using the depreciated remaining useful life of the physical environment.

3.5.3 Costs of Rapid Depreciation

An asset that has a value based on its useful life can theoretically be exploited until the value of the asset is zero. If a project proposes to depreciate a natural asset faster than the natural, or pre-determined useful life depreciation rate, then there should be a compensatory rate applied.

A compensatory scheme could be developed based on the starting useful value left and the starting useful life left, and then applying a premium based on how quickly the project develops. Equation 0-2 - Rapid Depreciation Cost outlines a proposed formula for this premium.

$$Rapid\ Depreciation\ Cost = V_E \times \frac{UL_E}{(10)PL} - RV$$

Equation 0-2 - Rapid Depreciation Cost

Where:

V_E is the value of the physical environment at the end of the proposed project's life without any development

UL_E is the useful life of the physical environment at the end of the proposed project's life without any development

PL is the project's proposed life

RV is the residual value left in the environment at the end of the project's life

An example of this equation applied is outlined below using a boreal forest as the physical environment.

The useful life assigned to a boreal forest is 350 years and the useful value is $350 million. As an example, if a project proposes to begin development in year 100, there are 250 years and $250 million left of value in the forest. The project proposes to operate for 20 years and will reduce the useful life of the forest to 50 years at a value of $50 million. The value that should have been left in the forest would be $230 million. The rapid depreciation cost would be as follows:

$$Rapid\ Depreciation\ Cost = \$230 \times \frac{230}{20 \times 10} - \$50 = \$214.5\ Million$$

The rapid depreciation cost would be a unique and sound way for governments to develop a royalty scheme by putting a real dollar value on their physical environments. Depreciation of the environment is necessary as the value of almost any asset is not infinite.

This cost would be in addition to the sustainable operation cost outlined in the sections above. For a project that lies in a boreal forest with a useful life of 250 years left and a unique social environment, the cost of sustainable development would be the maximum of $250 million for the physical environment (the depreciated value) and $375 million for the unique social environment ($375 million) plus $214.5 million for rapid depreciation costs. The total cost of developing this project in a sustainable way would be $589.5 million, in addition to the standard development costs.

4.0 Conclusion

Sustainable development has been hard to quantify due to the lack of market prices for things like social and physical environments. This paper has attempted to outline eight physical and social environments within Canada, prioritize each of them, and then plot them on a chart that will categorize them into either human-made, natural-asset, or critical capital. Any project that lies within critical capital cannot be developed due to its irreparable harm to future generations' abilities to meet their needs. A project that lies in natural-asset or human-made capital can be developed, given the ability to pay the costs associated with replacing or recreating the existing capital.

The costs of sustainable development can be determined by assigning a cost to both the physical and social environment. A physical environment can, and should have, a

useful life and as such, an economic value can be attached to that environment based on its useful life. A social environment can be valued like an intangible asset, primarily using the excess earnings method. The maximum value of between the physical and social environments is the resultant cost of developing a project in a sustainable manner.

The final consideration in development costs is that a physical environment is an asset and should be depreciated over time based on its useful life. If a project proposes to depreciate an environment faster than the natural depreciation, an added cost should be applied to compensate for the shortened useful life of the asset. This premium cost needs further examination, but would provide a strong basis for future royalty schemes for governments to compensate for the exploitation of its natural resources.

---

*Author: *Kolbie Calverley originates from Nanaimo, British Columbia, Canada. She recently graduated from the University of Alberta with an Engineering degree in mining. Three months ago she relocated to Brisbane, Australia with her fiancé to work as a graduate consultant mining engineer. She wrote this paper as part of her final year assignments. As an avid outdoors advocate, she has a personal stake in ensuring that we preserve our environments for future generations to the best of our abilities.*

References

Central Intelligence Agency. (2011, July). *World Fact Book*. Retrieved Sept 27, 2011, from CIA: https://www.cia.gov/library/publications/the-world-factbook/geos/uv.html

International Valuation Standards Council. (2009). *Revised International Valuation Guidance.* London: International Valuation Standards Council.

Mining Association of Canada. (2010). *Towards Sustainable Mining 101: A Primer.* Mining Association of Canada.

Pearce, D. W., & Warford, J. J. (1993). *World Without End: Economics, Environment and Sustainable Development.* Washington: Oxford University Press.

Rasmussen, E. (2011, Mar. 24). (K. Calverley, Interviewer)

World Commission on Environment and Development. (1987). *Report of the World Commission on Environment and Development:Our Common Future.* Retrieved Mar. 13, 2011, from UN Documents: http://www.un-documents.net/wced-ocf.htm

Earth Common Journal
Vol. 1, No. 1, September 2011

Feeling Blue – Get Green: The Benefits of Nature on our Mental Health and Well-being

Holli-Anne Passmore*
Grant MacEwan University, Canada

ABSTRACT

Human bodies and minds evolved together—simultaneously and interdependently. Therefore, if nature provides for our physical health and well-being, it follows that nature also provides for our mental health and well-being. Psychologists have begun to recognize the impact that exposure to nature has on many aspects of our mental health and well-being; and a substantial body of supporting research and empirical data has accumulated. Nature's beneficial effects on individuals' mental health have been shown to extend beyond a mere restoration to baseline after negative periods of stress, anxiety, or depression. Nature's beneficial effects extend to positively increasing true mental health and well-being, to elevating individuals beyond a neutral "just getting by" level and into an additive state of thriving and flourishing.

This paper discusses highlights from the ever-increasing body of research findings and empirical data evidencing the positive and additive effects that nature has on our mental health and well-being. Included in this discussion are findings from a recent series of studies conducted at Grant MacEwan University that this author was involved in. The research summarized in this paper demonstrates that our relationship with nature is vital to our mental health and well-being.

Many psychologists recognize that exposure to green spaces is useful as a means of boosting well-being (Gable & Haidt, 2005). In her recent book, *Positivity*, Barbara Fredrickson (2009) specifically lists "find nearby nature" (p. 177) as one proven strategy to increase one's level of positivity. A substantial amount of research has provided evidence of the importance of nature to many aspects of our mental health and well-being (see review by Joye, 2007).

Much of the initial research in this area focused on the restorative capacity of exposure to nature for people suffering from negative states such as stress, anxiety, or depression. Examples include stress reduction after outdoor excursions involving nature (both urban and wilderness), and reduction in feelings of anger and aggression after viewing colour photographs of scenes containing natural elements such as trees or open water (for a review, see Maller, Townsend, Pryor, Brown, & St. Leger, 2005).

Nature has been incorporated into a diverse array of therapeutic treatment programs. For example, therapeutic gardening (known as *horticulture therapy)* is utilized in a variety of treatment settings, such as the healing garden at the Alnarp University campus in Switzerland (Grahn et al., 2007; Stigsdotter & Grahn, 2003). The healing garden is an integral part of Alnarp's treatment program for individuals who have suffered from "burnout" or depression for an extended period. Private practice psychologists incorporating elements of nature into their therapeutic approach, when working with clients struggling with issues involving relationship difficulties, chronic pain, and depression (Berger & McLeod, 2006; Burns, 1998, 2009) is another example.

However, just as true physical well-being is more than the absence of illness or ailments, true mental well-being is more than the absence of negative states such as stress, anxiety, or depression (Keyes, 2005). It is more than just restoring mental health to a neutral baseline. True mental well-being is an "additive" state of thriving and flourishing beyond, "just getting by". Nature's beneficial effects have shown to extend beyond mere restoration by positively increasing true mental health and well-being. Highlights of some recent research follow.

A recent series of studies at Grant MacEwan University (Howell, Dopko, Passmore, & Buro, 2011) examined the relationship between nature affiliation—how connected one feels to nature—and various indicators of well-being. A total of 727 introductory psychology students participated. This research found that nature connectedness was associated with psychological and social well-being to a significant degree. Nature connectedness was also associated significantly with the trait of mindfulness (the

tendency to be highly aware of one's internal and external experiences), which, itself, is associated with high levels of mental well-being.

These findings were replicated in a second series of studies (Howell, Passmore, & Buro, unpublished manuscript) involving 746 MacEwan introductory psychology students. These studies again found that individuals who felt a high degree of connectedness with nature experienced a high degree of overall mental well-being. Additionally, those high in nature connectedness reported a high sense of meaning in their lives. Meaning in life is highly predictive of overall psychological well-being (Steger, 2009).

These studies contribute to the ever-increasing body of research examining the relationship between nature affiliation or exposure to nature and overall well-being. Correlational studies have found that nature affiliation is associated with positive affect, personal autonomy and personal growth (Herzog & Strevey, 2008; Nisbet, Zelenski, & Murphy, 2011). Outdoor activities involving nature have been demonstrated to result in feelings of greater vitality (Ryan et al., 2010). (Note, in Ryan et al.'s research, simply being outdoors did not predict vitality if the activity did not involve contact with nature.)

Several experiments have explored nature's effect on people's well-being. For example, after watching short nature-oriented video clips, participants' levels of positive emotions, ecstasy, respect, wonder, and spirituality were boosted, compared to participants who viewed video clips of urban scenes, (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Saraglou, Buxant, & Tilquin, 2008). Students resting for a mere five minutes in a plant-laden laboratory endorsed goals such as closeness and community, decreased their level of endorsement of extrinsic goals such as fame and fortune, and exhibited an increase in generous behaviour towards others to a greater degree than did students resting for five minutes in a plant-free laboratory.

Students in particular, may want to note the following findings: in Nisbet et al.'s (2011) study, students taking courses pertaining to the natural environment reported higher levels of vitality than did students in non-environmental courses. These greater feelings of vitality resulted from students maintaining a stronger connection to nature during the school year (compared to other students), when studying afforded less time to be outdoors—particularly during exam weeks. In Ulrich's study (as cited in Chilquist, 2009), the addition of flowers and plants to a workspace was found to increase cognitive functioning and resulted in a reported "15% rise in innovative ideas and more creative, flexible problem-solving than that of the control group without greenery nearby" (Ulrich, as cited in Chilquist, 2009, p. 2). It may be wise for students to keep these

findings in mind when choosing university course options and places in which to study and work on projects.

An Ipsos Reid poll (as cited in Nature Conservancy of Canada, 2011) reported that 90% of respondents agreed that the more connected they felt to nature, the happier they were; yet on average, Canadians spend almost 90% of their time indoors (Environment Canada, 2005). Worldwide, more people are spending more time indoors. Studies conducted in many countries show that the average time spent pursuing nature-based recreation is declining (Charles & Louv, 2009; Pergrams & Zaradic, 2008). Terms such as "nature deficit disorder" (Louv, 2005) and "nature starvation" (Royal Society for the Protection of Birds, 2010) have been coined to describe this lamentable disconnect from the natural world.

While technologically-mediated experiences of nature (e.g. high definition video clips, virtual reality computer-generated nature-games) do have some beneficial effects, consistent evidence is now emerging that synthetic experiences of nature differ in their effect on our health and well-being from direct exposure to, and contact with, the live natural world. For example, heart rate recovery time (while working on a stressful task) was associated with how long and how often participants glanced at a glass window affording a view of nature (Kahn et al., 2008). The longer and the more often they glanced at the window, the quicker their heart rate returned to normal. Yet for participants working on the same stressful task who had a plasma-screen "window" displaying a real-time view of the same nature scene, no relationship was found between heart rate recovery time and duration of viewing the "window". In fact, these participants were no better off than participants doing the same stressful task who had only a blank wall to look at!

We need to recognize the limits of technology, and remember that only relatively recently in our evolutionary history have we separated ourselves from a daily life immersed in nature (Gullone, 2000; Kellert, 1997; Nesse & Williams, 1996). "The time-span in our habitat change from the natural world setting into the technological habitat is too short for the evolutionary processes to permit any major biological adaptations" (Gelter, 2000, p. 86).

Evolutionary processes have left their mark not only on our physical bodies, but on our minds and emotions as well. For as scientists now recognize, our bodies, minds, and emotions are inextricably interwoven and interconnected. Thus, if nature provides sustenance for our bodies, it follows that—as the research in this paper demonstrates—nature also provides sustenance for our minds and emotions as well. Framed within this

context, affiliating with nature is a deeply rooted human need. We neglect our relationship with the natural world at the expense of both our physical and mental health and well-being.

---

*Author: *Holli-Anne Passmore is a senior undergraduate student in psychology. She has collaborated on research with Dr. Andrew Howell and Dr. Karen Buro in the area of nature affiliation and well-being, and has co-authored a book chapter on this topic with Dr. Andrew Howell. She is a part-time student at Grant MacEwan University and full-time program manager with Health Canada. After graduation, she plans to pursue a clinical psychology Ph.D. with an emphasis on both positive and environmental psychology.*

References

Berger, R., & McLeod, J. (2006). Incorporating nature into therapy: A framework for practice. *Journal of Systemic Therapies, 25*, 80-94.

Burns, G. W. (1998). *Nature-guided therapy: Brief integrative strategies for health and well-being*. Philadelphia: Brunner/Mazel.

Burns, G. W. (2009). Can you be happy in pain? Applying positive psychology, mindfulness, and hypnosis to chronic pain management. In G. W. Burns (Ed.), *Happiness, healing, enhancement: Your casebook collection for applying positive psychology in therapy* (pp. 202-213). Hoboken, NJ: John Wiley & Sons.

Charles, C. & Louv, R. (2009). Children's nature deficit: What we know – and don't know. *Children & Nature Network*, September 2009, 1-32.

Environment Canada. (2005). Retrieved May 13, 2010 from http://www.ec.gc.ca/cleanair-airpurIndoor_Air_Pollution-WS1280FDA8-1_En.htm

Fredrickson, B. (2009). *Positivity*. New York: Random House Inc.

Gelter, H. (2000) Friluftsliv: The Scandinavian philosophy of outdoor life. *Canadian Journal of Environmental Education, 5*, 63-76.

Grahn, P., Bengtsson, I-L., Welen-Andersson, L., Lavesson, L., Lindfors, L., Tauchnitz, F., & Tenngart, C. (2007). Alnarp Rehabiliation Garden: possible health effects

from the design, from the activities and from the therapeutic team. *Openspace conference summary paper*. Retrieved June 13, 2010 from http://www.openspace.eca.ac.uk/ conference2007/PDF/Summary_Paper__P_Grahn._AB_edit.W-out_trackg.pdf

Gullone, E. (2000). The biophilia hypothesis and life in the 21st century: Increasing mental health or increasing pathology. *Journal of Happiness Studies, 1*, 293-321.

Herzog, T. R., & Strevey, S. J. (2008). Contact with nature, sense of humor, and psychological well-being. *Environment and Behavior, 40*, 747-776.

Howell, A. J., Dopko, R., Passmore, H.-A., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences*.

Joye, Y. (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology, 11*, 305-328.

Kahn, P. H. Jr., Friedman, B., Gill, B., Hagman, J., Severson, R. L., Freier, N. G., Feldman, E. N., Carrere, S., & Stolyar, A. (2008). A plasma display window? The shifting baseline problem in a technologically mediated natural world. *Journal of Environmental Psychology, 28, 192-199*.

Kellert, S. R. (1997). *Kinship to mastery: Biophilia in human evolution and development*. Washington: Island Press.

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating the axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology, 73*, 539-548.

Louv, R. (2005). *Last child in the woods: Saving our children from Nature-Deficit Disorder*. North Carolina: Algonquin Books of Chapel Hill.

Maller, C., Townsend, M., Pryor, A., Brown, P., & St. Leger, L. (2005). Healthy nature, healthy people: 'contact with nature' as an upstream promotion intervention for populations. *Health Promotion International, 21*, 45-54.

Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*, 607-643.

Nature Conservancy of Canada (2011). Retrieve May 2, 2011 from http://www.natureconservancy.ca/site/PageServer?pagename=ncc_work_feature45

Nesse, R. M. & Wiliams, G. C. (1996). *Evolution and healing: the new science of Darwinian medicine*. London: Phoenix.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies, 12*, 303-322.

Pergrams, O. R. W. & Zaradic, P. A. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proceedings of the National Academy of Sciences, 105,* 2295-3000.

Royal Society for the Protection of Birds. (2010). Retrieved May 31, 2010 from http://www.rspb.org.uk/news/details.asp?id=tcm:9-238307#credits

Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagne, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology, 30*, 159-168

Saraglou, V., Buxant, C., & Tilquin, J. (2008). Positive emotions as leading to religion and spirituality. *Journal of Positive Psychology, 3*, 165-173.

Steger, M. F. (2009). Meaning in life. In C. R. Snyder & S. J. Lopex (Eds.), *Handbook of positive psychology (Second edition)* (Positive psychology. 679-687. New York, NY: Oxford University Press.

Stigsdotter, U. A. & Grahn, P. (2003). Experiencing a garden: a healing garden for people suffering from burnout diseases. *Journal of Therapeutic Horticulture, 14*, 38-49.

Earth Common Journal
Vol. 1, No. 1, September 2011

Efficacy of Green Roof Technology in Colder Climates

Yancey Corden*
Northern Alberta Institute of Technology, Canada

ABSTRACT

Green roof technology has been used within Canada as early as the first French settlers (1600) in the provinces of Nova Scotia and Newfoundland for necessity and survival in the Canadian wilderness. As home construction became more modernized, green roof technology was replaced by conventional roofing on houses and businesses. However, with the increased awareness of sustainable practices and environmental conservation, several European companies introduced new green roof technologies in the 1980s that began the movement of using this technology. While this technology has primarily been used in mild climates throughout Canada (Vancouver, British Columbia), little has been examined and researched regarding the use of green roof technology in colder and more severe climates within Canada. In his final year to complete his Bachelor Degree in Technology at the Northern Alberta Institute of Technology, Yancey Corden conducted research on the efficacy of green roof technology in Edmonton, Alberta capital region's cold and severe climatic conditions. The results suggested that native plants to the region are most successful when used in green roof technology.

Green Roof Technology

While green roofs in Canada were used as part of home construction design as early as the first French settlers (1600s) in the provinces of Nova Scotia and Newfoundland,

green roof technology has remained a less viable option for Canadians until the early 1990s when "several large European green roof manufacturers started to venture into the North American markets" (Peck & Kuhn, 2004). Green roof technology has been slowly embraced and implemented within Canada, with various architects and engineers promoting their uses and benefits. This article provides information about green roof technology, explains the benefits of this technology, and then describes a study conducted by a team of students in the Edmonton, Alberta, Canada region on the effects of green roof technology and plant species.

What is a green roof?

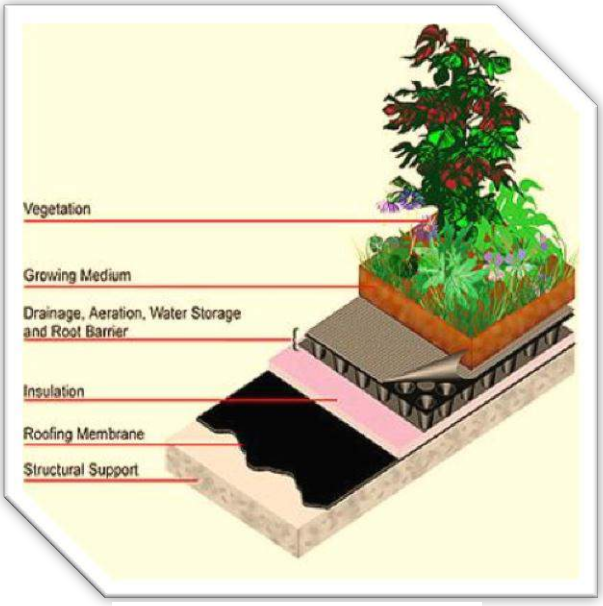


Figure 1: Green Roof Layers

A green roof is defined as being any roof of a building that is partially or completely covered with vegetation, and a growing medium (generally soil), which is planted over a waterproofing membrane. It may also include additional layers such as a root barrier, drainage, and irrigation systems (Toronto, 2011). The illustrated diagram (Figure 1: Green Roof Layers) shows an example of the typical layers of a green roof. Green roofs are generally classified in two categories related to their implementation: retrofit roofs, and new roofs.

Retrofit roofs entail taking an existing building and utilizing green roof technology, along with the buildings' existing structural load capacity, to create a suitable green roof. New roofs are installed on new buildings where the green roof is included in the design specifications. New green roofs are subject to substantially less structural constraints on the overall design, which enables easier upfront cost estimations. It should be noted that green roofs are unique in design and cost. There are no two alike. All load factors placed on the building have to be considered carefully, including the climate that the roof is located in, and the amount and type of precipitation that accumulates in that

environment. Failure to consider the load factors could result in the unthinkable for a green roof developer -- a roof collapsing due to the additional weight of the green roof (Toronto).

Benefits of a Green Roof

Constructing a green roof increases the insulation value of that building (Wark & Wark, 2003). This is a benefit in both the summer and winter months. Green roofs also help combat the phenomenon known as the *urban heat island effect* (Patel, 2011). As a result of urban heat island effect, temperatures on rooftops in the downtown Edmonton core on a warm summer's day are in the range of 50º Celsius, much greater than the ambient temperature on such a day. Using the same example, when a green roof is employed on these same buildings, the rooftop temperatures would be the same as the ambient temperature of that particular day, approximately 25º Celsius. The overall outcome as a result of this urban heat island effect is that the heat at these rooftops radiates downwards through the buildings and to the streets below. This equates to as much of an increase as two or three degrees Celsius. As the temperatures rise, buildings compensate with greater use of air-conditioning units, resulting in higher energy costs. When a green roof is utilized, this effect – and its resulting costs – is negated. In the wintertime, these same buildings are forced to pay for substantial heating costs as well. This is because buildings, much like the human body, lose large amounts of heat through the roofs. If these same buildings have a green roof installed, they are essentially wearing a green toque and retaining that heat which would otherwise be lost. The cost savings from such efforts can be substantial.

Another benefit of having green roofs in Edmonton is the wastewater management that is provided by the plants themselves. Wastewater is a term which includes all precipitation that encounters a building's roof on an annual basis (MassGov, 2011). One might not think this is a problem. However, it must be realized that all this wastewater has to be treated, and at a cost. The precipitation drains off the roof, runs into the storm sewers, and then goes to a facility for treatment. This volume is constantly calculated based on the square footage of the property, and the owner is billed accordingly. Green roofs are credited with utilizing up to 90% of all wastewater, another cost savings (MassGov).

Green roofs offer other benefits that are not initially seen in the cost benefits analysis. There is the aesthetic appeal when one looks out of an office window and sees a thriving green roof that can be accessed for lunchtime getaways. In addition, green roofs

help reduce carbon dioxide levels that accumulate during peak traffic patterns in urban cores. This translates into a greener and cleaner environment. There is also the biodiversity that green roofs bring to the urban core. This is in the form of plant species, bees, birds, and various other environmentally beneficial creatures that the public now realizes are integral to the overall healthy existence of any productive biosphere.

However, understanding the basic structures, principles, and benefits of green roofs is only one level of knowledge that can be gained regarding this technology. Establishing a deeper comprehension of how green roof technology is applied and implemented is another area that can be explored. With a strong sense of curiosity and the need to know more, three fourth-year students from the Northern Alberta Institute of Technology (NAIT) were compelled to research how local plant species that thrive in the varied and sometimes extreme climate of Edmonton are affected when grown in a green roof environment. A detailed description of their research project follows.

A Study on the Efficacy of Green Roof Technology in Colder Climates in the Edmonton Capital Region

Background

This study derives from my (Yancey Corden) recent completion of a Bachelor of Technology Degree (BTech) at the Northern Alberta Institute of Technology (NAIT) in Edmonton, Alberta, Canada. In the final year of studies for this program, the students were asked to choose a subject for their Capstone Project. This yearlong course began as a labour intensive research exercise, and culminated with presentations given to a doctorial panel of judges, as well as members of the local business community. I chose a sustainability-based Capstone Project in an area of knowledge that was new to me: *Keeping Green Roofs Green in the Capital Region* (2011). This project appealed to me because it dealt with changing certain perceptions in Edmonton regarding green roofs and

Figure 2: Student Research Team Members

the interest in creating a more sustainable urban landscape as an integral part of the development process. The study included three researchers: Yancey Corden, Ryan Boyd, and Ruth Bucknell (Figure 2: Student Research Team Members).

Purpose of the Study

The recognition of greening roofs as a feasible approach to improving urban sustainability has been on the rise in North America over the last decade (Press, 2006). There is, however, the perception that green roofs are feasible only for mild humid climates. Canada is a large and diverse country that is divided into zones identifying and describing the different climates that affect plant growth. For example, Vancouver, British Columbia has an 8A climate zone (warm and moist). In comparison, Edmonton, Alberta has an extreme climate condition with a 3A zone (dry and cold). This fact might affect the establishment and survival of plants used for green roofs in this zone. Winter survival studies are limited with respect to the climatic conditions experienced in the Edmonton region. The research team deemed it critical to know which plant species will survive in Edmonton's plant hardiness 3A zone (CanadaGov, 2011).

Therefore, the noted Capstone Project study was initiated in 2010 to observe the winter survival of plant species native to the Edmonton region which were grown on three green roofs. The three green roofs, each established in 2009-2010, were and continue to be located at the Williams Engineering (WE), Edmonton Waste Management Centre of Excellence (EWMC), and Esak Consulting Ltd. (EC) buildings.

Nature of the Study and Procedures

The study included one winter survival experiment per roof, each designed to determine a specific factor. The WE experiment was focused on determining if selected substrate (soil) depths affected winter survival; the EWMC experiment sought to determine if selected types of substrate (different soil mixtures with varying percentages of compost) and straw banking affected winter survival; and the EC experiment was created to determine if saturating the substrate with water affected winter survivability. Plant samples were taken from each green roof at four-week intervals (September 2010 to April 2011) and re-potted indoors, where growth rate and survival was monitored (weekly) by students at W.P. Wagner High School (located in the Edmonton Region).

Figure 3: The William Engineering Green Roof

The plant samples for the study included seventeen species in total. This included ten forbs species (flowering plants), six grass species, and one sedge species (grass-like plant). An example of some of these species is shown in Figure 3: The William Engineering Green Roof (2010).

Results

The WE plants grown in a 10 cm medium (soil) were most successful. Initially, this result seemed incongruous when compared against previous results, since there was 7.5 cm, 10 cm, and 12 cm growth mediums being used. It was assumed that the 12 cm medium would yield the best results. However, it was later determined that the samples appeared to be affected by the depth of medium in which the plants grew prior to sampling, which was similar to 10 cm. The plants at the EWMC roof were not affected by the different mediums. In addition, the straw banking did not appear to give those samples an observable advantage over the other non-covered samples. Finally, the plants removed from EC's water saturation treatments did not survive the winter, likely because the plants had effectively drowned in the initial phase of the experiment. Overall, observations indicated that grasses native to the region survived better than forbs in a 3A zone (Corden, Boyd, & Bucknell, 2011).

The study effectively demonstrated that green roofs survive the harsh winter climactic conditions that exist in the Edmonton area. Surprisingly, the WE roof study determined that the deepest medium was not in fact the best option. This is a successful finding; it means that shallower growth medium can be successfully utilized in Edmonton. This will help reduce the overall weight factor that is associated with the future implementation of green roofs in this region. This finding is most promising when looking at retrofit installations and the structural integrity issues that arise with these projects.

It should also be noted that the 2010/2011 winter in the Edmonton region was not a typical winter. The snowfall was greater than normal, and the overall environmental conditions during the study period were not ideal. For a more effective base line, the team recommended that this study continue to progress over a further period of two to three years, in order to truly measure the data. However, this study did have positive outcomes, noted above, and did lay groundwork for future studies with green roofs in the Edmonton region.

This Capstone Project study helped create awareness about the makeup of green roofs and how they benefit urban areas. As with any new venture, a cost base analysis for a proposed green roof should be undertaken prior to development. Green roofs cost on average one and a half times more to install than a traditional flat top roof does, and as previously noted, each green roof is unique. Therefore, the associated implementation costs are not always easy to estimate. This is largely due to the fact that many are retrofit installations. With retrofit roofs, there are hidden costs that can arise, such as structural loading capabilities of an existing roof, which could require additional work and funds. However, many positive benefits offset these costs when considering green roofs. One of the key factors to consider is that a green roof lasts, on average, one and a half times longer than its traditional counterpart does. This is of great importance when one looks to green roofs for future development with sustainability in mind.

Future Research

It is the author's hope that the business community of Edmonton will collaborate with innovative institutions like NAIT and continue to look into green roof technology to foster its expansion and growth. There are hurdles to overcome, and knowledge gaps to be filled. However, this study was a positive first step to the creation of a more sustainable and greener Edmonton.

---

*Author: *Originally, from British Columbia, Yancey Corden moved to the Edmonton region several years ago. A graduate from the British Columbia Institute of Technology in Aircraft Mechanical Engineering in 1996; he pursued a career in aviation for many years. Yancey returned to school at the Northern Alberta Institute of Technology where he received his Bachelor's Degree in Technology in 2011. He is now attending Simon Fraser University in Vancouver where he will receive his MBA. Yancey has always been a nature enthusiast. He believes strongly in sustainability; as he works to meld his ideals with business, striving to find a balance between People, Planet, and Profit (Fisk, 2010). This*

is known as the triple bottom line in industry. It is aimed at the creation of a more balanced approach to business. One in which an equal weighting is placed on all three components by managers and stakeholders alike. These ideals help improve current business environments and help to bring about long-term sustainability.

References

CanadaGov. (2011). Plant hardiness zones in Canada. Retrieved August 7, 2011, *from Agriculture and Agri-Food Canada*: http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html

Corden, Y., Boyd, R., & Bucknell, R. (2011). *Keeping Green Roofs Green in the Capital Region.* Edmonton: NAIT.

Fisk, P. (2010). *Planet, People, Profit.* London: Kogan Page.

MassGov. (2011). Water, wastewater & wetlands. Retrieved August 7, 2011, from *MassDEP*: http://www.mass.gov/dep/water/wastewater/grnroof.htm

Patel, N. (2011). *U.S. EPA Heat Island Reduction Program*. Washington, DC, USA.

Peck, S., & Kuhn, M. (2004). Design guidelines for green roofs. *Ontario Association for Architects.*

Press, T. A. (2006). Landscape architects tend to a green roof . Retrieved March 2, 2011, from *US News*: http://www.msnbc.msn.com/id/12512892/ns/us_news-msnbc_wire_services/

Toronto, C. o. (2011). *What is a green roof?* Retrieved August 7, 2011, from Toronto: http://www.toronto.ca/greenroofs/what.htm

Wark, C., & Wark, W. (2003). Green roof specifications and standards. *The Construction Specifier*, pp. 1-12.

Earth Common Journal
Vol. 1, No. 1, September 2011

"In the Company of Trees"

Courtney Rupertus*
Grant MacEwan University, Canada

ABSTRACT

"In the Company of Trees" article describes a collaborative project that was undertaken by two first-year Fine Arts program students who have a passion for art and for nature. More specifically, they have an intuitive connection with trees; hence, the name "Tree Installation." The article focuses on the research techniques artists use when creating a piece, and demonstrates how the application of such techniques combines and employs both artistic and academic knowledge to inform a creative project. The article discusses the research techniques used when the artists decided on what type of installation to create, what shape it would take, what its dimensions would be, and what materials would be selected and used. A discussion regarding creativity and spontaneity that is essential to art is also included. Also discussed throughout the article is the concept that some research that artists do while creating a piece of art, whether it be an installation, painting or sculpture, is done instinctively rather than overtly as the art work is evolving. Considerable effective research is done through experimentation and the "Tree Installation" embodies this method. The "Tree Installation" is not only beautiful art, but is a project that involved influential and meaningful research about the nature of trees.

The Project

When two first-year Fine Arts students had to decide what type of installation to create, it seemed only natural that Kassandra Harvey and Susan Winters would take on

the demanding task of building a tree that would extend to four floors of Grant MacEwan University's Centre for the Arts and Communications in Edmonton, Alberta, Canada.

Harvey agreed to be interviewed about the process of building the installation and the research involved, speaking for herself and for her creative project partner (Winters). It is difficult to imagine the amount of research involved in the undertaking of such a unique project and even more surprising that some of it is done intuitively by the artists as their art work evolves.

The finished installation, at 18 metres long and made entirely of dark wool fabric (Figure 2), appeared as if it was growing in the school. It was evident how much fabric was needed to create the tree (Figure 1). Its roots spread across the basement floor, the

Figure 1: Tree Installation

strong trunk leading straight up the stairwell, and the intricate canopy woven into the hand railing. When describing the project, it was immediately clear from Harvey's enthusiasm how passionate she was about the "Tree Installation" and art in general.

The Research

Harvey explained that the main goal of an installation piece is to completely transform the space. A feat the two artists met with unfazed ambition and dedication. She estimates that they both spent about 50 hours in a week working on the tree that would only last a day until it was critiqued by their Fine Arts faculty instructor who commissioned the project as part of their course curriculum. But why create an installation instead of another type of artwork? According to Reiss, "Most museums and galleries are designed to show masterpieces...but many artists today do not make self-contained masterpieces. Rather, their work includes the space it's in, embraces it, uses it" (Reiss, 1999).

The project began when the two artists were inspired by a previous installation that used hanging fabric and stones as its source materials. From there, the idea to create the tree sparked. The artists wanted to draw their peers' attention to trees with this project. Dillard wrote in *Pilgrim at Tinker Creek*, "There are creatures under our feet, creatures that live over our heads, but trees live quite convincingly in the same filament of air we inhabit, and, in addition, they extend impressively in both directions, up and down, shearing rock and fanning air, doing their real business just out of reach. A blind man's idea of hugeness is a tree" (Dillard, 1974, p. 88).

"We need to learn to live around trees, rather than cutting them down," added Harvey. The two artists also wanted to promote the reuse of fabric and to demonstrate the amazing things you can do with different materials. They share an interest in the areas *Earth Common Journal* specifically focuses on: sustainability, conservation, and global warming. The intrinsic nature of a tree as well as the symbolism behind trees communicates the relevance of the environment.

Harvey and Winters sought out discounted fabrics and stumbled upon the one type they would eventually use for their project. Harvey described the fabric as being "mossy and organic" looking (Figure 2). The fact that they could not determine the exact type of fabric they selected was intriguing to them. Not knowing the fabric type did not affect their vision of the project.

Figure 2: Fabric for Tree Installation

Some variables in research are unknown and therefore cannot be controlled within a project. However, this did not change the overarching visualization of their installation. Also, as artists, they brought a substantial backdrop of color information that they have gathered through research done on other projects, as well as from knowledge they have acquired within their studies. It is this previous research and prior knowledge, which could be as scientific as studying species of trees and their colourings, that were used to influence their choices in fabric and other aspects of their project.

Figure 3: Roots of Tree

Their goal was to make the installation look as much like a tree and as little like fabric as possible. The trunk was formed by roping together lengths of the fabric and the canopy was made of torn sheets knotted together. Figures 3 and 4 depict how much detail the artists put into creating the beautiful and intricate roots and leaves.

Figure 4: Leaves of Tree Installation

Most of the research for the project has come from previous information the artists have gathered at various times throughout their lives. Both have always been interested in nature and the environment and, as Harvey explained, she has carried this information with her wherever she has traveled. For Harvey, her interest in art as well as her affinity to nature came at an early age. High school was when she first began focusing on trees in her drawings and paintings. Based on her comments, it is clear that she is someone who inherently cares about the Earth.

Harvey and Winters collected their information using qualitative research as well as experimenting with different techniques. They looked through pictures and videos of past installations to gain inspiration and to select an appropriate technique. They took time to determine which space would work best and drew out different plans that would articulate the concept of their "Tree Installation."

Little information exists in a text book that assists artists on how to create an installation; however, everything artists have encountered in their lifetime filters into the creation of a project. For Harvey and Winters, art is their life, and life forms the background for the research needed to create their art. Their intent was to create a line in a real space similar to creating lines in a drawing. Harvey described it as a "learn by doing" experience. She said that about 70 percent of their time was spent trying to make it work and in the last two days everything finally fit together. In the book *Improvisation between Technique and Spontaneity,* the authors concluded that, "we are improvisers every day, without realizing it; most of the time we are unaware of the power of this generative process" (Santi, 2010, p.19). While this particular book referred to the art of jazz, the technique of improvisation can be applied to all of the arts.

According to Harvey, creating this installation involved using a substantial trial and error process until "something clicked." This type of research is often more demanding than the empirical research typically thought of. "You have to filter your ideas," said Harvey. Both Winters and Harvey had to experiment with various ways of twisting, folding, and tearing the fabric to make it look the way they envisioned.

Harvey stated that most of the time what you plan for does not happen and you have to move in the direction the art is going. Very similar to the writing process, you have to go through the motions of scrapping certain ideas and moving on from them. "A writer is only as good as the size of their wastebasket," said Harvey, "and it's the same with art."

The Artists and Collaboration

Both artists can be described as laid-back and down-to-earth in personality and who work well together. Harvey explained that as a team they compare and contrast ideas effortlessly and without conflict. Before this installation project, the two worked on a different project together, so it seemed natural for them to pair up. Harvey said that she hopes to work on future projects with Winters and had positive things to say about her partner.

In his book entitled, *Mastering the Art of Creative Collaboration*, Robert Hargrove writes, "Whether you are a scientist, elected official, business leader, or artist, being creative (or generative) means taking something that perhaps you believed would never come to pass, declaring it possible, and then working to make it a reality. 'Collaboration' implies doing something together, and that is exactly what it is. It is the desire or need to create or discover something new, while thinking and working with others that distinguishes the action" (Hargrove, 1998, p. 25).

Harvey is from the Queen Charlotte Islands and brings with her the ideal she grew up with: to enjoy nature. As someone with such a high level of respect for nature, one can understand why her art is focused around trees. She also recently completed an 8-by-4 foot painting of a forest pathway.

"I do not know whether it is possible to love the planet or not, but I do know that it is possible to love the places we can see, touch, smell and experience," wrote David Orr in *Earth in Mind*, which was a quote presented in *The Nature Principle* by Richard Louv (p.89). The "Tree Installation" is something that creates a new way to experience the campus.

According to Harvey, Winters also spent most of her childhood immersed in art and became interested in nature and the environment at an early age. Both students grew up with great families who supported their interests and encouraged them to pursue their goals. "Once you know what you want to do, you can't do anything else," said Harvey when asked why she chose to take the Fine Arts program at MacEwan. She describes her childhood as one where she was constantly creating art, which has influenced her current art as well as her future aspiration to teach art.

The Artists' Message

The biggest message Harvey hopes their art will communicate is, "Don't waste what you have and enjoy the beautiful earth we live on. Take art to a whole new level."

"It's nice to know that my fellow students are putting this together," said Harvey about being featured in *Earth Common Journal*. She went on to say that as undergraduate students, our ideas and voices about the three environmental topics of conservation, sustainability, and global warming count and need to be heard.

"It's us giving our feedback on what we think should be done and what we want to do about it."

---

*Author: *Courtney Rupertus is a recent graduate of Grant MacEwan University where she completed her Diploma in Professional Writing. She also sits on the Editorial Board for Earth Common Journal as the copy editor. Currently, she resides in Edmonton where she spends her time writing, reading, biking and hiking with her dog.*

References

Dillard, A. (1974). *Pilgrim at Tinker Creek* ([1st U.S. ed.). New York: Harper's Magazine Press.

Hargrove, R. A. (1998). *Mastering the art of creative collaboration*. New York: McGraw-Hill.

Louv, R. (2011). *The nature principle*. New York, N. Y.: Algonquin Books of Chapel Hill.

Reiss, J. H. (1999). *From margin to center: the spaces of installation art*. Cambridge, MA: MIT Press.

Santi, M. (2010). *Improvisation between technique and spontaneity*. Newcastle upon Tyne, UK: Cambridge Scholars Pub..

Earth Common Journal
Vol. 1, No. 1, September 2011

Conservation in Madagascar

Darren Joneson*
Grant MacEwan University, Canada

ABSTRACT

When most people hear the word Madagascar, images of animated dancing lemurs and quirky stranded penguins come to their minds. Although there is some truth in the movie's description of that far-away, mysterious place, it fails to paint a complete picture of Madagascar as being rich in biodiversity and culture. Few places on earth rival the variety of endemic plants and animals that are found there. It is estimated that Madagascar has more genetic diversity per unit area than anywhere else on earth (Karsten, et al., 2009). This makes it "one of the world's hottest hotspots for biodiversity conservation" (Consiglio, et al., 2006). Even though Madagascar is a biologically invaluable nation, it trails behind other ecologically notable countries, like Ecuador, in the conservation effort. Madagascar continues to suffer devastating loss to its precious habitats. The Madagascar government has the difficult task of preserving as much ecologically unique territory as it can, without depriving the already economically disadvantaged local people. Much international help is needed in providing support to the people and protection to the plants, animals, and natural resources of Madagascar.

Biodiversity and Threats

It is estimated that Madagascar has more genetic diversity per unit area than anywhere else on earth (Karsten, et al., 2009). This makes it "one of the world's hottest hotspots for biodiversity conservation" (Consiglio, et al., 2006).

Figure 1: Lemurs

Millions of years ago Madagascar was wedged in between Tanzania, India, and Antarctica as a part of Pangaea (Rickard, 1980). Continental drift has brought it to its current location in the Indian Ocean. During that period of time, this island has followed its own unique course of evolution which has resulted in tremendous endemic biodiversity (Benstead, et al., 2003). Some of the most popular of these species are the lemurs (Figure 1). Up until the 1980s, there were only six known species of lemurs on the island (Mittermeier, et al.). Now there are five families, and ninety-nine different species of lemur that have been recorded (Mittermeier, et al., 2008). That is one more primate family than exists in the entire continent of Africa, or the same amount of families as the Neotropics and Asia combined, all within an area 2-3% the size of those regions (Mittermeier, et al., 2008). Unfortunately, only about 10%, or about 50-60 thousand km^2, of the island is a suitable habitat for these lemurs and that habitat is shrinking quickly (Mittermeier, et al., 2008).

Lemurs are not the only ones threatened by habitat loss. There are 220 species of amphibians in Madagascar, 55 of which are listed as endangered or threatened. Many of these amphibians are exported by the pet trade or are losing their habitat to deforestation (Andreone, et al., 2005). A large number of them live in eastern littoral forests which, in and of themselves, are also ecologically invaluable. These forests hold 176 species of palm trees--172 of which grow nowhere else on earth (Aguiar, 1998).

The Madagascar terrestrial and freshwater ecosystems are in danger. Deforestation leads to erosion, which in turn leads to high levels of sediment poured into rivers and streams. This can affect the water chemistry and threaten fresh water vertebrates. Benstead, et al. (2003) stated that protecting Madagascar freshwater ecosystems is extremely important for three reasons. First, there is much more diversity in the country's freshwater species than previously expected. Second, many of these species are only located in isolated areas of specific streams or rivers. Therefore, contamination of these small areas could quickly lead to a complete loss of the species. Third, many of these species are "phylogenetically basal taxa (i.e. Those species forming the earliest diverging group in their clade.)" (p. 1102). These fish species could be valuable for filling gaps in the fossil or contemporary record. In addition to erosion, many of these fish species suffer from over fishing, as well as are affected by the introduction of foreign fish species for aquaculture (Benstead, et al., 2003).

Fishing is important for both the income and health of coastal Malagasy people. Fish have a symbiotic relationship with the coral reefs in which they help maintain the health of the various coral reefs and in return receive food and protection from them. Unfortunately, in coastal and freshwater regions, the fishermen tend to use non-specific nets to catch prey. This non-selective form of fishing is wasteful which results in a high diversity of species being caught in the nets, few of which are considered inedible by the Malagasy people. Paradoxically, these unsustainable fishing practices are economically helping some Malagasy families rise above the poverty line; however, this type of economic aid is diminishing due to dwindling fish stocks which subsequently will affect these families' incomes (Davies, Beanjara, & Tregenza, 2009).

Government Intervention and the National Environmental Action Plan (NEAP)

The government of Madagascar realizes the importance of the country's biodiversity and has taken steps to preserve some of its regions. The protected areas of the country are divided into three categories; complete natural reserves, national parks, and special reserves (Madagascar National Parks, 2010).

Complete natural reserves are known for their exceptional flora and fauna. The highest priority is given to preserving the pristine conditions of these areas. For this reason, tourists are not allowed to enter these areas (Madagascar National Parks, 2010).

Contrary to this approach, however, is that the national parks are also designed with tourists in mind, while still containing a wide array of plants and animals. In order to ensure that the parks are environmentally maintained, the national parks charge admission, and a guide is responsible for touring visitors throughout the area. Finally, there are the special reserves. These are designed and managed, as with all the other parks, with conservation as the primary goal. These parks are set aside because of the important species they contain, as well as their potential for future ecotourism (Madagascar National Parks, 2010).

Most reserves and parks are managed by the National Association of Protected Areas Management (ANGAP) while a few are overseen by the World Wildlife Fund (WWF). Through ANGAP and the Ministry of the Environment, Water, and Forests (MEWF) extensive effort has gone into planning for the protected areas of the country. As of 2008, there were 50 protected areas in Madagascar divided into parks and reserves approximating 3% of the country's surface area (Rabearivony, et al., 2010). The five main objectives of these organizations for the parks are conservation, research and

ecological monitoring, sustainable development, environmental education, and ecotourism (Ministère de l'Environnement, des Eaux et Forêts, 2003). In essence, ANGAP's main goal is to maximize the number of species they can protect in the minimum amount of land (Rabearivony, et al., 2010).

The major components of ANGAP's plan are outlined in the National Environment Action Plan (NEAP). The NEAP was implemented in three phases beginning in 1990. The major objectives of the first phase were to "reverse the downward spiral of environmental degradation, while promoting the sustainable use of natural resources and sustainable development" and to "create the necessary conditions to ensure that environmental considerations are fully integrated into all sectorial and macroeconomic programs within the country" (Ministère de l'Environnement, des Eaux et Forêts, 2003). In 1997, the second phase of the NEAP began. It consisted of four main components; direct specialized and operational components, transversal components, strategic components, and support components. The main objective for the direct specialized and operational components is to get local communities to take over natural resource management. Strategic components of NEAP are concerned with codes, legislation, and ensuring that international investment projects, like mines, are in environmentally acceptable areas. Finally, support components of NEAP focus on researching, training, and educating. In 2001, the third phase of the NEAP was implemented. It "has the overriding objective of ensuring the sustainability of environmental activities and their financial base" (Ministère de l'Environnement, des Eaux et Forêts, 2003).

Geography and Ecology

The NEAP is more than just objectives and phases, and the key to understanding its program is to understand the geography of the country.

The country of Madagascar is roughly the shape of your left foot; it spans 1000 km north-to-south, and 600 km east-to-west (Figure 2). It has six provinces and its ecology is separated into three main areas; the east coast and central highlands, the west coast, and the south. The central highlands contain the greatest number of inhabitants and are largely used for agriculture. Much of the land suffers from erosion because of the lack of vegetative cover due to

Figure 2: Island of Madagascar

deforestation. Bare red soil can be seen in most places, which is where the country gets its name as the red island. The east coast forests are rich in biodiversity but they are being deforested at an alarming rate. Leaves are used for the thatching on roofs, and wood is used for construction. However, the most prominent devastation to the forests derives from the slash and burn practices that gather charcoal for fuel. Western Madagascar contains a wide variety of natural wonders including Tsingy National Park, which is a maze of razor sharp limestone spires, and the majestic Baobab trees. Southern Madagascar is the driest part of the country; one of its more interesting landscapes are the spiny forests (Ministère de l'Environnement, des Eaux et Forêts, 2003).

The NEAP has broken with the traditional geographical zoning of Madagascar, and instead has opted for protected land to fall under one of seven eco-regions; Northern highlands, Eastern, Center, High Mountains, Western, Southern, and Unique Isolated or Transitional Habitats (Ministère de l'Environnement, des Eaux et Forêts, 2003). Some of these eco-regions, their biodiversity, and the threats they face are discussed in more detail below.

The northern highlands are probably the most preserved area of Madagascar. This is due to the ruggedness of the terrain and the difficulty in accessing the area. In spite of this, only a little less than 40% of the area in the region contains its natural flora and fauna. About 20% of that area is within a protected zone. This area is rich in endemic arthropod, amphibian, reptile, and rodent species, and uniquely (for Madagascar), it does not contain any lemurs. Currently, the country sees no need for new parks in this area, only the possibility of expanding the area of its current parks (Ministère de l'Environnement, des Eaux et Forêts, 2003).

The eastern eco-region is in greater difficulty than the northern highlands. The eastern eco-region has a variety of different forests, but the most notable are its littoral forests. Littoral forests are unique in the fact that they can grow on sand and they have a great degree of plant biodiversity. The littoral forests of eastern Madagascar contain 13% of Madagascar's plant species in less than 1% of its land area. Today, less than 50,000 hectares remain (Cosiglio, et al., 2006). In addition to the littoral forest, other forests of the east gradually transform from the central seasonal forests to the coastal humid forests (Ministère de l'Environnement, des Eaux et Forêts, 2003). This transformation is also evident in the architecture of the villages as you travel west-to-east. The huts slowly transform from brick, to brick and wood, and finally to completely wooden structures. Unfortunately, these forests are severely threatened by the very inhabitants of these huts. Consiglio, et al. (2006) note that there is "considerable pressure from local inhabitants in coastal villages for fuel, wood, and construction materials" (p. 1800). The villagers may

be harming themselves in the long term, given that the eastern forests are also a protection from the seasonal cyclones that frequent Madagascar (Consiglio, et al., 2006).

The forests of the east are not the only areas affected by deforestation. This region is one of the most species-rich areas of Madagascar (Ministère de l'Environnement, des Eaux et Forêts, 2003). There is a great need for more protected land in this region. Approximately 30% of the natural habitat in the area remains, and of that land, only 20% is protected. Ideally, all of the remaining area should be protected, but due to the needs of the local residents, a system of prioritization needs to occur (Ministère de l'Environnement, des Eaux et Forêts, 2003).

Further inland, the effects of human development has been devastating. Human activity in the center eco-region has reduced the natural habitat to only 5.5% of what it originally was, and less than 20% of that small amount of land is currently protected. Fires, cattle grazing, and illegal timber extraction continue to threaten this region (Ministère de l'Environnement, des Eaux et Forêts, 2003). Unfortunately, this is not the only region affected by fire and human practices.

The western eco-region is one of the driest regions and is commonly affected by slash and burn agriculture. The western region is so diverse that it could probably be divided into even smaller eco-regions, each completely distinct from the next. Five major types of soil are found there, which influences the flora and fauna that can grow in each area (Ministère de l'Environnement, des Eaux et Forêts, 2003). This area is extremely rich with endemic biodiversity. Yet Rabearivony, et al. (2010) pointed out that more effort is going into preserving the eastern rain forests and little is being done to preserve areas in the west. Currently, only 13% of the area's original vegetation remains, and as with other regions, approximately 20% of that is protected (Ministère de l'Environnement, des Eaux et Forêts, 2003). More positively, however, Rabearivony, et al. (2010) have proposed three new areas for conservation. These areas include forests, wetlands, freshwater lakes, rivers, and grasslands. In these areas, 334 species were observed, 243 of which are endemic to Madagascar. Within these endemic species are included; "44 reptiles, 54 amphibians, 104 birds, 23 small mammals, 17 lemurs, and one fish. Of these 243 species, 30 are considered endangered" (p. 35). One of the most notable endangered species is the Madagascar fish eagle, of which only 40 breeding pairs are left in the wild (Rabearivony, et al., 2010).

It is clear that Madagascar has significant conservation work to accomplish before it has achieved its goals. In 2003, the government of Madagascar committed to more than triple the area of the country's protected regions (Madagascar National Parks, 2010).

However, what is more important to note is that the government of Madagascar is not alone in achieving its goal. Many private organizations such as the WWF, the Madagascar Fauna Group, and Operation Wallacea all contribute to the conservation efforts in Madagascar. Some obtain government funding. Yet, even with progression in conservation efforts, rates of deforestation have increased every year since 2000 (Rabearivony, et al., 2010).

Opposition and Culture

It is easy to judge the majority of the people in Madagascar for their lack of conservation ethic, but it should be remembered that Madagascar is a place of poverty. Almost 70% of the people in Madagascar live on less than $1.25 a day. Including the wealthy, the average income in Madagascar is $410 in a year (UNICEF). This poor standard of living is what has led to an overall lack of foresight in the country. This has led to practices of deforestation, over fishing, and illegal animal trading as a meagre source of income for many impoverished villagers.

Although it would be beneficial to biodiversity for the government of Madagascar to expand the current protected area in the country, the potential unfavourable effects on the local inhabitants must also be considered. Many tribes and villages only escape starvation and destituteness because of their reliance on the land. In these locations, little emphasis is placed on material wealth. Instead, the people have great joy in their families and posterity (Keller, 2008). They rely on the land to support their families and when that land is taken away, they are no longer able to support large families. Keller (2008) argues that some of the rural locals feel defeated when their land is turned into a national park. The government is aware of the opposition from some villages and is encouraging rural villages to help in the preservation and maintenance of parks by providing funding to schools and other needs of the people (Madagascar National Parks, 2010). Recent political instability and corruption, however, has affected Madagascar's tourism industry, which in turn limits the amount of conservation practices and strategies that the government can implement and accomplish.

Conclusion

Urgent international intervention is needed in helping with conservation efforts in Madagascar. The country has reasonable short term and long term goals for preserving

its significant biodiversity. The people of Madagascar have tremendous potential for educating the world about their natural wonders. This can be achieved by working collaboratively with conservation experts, and by participating in maintaining their region's parks through local jobs, creating a level of financial stability within their villages. By establishing partnerships with various organizations, Madagascar's biodiverse eco-regions can be better protected, which can then enable conservationists and researchers to increase their knowledge about the significant species that exist in these regions.

---

*Author: *Darren Joneson is a student at Grant MacEwan University.*

References

Aguiar, J. (1998). Evanescent diversity--the palms of Madagascar. *Bioscience, 48(7)*, pp. 499-503.

Andreone, F., Cadle, J., Cox, N., Glaw, F., Nussbaum, R., Raxworthy, C.,... Vences, M. (2005). Species review of amphibian extinction risks in Madagascar: Conclusions from the global amphibian assessment. *Conservation Biology, 19(6)*, pp. 1790-1802. doi:10.1111/j.1523-1739.2005.00249.x.

Benstead, J., De Rham, P., Gattoliat, J., Sartori, M., Gibon, F., Loiselle, P.,...Stiassny, M. (2003). Conserving Madagascar's freshwater biodiversity. *Bioscience, 53(11)*, 1101-1111.

Consiglio, T., Schatz, G., McPherson, G., Lowry II, P., Rabenantoandro, J., Rogers, Z.,... Rabehevitra, D. (2006). Deforestation and plant diversity of Madagascar's littoral forests. *Conservation Biology, 20(6)*, 1799-1803. doi:10.1111/j.1523-1739.2006. 00562.x.

Karsten, K., Andrianmandimbiarisoa, L., Fox, S., & Raxworthy, C. (2009). Population densities and conservation assessments for three species of chameleons in Toliara region of south-western Madagascar. *Amphibia-Reptilia, 30(3)*, 341-350. doi:10.1163/156853809788795254.

Keller, E. (2008). The banana plant and the moon: Conservation and the Malagasy ethos of life in Masoala, Madagascar. *American Ethnologist, 35(4)*, pp. 650-664. doi:10.111/j.1548-1425.2008.00103.x.

Madagascar Fauna Group (2010). Retrieved September 16, 2010, from http://www.savethelemur.org

Madagascar National Parks (2010). The conservation. Retrieved September 9, 2010, from http://www.parcs-madagascar.com/madagascar-national-parks_en.php?Navigation=26

Ministère de l'Environnement, des Eaux et Forêts (2003). *Madagascar protected area system management plan.* Retrieved September 2010, from http://www.parcs-madagascar.com/madagascar-national-parks_en.php?Navigation=26

Mittermeier, R., Ganzhorn, J., Konstant, W., Glander, K., Tattersall, I., Groves. C.,... Rasoloarison, R. (2008). Lemur diversity in Madagascar. *International Journal of Primatology, 29(6),* 1607-1656. doi: 10.1007/s10764-008-9317-y.

Rabearivony, J., Thorstrom, R., de Roland, L., Rakotondratsima, M., Andriamalala, T., Sam, T.,... Rakotoson, M. (2010). Protected area surface extension in Madagascar: Do endemism and threatened species remain useful criteria for site selection?. *Madagascar Conservation & Development, 5(1)*, pp. 35-47.

Rickard, M. (1980). A new continental assembly for Pangea. *Tectonophysics, 63(1-4),* pp. 1-12.

UNICEF (2008). Economic indicators. Retrieved September 15, 2010, from http://www.unicef.org/infocountry/madagascar_statistics.html

Earth Common Journal
Vol. 1, No. 1, September 2011

Nuclear Concern

Adriianne Foss*
Grant MacEwan University, Canada

ABSTRACT

Finding an alternative energy source to fossil fuels is becoming increasingly important. This has led many countries to question whether nuclear power, touted as an environmentally friendly source of energy, is the answer. A look at the environmental effects attached to this source of energy—the risk of radiation exposure for communities adjacent to nuclear plants, and nuclear power's volatile history—coupled with current events provides countries with reason to seriously doubt the safety and sustainability of this energy source. Nuclear plants do immediate damage to the system in which they are built, and that is not the end of their effects. Continuous release of radiological material into the surrounding area that threatens the ecology and nearby communities, the creation of waste, for which there is currently no solution, and a threat of radioactive materials falling into the hands of terrorist activists also weigh heavily against the sustainability of this energy source. The history of the nuclear industry makes it undeniable that more nuclear disasters are inevitable. Every community is vulnerable, whether a nuclear disaster is caused by nature's wrath, as in Japan, or by human or technological error, as in many previous nuclear accidents, including Chernobyl. The countries of the world have a weighty decision to make about whether nuclear energy is the answer.

Nuclear energy is touted as a clean, efficient, and inexpensive source of energy, but is it safe? Recently, the world watched as a nuclear catastrophe unfolded in Japan. The long term effects of this ongoing tragedy are unknown as of yet, but "government officials warned Friday that there were no plans to lift the evacuation order anytime soon" (Alibaster & Yamaguchi, 2011, para. 13). With such potential for catastrophe, it is

important to consider the facts about nuclear power before adopting it entirely to fuel our lifestyles and our economies. The negative consequences greatly outweigh the benefits, and considering nuclear power's history, additional disasters seem inevitable.

Paschoa (2004) recognizes that nuclear energy, the energy released from the nucleus of an atom through sustained fission, has been tamed since its use during World War II in the development of military weapons (p. 4, para. 2). Since then, nuclear energy has been "used commercially . . . to meet a fraction of the electrical energy needs" (El-Hinnawi, 1976, para. 1). It is considered a green energy source.

Negative environmental effects contradict this. Paschoa (2004) notes a nuclear plant begins disturbing the environment at inception. Trees are cleared, land is excavated, and new roads are built, demolishing animal food sources and natural habitats. Large man-made lakes replace natural rivers, in the case of a hydroelectric plant (p. 6). Furthermore, nuclear reactors routinely release radioactive material into the air and nearby water sources during normal operation (Caldicott, 2006, p.48). In previous "examinations of the impact of energy on the environment, it has become apparent that individual nations are not isolated . . . the actions of one country may well result in environmental damage in a neighbouring State" (El-Hinnawi, 1976, para. 4). This is evident as western North America is exposed to effects of a crisis an ocean away. "The Environmental Protection Agency and the Food and Drug Administration in the U.S. state that very low levels of radiation have been detected in a sample of milk from Washington" (Ramu, 2011, para. 1). Advocates of nuclear energy argue that it expels less carbon dioxide, a heavy pollutant, into the atmosphere in comparison to fossil fuels. According to the World Nuclear Association (WNA), in 2011 "Nuclear power reactors operating in 32 countries . . . provide fourteen percent of the global electricity" (para. 2). Dutch researchers "found that nuclear power plants that use high-grade ore . . . emit about 40 percent of the greenhouse gas emissions of a natural gas power plant, from ore refining and plant construction" (Hunt & Krieger, 2006, para. 6). Andseta, et al. (1998) noted in their research that greenhouse gas emissions from nuclear plants rise as more fossil energy is needed to refine lower quality ore (Review, para. 2).

Nuclear power is not the only alternative to fossil fuels. Many power companies are beginning to adopt green energy sources that do not have the same risks as those associated with nuclear power. One such source is tidal power, which is "as reliable as the orbit of the moon" (Blue Energy, 2009, para. 1) according to Blue Energy, a company committed to finding alternate energy. Solar energy is used successfully around the world including Israel, which, according to Sandler (2008), relies increasingly on alternate energy (para. 1). Another division of solar power is wind; developed "through

highs and lows in temperature" (Alternate Energy Source, 2010, para. 1). National Geographic (2011) reports that "Industry experts predict . . . by 2050 the answer to one third of the world's electricity needs will be found blowing in the wind" (para. 8). These alternatives have substantially lower risks and use environmentally sustainable practices.

Creation of nuclear energy generates waste. Waste, for which there is no permanent solution. Professor Eric J. Hall posited that "life on earth has evolved amid the constant exposure to naturally occurring radiations from beyond earth [cosmic radiation] and from radioactive material within the earth's crust" (quoted in WNA, 2011, para. 1). This attitude leads some to believe permanent disposal for nuclear material presents no inconvenience. Nonetheless, nuclear waste is a growing problem that continues to plague countries like Canada. A primary source of nuclear waste is reactors. Nuclear SA (2002) lists other sources as the "mining and processing of uranium, nuclear weapons . . . and nuclear power stations" (para. 2). The waste produced is radioactive for millennia.

"According to Environment Canada, true walk away disposal methods are unlikely to be possible given the long time periods . . . longer-lived radio nuclides would have to be isolated from the soil, air, and water" (Boyd, 2001, "Waste", para. 3). An article by Kemp (2009) reports that about two million used fuel bundles remain from Canada's forty-year history with nuclear creation ("Fuel Bundles Handled"). "After use in a nuclear power plant the bundles contain radioactive material . . . which can damage human tissue and cause cancer" (Kemp, 2009, "Enviro. Concern," para. 3). Considering the menacing potential of radiation on health, a community willing to host waste storage has yet to be found. With no permanent solution, nuclear waste concerns will never be resolved. "There are two million high-level radioactive fuel bundles sitting at temporary storage sites in Canada, as the Nuclear Waste Management Organization wrestles with the mandate of finding a community to host a central storage facility for the waste for perhaps tens of thousands of years" (Kemp, 2009, para. 1). An additional concern, which has amplified in recent years, is the potential for stored radioactive material to be accessed by terrorist activists.

Nuclear waste storage is one of several community concerns tied to nuclear energy. Nuclear plants such as the one proposed in Peace River, Alberta, put those communities at potential risk to befall the fate of people in Japan. Advocates, such as Tom Kauffman, senior media relations manager for the Nuclear Energy Institute in Washington, D.C, argue a Chernobyl-type disaster is not possible (Staedter, 2010, para. 7). While many nuclear reactors are now self-limiting, which Chernobyl's reactor was not; this does not guarantee a great discharge of radiological substance into the environment will not happen.

All populations hosting nuclear plants are vulnerable to the devastation of a nuclear tragedy. All populations are defenceless against nature's wrath. All populations are susceptible to human and technological error. Alberta is not prone to violent earthquakes, nor to tsunamis; the cause of Japan's accident. Nevertheless, Alberta is susceptible to tornados. The families of people lost to the tornado on Black Friday, 1987, can attest to nature's destructive power.

Yet, nature is not the greatest vulnerability of nuclear power plants. Technological failure and human miscalculation pose far greater risks. Since 1952, thirty-three incidents have been identified at nuclear power plants (Rogers, para. 4). One such accident includes the Three Mile Island Nuclear Generating Station, in Pennsylvania, U.S. where according to WNA (2010), in 1976, the plant experienced a system failure, not immediately recognized by plant officials, that caused the reactor core to melt (para. 3). Although the incident at Three Mile Island is not rated as one of the most severe accidents, Helen Caldicott, an expert on radiation, notes that it took eleven years to clean up. The reactor building remains highly radioactive to date (p. 74). The International Chernobyl Radiation Portal acknowledges that, "on 26 April 1986, the most serious incident in the history of the nuclear industry occurred at Unit 4 of the Chernobyl nuclear power plant in the former Ukrainian Republic of the Soviet Union" ("Pfc: Chnbl Acdnt," para. 1). According to the IAEA the radiation levels released were 400 times that of the atomic bomb dropped on Hiroshima (para. 12). The 30 kilometre "exclusion zone" surrounding the plant, still effectively uninhabited (IAEA, para. 6), serves as a sobering reminder of the destructive power of nuclear energy when control slips out of human hands. As the reactor's concrete tomb begins to deteriorate, humans are not likely to forget any time soon.

Currently the Japanese public is struggling to return to normal life amid radiation concerns, report Alibaster and Yamaguchi (2011). Thousands are without power or running water, and 165,000 are living in shelters (para. 15). Nuclear power is a means to an end. Across the globe people have an obligation to weigh those means; disruption to the eco-system, accumulation of toxic waste, and radiation risk. They then have to decide what they are willing to lose to achieve that end. Before making that decision, it is important to consider that, in an instant, clean and efficient power could alter people's lives forever.

**Author*: *Adriianne Foss is currently a first year student in the Bachelor of Applied Communications in Professional Writing program at Grant MacEwan University. She has a passion for environmental issues, and it is from this passion that she finds inspiration.*

References

Alabaster, J. & Yamaguchi M. (2011). Japanese prime minister visits tsunami-hit villages. *The Globe and Mail*. Retrieved (March 17, 2011), from http://m.theglobeandmail.com/news/world/asia-pacific/japanese-prime-minister-visits-tsunami-hit-villages/article1967392/?service=mobile

Alternate Energy Sources. (2011). 30 Facts about solar energy. Retrieved (March 17, 2011), from http://www.alternate-energy-sources.com/facts-about-solar-energy.html

Andseta, S., Thompson, M. J., Jarell, J. P., & Pendergast, D. R. (1998). *Candu Reactors and Greenhouse Gas Emissions*. Retrieved (March 19, 2011), from: Computare Thinking About Climate Change http://www.computare.org/Support%20documents/Publications/Life%20Cycle.htm

Blue Energy. (2009). *Tidal Power*. Retrieved (March 18, 2011), from http://www.bluenergy.com/TidalPower.htm

Boyd, D. R. (2001). Canada vs. the OECD: An environmental comparison. Retrieved (March 19, 2011), from http://environmentalindicators.com/htdocs/indicators/13nucl.htm

IAEA.(n.d.). Frequently asked Chernobyl questions. Retrieved (June 20, 2011), from http://www.iaea.org/newscenter/features/chernobyl-15/cherno-faq.shtml

Caldicott, H. (2006). Nuclear Power, Radiation, and Disease. *Nuclear Power is not the Answer*. New York: The New York Press.

El-Hinnawi, E.E. (1976). Review of the environmental impact of nuclear energy. *International Atomic Energy Agency Bulletin,* 20(2), 32-42. Retrieved (March 18, 2011), from http://www.iaea.org/Publications/Magazines/Bulletin/Bull202/20205083242.pdf

Hunt, T. & Krieger, D. (2006). *Does Nuclear Power Really Make Sense.* Nuclear Age Peace Foundation. Retrieved (March 19, 2011), from http://www.wagingpeace.org/articles/2006/04/00_krieger_hunt_nuclear-power-sense.htm

Kemp, B. (2009). Storing nuclear waste a $24-billion problem. *CBC News Canada.* Retrieved (March 17, 2011), from http://www.cbc.ca/news/canada/story/2009/08/18/f-nuclear-waste-storage.html

International Chernobyl Radiation Portal of the ICRIN project (2010). *History of Chernobyl Disaster.* Retrieved (June 19, 2011), from http://chernobyl.info/Default.aspx?tabid=274

National Geographic. (2011). *Wind Power.* Retrieved (June 19, 2011), from http://environment.nationalgeographic.com/environment/global-warming/wind-power-profile/

NuclearSA. (2002). *Nuclear Waste: Sources and Types.* Retrieved (June 20, 2011), from http://www.ccsa.asn.au/nuclearsa/index.html

Paschoa, A.S., (2004). Environmental effects of nuclear power generation. Interactions: Energy/Environment. *Encyclopaedia of Life Support Systems.* [eolss.net] Retrieved (March 18, 2011), from http://www.eolss.net/ebooks/Sample%20Chapters/C09/E4-23-03-03.pdf

Ramu. P. (2011). Radiation detected in Washington milk. CBC News Canada. Retrieved (June 19, 2011), from http://www.cbc.ca/news/canada/british-columbia/story/2011/03/30/bc-radiation-milk-washington-state.html

Rogers, S. (2011). Nuclear power plants: Listed and ranked since 1952. *Guardian.co.uk.* Retrieved (June 20, 2011) from http://www.guardian.co.uk/news/datablog/2011/mar/14/nuclear-power-plant-accidents-list-rank

Sandler, N. (2008). At the zenith of solar energy. *Bloomberg Business Week*. Retrieved (March 19, 2011), from http://www.businessweek.com/globalbiz/content/mar2008/gb20080326_485582.htm

Staedter, T. (2010). Is nuclear energy safe? *Discovery News*. Retrieved (March 17, 2011), from http://news.discovery.com/tech/is-nuclear-energy-safe.html

World Nuclear Association. (2011). *Radiation and Life*. Retrieved (March 19, 2011), from htt p://www.world-nuclear.org/education/ral.htm

World Nuclear Association. (2011). *Nuclear Power in the World Today*. Retrieved (March 18, 2011), from http://www.world-nuclear.org/info/inf01.html

World Nuclear Association. (2011). Three mile island accident. Retrieved (June 19, 2011), from http://www.world-nuclear.org/info/inf36.html

Earth Common Journal
Vol. 1, No. 1, September 2011

Rachel Carson: The Inspiration of a New Generation

Dawn Doell*
Grant MacEwan University, Canada

ABSTRACT

It is rare for the intrinsic power of distilled prose to span across generations, shaping politics, policy, and perception. Blending conservation ethics, meticulous research and political knowledge into an easily readable prose, Rachel Louise Carson left a legacy through the written word. Criticized for being a single woman in a male-centric field, she established her individuality, her free spirit, and her amazing dedication to her ethics. Carson's contribution to science lies within her meticulous attention to scientific detail and her ability to communicate complex scientific theories to the general public. Carson portrayed peremptory evidence of the devastating effects of synthetic chemicals and nuclear testing, while simultaneously communicating the role of ecology and environmental change to the general public. Carson challenged agricultural scientists, chemical companies, and the government for their misuse of chemical agents, and their misguided notions of trying to dominate nature. Technology and scientific testing was severely limited and yet Carson was able to draw sound scientific proof of the devastating lasting effects of the human-made chemicals she dubbed "elixirs of death." Rachel Carson left a legacy through her chosen medium, the written word; inspiring generations of scientific writers to distill complex scientific processes into creative prose to inspire the general public to consider their own role within the environment.

Rachel Carson (1907 – 1964)
(Permission: U.S. Fish and Wildlife Service)

"Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts."
~ Rachel Carson, Silent Spring

An Impressionable Beginning

It is rare for the intrinsic power of distilled prose to span across generations, shaping politics, policy, and perception. Blending conservation ethics, meticulous research and political knowledge into an easily readable prose, Rachel Carson left a legacy through the written word. Her passion for the natural world is a continuing catalyst for change. The "Mother of the Modern Environmental Movement," Carson showed that DDT (Dichloro-diphenyl-trichloro-ethane) and other toxic chemicals persisted in the environment, in the tissues of birds, and even in mother's milk. Even with the aggressive backlash from the agricultural chemical industry, Carson portrayed peremptory evidence of the devastating effects of synthetic chemicals and nuclear testing, while simultaneously communicating the role of ecology and environmental change to the general public. Criticized for being a single woman in a male-centric field, she established her individuality, her free spirit, and her amazing dedication to her ethics.

Rachel Louise Carson was born on May 27, 1907 in the rural town of Springdale Pennsylvania, U.S. Her mother instilled in her a love of nature that led to a voracious appetite for knowledge. At the impressionable age of 11, she portrayed her penetrating observations of the wild world, inevitably leading to a career pursuing writing and science. Within the esteemed pages of the children's literary magazine *St. Nicholas*, Carson joined the published company of F. Scott Fitzgerald, E. E. Cummings, and E. B. White (Lear, 1998, p. 12). Between 1925 and 1932, Carson studied science at the Private

Pennsylvania College for Women, supported at great financial sacrifice to her family, and further funded by scholarships (Corcoran, 2001, p. 200). She later earned her master's degree in Zoology from the Johns Hopkins University. The Great Depression from 1929-1939 thwarted her hopes of earning a doctorate, being forced to assume the role of head of the household.

Purposeful Writings

Eventually becoming the editor-in-chief of all publications for the U.S. Bureau of Fisheries, Carson supplemented her meager income through writing. While working as editor-in-chief, she wrote pamphlets on conservation of natural resources, scripted radio segments about fish ecology, edited scientific articles, and in her sparse free time, crafted her meticulous research into readable prose that later became the backbone of her published works. Feature newspaper articles produced during this time would have been lost to new generations if not pulled from the archives by her biographer Linda Lear; portraying "Carson's already broad interest in the conservation of resources, her special interest in wildlife, her concern with the impact of human exploitation on wildlife habitats, and her fascination with the intricate processes of nature" (Lear, 1998, p. 15). While her most famous literary contributions span only four published books, the bulk of her writing has been pulled from the archives; Lear compiled Carson's writing into collections and even scanned documents as visual relics of a world governed solely by paper. The scanned documents, easily accessible through internet searches, feature the scrawls of highlighters, penciled notes in margins, and photocopier marks.

While working for the U.S. Bureau of Fisheries, ample research passed across her desk that further supplemented her perseverance to inform the public of nature's "hidden processes" (Lear, 1998, p. 24). *Under the Sea-wind* (1941) began as a feature article which offered her experience writing readable science for the public. In 1946, Carson proposed a model for developing *Conservation in Action* booklets for the U.S. Bureau of Fisheries. The research required for these booklets offered her the first and most extensive travel opportunities to observe habitat and behaviour of wild animals. The now outdated *Conservation in Action* booklets are still considered a classic among government publications and still available for reading. Carson's first three books encompassed a biography of the ocean, launching her face into the public as a naturalist and science writer. In 1952, *The Sea Around Us* became a prize-winning study of oceanography, and stayed at the top of the New York Times best seller list for an astonishing 86 weeks. The small fortune brought about by international fame allowed

her to resign from the government and pursue writing. Leaving a legacy of the ecological importance of conservation, *The Edge of the Sea* (1955), *Help Your Child to Wonder* (1956), and *Our Ever-Changing Shore* (1957) communicated Carson's themes of "the timelessness of the earth, the constancy of its processes, and the mystery of life" (Lear, 1998, p. 51). In 1958, Carson received a letter from a friend in Massachusetts who noted that aerial mosquito spraying was killing birds and other animals on his private wildlife sanctuary. Carson found her first pieces of tangible evidence that pesticide use was harming non-target species; her introductory papers were rejected by a multitude of magazines, so Carson decided to compile her findings into a book (Quaratiello, 2004).

No longer constrained by the restrictions of government bureaucracy, her ethical and political views began to resonate through her writing. Carson prepared a speech on the sea which left her in demand as a female public speaker well-versed in scientific knowledge. Carson was quoted to say "people often seem surprised that a woman should have written a book about the sea... even if they accept my sex, some people are further surprised to find that I am not a tall, oversized Amazon-type female. I can offer no defense for not being what people expect" (Lear, 1998, p. 77). Normally a soft-spoken woman, Carson grew more confident in the public spotlight by concentrating her efforts on the major themes expressed in her writing and allowing her confidence to extend into other critical topics plaguing her ethical views on the human-centric dominance over the world. Pesticides such as DDT were no longer effective as insects developed immunities to human-made poisons. However, their bioaccumulations up the food chain were killing other animals, such as the Bald Eagle and other predatory birds (Quaratiello, 2004). The prolific use of synthetic chemical pesticides after World War II eventually altered her focus; her commitment to communicating her knowledge to the general public drove her to compile her most controversial piece of writing yet, *Silent Spring* (1962).

An Unwavering Mission

"Only within the moment of time represented by the present century has one species -- man -- acquired significant power to alter the nature of his world."
~Rachel Carson, Silent Spring

Carson's timeless classic resonates the vivid imagery of humanity's naive dominance over the intimate connection of air, water, soil, and living organisms. It took Carson nearly five years to gather the scientific evidence and distill her findings within the

lengthy pages of *Silent Spring* (Lear, 1998, p. 187). Carson begins this literary genius by evoking a disturbing fable of a spring without the sound of wildlife, devastated by the overuse of synthetic chemicals: "on the mornings that had once throbbed with the dawn chorus of robins, catbirds, doves, wrens, and scores of other bird voices there was now no sound; only silence lay over the fields and woods and marsh" (Carson, 1962, p. 2). While literary critics praised the brilliant rhetoric as a creative way to introduce the disturbing subject of the effects of synthetic chemicals, many scientists were outraged that Carson used an allegory to introduce environmental pollution (Lear, 1998, p. 197). Carson used the fable and incorporated detailed illustrations as an agent to entice nonscientific readers. E.B. White, who was published alongside Carson when they were children, provided the overall opening message of the *Silent Spring*, "Our approach to nature is to beat it into submission. We would stand a better chance of survival if we accommodated ourselves to this planet and viewed it appreciatively instead of skeptically and dictatorially."

Carson challenged agricultural scientists, chemical companies, and the government for their misuse of chemical agents, and their misguided notions of trying to dominate nature. Technology and scientific testing was severely limited and yet Carson was able to draw sound scientific proof of the devastating lasting effects of human-made chemicals she dubbed "elixirs of death":

> These sprays, dusts, and aerosols are now applied almost universally to farms, gardens, forests, and homes - nonselective chemicals that have the power to kill every insect, the "good" and the "bad," to still the song of birds and the leaping of fish in the streams, to coat the leaves with a deadly film, and to linger on in soil-all this though the intended target may be only a few weeds or insects. Can anyone believe it is possible to lay down such a barrage of poisons on the surface of the earth without making it unfit for all life? They should not be called 'insecticides,' but 'biocides.' (Carson, 1962, p. 7)

Carson argued that chemical companies possess too much economic interest and cannot be trusted to govern their own actions. She claimed that the intended use of chemical agents have not successfully controlled unwanted species. The unexpected by-products of chemical application resulted in rapid declines of top predators such as Bald Eagles. Through public speaking and further writing, she "attacked the integrity of the science establishment, its moral leadership, and its direction of society. She exposed their self-interest as well as their poor science, and defended the public's right to know the

truth" (Lear, 1998, p. 187). In 1963, she publicly addressed the U.S. Senate on two occasions, calling for regulated policy to protect human health and protect the environment. Carson challenged the irresponsible and merciless application of pesticides, herbicides and other chemical agents, and included a final warning against dumping the "poisonous garbage of the atomic age" into our seas (Lear, 1998, p. 228).

The devastating effects of DDT earned Paul H. Müller a Nobel Prize in chemistry. In his speech to the Nobel prize committee, Müller praised the efficacy of DDT, stating "the toxic action of DDT is so strong that some of the scientists who first used it, ruined important experiments because they failed to clean their insect cages before using them again, and the small amounts of DDT remaining were sufficient to kill the new insects introduced" (Müller, 1948, p. 228). Carson's apt descriptions of the side effects of chemical applications were seen in the public's backyards. News reports featured convulsing and dying song birds; these birds had ingested earth worms that had consumed fallen leaves sprayed with DDT. Carson reported continuing accumulation effects of toxic substances on annihilated rabbits, muskrats, and squirrels, further gleaning her research from other scientists and former government colleagues (Lipske, 2000).

Personal attacks on Carson escalated after the publication of *Silent Spring*; she handled her critics with grace and poise, used compelling arguments, sound scientific literature, and unexpected political insight. When critics were unable to destroy the credibility of her research, critics claimed she was a Nazi, verbally bashed her for being a single, unwed woman, and attempted to discredit her science on the basis that she was "just a hysterical woman" (Quaratiello, 2004). Carson warned the general public of "the rapidity of change and the speed with new situations are created follow the impetuous and heedless pace of man rather than the deliberate pace of nature" (Carson 1962, p. 7). While fighting the onslaught of personal attacks and criticisms, she was also fighting her mortality. Her passion to defend nature was further propagated when she was diagnosed with an aggressively metastasizing breast cancer. In her last year of life, Carson brought new information to the public with each speaking engagement, further communicating to the public her moral conviction that "no civilization can wage relentless war on life without destroying itself, and without losing the right to be called civilized" (Lear, 1998, p. 211). Carson concludes *Silent Spring* with a plea for public education, involvement, and responsibility (Carson, 1962, p. 297)

"There would be no peace for me if I kept silent." ~ Personal letter to a friend.

Rachel Carson's contribution to science lies within her meticulous attention to scientific detail and her ability to communicate complex scientific theories to the general public (Dodds, 2002, p. 270). Dodds goes on to describe the popular response to *Silent Spring* along with the incurring backlash from chemical companies, evoking a focal point over the debate of synthesized chemical use; through Carson's writings, she exposed the financial and professional stake of chemical companies and entomologists in maintaining indiscriminate synthetic chemical use. In her last public appearances, she urged the public to demand policy change, encouraging the public to address the disinformation provided by agricultural pesticide companies and the government. Carson established herself as a political infighter with compelling scientific proof, while simultaneously directing her overall message to concerned individuals to take on her crusade after her death (Quaratiello, 2004). Rachel Louise Carson died in 1964 at the age of 56.

An Indelible and Enduring Legacy

The public interest surrounding *Silent Spring* engaged President John F. Kennedy to assemble a special panel of the President's Science Advisory Committee. The panel introduced legislation in several states seeking the immediate halt of pesticide spraying without notification of the public. President Kennedy called for testing of the chemical compounds Carson described. Legislations produced uproars against the agricultural chemical industries that were exposed as using "disinformation tactics" to promote synthesized chemicals as miracles (Lear, 1998, p. 201). While gathering research regarding the cause of population declines, California Brown Pelicans provided a current, tangible piece of recurring science that is afforded to Carson's battle cry. DDT accumulation alters calcium metabolism of eggshells, and the eggs are easily destroyed by normal nest activity (Lipske, 2000). Lipske goes on to suggest that populations of Pelicans were crashing as *Silent Spring* was published in 1962, being listed as endangered in 1970; Carson's findings eventually led to a ban on the use of DDT by 1972. By 1985, Atlantic Coast Pelicans were removed from the list, and Gulf Coast populations are being considered for delisting.

"Like the resource it seeks to protect, wildlife conservation must be dynamic, changing as conditions change, seeking always to become more effective."
~ Rachel Carson, Silent Spring

The "Mother of the Modern Environmental Movement," Carson inspired generations, her efforts eventually led to the Clean Air and Clean Water Acts, and the creation of the Environmental Protection Agency (Quaratiello, 2004). The Environmental Protection Agency history site states: "*Silent Spring* prompted the Federal Government to take action against water and air pollution — as well as against the misuse of pesticides — several years before it otherwise might have moved" (Graham, 1978). Carson was awarded the Presidential Medal of Freedom in 1980, the highest civilian honour in the United States (Quaratiello, 2004). The Silent Spring Institute was founded in 1994, "building on a unique partnership of scientists, physicians, public health advocates, and community activists to identify and break the links between the environment and women's health, especially breast cancer." Time Magazine awarded Carson as one of 100 most influential people of the 20th Century. Audubon's Rachel Carson Award honours female leaders within the environmental world. Recognizing women whose "immense talent, expertise, and energy greatly advance conservation and the environmental movement locally and globally" (Audubon, 2010). From local to national efforts, the National Audubon and the Rachel Carson Awards Council honour a small group of women who have "shown extraordinary commitment, energy and passion in working to protect and improve our world... including the worlds of journalism, academics, education, science, entertainment, business, law and philanthropy."

Carson did not live to see the banning of DDT, the legislation of the National Environmental Policy Act, nor the establishment of the Rachel Carson Council. Rachel Louise Carson left a legacy through her chosen medium, the written word; inspiring generations of scientific writers, instilling the faith that complex scientific processes can be distilled to inspire the general public to consider their own role within the environment.

"The obligation to endure gives us the right to know."
~ Rachel Carson, Silent Spring

Rachel Carson's major writings:

- Under the Sea-Wind, Oxford University Press, 1941
- The Sea Around Us, Oxford University Press, 1951
- The Edge of the Sea, Houghton-Mifflin Company, 1955
- Silent Spring, Boston, Houghton-Mifflin Company, 1962
- The Sense of Wonder, Harper & Row, 1965 & Harper Collins (1998)
- Lost Woods: The Discovered Writing of Rachel Carson, ed. by Linda Lear, Beacon Press, 1998

**Author: As a single, independent woman dedicated to full-time studies, Dawn Doell has found a vital niche allowing her to pursue her studies, her career, and her contribution to her community. With a diploma in Applied Communications in Professional Writing, Dawn has dedicated the next portion of her life to achieving a Bachelor of Science majoring in Environmental Sciences with a minor in Earth and Atmospheric Sciences. Recently accepted to the Golden Key International Honours Society, Dawn is balancing full-time studies at Grant MacEwan University while pursuing her career. As the Conservation Land Registry Coordinator for the Land Stewardship Centre, she must balance school work while simultaneously managing an ever-growing database housing critical data on Alberta's conservation areas. The Conservation Land Registry is a single source database that assists natural resource companies in meeting development requirements around the province. For over four years, Dawn has dedicated a significant portion of her time to working for the Land Stewardship Centre, a small, not-for-profit organization enabling people and organizations to become better stewards.*

Dawn offsets her heavy work load by volunteering in her community and seeking adventure. Volunteering for the Wildlife Rehabilitation Society of Edmonton, Dawn is growing her skill-set in wildlife management techniques. Handling and evaluating injured wildlife, responding to emergency cases, and providing the Society with a reliable volunteer has enabled Dawn to expand her knowledge while contributing to a not-for-profit organization that relies on volunteer time and donations. Using the knowledge she gains from school, work, and volunteering, Dawn has grown to appreciate the natural world she strives to conserve. Hiking and camping in Alberta's National Parks is the catalyst driving Dawn to seek a life conserving the natural world and ultimately contributed to her decision to pursue a life in Environmental Sciences.

Dawn has developed an essential balance between writing, work, school, volunteering, and travel that contributes to her evolving stewardship ethic.

References

Audubon. (2010). The Rachel Carson Award. *National Audubon Society*. Retrieved November 2010, from www.womeninconservation.org.

Carson, R. (1962). *Silent Spring*. Houghton Mifflin Company.

Corcoran, P. (2001). *Fifty Key Thinkers on the Environment*. Routledge. Taylor & Francis Group. pp.194-200.

Dodds, W. K. (2002). *Freshwater Ecology: Concepts and Environmental Applications*. Academic Press.

Graham, F. (1978). Rachel Carson. *EPA Journal*. Retrieved November 2010, from http://www.epa.gov/history/topics/perspect/carson.htm

Lear, L. (ed.). Carson, R. (1998). *Lost Woods: The Discovered Writings of Rachel Carson*. Beacon Press.

Lear, L. (2010). *The Life and Legacy of Rachel Carson*. Linda Lear Center for Special Collections & Archives. Retrieved November 2010, from www.rachelcarson.org

Lipske, M. (2000). How Rachel Carson helped save the brown pelican. *National Wildlife*. 38:1.

Pope, C. (2007). *Ways & Means: Trashing Rachel Carson*. Sierra Club. Retrieved November 2010, from: www.sierraclub.org/sierra/200709/ways_and_means.asp

Quaratiello, A. (2004). *Rachel Carson: A Biography*. Greenwood Biographies. pp. 33-117.

Earth Common Journal
Vol. 1, No. 1, September 2011

The Problem with People:

Why Energy Conservation Efforts are Failing Despite an Impending Energy Crisis

David Campbell*
Grant MacEwan University, Canada

ABSTRACT

Climate change has become a critical political issue in the past twenty years. However, there is a related issue that is often overlooked by governments, industry, and the public: energy supply security, defined by the IAEA (2007) as "...the ability of a nation to muster the energy resources needed to ensure its welfare" (n.p.). Conventional energy requires the burning of fossil fuels, which releases carbon dioxide, the primary driver behind climate change (Pulles & Amstel, 2010, p. 4). Because of this, the problems of our dependence on fossil fuels and carbon fuelled global warming are interrelated. As such, solving the climate change problem may mitigate energy concerns. However, the potentially disastrous consequences of climate change will not be felt immediately while energy is critical to our daily survival; so, energy issues are arguably a more pressing concern.

As geologist and ex-Shell oil researcher, Deffeyes (2001) points out in the preface to the 2008 edition of his award-winning book *Hubbert's Peak: The Impending World Oil Shortage*, world oil prices have tripled since 2005, while oil production has gone up by a meagre factor of 1.005(x).

Earth Common Journal
Vol. 1, No. 1, September 2011

Book Review

Sleeping Naked is Green by Vanessa Farquharson

Danielle Paradis*
Grant MacEwan University, Canada

Environmental books, while informative, can sometimes make for dry reading. What initially attracted me to this book by Vanessa Farquharson was the title. The premise of the book is Farquharson—a young Arts and Life reporter for the right-wing, climate change-denying National Post—decides to spend a year greening her life. She commits to making one change a day. The entire year was captured on her Blog "*Green as a Thistle*" and the book strings together her events from a post-experiment perspective, although it is written more like a journal reflection of her blog. Some of her eco-conscious changes are small— like the switch to recycled paper towel—but some of the changes she implemented are not for the pseudo-environmentalist. Some of the most memorable changes are Vanessa using only vegan-friendly dental floss (p. 27), unplugging her fridge (p. 62), and giving up birth control (p. 157). Says Farquharson in the very beginning of her journey:

> Even if the only thing this self-imposed challenge does is force me to re-evaluate my shopping habits, offer a few sacrificial light bulbs at the feet of Mother Nature, and figure out what it truly means to be a modern environmentalist, then ultimately, it's worth it. That cheesy saying we have—about always regretting what we haven't done, never what we have—is what I'll have to cling to…" (p. 23)

Farquharson labels herself as a cynic, and her book is anecdotally written with refreshing candour. Making one change a day seems easy, but combining all of those changes takes her far away from her previous average consumer life. She writes with

honesty about the frustration that many people trying to reduce their carbon footprint come across. Distaste for the eerie glow cast by LED lights, remembering to carry around a re-usable shopping bag, the dilemma over whether or not someone who cares about the environment can eat meat—these issues are always on the minds of people interested in pursuing a greener lifestyle. Farquharson confronts these issues and her own feeling of hypocrisy in her book *Sleeping Naked is Green* in a way that really involves the reader. Her absolute humanity, including a very human predisposition to selfishness and hatred of change makes the book relevant and meaningful.

The most impressive thing about the book is the incredible inspiration that Farquharson evokes. The reader's inspiration comes through the process of watching the metamorphosis of someone else change her life for noble purposes—and wanting to be a part of that picture. Vanessa herself was inspired. Her goal was to share her experiences but she did it in a way that did not come across as preachy or judgmental. She made a real impact with her experiment. During her one hyper-eco-conscious year, she managed to save 11.02 tons of carbon dioxide.

This memoir is a book that is suitable for quiet reading. It is fun and yet informative. Farquharson's voice allows the reader to feel at ease—even if he or she is not a die-hard environmentalist. On the other hand, someone who is already invested in making lifestyle changes to reduce carbon emissions can still learn from Vanessa's changes. This book was a revitalizing and heartfelt read.

---

*<u>Author</u>: *Damielle Paradis is currently a fourth-year student in the Bachelor of Applied Communications in Professional Writing program at Grant MacEwan University. She is an avid reader, a broad-spectrum writer (everything from poetry to non-fiction to academia), and a sometimes environmentalist.*

References

Farquuharson, V. (2009). *Sleeping Naked is Green*. Toronto, Canada: Wiley & Sons Ltd.