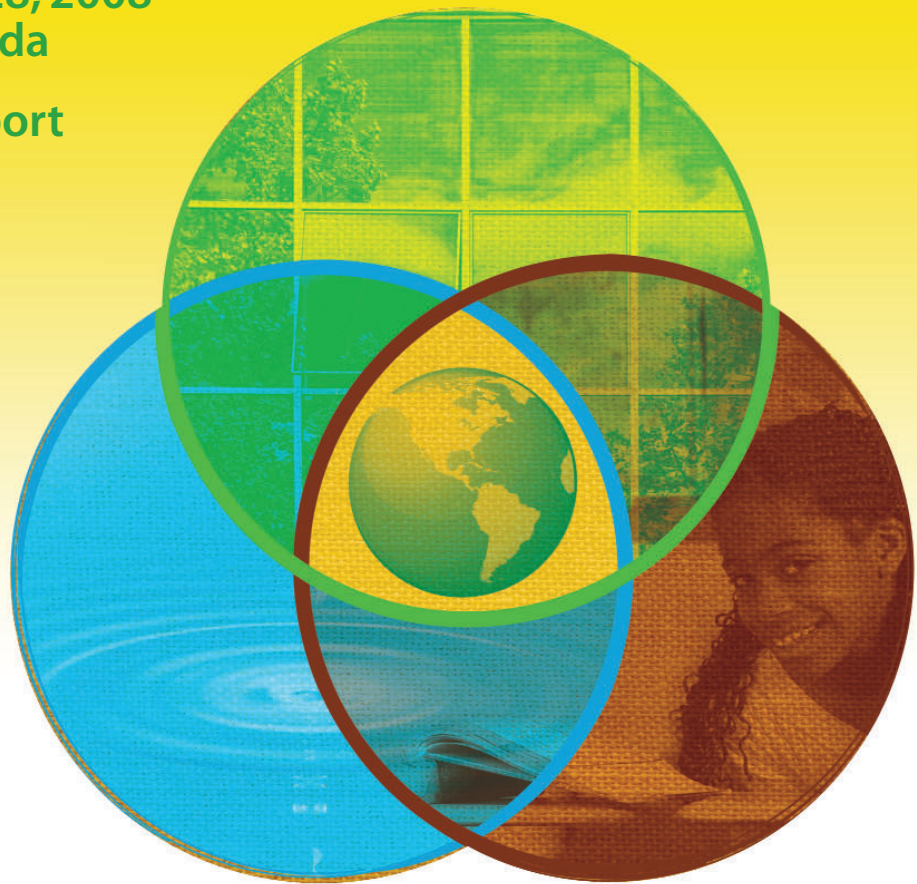


Choose the Future

Education for Sustainable Development

November 26–28, 2008
Winnipeg, Canada

Conference Report



Prepared by Robin Gislason, Carolee Buckler and Heather Creech

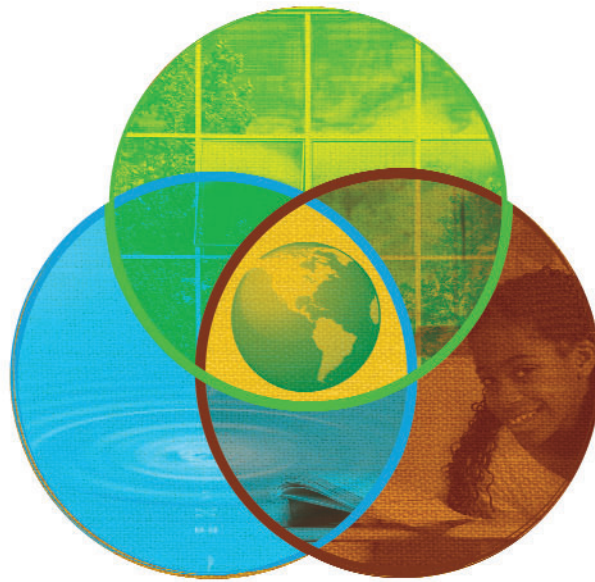


Creating, Supporting &
Fostering a Culture
of Sustainable
Development
in Manitoba

iisd International Institute for Sustainable Development
Institut international du développement durable

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The Manitoba Education for Sustainable Development Working Group brings together stakeholders from the formal, non-formal and informal education sectors in an effort to further develop, communicate and promote ESD in Manitoba. It was established in 2005 by Manitoba Education, Citizenship and Youth, Manitoba Advanced Education and Literacy, Environment Canada and Learning for a Sustainable Future.

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The International Institute for Sustainable Development contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change, measurement and assessment, and natural resources management. Through the Internet, we report on international negotiations and share knowledge gained through collaborative projects with global partners, resulting in more rigorous research, capacity building in developing countries and better dialogue between North and South.

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Conference Report: Choose the Future – Education for Sustainable Development. November 26–28, 2008, Winnipeg, Canada

Prepared by Robin Gislason, Carolee Buckler and Heather Creech

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Diamond Level

Manitoba Education, Citizenship and Youth

Manitoba Hydro

Platinum Level

Manitoba Conservation (Sustainable Development Innovations Fund)

Gold Level

Ducks Unlimited Canada

Monsanto Canada

Science Teachers Association of Manitoba

Canadian Commission for UNESCO

Silver Level

Assiniboine Credit Union

The Manitoba Association of School Trustees

Manitoba Lotteries Corporation

Genome Prairie

Bronze Level

Nutrients for Life

CBC News at Six

Special thanks also go out to the volunteer Rapporteurs and Rapporteur Team Lead for their hard work in creating this report.

Rapporteur Team Lead: Robin Gislason

Rapporteur Volunteers: Laura Normand, Jessica Kotierk, Linda Chow, Crista MacDonald, Michael Moreau, David Rubinger, Jane Orihel and Michelle Hamilton

Foreword

Dr. Rick Wishart, Chair of the Manitoba Education for Sustainable Development Working Group (MESDWG)

This document provides comprehensive proceedings for “Choose the Future,” the first major conference on education for sustainable development (ESD) held in Canada. The conference was a Manitoba Education for Sustainable Development Working Group (MESDWG) project, with assistance and support from a broad array of community partners and sponsors.

Sustainable development (SD) is a difficult concept because it requires systems thinking and the integration of considerations about economic, environmental and social factors. The most commonly accepted definition of sustainable development is *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. There have been many challenges to broadly incorporate SD standards into the formulation of government policies, business practices and individual behaviours. To achieve the necessary changes, it was recognized by the United Nations (UN) and member governments that an effective strategy for delivering ESD at all levels of society was needed. The Decade of Education for Sustainable Development was initiated in 2005 to establish this as a priority for the planet.

UNESCO (United Nations Educational, Scientific and Cultural Organization), the lead organization for the Decade, stated that ESD is a process of learning how to make decisions that consider the long-term future of the economy, ecology and equity of all communities; a key task for education is building this capacity. The MESDWG was established in 2005 to advance the objectives of the Decade in Manitoba.

The MESDWG took on the role of providing a focal point for stakeholders from business, government, academia and the not-for-profit sector, to work together to create a culture of ESD in Manitoba. Representatives of the MESDWG, as well as those from other provincial and territorial working groups, sit on the National Education for Sustainable Development Expert Council (NESDEC). NESDEC is Canada’s ESD umbrella group, with funding provided by Environment Canada, and Learning for a Sustainable Future (LSF) acting as secretariat.

The “Choose the Future” conference was a priority of the MESDWG for several reasons. First, it provided an opportunity to introduce educators from the formal school system, as well as educators from all other sectors, to sustainable development (SD) and the importance of including SD as a central education theme for Manitobans. To further this goal, the Science Teachers Association of Manitoba (STAM) was enlisted as a partner in organizing the conference, and the dates for the conference were selected to coincide with an established province-wide professional development opportunity for all teachers. Second, the Working Group wanted to establish a benchmark for ESD in Manitoba so that progress in establishing ESD as a provincial priority could be measured over the remainder of the Decade and beyond. Finally we wanted to have the conference act as a showcase for the many innovative ESD projects and programs contemplated or already taking place.

The proceedings for “Choose the Future” were prepared by IISD, the International Institute for Sustainable Development. Sincere thanks to Robin Gislason, Carolee Buckler and Heather Creech of IISD for leading this project, as well as the talented team of university students they recruited to act as conference rapporteurs.

The proceedings will act as a valuable legacy of the conference. It, along with the abstracts and PowerPoint presentations for the concurrent session speakers, will be housed on the MESDWG Web site at www.mesdwg.ca. Those in Manitoba and beyond, who may organize future ESD conferences, and those wishing to review the “state of the art” of ESD will find these resources useful.

Richard A. Wishart Ph.D.
Chair, MESDWG
Winnipeg, Manitoba

*Documents related to the event can be found at
www.mesdwg.ca/events_hom.html*



Executive Summary

The “Choose the Future: Education for Sustainable Development Conference” was held in Winnipeg, Canada, November 26–28, 2008. This international conference was planned for everyone who understands that education is required to sustain our future. “Choose the Future” stands as a major contribution to Canadian activities supporting the United Nations Decade of Education for Sustainable Development (2005–2014).

This was a unique forum on the knowledge and actions needed to achieve economic goals, just social systems and a healthy environment. The conference was designed for several audiences: first, for educators who wished to embed the principles and practices of sustainable development in their teaching and program planning; and second, for leaders in business, NGOs and government who wished to engage their employees and stakeholders in sustainable practices and operations.

On the evening of November 26, polar explorer Lonnie Dupre set the stage for the conference with his video presentation on Arctic Change at the Imax Theatre. The Hon. Lloyd Axworthy, president and vice-chancellor of the University of Winnipeg opened the conference on November 27 at the Winnipeg Convention Centre. Close to 500 participants from across Canada attended the six plenary sessions and 22 concurrent panel sessions and workshops on education for sustainable development (ESD).

Throughout the two days, international sustainability leaders presented their global perspectives on science, education, energy, business and humanitarian concerns. These keynote speakers provided the vision and challenge for sustainable development, and the need for education to strengthen knowledge, values and actions in youth and adults.

The concurrent sessions covered a wide range of issues, from research into new approaches for ESD in K–12 and tertiary formal education, programs for communicating sustainable development in business and industry, First Nations perspectives and the science supporting sustainable development.

The conference also recognized Manitobans for their leadership in science, education and sustainability. It showcased the Manitoba Sustainable Development Round Table 2008 Manitoba Excellence in Sustainability Awards hosted by Conservation Manitoba at the Delta Inn on the evening of November 27. Eleven Manitoban organizations and individuals were recognized for successfully turning the principles and guidelines of sustainable development into concrete, lasting achievements. The Science Teachers Association of Manitoba also presented three STAM awards for science achievements and teaching excellence at the Friday plenary luncheon at the Winnipeg Convention Centre. The conference concluded with remarks from Dr. Rick Wishart, Chair, Manitoba Education for Sustainable Development Working Group (MESDWG).

This conference was a project of the MESDWG, which brings together stakeholders from the formal, non-formal and informal education sectors in an effort to further develop, communicate and promote ESD in Manitoba. The MESDWG was created in 2005 jointly by Learning for a Sustainable Future (a national not-for-profit organization), Environment Canada (federal government), Manitoba Education, Citizenship and Youth, and Manitoba Advanced Education and Literacy (provincial government).

The Science Teachers Association of Manitoba (STAM) was a major sponsor and partner in the “Choose the Future: Education for Sustainable Future Conference.”

“Choose the Future” conference co-chairs:

Dr. Christina McDonald
Sustainable Development Coordinator
Manitoba, Education, Citizenship and Youth
and Manitoba Advanced Education and Literacy

Mr. Robert Adamson
Coordinator for MESDWG,
Learning for a Sustainable Future



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1

Welcome and opening remarks

1.1

The Hon. Lloyd Axworthy, President and Vice-Chancellor, University of Winnipeg

The Hon. Lloyd Axworthy, distinguished public figure and current president and vice-chancellor of the University of Winnipeg (UW) delivered the opening remarks for the “Choose the Future: Education for Sustainable Development” Conference in Winnipeg, Manitoba on November 27, 2008. Dr. Axworthy presented to a diverse audience of educators, government officials and representatives from the private sector and NGOs.

Dr. Axworthy opened with a reflection on the momentum that climate change science has generated over the past decade; a thought he contrasted with the fact that we have continued to emit more carbon in the past decade than we have in any of the previous decades. He went on to note that evidence is beginning to demonstrate the extent of the impacts of climate change; climate change is a problem without a passport.

The challenge for educators is that conventional wisdom no longer applies. How can educators prepare the next generation for the bewildering rate of change they will be faced with? Put more simply, education for a sustainable world is uncharted territory, and we are all looking for solutions. We cannot repeat what has been done.

Dr. Axworthy gave a message of hope to the gathered educators. This period of chaos can be a time of creativity: how can we create sustainable answers? He described the University of Winnipeg’s journey towards becoming a sustainable institution, and the various initiatives that they have created. The University and its Board of Regents have committed to measuring all activities through a lens of sustainability. Initiatives that the academic institution has created include:

- How to integrate sustainable development into all levels of curriculum development.
- First Nations Knowledge and Indigenous science now have a chair at the University, and there has been the creation of an Aboriginal governance program
- The Eco-Kids program promotes environmental stewardship in the next generation and has, to-date reached over 1,000 youth.

Axworthy concluded his presentation with a message of hope he received from a First Nations Elder: “it is time to stop the injury, and begin the healing of Mother Earth.”

1.2

Dr. Gerald Farthing, Deputy Minister, Manitoba Education, Citizenship and Youth

Dr. Gerald Farthing, Deputy Minister of the Department of Education, Citizenship and Youth in his opening remarks stated that it is imperative that we prepare our youth to deal with the environmental and ecological challenges they will be faced with. To address these challenges we need to talk with and teach our students about what it means to live in a more sustainable way—in a way that helps students to understand that social, economic and environmental challenges are connected and must be thought of in relation to each other. We need to be doing this while acknowledging that we as educators are struggling to figure this out ourselves. Youth, however, will remind us that how we are living today is not how we should or have to live in the future. We can all challenge ourselves to find new ways to live that are more sustainable. Preparing students to live sustainably is one of the top priorities in the Department of Education. We believe there is no time to waste. We must continue to support educators and students, allocate whatever resources we can to the effort and talk frankly and openly with our students about the challenges. We can meet these challenges if we put our minds to it and work together.

Dr. Gerald Farthing,
Deputy Minister,
Manitoba Education,
Citizenship and Youth



2

Keynote Addresses

2.1

Chuck Hopkins, UNESCO Chair for ESD

Charles Hopkins, UNESCO Chair for ESD provided the Keynote speech on the first day of the conference. Dr. Hopkins explained the role of education for sustainable development (ESD) in creating a sustainable future.

ESD is not just about the environment; the full spectrum of ESD includes the social and economic dimensions. It is important to note that it is education *for* sustainable development rather than education *about* sustainable development—this terminology is deliberately chosen. When talking about ESD, we are not just referring to formal education, but also non-formal and informal models of education. ESD is not just a unit to be taught in school but something that is incorporated into all levels of education.

ESD has four major thrusts:

- 1 Public awareness and understanding of the issues: Governments are primarily concerned about staying in power, so for them to take any initiative or create any policy towards sustainable development, popular support is needed. This support can arise from education and widespread awareness of the issues at hand.
- 2 Access to public education: The average level of educational attainment in the world is Grade 5; school is largely irrelevant or inaccessible in the developing world. A focus on expanding access to the education system is necessary to foster ESD.
- 3 Reorientation of the current educational system: The countries with the highest levels of educational attainment are the ones leaving the largest ecological footprint. Exporting the Western educational model to the developing world may be good for development but not necessarily for sustainability.
- 4 Emphasis on training: we now know how to do many things better. We need to focus on sharing that information so that we can transition the debate from “How are we going to compete with China or India?” to “How are we going to collaborate to solve climate change?”



Chuck Hopkins,
UNESCO Chair
on ESD

This is not something we should leave to the next generation to resolve; we can do something about it now with everyone contributing. The model for this is the “strength model,” in which everyone uses his or her own greatest strength towards helping the cause. Not only can everyone help, but everyone must because no one agency or individual can make all the difference. The only way we can meet the social, environmental and economic challenges of the future is by working together.

2.2

Samantha Nutt, Founder and Executive Director of War Child Canada

Samantha Nutt, Founder and Executive Director of War Child Canada addressed the audience on the crucial role that educators play in shaping how a child perceives the world. Educators can create a more sustainable world through the knowledge they instill in the next generation.

Nutt noted that in a recent survey, children from all over the world were asked who they considered to be the most important source of global information. Seventy-five per cent (75%) answered their teachers. It all comes back to schools and the educational system to provide the analysis and perspectives needed for the next generation to build a truly sustainable society. Nutt challenged the audience to encourage their students to think critically and to orchestrate classroom discussions on the impact of Canadian decisions and actions on matters here and abroad. This includes facilitating students in gaining a sense of global understanding and wider awareness of the connection between what citizens do and don't do, and action and inaction.

Nutt asserted that it is only through education that societies will ever be able to affect global change. She left the audience with four things they can do to affect global change:

- 1 Knowledge and information – It is important for students to be aware of the issues and the role of an individual's actions. Nutt suggests that educators connect their classroom with NGOs like War Child Canada, and make global thinking part of their reality.
- 2 If an individual wants to engage in action on global issues, one can financially support organizations that are committed to working on them. Less than five per cent of charitable giving goes to global issues and overseas development.
- 3 Make incremental changes by demanding corporate social responsibility from the corporations that are playing a role in ongoing conflicts. For example, on the issue of coltan (a metal used in the production of electronics, the mining of which plays a vital role in financing the ongoing conflict in the Congo), ask students to think before they buy their next piece of technology; get them to write the manufacturer to ask them where they get their coltan from.
- 4 If we really believe in social justice, we need to stop seeing Western life and loss as inherently more important than life and loss in other countries. Our inaction constantly reinforces this message.

Nutt concluded her address with a final statement of hope, that we can effect change, and that we can move the next generation towards change.

2.3

Bob Willard, Author and Business Consultant: The Sustainability Advantage

Dr. Willard is a leading expert on the business value of corporate sustainability strategies. He is the author of *The Sustainability Advantage* in which he quantifies potential bottom-line benefits from using sustainability strategies, and *The Next Sustainability Wave*, in which he shows how to convince senior executives to commit to sustainability strategies.

Dr. Willard addressed the audience and spoke about the relevance of sustainable development to the business community, showing how environmental organizations can partner with business and capitalize on corporate consciousness.

Dr. Willard provided a brief overview of the United Nations Decade of Education for Sustainable Development and spoke about its four main thrusts;

- Public awareness and understanding
- Access to quality basic education
- Reorienting existing education
- Training programs for all sectors

Willard provided a definition of sustainability and introduced the three-legged stool concept. Leg 1 is the economic leg, which includes good jobs, fair wages, security, infrastructure and fair trade. Leg 2 is the environmental leg, which includes the health of the planet, eco-effectiveness and eco-efficiencies. Leg 3 is the equity-people leg, which includes employees, community, culture and the world. Smart businesses use the three-legged stool to reach success. Willard noted that it is important to remember that when you are consulting with businesses, you do not use this language: you must use business jargon such as asset management, good stewards of asset management and capital in order to get them to buy in.

Willard spoke about the five-stage sustainability journey businesses will go through to reach true sustainability:

- Stage 1: Pre-compliance.
- Stage 2: Compliance with regulation – many organizations stop here.
- Stage 3: Beyond compliance – seeking eco-efficiencies; acting in advance of threats of regulation by government.
- Stage 4: Integrated business strategy – enhanced business value, when everyone in the company is thinking sustainability. A sustainability culture is integrated into the business culture; it is every employee's choice to pursue sustainability.
- Stage 5: The purpose and passion of the business is sustainability. The business is sustainability, with the business values driven by the founder or CEO.

The difference between Stage 4 and Stage 5 is that they are doing it for different reasons. Stage 5 companies want to be globally responsible first, and do so because it is good for business second. Stage 4 companies do it because it is good for business first, and because it is the right thing to do second. These are very different reasons for wanting to run a business sustainably. For those of us who are trying to engage business, we need to let these companies justify and rationalize sustainable choices. Willard noted that there have been a number of NGOs—the David Suzuki Foundation, the Sierra Club, etc.—that have been trying for decades to get the attention of corporations. Scientists have previously noted that trend lines had been heading in the wrong direction for many years; companies were not interested in listening to them. Recently, things have changed. Scientists are now joined by the public, employees, investors and media in the move to change. As a consequence, the companies are starting to pay attention.

The Two-Part Business Case

Businesses have two main priorities: to capture opportunities and avoid risks. In this, there are opportunities for sustainability:

- Employees – Employees/graduates are looking for companies that share their values; they are more loyal to those companies, and they are more motivated to work for these companies. The war for talent is still a huge issue in the corporate world.
- Corporate image – Companies want to avoid the risk of being identified as a “risky investment” through mechanisms such as The Carbon Disclosure Project. Leading, well-positioned companies can gain an 80 per cent increase in value. Poorly positioned companies risk up to 65 per cent of their value if investors believe they are not a good risk for sustainability. This is not a “green” issue—this is a money/investment issue.

Today the potential profit increase for a sustainable business is 66 per cent because sustainable companies energize employees, improve their corporate image, offer a competitive advantage and are well positioned for business in the future. There are six benefit areas to having a sustainable business that can contribute to potential profit increase:

- Reduced recruiting costs
- Reduced attrition costs

- Increased employee productivity
- Eco-efficiencies
- Increased revenue/market share
- Lower insurance and borrowing costs

Willard concluded that sustainability is smart business. Stakeholder sustainability expectations are rising; there are new market forces and risks in play. The ways in which sustainability will protect and enhance company value must be communicated to companies in terms relevant to the business world so they see there is opportunity for leadership in sustainable businesses.

2.4

Lonnie Dupre, Polar Explorer, One World Expedition

During an arctic career that has spanned over 20 years, Lonnie Dupre, Polar Explorer, has travelled over 14,000 miles through the high Arctic and Polar regions by dog team, ski and kayak. Dupre's path has followed in the footsteps of the Arctic explorers of the last century—Robert E. Peary, Roald Amundsen and Knud Rasmussen. In 2001, Lonnie Dupre and Australian John Hoelscher completed a 6,500 mile journey by dog team and kayak, the first such team to round Greenland's rugged coastline. Throughout their journey, the two explorers gathered information and pictures of the land, animals and culture of the Polar Inuit. In 2004 Lonnie received the coveted "Rolex Award for Enterprise" for his One World Expedition. Dupre's expedition was supported by Greenpeace and drew international attention to the potentially disastrous effects of global warming on the Arctic Ocean environment and its unique, ice-adapted wildlife. In 2006, the One World Expedition completed the first summer expedition to the North Pole pulling and paddling modified canoe/sleds over 600 miles of shifting sea ice. Lonnie Dupre and Eric Larsen reached the Pole on July 1, 2006 and, in the process, reached 68 million people world-wide about global warming.

At the Imax theatre on November 26, Dupre presented dramatic video images of his expeditions and offered the audience his observations and experiences of a rapidly changing Arctic, observations that have further fuelled Dupre's commitment to raising awareness of the impacts of climate change.

2.5

Wade Davis, Explorer-in-Residence, National Geographic Society

Wade Davis is a noted anthropologist and ethnobotanist whose work has largely focused on observation and analysis of the customs, beliefs and social relations of indigenous cultures in North and South America, particularly the traditional uses and beliefs associated with plants with psychoactive properties. Davis has been dubbed a "real life Indiana Jones." He holds degrees in anthropology and botany and is the author of several books.

Davis spoke of the importance of travel and the opportunity to live among those who have not forgotten their traditional ways. One of anthropology's central ideas is that the world into which you are born is just one model of reality; there are always other ways of being and thinking. This thought provides hope and inspiration to a society that is engaged in a search for an alternative way of being.

Culture is the social and intellectual web of life. Dr. Davis fears that the "ethnosphere" is currently shrinking; as can be seen in the loss of languages as a global indicator. While there were 7,000 languages spoken when Davis was born, only half of these are still being taught to children. On average, every fortnight, one ancient tongue is dying. Westerners speculate that if we all spoke the same language, we would have more understanding and cooperation, but Davis refutes this. The native speaker of the "universal" language, and their culture, would always be in a position of privilege.

Davis reinforced that there are many different ways of being human. We all come from the same genetic cloth, and therefore we all share the same intellectual capacity. Each culture interprets that intellect differently based on different priorities. The West sometimes privileges its culture as being more advanced, due to "progress" and growth of technology, than more "primitive" cultures. This is not the case. Buddhism for example is centred on the science of the mind, and based on 2,500 years of empirical observation. A Buddhist might say: "We don't believe you went to the moon"; whereas, a Westerner might say: "We don't believe you achieved enlightenment." Yet in both cases, they did.

When colonialism started in Australia, the Victorian people equated humanity with progress and evolution of society. Aboriginals did not subscribe to this worldview, and were therefore seen as savages. Of the 270 indigenous languages spoken, none had any notion of time (past, present, future) in its vocabulary. The purpose of life was to maintain balance in the world. We must remember that fame, wealth and happiness are not correlated.

Davis spoke about how the 20th century will be associated with wars, technological innovation and loss of culture. However, the idea that culture is destined to fade away is not true. Technology and change do not threaten the integrity of culture; power is the threat. We must look at the fundamentals of how we operate and realize this is not how it has always been. The idea of globalization as an evolving organization of goods and services that is an inevitable outcome of modern society is an ethnocentric worldview.

Davis concluded by noting what is at stake: if we continue to shift towards a monochromatic society, we risk creating monotony and forgetting other ways of being. One must recall that modern society as we know it, has only been in existence for 300 years—a shallow history in the span of humanity. We should aim to remain a polychromatic society that embraces diversity. Indigenous people are not failed attempts to be human; they are not less intelligent; simply they have failed to be modern in the way we see as desirable.

If value were placed in survival, the Inuit in Northern Canada, able to survive at temperatures of -80 Celsius, when most people would perish, would be considered the geniuses. Maintaining culture is not simply a human rights issue, rather it is one of geopolitical survival.

2.6

Patrick Moore, Founding Member of Greenpeace, Environmental Consultant and Founder of Greenspirit for a Sustainable Future: “Searching for a Sustainable Energy Future”

Dr. Patrick Moore, founding member of Greenpeace and Founder of Greenspirit for a Sustainable Future, provided his overview of myths and misinformation about the environmental debate surrounding climate change, and suggested that one must focus on objective data, clear communication and dialogue. In Moore's early years, he loved ecology and was a radical environmental activist. Moore was committed to fighting against nuclear weapons testing, factory whaling and other environmental issues. In his later years, he has turned from the politics of confrontation on the environment to the politics of forming consensus to find out what we should do.

Dr. Moore asserted that there is a dangerous myth in environmental circles that, through a combination of changes in behaviour and the use of renewable energy sources, everyone can be provided with what they need. Moore argued that in the field of renewable energy technologies, wind and solar power make small contributions, while wood makes the greatest contribution followed by hydropower. But 87 per cent of the world's energy production by source is produced by fossil fuels. According to Moore, renewables will not be enough to replace this.

Moore noted the many arguments for why we are causing the rise in CO₂ levels and affecting climate change and why this may have fateful consequences for the planet. He presented some of the counterarguments and suggested that there was not a consensus on climate change.

Nevertheless, Moore noted that we do need to look at energy sources for the future:

- Wood has tremendous potential because it is renewable and we should be growing more trees. We cannot keep using food crops as energy sources because they are inefficient and are competing with our food supply.
- Hydro is a very good source of renewable and clean energy.
- Wind is tough to deal with because of its inconsistency and variability. It can be paired well with hydro and to a lesser extent gas because hydro and gas can pick up when wind energy dies down. Manitoba is a good candidate for wind because of the prominence of hydro.
- Solar energy is too expensive for the grid. Only rich people can afford it and it is therefore not a good solution for the developing world.
- Solar thermal energy has some potential. Solar energy is used to heat liquid to run a steam engine. Solar hot water heaters are cost effective.

- Geothermal is energy that results from the nearly half of the sun's energy that the earth absorbs. Under every person's house, there is enough trapped energy to sustain that home. It represents one of the best opportunities in renewable energy sources because it can deliver heating and cooling to the house when you want it.
- Nuclear has a capacity for long term storage and a 90 per cent recovery rate. Moore believes he made an error during his days with Greenpeace by treating nuclear weapons and nuclear energy as the same issue, noting that we do not conflate nuclear medicine with nuclear weapons. Twenty-one countries produce 15 per cent or more of their electricity from nuclear energy. Moore suggested that the damages from various nuclear plant accidents such as at Three Mile Island and Chernobyl have been overstated, and proffered the opinion that we did not stop building chemical plants after making mistakes, we just made them better. He observed that hydro and nuclear power have the lowest CO₂ emissions that are base load energy sources (energy available when you want it). The proliferation of weapons should not discourage nuclear energy use, according to Moore.

Transportation represents the greatest challenge to fossil fuel reduction. Hybrids and plug-in hybrids are promising but it does not make sense to plug a car into an energy source generated from fossil fuels (eg, coal fired generators). Not only do we need to change the technology of cars but also the habits and preferences we have for cars. We do not need cars with huge power; culturally, we simply want them.

In conclusion, Moore recommended that a combination of nuclear and renewable energy is the only way we can replace fossil fuels and satisfy global demand—renewable energy sources cannot fill the demand on their own. He observed that the environmentalist movement is a major obstacle to changing our energy sources because they oppose nuclear energy, major dam projects for hydro, intensive forestry and genetic engineering for such things as trees. To end the carbon cycle we need:

- Renewable energy sources (hydro, geothermal, biomass, wind)
- An aggressive nuclear power program
- Ground source heat pumps for buildings (which replaces gas)
- Biotechnology (genetic science)
- More trees planted to replace crops as fuel sources
- Conservation and efficiency (efficient cars, buildings)
- Hydrogen-powered transportation
- Improved battery technology

Dr. Patrick Moore,
 Founder of Greenspirit
 for a Sustainable
 Future, Founding
 member of
 Greenpeace



3

Concurrent Session Presentations

3.1

Current ESD Research I

3.1.1

A Sustainability-Based Learning Resource to Address “Uninteresting” and “Complex” Secondary Level Science: Trends in formal education

Presenter: Mona Maxwell, Masters Candidate, Pembina Trails School Division

Through the Centre for Research in Youth, Science Teaching and Learning (CRYSTAL) at the University of Manitoba, Ms. Maxwell developed a teaching resource called “21 Lessons on Sustainable Development.” In this presentation, Ms. Maxwell focused on the insights gained from a 2007–2008 pilot of 21 Lessons on Sustainable Development and the TAKE-MAKE-WASTE project, a project meant to bridge the “gap” between students’ negative perceptions of science and the importance of using less reductionist science to address sustainability uses.

The project challenges groups of students to manage a sustainable business, nongovernmental organization or community. Each group designs, produces and disposes of a petroleum- or carbon-based product. Through participation in this project, the student group learns to minimize their business footprint, exploring cyclic, as compared to linear, “mental models.” Students are shown a chart with a simple economic model using households to represent labour for wages, and factories to represent products for money. The model is then expanded by “zooming back” and the economy is seen as nested in the environment from which it takes resources and into which it dumps waste.

The CRYSTAL Project addresses the Manitoba Curriculum and ESD. It is meant to be used in Grade 11 Current Topics in Science and Grade 11 Chemistry, which have curricular goals related to SD. Educators found that little prep time was needed for lessons, and though curriculum time is a factor in Chemistry, Current Topics has more room to fit SD into the class. There were also many positive results for students, including increased understanding of systemic approaches to problems. Crystal is a good framework for sustainability integration because it is interdisciplinary and includes holistic systems thinking.

3.1.2

Training for Sustainability Leadership: Trends in professional development

Presenter: Carolee Buckler, International Institute for Sustainable Development (IISD)

The International Institute for Sustainable Development (IISD) trains young professionals to become sustainability leaders, conducts research in best practices in leadership training, monitors changes in the sustainability sector, and researches the skills and leadership gap.

In the IISD report, *Becoming a Sustainability Leader*, several important issues are raised, including skills needed to become sustainability leaders and reasons why we need to train leaders in SD. Among the values required in SD leaders, the most cited were: capacity for innovation, global mindset, passion for sustainability and commitment to an SD lifestyle. The leadership gap is real and urgent. Demographic shifts are occurring, the sustainability job market is

growing, and to achieve sustainability we need to inspire and engage the new generation. We need people who can work in interdisciplinary fields, not in silos.

These new SD leaders need to be trained in sustainability knowledge, communications, reflective leadership, collaborative problem solving, conflict management, organizational development, teamwork and networking. Their training needs to include methods such as more skill-based training, mixed methods of training, evolution of programs, alumni networking and longitudinal evaluations of training impact.

In terms of designing new learning processes, we must account for the special needs of adult learners such as: different motives, more targeted focus and personalization. Using peer and experiential learning is key and focus should be on skills development.

Learning from past successes is vital for inspiration, hope and new ideas.

3.1.3

Climate Change Connection: Trends in public education and outreach

Presenter: Susan Lindsay, Climate Change Connection Project Manager

What is Climate Change Connection (CCC)? Lindsay describes CCC as a non-profit organization whose mandate is to inform the public and produce publications for ESD, including puzzle books for sceptical questions, and *You are what you wear*, a footprint self-assessment of one's clothing. CCC is a Manitoba-based organization that hosts youth conferences focusing on education about climate change, consumerism, food issues and transportation.

One of the biggest issues facing CCC is the question about whether, after 20 years of discussing climate change, we are any further ahead. Public discussions sometimes suggest otherwise and science journals are not read by the general public. In the public press, 53 per cent of articles printed have doubted climate change!

How do we get the message out?

- Journals, newspapers
- Magazines
- Events (e.g., Earth Hour)
- TV Shows, documentaries (e.g., Nature of Things, 11th Hour)
- Public presentations
- Protests (e.g., Greenpeace)
- Posters
- Conferences
- Workshops
- Activities such as SD Boot Camp or publications such as *You Are What You Wear*
- Active learning (e.g., Fort Whyte Centre).

An awareness-action connection that needs to be made; awareness is a stepping-stone to action.

3.1.4

Assessing Changes in Knowledge, Attitudes and Behaviours among Adults and Youth as an Outcome of Formal, Non-Formal and Informal ESD

Presenter: Heather Creech, Director of Knowledge Communications at the International Institute for Sustainable Development (IISD)

How do we know that ESD works? IISD has asked whether knowledge, attitudes and behaviours are changing. To measure change, baselines are needed. IISD has created a pilot project to establish a baseline through surveys of house-

holds and convenience surveys at schools. The survey was designed to measure knowledge, attitudes and behaviours drawn from existing instruments and refined by over 160 experts in ESD.

Results from the study of households:

- 50 per cent of households in Manitoba received an A for knowledge
- There was a lower positive response on gender roles and sustainability
- Favourable attitudes are linked to favourable behaviour more than knowledge of behaviour
- Gender equity education levels are linked to positive behaviour
- Higher education levels are a better behaviour predictor than knowledge of SD

Results from the study of students:

- 20% received an A; knowledge improves with age
- Lower correct results on social justice questions
- Attitudes progress through the age groups; e.g., Disposables viewed as worse in older grades
- 13.7 per cent have learned about SD in courses
- Observations: attitudes are more closely linked to behaviour than knowledge
- Gender factor: females are more likely to score higher than males
- Caveats: better questions are needed; much of the variation is unexplained; results may not be entirely generalizable

Further work is needed to establish a baseline for future studies of knowledge, attitudes and behaviours.

3.2

Leadership Models to Support Student Engagement (double session)

3.2.1

Engaging in our Communities as Global Citizens: Workshop

Presenters: Tracy Web and Sharon McKenzie, Green Street and Canadian Teachers Federation

This presentation invited the audience to change the way they do things and think of doing things. This concurrent session included activities for audience members rather than presentations. Participants in the session broke out into teams of four to six people at each table. They formed a circle starting with the person with the least years of experience to the person with the most (e.g., 1–4 years to 5–10 years, senior, etc.). The group further split into groups of early years teachers, to middle and senior years teachers to give participants an idea of who was in the room.

A human bar graph was created to represent participants' passion for environment, peace and democracy. The environment inspired the most passion; peace and democracy tied for second place. When participants were then asked to move to different parts of the room based on the sections they teach on a daily basis, very few participants moved to a different section.

A discussion then centred on the Environment Green Schools (EGS) program. EGS, alongside a landmark report, originated in Quebec in 1987. Since then, many schools have become active in the program. EGS follows four main concepts for peace, democracy and solidarity: action and community action, with students empowered in knowledge and awareness. EGS is also a network of educational and health institutions whose members share a hope for a better world. It is a forum to discuss ideas, projects, successes and concerns related to education for a sustainable development. The process "Engaging in our communities as global citizens" was described as a series of 12 activities. Activities one through three explore values, four through seven explore creating active engagement in the classroom and a way to involve the community, and activities eight through 12 explore development and discovering ways of doing.

The sample project by one school in Ottawa was presented:

- Chart one: Things we do already in the school: Peer tutors, etc (programs that they have in the school)
- Chart two: Democracy
- Chart three: Peace
- Chart four: Solidarity
- Chart five: Environment

Each teacher was given the opportunity to go up and place dots where they are active in their classrooms (not at all, sometimes, often, always, etc.). They found that each chart was full in every subject (fine arts, languages, math science, social studies, technology and others), except solidarity, which was left blank. Participants found that science is one of the easiest subjects in which to tie everything together.

The presenter concluded by noting that only 58 per cent of Canadians voted in the last federal election. As educators, we need to bump that number up. As educators, we need to move away from awareness towards action. Teachers need to take personal responsibility so students can move into authentic, engaged action. Every human being can make a difference and all students need to know and act on this.

3.2.2

Action Research for Community Problem Solving (AR:CPS)

*Presenter: Claude Poudrier, Director of the Environmental and Citizenship Education Program,
Quebec Ministry of Education*

Claude Poudrier presented on the success of the Action Research for Community Problem Solving (AR:CPS) model that has been running in Quebec since 1993. This model is rooted in the Action Research process of actors solving real life problems in, with, and for their community. This model has resulted in significant impacts for both the actors and the community itself. And is now readily available in all Quebec schools, from the elementary through the university levels. Groups elsewhere in Canada have also successfully implemented this model and Natural Resources Canada has selected this tool as a Success Story for climate issues.

The Ministry of Education in Quebec is currently collaborating with 14 other researchers and is engaged in its seventh year of providing teacher training. Currently, there are 70 schools, some pre schools and universities, involved in the program.

A researcher can be an actor as well. There are five objectives in environmental education (UNESCO):

- Awareness
- Knowledge
- Understanding
- Participation
- State of mind

For the teacher: AR:CPS helps educators discover their students' potential, renews their skills and generates community goodwill. For some teachers, the model is easy to use, but for others, it is more of a challenge. To be successful when using the tool, educators must have support from the schools, private sectors, parents, etc.

For the students: AR:CPS helps develop self-esteem and self-awareness of their individual power as actors within, for and with their community. It allows the student to appreciate teamwork. Furthermore, it appears that students prefer the AR:CPS model to the traditional teaching model.

For the principal: This program enhances the school-community relationship, encourages school staff to be involved in the surrounding community, responds to need for reform in the education system and responds to the needs of society.

We are here to achieve our dream.

3.2.3

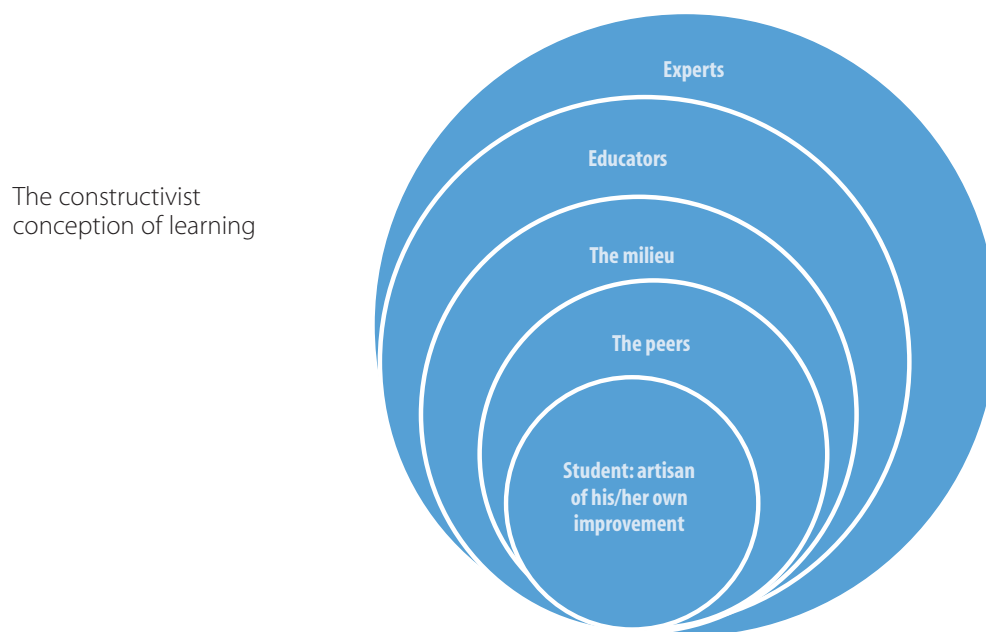
New Skills for the Twenty-first Century

Presenter: Roch Laflamme, Professor, Department of Industrial Relations, Laval University

What does the new millennium have in store for young graduates? What challenges will they face in the coming century? What skills and abilities will they need to make a positive contribution to their organizations and communities?

New challenges will force youth to redefine their know-how, as well as their know-to be and know-to-become. Students will be interested in environmental education or education for sustainable development as long as they see the benefits.

The reform in education needs to be seen in transferable competences and in the real life.



3.3

ESD Initiatives

3.3.1

Working Together to Advance ESD in Manitoba

Presenter: Dr. Christina McDonald, Sustainable Development Coordinator, Manitoba Education, Citizenship and Youth/Manitoba Advanced Education and Literacy

Dr Christina McDonald provided an overview of the growth and change of ESD over time in Manitoba from an administrative/policy perspective.

McDonald opened by introducing the notion of ESD in Manitoba using the nautilus as a context. ESD is about living within changing, connected systems. ESD's growth and change over time in Manitoba is analogous to a living organism in an open system. The chambered nautilus is the last of its kind living, with over 400 million years of evolutionary history. It carries with it all of its past, spiralling outward and growing exponentially as time passes, but it always

stays connected to its earlier stages of growth. In a similar way, ESD continues to grow in Manitoba from its small beginnings, and has the potential for unlimited reach. Like the nautilus, McDonald expects that growth in the understanding of ESD will begin new stages of growth through partnership and collaborative effort.

The impetus for focusing on the implementation of sustainable development (SD) and education for sustainable development in Manitoba was due, in large part to the proclamation of *The Sustainable Development Act* in 1998, which calls for provincial government departments to incorporate the principles and guidelines of SD into their operations, programs and activities.

Through the Act, the Manitoba Round Table for Sustainable Development was established and is still active today. A Sustainable Development Innovation Fund (SDIF) was established through the Act and has provides approximately CDN\$3.6 million annually to support innovation in SD in Manitoba. The SDIF has funded over \$30 million worth of initiatives in the past decade; approximately \$1 million goes to the education sector annually. The Act also developed and established SD indicators, Provincial Sustainability Reports and procurement and financial management guidelines. Regional and municipal governments have worked towards integrating these guidelines into their systems.

The Department of Education made a policy decision to integrate SD concepts into all curricula (in all subjects and at all grade levels) wherever appropriate. In 2000, the department published an ESD support document, *Education for a Sustainable Future: A Resource for Curriculum, Developers, Teachers, and Administrators* in English and in French to help curriculum developers and educators integrate sustainability concepts into the curriculum. During the same time period, the department also led the ESD initiative for the Council of Ministers of Education (CMEC) to identify the status of ESD across Canada, and published the *Status of Sustainable Development Education in Canada* on behalf of the CMEC.

The department of education discovered that it had to focus on fostering the teaching and learning of sustainability in Manitoba K–12 classrooms and set out to establish and implement an *Education for Sustainability Action Plan (2004–2008)*. The action plan called for learning outcomes and related resources focused on sustainability education identified and shared with educators; teacher training workshops; establishment of categorical grants for school divisions to enhance the teaching and learning of ESD in classrooms, coordination of the UNESCO Associated School Project Network, youth Taking Action Forums; grants for educators to collaboratively, plan, develop and implement sustainability-focused units (partnered with Manitoba Hydro); and established a provincial Education for Sustainable Development Working Group and a bilingual Web site dedicated to ESD.

In 2005, the United Nations declared 2005–2014 the Decade of Education for Sustainable Development, which provided further impetus for the Department of Education to continue promoting and developing ESD in Manitoba and supporting work in that regard across Canada.

The Province further supported the action plan by forging partnerships with other parties and organizations that were advancing SD within and outside the province. Through a partnership with Environment Canada, the Province of Manitoba and the not-for-profit national organization Learning for a Sustainable Future, a National ESD Expert Council (NESDEC) and nine provincial/territorial Education for Sustainable Development Working Groups have been established across Canada. Their purpose is to foster a culture of ESD in Canada by engaging leaders from provincial and territorial ministries, the federal government, the formal, non-formal and informal education sectors, business and community organization in discussions and actions to advance ESD. The Manitoba Education for Sustainable Development Working Group was established as the pilot in December 2005 and was replicated in eight other jurisdictions. The group is comprised of stakeholders from the formal, non-formal and informal education sectors, governments, not-for-profit organizations, industry and community groups. One of the outcomes of this network is the planning and hosting of this international ESD Choose the Future Conference.

The completion of the ESD action plan created a way to support educators and parents, and expand teachings, curriculum and learning. This was done through the creation and delivery of:

- Workshops for educators
- Correlation chairs
- Posters/teacher guides
- Brochures for parents
- Newsletters
- Toolkits
- Recognition programs

These served to raise awareness across the province, and subsequently, other provincial government departments began to provide support to schools that focused on ESD. For example, Green Manitoba established a Green Schools Initiative designed to stimulate student- and teacher-led responses to sustainability issues connected with schools. The program provides financial and resource support primarily for schools in Manitoba, builds upon activities already underway and assists in establishing new projects that promote innovative approaches to reducing water use, minimizing waste and supporting improved school ground greening and sustainable transportation.

In 2008, the CMEC identified ESD as a priority and Manitoba continues to be designated as CMEC lead on the ESD file. To address that priority, Manitoba has begun to work with all jurisdictions in Canada to develop a Pan-Canadian/National Framework for Collaboration and Action.

On the research and policy side, there has been collaboration and partnerships with organizations like York University, resulting in senior officials in school divisions trained to incorporate sustainable development into their operations, policies, programs and activities in partnership with organizations like the International Institute for Sustainable Development (IISD), resulting in projects such as:

- Assessing citizen and K–12 students ESD knowledge, skills and behaviour
- The creation of the K–12 Schools and Sustainability Policy Database

Manitoba is working towards cultivating school division leadership for 2009 and beyond, and will continue to develop ESD in Manitoba. Manitoba will continue to lead the ESD file for the CMEC, extending the Provincial ESD Action Plan; continuing its support to school divisions, schools, educators and ESD Networks; and promoting the ECO-Globe ESD recognition program with schools.



Christina McDonald,
Sustainable Development
Coordinator,
Manitoba Education, Citizenship
and Youth

3.3.2

Building a Sustainability Management System at the University of Winnipeg

Presenter: Mark Burch, Director, Campus Sustainability Office, University of Winnipeg

Since 2005, the University of Winnipeg (UW) has been developing a strategic systems-based and holistic approach to the sustainable management of institutional operations and sustainability education programs. Using the ISO 14001

EMS model, the UW is the first university in Canada to address all aspects of operations and programming from a sustainability perspective rather than launching one-off initiatives in unrelated areas of operations and curriculum. The university's Sustainability Management System offers senior administrators a holistic view of operations, while UW's new Richardson College for the Environment promises an integrated approach to the academic and curricular dimensions of education for SD.

In 2004, Lloyd Axworthy arrived at the UW and began to work towards promoting SD initiatives at all levels of the university, placing UW in a leadership position. Sustainability has become a cornerstone for all activities, and the governing category for all strategic planning. A four-part Sustainable Development vision has been created and includes the following:

- Greening campus infrastructure
- Greening curriculum and programs
- Building community partnerships
- Creating a sustainability management system

This overarching vision is aimed at transforming UW into a creative centre for cultural innovation that integrates environmental awareness. The university has created a sustainability management system. While most institutions start with a single initiative, UW decided to do it all simultaneously.

An example of Greening Infrastructure at UW includes the Richardson College for the Environment. A LEED gold facility with one of the most efficient lab buildings in North America. The atrium will serve as a living lung inside.

As an example of the university's greening of Curriculum and Programming, the Richardson College for the Environment will be guided by a sustainability-learning framework that integrates the environment, human rights, economics and social justice. The curriculum will express and integrate an interdisciplinary, whole system solution focused approach to research.

Examples of Building Community Partnerships include:

- The Global Welcome Centre is opening doors to new constituencies to university life and possibilities. The focus is on recent immigrants.
- The Innovative Learning Centre will host ECO-Kids and Eco-U Summer camp programming
- The Model School program is focused towards at-risk youth
- Community gardens
- Global college
- College of adult learning

The Sustainability Management System is a holistic strategic system for managing all aspects of sustainable partnerships. The system is based on the ISO 14001C system, but will include social and sustainability dimensions. The system will also include policies, procedures, 130 indicators, reporting systems, action planning, performance monitoring and management. The system's highest goals are those of the natural step system, which address air quality, energy conservation, procurement, transportation, risk management, waste reduction, water use, and property and facility operations.

3.3.3

St. James-Assiniboia School Division's ESD Initiatives and Opportunities

Presenter: Ron Weston, Chief Superintendent of St. James-Assiniboia School Division

Mr. Weston introduced the audience to the overall commitment and leadership that St. James-Assiniboia School Division has exemplified in their commitment to Education for Sustainable Development (ESD). Weston and the St. James-Assiniboia School Division's ESD journey began three years ago when the division first began to challenge staff to integrate the concept of ESD into the education system. The first lesson that emerged from this journey was that staff and student engagement was key. Staff and students had to connect.

In order to determine the next step for the division, a graduate student was hired to research and create a document that provided a broad introduction to ESD. This document, *Get Started: Sustainable Living for Now and for the Future*,

has served as an anchor for the division's work. This document provided an extensive overview of all teaching resources related to SD. It proved to be a strong beginning point for the schools; staff are now building on these resources for all grade levels and subjects.

Recently, the division invited David Suzuki to speak at a staff in-service. The staff was tasked with returning to their schools to engage in a goal-setting session. Individual departments and schools began to look at how to focus their activities in regards to student engagement. A student forum was held in 2007 for K–8 and another one is slated this year for all grades. The forum asks what sustainability means to them and the core of these students have created a leadership team.

The schools now have guiding belief statements, such as: "We believe that we have to teach students that we cannot throw anything away and human activity is shaping the environment." The division is also working to engage the management side—maintenance and purchasing—in order to reassess how all division—related operations can become sustainable.

Weston forged a partnership with Brown Ferris (a waste management company) to provide the school division with the statistics on the tonnage of their waste and recycling. They are also working with the City of Winnipeg to compile energy and water use data. The Division will use this data to establish division-wide and school footprints; footprints that will be used as teaching tools in division classrooms.

The St. James-Assiniboia School Division is also developing a software package which will show where waste and recycled material go, as well as a Web site that will be a virtual village for students to see the impact of student activity on the environment.

3.3.4

"Resources for Rethinking": An online database of sustainability resources for teachers

Presenter: Pam Schwartzberg, Executive Director, Leaders for a Sustainable Future (LSF)

Ms. Schwartzberg introduced the audience to the Learning for a Sustainable Future (LSF) organization and their online database of peer reviewed curriculum-matched teaching resources that support active interdisciplinary learning about key sustainability issues.

LSF is a national, bilingual, not-for-profit organization that was founded in 1991 by a diverse group of youth, educators, business leaders, government and community members. LSF was established to integrate Education for Sustainable Development into the curricula at all grade levels across Canada. LSF's mission is to promote, through education, the knowledge, skills, perspectives and practices essential to a sustainable future.

Schwartzberg explained some of the current LSF ESD initiatives:

- Curriculum policy reform
- Provincial and Territory ESD Working Groups
- National ESD Expert Council
- Sustainable Education Academy to advance ESD
- 32 Youth Forums across the country
- Education Resource Database

ESD provides a framework for addressing complex issues. It is a context for what we teach and how we teach. It prepares students to be responsible active citizens. Transitioning from traditional education to ESD requires taking youth out of the classroom.

Ms. Schwartzberg introduced the Resources for Rethinking (R4R) (D) database, which was created by LSF. Resources for Rethinking is an online database of high quality, relevant, peer-reviewed curriculum resources relating to education for sustainable development. A resource is anything (print, multi-media) developed for use in the formal education system (K–12) and must come with instructions and materials, all of which can be accessed from the database.

3.4

Corporate Leadership in ESD

3.4.1

Environmental Industries: An overview of current initiatives

Presenter: John Fieldsted, Executive Director, Manitoba Environmental Industries Association

John Fieldsted has worked with Manitoba Hydro for 35 years and recently stepped down to become a corporate planner and environmental manager. His presentation focused on the following points:

- Background of the Manitoba Environmental Industries Association (MEIA)
- MEIA today
- Industry initiatives
- Thoughts on sustainable development

The Manitoba Environmental Industries Association (MEIA) is a not-for-profit organization that is committed to connecting business, government and interested stakeholders with environmental issues and opportunities. MEIA has been an association for Manitoba companies and professionals practicing in the area of environment and sustainable development since 1991. It has in place an Executive, a Board of Directors and Standing Committees and is staffed by an Executive Director and a Communications and Events Coordinator. There are 85 member companies at present.

MEIA provides opportunities to expand contacts, gain business development information, stay current with governmental policy and legislation, and increase knowledge of environmental practices and initiatives. It facilitates information exchange and networking through special events, breakfast sessions, training programs, information updates and newsletters. MEIA undertakes initiatives with the provincial environmental industry associations in Western Canada to develop business opportunities and promote the environmental sector. Statistics Canada defines the environmental industry as consisting of businesses producing goods and services that measure, prevent, limit and correct environmental damage. MEIA is trying to broaden that definition by working to determine the value of industry.

Fieldsted noted that many businesses have embraced the notion of sustainable development. Through sustainability we get corporate social responsibility, but there is always the danger of green washing. Society needs to demand the highest quality of reporting. At the moment, this is not really happening. The public needs to pay attention and demand reporting from industries to see if they really are being sustainable.

3.4.2

A Triple Bottom Line Approach to Business at Assiniboine Credit Union

Presenter: Cheryl Crowe, Assiniboine Credit Union, SRI specialist

Cheryl Crowe introduced the audience to the triple bottom line model (social, environmental and economic spheres) that the Assiniboine Credit Union (ACU) has developed and how they have integrated these spheres into the way the company does business. ACU is a newly merged credit union that opened its doors in January 2007. They have 25 branches, 500 employees, 108,000 members and over CDN\$2 billion in assets.

The mission of ACU: Our purpose as a *socially responsible* organization is to provide fair and meaningful employment and accessible financial services. We do business with a Triple Bottom Line Perspective that includes:

- Responsibility and accountability for environmental, social and financial issues
- Responsiveness to stakeholder concerns and expectations as they evolve
- Focus on business, society and environment

ACU runs a Community Financial Services Centre in a low-income area in Winnipeg with:

- Basic bank services
- Micro loans as small as \$100
- Matched Savings Program
- Business starts
- Health care programs
- Dental care

Community investments include:

- Financing affordable housing
- Grants and sponsorships
- Basic banking/buying homes programs
- Grants up to \$2,000, which must have social and environmental inclusion
- \$196,000 to community education groups
- \$80,000 to support community events
- Sponsorship of the Aboriginal Film Festival
- Inner city renovations that use inner city residents for building

Sound environmental practices include

- Green buildings
- Green purchasing
- Recycling programs
- Supporting green projects

ACU has a new green building at its Fort Richmond Branch that includes the following green components:

- Geo-thermal heating
- Solar walls
- Low flush toilets
- Sensors on lights to go off when people are not in the room
- Used scrap lumber
- Counters are made of strawboard and recycled materials
- Concrete floors

In conclusion, Crowe spoke about how their Triple Bottom Line includes being committed to social and environmental issues, maintaining a strong business model, concern for our communities, education, training and information for our employees and customers, and cooperation among co-operatives.

3.4.3

Forest Policy and Sustainability

Presenter: Barry Waito, Waito Resource Consulting

Waito introduced the audience to how progressive forest companies across Canada have recognized the need to not only develop sustainable development practices, but also the need to “walk the talk.” In particular, he spoke about the 10-year Forest Management Plan (FMP) in southwestern Manitoba that was built on the need for watershed conservation—to conserve water resources. The main objective of the FMP was to involve stakeholders in proactive planning processes. It was designed to satisfy multiple ecological and social values and to deal with ecological issues in

plans. This is the first plan of its kind. It looked at biodiversity, watersheds and climate change, and gave outputs for valuation and trade-off assessment.

Stakeholders, including loggers, tourist outfitters, cottagers, First Nations, environmental groups and university researchers, came up with suggestions and worked with a modeller who could develop a model around these suggestions. These groups were consulted to determine what people want to do with the land base.

Waito noted that with a Forest Plan (FP) there are always going to be impacts which will be monitored. Outputs of the plan are done on a systems approach, connecting trees, wildlife, water, rare habitats, etc. Managing for non-timber values first ensures that the plan takes ecological issues into consideration rather than doing business first then trying to work ecological issues into the plan.

For more information: www.swanvalleyforest.ca

3.4.4

Advanced Energy Projects

Presenter: Bob Parsons, Science Technology Energy and Mines, Advanced Energy Projects Manager

The purpose of this presentation was to introduce the audience to new initiatives in advanced energy projects in Manitoba. As Parsons noted, “the future of energy is uncertain, there are no ‘sure bets.’ Fossil fuels need to be replaced. Hydro is now seen as a cash cow. Geothermal seems to be the new rising star, and there is still a lot of unknowns in terms of wind power.”

Hydro and Wind Power

Hydro has links to a cleaner future. It has low emissions, the highest renewable grid mix and has a new low flood design for the Wuskwatim Dam. Wind is portrayed as magnificent and stunning. It produces clean energy and Manitoba has a world-class wind resource. Parsons asserts that Manitoba is the “Kuwait” of wind power with a 300 megawatt wind farm in St. Joseph area. Hydro and wind are complimentary in nature. Wind can be available for use when the weather cooperates, and in times of low wind velocity hydro can fill in the gaps.

Ethanol

Manitoba is the first province to have incentives for ethanol-blended fuel. We produce 130 million litres per year in our Minnedosa plant.

Biodiesel

A biodiesel mandate is under consideration and Manitoba Hydro is incorporating biodiesel into its fleet of vehicles.

Hydrogen

Hydrogen is a serious option for buses and refueling. Manitoba is the bus capital of North America. There is also current research for a diesel hybrid bus. New Flyer is the leader in this technology. There are numerous bus hybrids currently being developed and being tested.

Key observations

There are an array of new technologies and energy opportunities in Manitoba. Skill sets are going to be required for the future; skills that must be based on solid education. We are talking about the same skills that have always been important, but now these skills must be applied to new applications.

Conclusion

Manitoba is creating a portfolio of renewable, clean energy pathways.

3.5

Leadership for Educational Administrators

3.5.1

Inspiring Educational Leaders to Create a Culture of Sustainable Development, Integrated into all Aspects of the K–12 Education System

Presenter: Bob Willard and Brian Kelly, Co-Directors, Sustainability and Education Academy, Schulich School of Business

This session introduced the audience to the Sustainability and Education Academy (SEdA). Kelly argued that there is a challenge in integrating sustainable development principles into education and the challenge lies in reaching every teacher.

The Sustainability and Education Academy is a collaborative program involving Schulich School of Business, the Faculty of Education at York University, the UNESCO Chair on “Reorienting Teacher Education to Address Sustainability” and Learning for a Sustainable Future. The Education Leaders’ Seminar is the flagship offering of SEdA, and motivates and equips senior education officials to lead the integration of sustainability as a core value in all aspects of formal education including policy, curriculum, teaching, learning, professional development and the sustainable management of human, physical and financial resources. The seminar is a two-and-a-half day intensive, residential, informative and motivational event for up to 50 senior education leaders. The primary target groups include senior officials from Ministries of Education, School Boards and Faculties of Education across Canada.

The inaugural Education Leader Seminar was held on October 22–25, 2007, in Toronto. A second seminar was held May 4–7, 2008, in Toronto. To date the program has reached over 100 participants that included teams of senior officials from 14 Boards of Education across Canada, as well as participants from Government and Faculties of Education.

Focus:

- Insight into the emerging trends, drivers and opportunities for education for sustainable development
- Vision of education for sustainable development and its contribution to education in the 21st century
- Models, tools and strategies for assessing and creating programs for education for sustainable development based on practical approaches currently underway in Canada and internationally
- Change management techniques for transforming school, board and ministry culture toward sustainability

Program highlights:

- What is Education for Sustainable Development (ESD)?
- Innovations and Case Studies in Education for Sustainable Development
- Best Practices Workshops
- Team Level Coaching on Action Plans for Change
- Whole System Implementation Strategies for ESD

Kelly emphasized the need to train new teachers and not just retool mature teachers. There is great difficulty in bringing change to a static system. Currently ESD is being applied in a piece meal approach: teachers are told to include environmental aspects of sustainable development into education, while the administrators are not active in this area. It is instead the “entire school approach” that has the most impact. ESD needs to be incorporated into all levels and spheres of education; it cannot just be an added-on topic.

The SEdA seminar is leadership training focused on the goal of creating networks that can work together in the future. A leader is the one who is first to recognize how much more there is to do. Currently there is work being done for ESD at the K–12 level, but the post-secondary field is dragging behind. SEdA is committed to engaging the post-secondary levels and aims to include both universities and colleges in their next seminar. SEdA has found that it is easier to implement ESD at the primary levels, as the schools are not as divided and individualistic in their approach.

The main strategy is integration, in addition to an optional focused course for grades 11 and 12 that will connect the dots.

3.6

Manitoba ESD Providers

3.6.1

Youth Encouraging Sustainability (Y.E.S.)

Presenter: Dr. Heather Robinson, Science Council Manitoba

In partnership with the Oak Hammock Marsh Interpretative Centre, the Y.E.S., Science Council Manitoba Project provides workshop, conference and field camp opportunities to teacher/student teams who wish to generate sustainable development projects through investigation, invention or innovation processes. As well as providing coaching and mentoring assistance, Y.E.S. also organizes and produces an annual May showcase of these sustainability projects at the Oak Hammock Marsh Interpretative Centre. Teacher/student teams may exhibit their work at this venue, receive adjudication and win certificates, scholarships and awards of excellence.

This session described the best practical approaches that teacher/student teams should follow to tackle sustainability topics for production of first-rate projects. They include educational practices to enhance awareness, implementation principles, collaborative systems and continual assessment of work.

This enterprise has developed as a project-based community outreach initiative and focuses on integrating scientific literacy, differentiated instruction, research methodologies and philosophy into various areas connected to sustainable development investigation.

3.6.2

Teaching about Sustainability at Oak Hammock Marsh

Presenter: Natalie Bays, Education Coordinator, Oak Hammock Marsh Interpretative Centre

This session introduced the audience to the award-winning Oak Hammock Marsh Interpretative Centre. Natalie Bays offered the audience successful examples of how Oak Hammock is designed to engage students and give concrete examples of sustainable development through education programs and the buildings themselves (green roof, sewage lagoon and groundwater cooling system). Oak Hammock Marsh helps students to feel a sense of place within their environment, which is a key component for them to demonstrate behaviours that contribute to its well being. The main goal of Oak Hammock Marsh is to empower youth interest in the environment.

The Oak Hammock Marsh Interpretative Centre is a joint project between Ducks Unlimited and the Government of Manitoba. The centre offers all-age programs dealing with wildlife and interactive exhibits. The wetland is the playground, emphasizing the importance of wetlands biodiversity and clean drinking water. The centre also has hands-on activities for youth groups, events and eco-tourism. The centre's education specialists provide schools visits, creative (CSI type) approaches and educational kits. Examples include river watch, GPS mapping and a watershed model presented during audience rotation.

3.6.3

The Outdoor Connection: Fort Whyte's ESD Initiatives for Educators

Presenter: Jody Watson, Education Director, Fort Whyte Alive

This session introduced the audience to Fort Whyte Alive's outdoor connection. Located within the city limits, Fort Whyte Alive offers an outdoor classroom for teachers and students to explore. With over 640 acres of wetlands, forests and prairie landscape, students are able to experience nature hands-on. Fort Whyte offers social science, environmental science and recreational programs to grades K–12, youth, seniors and public. Through its curriculum-linked programming, Fort Whyte promotes awareness and understanding of the natural world and actions leading to sustainable living. Fort Whyte offers 35 school programs and receives 30,000 visitors a year. The goal is to preserve green

space, and we offer corporate sponsors for school visits. Fort Whyte has a bike path, and it offers free admission if visitors arrive by bicycle or on foot.

Fort Whyte Farms Schools in “at risk communities” are provided with the opportunity to introduce their students to Fort Whyte and do bee keeping, poultry, gardening, summer internships selling at our market, composting or working in the Buffalo Stone Café.

Fort Whyte is known for its fall Canada goose migration site, its school programs and more. Fort Whyte has recently introduced a “carbon bank,” ecological footprint calculations and pledge documents.



Jody Watson and Dana Steingart, Fort Whyte Alive

3.6.4

Manitoba Envirothon: A showcase for environmental awareness engagement

Presenter: Andrea Swain, Envirothon Coordinator, Manitoba Forestry Association

This session introduced the audience to the Manitoba Envirothon program and competition. Learning opportunities are available to the formal and non-formal education sectors both as participants and volunteers.

The Manitoba Envirothon offers hands-on competition, classroom to real life, science and resources for the environment. It helps to promote job opportunities and student education.

An Environmental Olympics in Manitoba was also held this past year. Teams of five high school students and one teacher discuss nature (soil, forestry, aquatics, wildlife), current issues and field equipment. They have opportunities to meet other students, improve teamwork and public speaking techniques. Manitoba Envirothon is also beginning to include more middle years programs. The Manitoba Forestry Association has the largest Envirothon program in Canada.

3.7

ESD in the Classroom

3.7.1

Education for Sustainable Development to Grade 12 in Manitoba

*Presenter: Anne MacDiarmid, Sustainable Development Education Consultant,
Instruction Curriculum and Assessment Branch, Manitoba Education, Citizenship and Youth*

This presentation provided details on current K–12 ESD resources for teachers and schools in Manitoba. This includes correlation charts, current curriculum support documents, ESD grant and award programs, ESD Web site and support for educators implementing ESD in their classrooms and schools across the province.

The vision of Manitoba Education Citizenship and Youth (MECY) is that students will become informed and responsible decision-makers, playing active roles as citizens of Canada and the world, and will contribute to social, environmental and an equitable quality of life for all, now and in the future.

The priority for MECY is to assist teachers to understand how ESD is integrated into the existing curriculum. ESD can be presented in an interdisciplinary fashion across the curriculum. It is included in social studies, math, science, health, English, art, music, drama and in school clubs. Education for sustainability includes knowledge, skills, values, attitudes, behaviour and preparing students, so that as adults, they are able to deal with the challenges of living sustainably on both a local and global level. Educators are encouraged to raise student's consciousness and encourage students to take action.

In K–4 and middle and senior years this is done by introducing themes of respect and concern for the natural environment, human health and well-being and the economy into the curriculum and through supplementary posters and poster activities, parent pamphlets and celebrating the activities and initiatives in the schools through the Eco-Globe recognition program.

New ESD-specific curriculum has been developed for Grades 4, 7, 8 and 12 and the new social studies curriculum includes extensive SD.

ESD grants are available for schools and students:

- Categorical: \$700 per school for ESD activities
- 15 \$2000 grants for ESD
- Scientists in the Classroom Grant (\$1,000)
- Innovation in Citizenship Grants (\$1,000)

Other Manitoba ESD initiatives include:

- Green Manitoba Initiative: water, waster, transportation, greening funds (www.greenschoolsmb.ca)
- Manitoba Sustainable Development Innovation Fund
- Eco-Globe schools recognition program: Awareness, action, transformation
- Message to educators and students: "It's In Your Hands"

3.7.2

Educating and Communicating about Climate Change

Presenters: Diane Pruneau, Melanie Demers and Charline Vautour, University of Moncton, Faculty of Science Education

Climate change (CC) education is a great challenge. The challenge lies in the difficulty in perceiving gradual environmental changes, the fact that consuming behaviours bring people pleasure, the weak connection that most individuals have to nature and the complexity of concepts hinder citizens' ability and motivation to get involved in CC. Strategies such as future education (anticipatory action learning, scenario planning), a socio-constructivist approach

(involving citizens like scientists in the study of CC related problems), affective and reflexive experimental activities, success stories and creativity techniques were successfully experimented with Moroccan and Canadian illiterate adults. These strategies were used to reinforce participants' sustainable development-related skills: problem solving, decision-making, risk management, analysis of vulnerability, futures thinking and sustainable planning. The projects resulted in the implementation of mitigation or adaptation actions.

Teaching CC can lead to depression in many students, due to the complexity of CC issues. CC notions are numerous and difficult. Many misconceptions exist. Slow changes are difficult for most to perceive. CC science uses large numbers that can scare off students. Some things happen too far off into the future for students to comprehend. There are also behavioural challenges associated with habits that need to be changed. Risk evaluation skills are not always developed.

Successful CC education includes sharing information about data, how CC will impact lives and a positive message about taking action. Presentation to students should include simple messages, repetition and the localization of the phenomenon.

An experiential learning model and reconnecting to nature with a community approach have been the most successful pedagogical approaches to education on mitigation. Working in groups and sharing experiences through communication are key to success. Using reflexive pedagogy such as journaling, students should be encouraged to think about what they are doing. The emphasis should be on changing the future rather than feeling guilty about actions past.

To educate on adaptation, an analysis of the surrounding milieu and its vulnerability works best. Students should develop citizen skills, including problem posing and solving, decision-making, sustainable planning, future thinking and risk assessment to aid in success.

3.7.3

An Integrated Senior Years Resource Package for ESD in British Columbia

Presenter: Paul Lukaszek, Manager, Green Schools Education Program, Learning Initiatives Branch, BC Ministry of Education

Participants in this workshop had the opportunity to review the new British Columbia (BC) Ministry of Education Integrated Resources Package (IRP) for Sustainable Resources for Grades 11 and 12. The presentation outlined the various components of this new IRP. A summary of the objectives of the courses, their structures and the development process was provided.

BC has a long history of social justice teaching. It has recently developed the Green School Strategy. It includes four strategies:

- Support students to become leaders of action
- Support teachers in integrating ESD into all subjects
- Creating SD learning communities
- Enhancing school infrastructure to be more sustainable

The vision and framework developed includes systems thinking, emphasis on community groups and action orientation. BC has created an Environment Learning and Experience Guide available online. It is a how-to for integrating ESD into all classrooms, with an experiential model and CARE principles. The Ministry has also recently added the Sustainable Resources 11 and 12 Courses. They have a new curriculum that covers five key BC resource areas; Agriculture, Energy, Fisheries, Forestry and Mining. The courses also include sustainability outcomes and achievement indicators.

3.7.4

A New Environmental Education Science Course for Newfoundland Students

Presenter: Craig White, Program Development Specialist, Science Curriculum Section, Government of Newfoundland and Labrador

In the spring of 2004 the Newfoundland and Labrador (NL) Department of Education formed a partnership with the Department of Environment and Conservation to develop a new Environmental Science course for high school. This

initial partnership was expanded to include all provincial and federal agencies with links to environmental issues. This was a cooperative approach to curriculum development. The result is a dynamic and engaging curriculum, complete with partner-created resources, and authenticated by experts. White presented this curriculum, the process followed and lessons learned.

The rationale for the course is based on a view of sustainable development as “a new resource and environment management model.” It capitalizes on online expertise and utilizes the Centre for Distance Learning and Innovation (CDLI).

3.8

In-depth Overview: Climate Change – Natural Resources

3.8.1

What is IPY and Why Should You Care About Climate Change in the Arctic?

Presenter: Dr. David Barber, Professor, Associate Dean of Research, Project Lead of the International Polar Year Circumpolar Flaw Lead System Study, Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Dr. Barber’s focus is on the Arctic and Arctic marine system sciences. He looks at how changes in the Arctic affect the entire ocean system. Barber noted that we are in the midst of the International Polar Year (IPY), a year recognizing international scientific research and communications on polar issues.

Barber presented an overview of the planet’s physical systems. Heat and energy move throughout the planet through water. The ocean is heated at the equator and moves towards the poles, warming the ocean there while that same water becomes cooler. The cooled water then makes its way back to the equator in order to warm up again and the system continues on this way. These ocean currents make the North habitable by heating up the ocean and air. Otherwise, without the oceans, the only habitable part of our world would be by the equator.

The Circumpolar Flaw Lead System Study

This study focuses on changes in sea ice thickness and its impact on arctic marine systems. There are over 300 investigators from 28 countries involved. Most of the research is collected from an icebreaker vessel in the Western Beaufort Sea that holds 80 people. This project saw the icebreaker, CCGS Amundsen, running September to August.

The average temperature since 1860 has shown considerable variability but is getting increasingly higher. Global scale warming will first occur at the poles. This is evident in the loss of 70,000 km² of multi-year ice per year (the area of Lake Superior per year), with 2.2 million km² over 30 years in sea ice loss. We are now looking at a seasonally ice free Arctic by 2015. The last time this occurred was 1.1 million years ago. The Arctic was tropical at one point due to orbital cycles (which can be predicted). But this happened over time scales that are not measured in human years

The change that is occurring right now is happening much faster. Ecosystems are not able to adapt because of how quickly the climate is changing. Glacier melt is increasing sea levels. There is enough ice on Greenland that, if melted, it will increase sea level by six meters. The potential to impact the ocean cycle is also present.

Arctic development

We are looking at a “New Arctic.” As the Northwest Passage opens, shipping companies can and will use the Arctic Ocean. They can use the Port of Churchill for trade. A search for hydrocarbons in Arctic Sea has begun, and further development is going to happen. But, climate change is happening too quickly for any ecosystem to adapt to it. There is an abundance of natural resources in the Arctic that we will be able to access, but there are also lots of challenges.

In Manitoba, much of our climate is affected by the Arctic. For example, there is now less sea ice in the Arctic, so we are experiencing low pressure systems instead of high-pressure systems. This means we will experience milder winters and hotter summers. We will also experience extremes in precipitation—extreme rains and more droughts.

There are 160,000 Inuit in the circumpolar region. They are finding it difficult to adapt because the climate is changing so fast. This is causing social and cultural difficulties.

Change in sea ice thickness does take place over thousands of years but our concern is that this cycle is occurring over hundreds of years, not thousands. The change is happening now. Reduction in sea ice feeds back into the global climate system so it will warm the planet up more quickly. We need to slow down and think about how to build our economy and environment to be sustainable into the future.

3.8.2

Importance of Natural Resources Stewardship in Moving to a More Sustainable Society

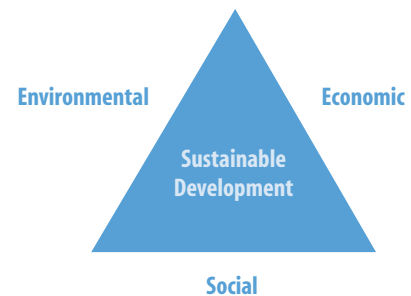
Presenter: Professor Thomas Henley, Acting Director and Professor, Natural Resources Institute

Thomas Henley provided the audience with key concepts associated with natural resource security and sustainability of economic growth. He reflected on how we use natural resources and posed a number of key questions to address;

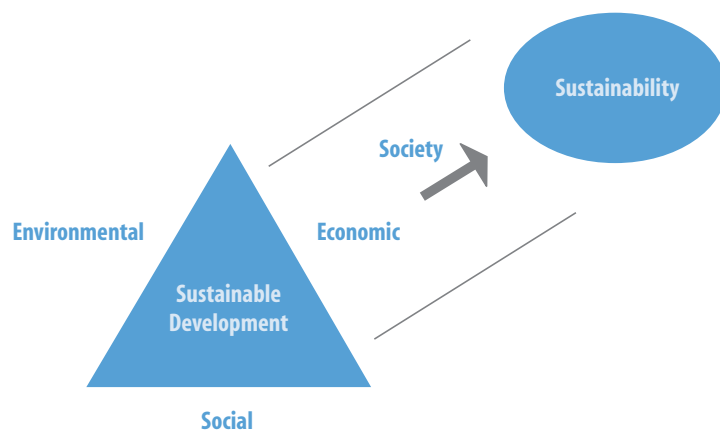
- Why are natural resources so important to sustainability?
- Are we going to run out of natural resources?
- What are the kinds and quality of development we are seeing?
- What are the economic and ecological perspectives and issues?

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability requires long-term continuing eco-systems capable of supporting human life.

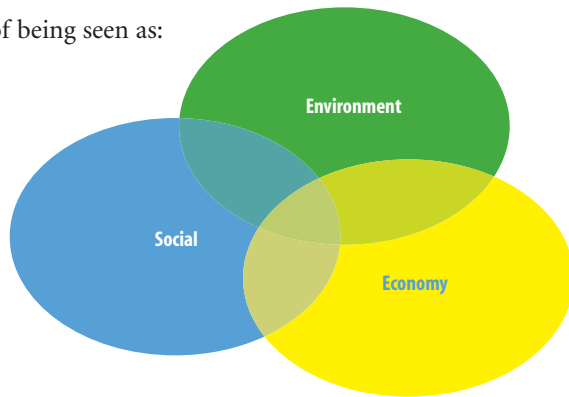
The Sustainable Development model has developed over time, and it depends on your perspective. It used to look like this:



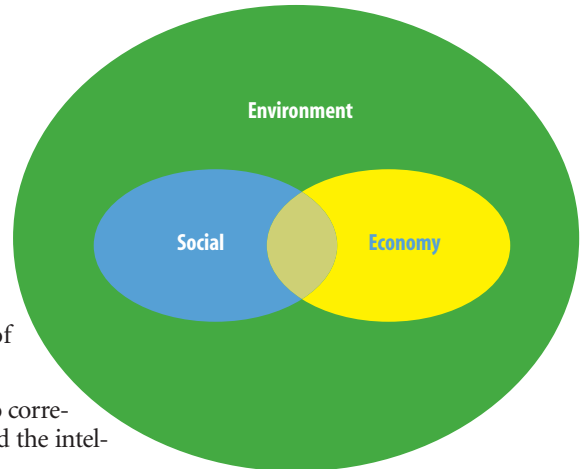
But it should be seen as more of a pathway to Sustainable development



Instead of being seen as:



It should be seen as:



We can use conceptual maps, models, whatever, as long as we think about the past, present and future. In the 1930s, Canadians and Manitobans were mostly rural people. But now, 90 per cent of our population lives in eight or nine cities across the country.

The focus should be on quality of life. Quality of life does not have to correlate to physical wealth. Perhaps personal satisfaction with culture and the intellectual conditions under which one lives should be the goal.

There has been life on earth for 3.8 billion years. Our presence on the earth is small; we have not been here for long. There have been five major extinctions prior to us, during which 94 per cent of species died. We know we live now in a period of the largest biodiversity loss ever. We should not be surprised if a 6th major extinction occurs. Nature does not care who survives a catastrophic extinction: we are the only ones who care if we (our species) carries on.

The West uses 70 per cent of the world's resources with only 20 per cent of the world's population. People are dying today because we have reached our environmental limits. Parents worry about the future for their children, and a lot depends on the message educators promote.

3.9

Leadership in Business and Industry

3.9.1

Assisting Business in the Transformation to Corporate Sustainability

Presenter: Brian Kelly, Director of the Sustainable Enterprise Academy

The Sustainable Enterprise Academy (SEA) is an executive education program that works on corporate sustainability, at the Schulich School of Business, York University. The academy is North America's premier executive education program on sustainable development. SEA provides executive seminars on corporate sustainable development featuring leading-edge thinkers and practitioners. It assists business in the transformation to corporate sustainability by providing senior executives in business, government and civil society with the vision, education, tools and support necessary to champion sustainability in organizations. The primary offering is a leader seminar and 3.5 day residential seminars.

Main themes of SEA

Companies can be both sustainable and profitable. With the right business strategies, there is no trade-off between sustainability and profitability. The world has changed and the key to profit is sustainability.

SEA incorporates a number of pedagogical tools and participants come away with an action plan. SEA is intended for members of governments and corporations, ranging from CEOs to Future Leaders. The target audience is large companies.

SEA's Sustainable Business Model builds on the Shareholder Value Model. The model has its roots in the traditional business matrix which looks at today, tomorrow, the internal and the external. Kelly asserts that when running a business in today's world, one needs to be worried about costs and risk reduction. Companies need to be worried about reputation and legitimacy. One needs to be worried about innovation and repositioning. Growth path and trajectory: Do you have a strategy and products that convince others your stock is valuable? What is your compelling growth strategy?

To be successful you have to be doing all of these. Most corporations focus on the shareholder Value Added model. SEA converts them to the Sustainable Value Added model and asks "how do you perceive business drivers, are they threats or opportunities?"

New Century Drivers

- Pollution, material consumption, industrialization
- Demands of globalization, the Internet explosion and civil society
- Disruptive innovation, new technology is replacing current technology
- Huge global issues-poverty, inequity, population and urbanization

Are these drivers threats or opportunities? Through the sustainability lens most companies would be scared and view these as threats, but there are huge business opportunities here.

Business opportunities include engaging in eco-efficiency strategies, and footprint reduction. Business must also consider reputation and legitimacy through looking at the lifecycle management for products and stakeholder engagement. Look at innovation and repositioning. Engage in creative destruction of incumbent technology and producing the alternative services that customers are looking for like clean technology.

The SEA model looks at these strategies. There is a whole new set of business drivers in the twenty-first century. The conventional lens is being traded in for the sustainability lens. The current state of the economy is an advertisement for sustainability. Through the sustainability lens we can reduce costs, risks, and raise opportunities, markets and shareholder value. Most companies are usually focused on footprint reduction. To take full advantage of the sustainability lens, you have to push out into all quadrants.

3.9.2

Richardson International Limited: A corporate approach to sustainability

Presenter: Al Raine, Assistant VP, Crop Inputs Marketing, Richardson International Limited

Richardson & Sons is a fifth generation company with three main arms. Richardson International focuses on agriculture. The other two arms are Tundra Oil & Gas and Richardson Partners Financial. The Richardson Foundation is the philanthropic arm of the organization.

Richardson International is working to support a healthy prairie landscape through a variety of initiatives. For example, it works with Ducks Unlimited to provide wetland habitats for wildlife, and investigate how to store nutrients and pollutants while reducing flood threats. Wetlands are being lost at an alarming rate. Richardson's response has been conservation and education, through the Kelburn Farm, the Oak Hammock Marsh Interpretive Centre and Canola Kids.

Richardson International works with Kelburn Farm to research fertilizing techniques that use GPS technology. Canola Kids is a program that hosts 1,000–1,200 students per year, and allows children the opportunity to learn about canola agriculture. These activities highlight how modern agriculture can work in concert with the environment. The Wetland Centre of Excellence between Kelburn Farm, Ducks Unlimited and Fort Richmond Collegiate takes a cross-curricular approach and offers hands on experimental learning.

Richardson offers these programs free of charge and extends invitations to all school divisions, in an effort to show how technology and agriculture can offer opportunities, and demonstrate the compatibility of commercial agriculture and sustainable environmental stewardship.

There is also a Yorkton site that will be developed for teaching students and consumers in grain handling, and food processing. The Virden site is being managed by Tundra Oil & Gas, and shows habitat restoration, agricultural innovation and environmental stewardship. Richardson is showing compatibility of commercial use and sound environmental stewardship to a wide audience.

The Nutrients for Life Program is a resource centre for feeding the world and keeping Canada green, paid for by large fertilizer companies. Ten curricular units will be developed for middle school and high school students.

Richardson wants to share their science-based information on plant and soil science, and is currently working on creating buffer zones and environmental farm management planning.

3.10

Feeding the World Population (double session)

3.10.1

Food Security in a World without Trucks

*Presenter: Dr. Peter Denton, Instructor in Ethics and in Technical Communications, Red River College;
Associate Professor of History, The Royal Military College of Canada*

The topic discussed by Dr. Denton is a question, not a statement; a question about our inability. As citizens, we need to think about the fact that the last people we need to listen to are the experts. Experts in science and technology are a hindrance. We have a tendency to listen to them and disregard our own ideas. From a systems perspective, large-scale agriculture at a distance from people is not sustainable. Never before, in the history of humanity, have so many people lived so far away, in terms of distance, time and knowledge, from their essential food supply. We do not need new technology to solve these problems—we need wisdom; it is a wisdom deficit, not a technological deficit.

Take a look at where the food on your plate comes from. Most of our food comes from a great distance from where we are. This did not used to be the case, we used to preserve, or keep food in cold cellar; we had vegetable gardens, pig and chickens.

What happens if the trucks stop? This is what a sustainable system has to address. We must consider the sources of vulnerability and disruptors in the system such as climate change and fuel costs. We need to consider not just distance in terms of space, but also distance in terms of time; not selecting for food quality, but rather viability.

We are in an unstable situation, on the verge of a catastrophe. All of the things happening with us are amplified by those that don't have the kind of access that we have. We do not understand the tools that we are using and don't have the wisdom to make the right choices.

What we can do? Undertake a sustainability audit in your community regarding food and other essentials to see what would happen if the trucks stopped. Keep track of where the food you eat is coming from.

3.10.2

Agriculture in the Classroom

Presenter: Ernie Sirski, President, Manitoba Canola Growers Association

Manitoba Canola Growers Association members grow canola, which is the highest valued crop in Western Canada. Farming is a business and there is a need to stay competitive. But it is also a lifestyle and philosophy. We are innovators because we use the straight-cutting technique for canola.

Our philosophy is that we believe we should never stop learning; we should learn well enough to teach. In Canada, farmers planted 15 million acres of canola: 5 per cent conventional; 15 per cent special (high stability); 80 per cent genetically modified (GM).

Sirski has been growing GM canola because it offers:

- Increased yield/decreased dockage (reduced tillage is now zero-tillage)
- Sustainability: allows farmers to save approximately 31.2 million gallons of fuel
- Environmentally: reduces pesticides and herbicides
- Food: World population is expected to increase to more than 10 billion people by 2050

- Fibre: cotton, insect-resistant GM crops protect themselves from pests and do not require insecticide sprays
- Biofuels: an alternative to fossil fuels; in the US, corn from ethanol, canola-based biodiesel in Canada
- Canadians have the advantage of the development of technology

3.10.3

Richardson Centre for Functional Foods and Nutraceuticals

Presenter: Curtis B. Rempel, MBA, Ph.D., Adjunct Professor, Dept of Food Science, Research & Development Manager, Richardson Centre for Functional Foods and Nutraceuticals

Can we feed the people on the planet and provide for their energy needs from the same acre? Can technology enable this in a sustainable manner? At one point in time, if there were problems with depletion, you moved. We cannot do this today. In today's world, global agriculture drivers include hunger, health and environment. We do not have more people living in urban centres than rural areas as of this past year. China, India and South Africa have done well with technology: better soil, tillage, improved water use and reduced pesticide benefits are starting to show. Farmers are making more money. Although cost profiles have increased, benefits per acre are also increasing. Farmers are using technology smarter; keeping input costs fixed, allowing supply chains to innovate, and improving bottom lines.

Organic agriculture is a North American and Oceania phenomena. We believe organic agriculture and biotechnology are going to intersect because we are looking for sustainability.

Biorefinement is a new paradigm at Richardson Centre. The idea is that food is medicine. Up to now, society has focused on eliminating unhealthy things from foods. What about producing foods with health benefits?

The opportunity to utilize all parts of the plants (or dairy or meat) for optimum benefit for health, fuel or polymers is the goal. This requires diverse skill sets grounded in science, but also applied science, such as engineering. We are using temperature and pressure to modify foods – this is not genetic modification, but biorefinement. A great example of this is grain. The old paradigm consists of grinding grain and processing. The new paradigm includes grain co-products (protein, insoluble fiber, etc) and biofuel/biopolymer production (flour malt, ethanol, fibre).

Most of what we want for health management is in the outer layer of cereal grain. The way we mill now is to remove the outer grain or feed it to animals. We are feeding ourselves with the inner grain. 75–90 per cent of essential bioactive parts are thrown away or fed to animals. Using the outside of the grain will make us healthier and more sustainable.

3.10.4

Approaching Challenges to Feeding the World

Presenter: G. Murray Ballance, Ph.D., Professor, Department of Plant Science, Faculty of Agricultural and Food Sciences, University of Manitoba

All the food we eat is a product of photosynthesis. Do we produce enough food? Historically, we have not. Out of this came the Green Revolution (1948) in which Mexico asked for help in achieving food self-sufficiency (food irrigation, better genetics, fertilizer). This allowed food production to keep pace with world population growth. The Food and Agriculture Organization for the United Nations has stated that there is enough food production to feed the world, yet 800–900 million people experience malnutrition every year. There is more to the problem than not enough food, but we will focus on this today. Production challenges facing us include increased demand, decreasing arable land base, non-sustainable production practices and climate change.

Arable land mostly occurs in the temperate world. As noted by the Intergovernmental Panel on Climate Change, projections of climate change between the year 2080–2099 suggest that the core of North America will be between 3.5 and 5 degrees warmer than today. When temperature increases we need more moisture. Climate change will affect our high-productivity areas. Competition between agriculture and city growth will also increase water demands and create more pest problems. There will also be a greater frequency of extreme weather.

We need educated people to be part of a second generation Green Revolution, a more sustainable revolution. We need teams of researchers, producers and knowledgeable producers.

3.10.5

Food as a Catalyst for Cultural Adaptation: Can we learn to think like a system?

Presenter: Dr. Glenn Sutter, WorldViews Consulting, Regina, Saskatchewan

We need to think about culture, food and sustainability through a systems lens. As a way to foster understanding and actions aimed at sustainability, food-related issues are easy to personalize, since they reflect how we live (our culture) and we literally consume them. Food is also a tangible reflection of complex systems that produce and deliver goods and services at global, regional and local scales.

Sustainability is a cultural matter with social, environmental and economic dimensions; culture (how we live) is the interface. The capacity for adaptation is the fundamental quality that needs to be sustained. Sustainability is making sure we can adapt as things are going to change; economic collapse, environmental problems are inevitable. The question is whether and how we can adapt to them.

Nature is constantly evolving; we're not faced with a static landscape. It is always changing; even our society is always ebbing and flowing; evolution is occurring. People can be rational, but we are also guided by emotions and external factors beyond our control. Systems thinking can shed light on key interactions. Why look at food? Food issues are easy to personalize and are a tangible reflection of complex systems.

Individuals and groups have to pursue their needs, including food, through complex systems built on relationships that are regulated by feedbacks (positive and negative). Systems can move to new states such as from globalized to localized food systems. New selective pressures such as fair trade can influence the system.

The tipping point is a small action that triggers a big effect. It can be a positive or negative tip. An example is Apo Island. It has a fishing economy, and a population of 700. The negative tip for this island is that more efficient (but destructive) fishing methods have been introduced causing damage to in-shore breeding areas. The positive tip is the marine sanctuary established in 1982 that was started by 14 families.

Sustainability is an adaptive renewal of our systems. A useful systems model for sustainability would cover:

- *Release:* Triggered by a disturbance. A process of “creative destruction” begins with the rapid release of stored capital such as disease.
- *Reorganization:* New conditions. This is a time for experiments, creativity and surprises such as organic farming.
- *Exploitation:* Gaining experience. Connections get stronger and the potential for change starts to increase.

Government's role in sustainability is to make sure that releases occur with as little harm to human welfare as possible.

3.11

Cities of the Future (double session)

3.11.1

Can One University Make a Difference to our Cities of the Future? Creating a sustainable campus

Presenter: Laurel Repski, Vice-President Human Resources, Audit and Sustainability, University of Winnipeg

University campuses have a leadership role to play in both educating our future leaders in a manner that supports the necessary cultural and practical changes that are necessary to establishing sustainable cities and communities, and in creating an environment that embraces and enhances our community. The University of Winnipeg (UW) has taken up both of these challenges, and provides some insight to the steps being taken to both “green” the campus and to the importance being placed by this University in embracing the broader community to create an accessible and sustainable campus. The presenter describes UW's *The Campus Sustainability Initiative*.

This initiative gained support from the top. The President of the UW, Dr. Lloyd Axworthy, began asking how to make UW a sustainable campus. He looked at the campus's role as anchor in the community, and the cost/benefits of going this route. Support from senior management was key. The university is diverse and therefore consultation was essential.

UW established five working groups to encompass the diversity of the university in the Campus Sustainability Initiative:

- Academic, to provide a link to senate and faculty
- Material conservation
- Social marketing
- Sustainable transportation
- Social sustainability

Achievements of the Campus Sustainability Initiative:

- Introduction of sustainability teaching techniques
- Establishment of SOMA café, which carries locally sourced food
- 5.5 per cent decrease in emissions
- Adoption of Green procurement policy
- Renovations and new construction according to LEED gold standards
- 26.3 per cent decrease in waste generated and 13.6 per cent increase in recycling
- Carpooling/ridesharing
- Bike box

Challenges:

- Funding multiple priorities and costly new technologies
- Measurement and monitoring systems
- Program expansion
- Campus expansion

Key initiatives:

- Community learning partnership council aimed at bridging graduation gap in lower socio-economic groups
- Global Welcome Centre
- Wiichiwakkanak Centre
- Innovative Learning Centre (Eco-Kids on Campus, Eco-U summer camp)
- Achieve Training Program
- Enviro-tech Program
- Model School targeting talented at-risk youth
- Opportunity Fund, enabling youth to earn tuition credits as they participate in community initiatives

3.11.2

Can We Go Forward without Knowing Where We Are Going? Toward an urban agenda for the next decade

Presenter: Dr. Jino Distasio, Director, Institute of Urban Studies, University of Winnipeg

Cities both past and present have faced significant challenges with respect to growth. Cities are vast and consume resources; how can we move forward sustainably? In particular, how do we retrofit our cities and neighbourhoods to address environmental issues, when poverty is pervasive and also must be addressed?

Both Mountain Equipment Co-op and Red River College here in Winnipeg have undergone significant transformations and are examples of reshaping the city's fabric in a sustainable way. It is great; but it is also costly. How do we do this in the environmental sector when there is so much inequity? The United Nations has used Vancouver as an example of this challenge. Its poverty stricken downtown eastside is located in the midst of prosperity; and there is a stark divide between those who live in LEED standard buildings and those who live on the streets. In Mumbai, India's richest man is building the greenest building. This residence will soar 173 meters high, but below, over 100,000 Indians will continue to live in slums and trash dumps.

How do we green the divide between rich and poor? What will the city of the future look like?

- Part historic (e.g., streetcars)
- Social equity
- Connectedness and a sense of place
- Economic opportunities
- Sustainable communities
- Walkability
- Transit oriented

3.11.3

Easy Solutions for Intractable Problems

Presenter: Arne Elias, Research Executive Director, The Centre for Sustainable Transportation, University of Winnipeg

Sustainability in transportation is integrally connected to other aspects of sustainability: solutions in this field are connected to how we are to build a sustainable future.

Why we need to act fast:

- Climate change
- Criteria air contaminant
- Energy security and supply
- The impacts of transportation on land use

There are three main areas where transformation in transportation is needed:

- Behaviour
- Technology
- Infrastructure

The technological approach creates change. In the process of that change there is an increased capacity for behavioural change. In transportation there are six technological approaches:

- Fuel shifting
- Mode shifting
- New technology
- Fuel efficiencies
- Demand side management
- Planning, design and infrastructure development for active transportation

At present, there is a transportation hierarchy: cars rule the city, followed by transit and active transportation (walking, cycling) is at the bottom.

This hierarchy needs to be inverted. In Toronto, only 20–30 per cent of trips need to be by car. In Winnipeg it is closer to 50–60 per cent. In Ontario 80 per cent of children are being driven to school. Exercise and independence is being

taken away. We are perpetuating a culture of car riders. Investing in the use of sidewalks to support active transportation is the way to start. We need to build off-road cycling routes, facilities and infrastructure.

We need to increase ridesharing, and if we are driving a single occupancy vehicle it must be green. Plug-in hybrid electric vehicles are a necessary transformation. As batteries increase in capability, the need for the internal combustion engine will be reduced. It is going to be a slow evolution to reduce the use of vehicles in general.

3.11.4

Linking Technology to ESD

Presenter: Rodelyn Stoeber, Professeure, Faculté d'éducation, Collège universitaire de Saint-Boniface

The International Institute for Sustainable Development states that ICTs (Information and Communication Technologies) can play an important role for the advancement of ESD by increasing access to educational materials about sustainability and by promoting new ways of interacting in order to facilitate ESD learning with regards to knowledge, choices, values and actions. This presentation described two projects which exemplify how technology can be used to enhance ESD teaching and learning. These were: “Petites écoles en réseau (PEER)” and “The use of the microcomposter to study the dynamics of ecosystems.” These projects utilized technology tools to make ESD more accessible to students and teachers.

- PEER: The creation of virtual learning communities for the purposes of addressing the needs of small rural schools provides teachers with the opportunity to teach using areas of expertise and promoting the sharing of expertise to create relevant strategies and models. This was done through the delivery of online content to teachers so teachers could remain in the classroom.
- “The use of a microcomposter to study dynamics of ecosystems”: This techno-pedagogical approach encourages the younger generation to get involved with science. Microcomposters are brought into the classroom and can be used year round. Students enjoy watching the process of decomposition. This project brings a small-scale zoo into the classroom. The microcomposter is aerated, and there is a glass panel for viewing purposes. This project allows children to learn about biology, physics and science.

3.11.5

When Green isn't Green

Presenter: Lisa Pope, History and Geography Coordinator, Australian Science and Mathematics School, c/o Flinders University

This session outlined the water-related issues that the residents of South Australian state capitol Adelaide are currently facing. South Australia is known as the driest state in the driest inhabited continent. Residents have been living with compulsory water restrictions for two years and are now being forced to examine a range of options necessary to secure the water supply to the city. The session highlighted the environmental implications of some of the more drastic measures that are being considered and the importance of educating students so that they are able to contribute as adults in an informed manner to the decision-making process.

The school discussed in this session is the Australian Science and Math School, in Adelaide. The study involved the local university and used an integrated learning approach (themes, not subjects). The students used a learning commons, not classrooms, and it was a compulsory two-year program for grades 10 and 11.

Adelaide's water source is the Murray River system (90%); plus ground water. Since 2004 houses have required rainwater tanks (1,000 L minimum). These tanks only hold enough water for one week. The Murray-Darling Basin is controlled mostly by other states in Australia. Seventy-five per cent of the system water is used for irrigation and there are many unsustainable practices putting pressure on this water system. South Australia is a drought and flood eco-system. Many new dams and lakes have drowned the natural system. There is also a temporary weir set to be built for Adelaide's use but it will devastate eco-systems downstream (wetlands). Adelaide is looking at a severely stressed system.

Responses to the water shortage include education and water restrictions such as grey water usage, dual flush toilets and restrictions on water usage for pools. Internal domestic use is currently not restricted. Increased ground water use has been one response but has resulted in depletion of the Great Artesian Basin through poor extraction management.

There are unknown long-term consequences to this approach. Desalinization plants have also been introduced at a cost of AUS\$1.2 billion per plant. This is seen as a “political quick fix.” They are energy intense (high CO₂) and cause saline discharge into the gulf. A storm-water recovery and aquifer recovery system has been set up. Over 60 per cent of storm water is recycled. This is considered a cheaper option. Education for future decision-making is needed.

3.11.6

An Approach to Integrate and Manage Corporate Sustainability

Presenter: Donna Dagg, Sustainable Development Coordinator, Manitoba Lotteries Corporation

Manitoba Lotteries Corporation (MLC) is a Crown Corporation that manages gaming and VLTs, including casinos. The MLC also distributes tickets for the Western Canada Lottery Corporation. The revenue generated goes to the Manitoba provincial government.

Why go green?

- Stakeholder expectations
- Business sense
- Provincial legislation
- Right thing to do

We achieved our green status through executive support. We were able to create a sustainable development coordinator position in the Finance Department. This position aids MLC in understanding local and global issues, determines impacts, and provides education and awareness. We also modified governance and financial processes, and developed working groups, both top-down and bottom-up.

The operational aspects MLC has improved are:

- Solid waste reduction
- Green house gas (GHG) reduction
- Fleet management
- Green procurement
- Buy locally and from Aboriginal groups
- Water conservation (new initiative)

Results to date include:

- GHG emissions down 70 per cent
- Becoming a carbon neutral organization
- 80 per cent waste diversion by 2010
- Significant benefits down and upstream due to “green procurement”

Our future outlook includes reducing water consumption, separating organic waste, achieving Leadership in Energy and Environmental Design (LEED) standards (consistent with provincial policy), Building Owners and Managers (BOMA) certification and ISO 14001 certification for Environmental Management Systems.

3.11.7

Land and Water Stewardship Education: Building the foundation for sustainable decision-making

Presenter: Gary Enns, Winnipeg River Learning Centre

The Winnipeg River Learning Centre (WRLC) is re-tooling the definition of sustainable development. The 1990s saw environment, economy and health and well-being as separate circles which meet at sustainability. However, the new

model is based on nested circles with human health located at the centre of the economy, which itself lies at the centre of the environment. Everything is connected. But how do we take this into the classroom?

Prior to the 1990s the Department of Education in the Manitoba Government introduced a curriculum for SD. In the 1990s, the focus changed to integrating SD into curriculum at all levels and in all subjects wherever appropriate, on the basis that SD should not be considered an “add-on.” An example of this is sustainable development being taught within a Grade 6 social studies (history) unit.

According to Enns, central to the concepts of sustainability that should be taught is the concept of stewardship. WRLC considers stewardship as central to its work. Stewardship is multi-layered in its meanings. Stewardship crosses all circles of sustainability: stewardship of finances, of land and water, of social connections.

Stewardship issues of relevance to WRLC programming include:

- Examining the economic profile of the Winnipeg river system and the economic activities it supports: hydro, forestry, mining
- Mapping the “human geography” of the region: cottages, tourism, retirement destinations
- Understanding the physical geography
- Looking at potential impacts of proposed new dams in much greater depth than in the past.

WRLC notes that there is a positive shift in attitudes occurring: but more post-secondary training and expertise in resource conservation is needed.

3.12

Seven Generations: Aboriginal Perspectives (double session)

3.12.1

Teaching about Biodiversity in First Nations Classrooms

Presenter: Tracy Ruta-Fuchs, Research Associate, Centre for Indigenous Environmental Resources (CIER)

This presentation covered the loss of biodiversity and the significance of this loss to First Nations in Manitoba. Tracy Ruta-Fuchs forwarded reasons for educators to incorporate biodiversity into First Nations classrooms, and provided an overview of the Species at Risk Teaching Kit and calendar developed by CIER.

What are the goals of the Species at Risk Teaching Kit Teaching Kit?

The Species at Risk Teaching Kit and calendar were developed for use in the K–12 classrooms of First Nations schools in Manitoba and Saskatchewan. The kit helps teachers engage First Nations students in learning about the role of biodiversity in the environment, threats to species at risk and the importance of healthy habitats. Students and teachers explore means of protecting and recovering species at risk and habitat within First Nations territories, through the use of tools such as First Nations’ own natural laws and the Species at Risk Act (SARA). The kit was designed to be culturally relevant to today’s First Nations communities; special attention was paid to language, interactive exercises and examples of communities that are actively involved in protecting species at risk.

What’s in the Teaching Kit?

- 80-page booklet, containing:
- Introduction to the concepts
- Seven Lesson Plans, including: role-playing, mapping, campaign to save a species at risk, making a book, “Prairie Puzzle” and “Migration Madness”
- Fun activities: Bingo, crosswords, word search, true and false, and “What Fits”
- List of species at risk in Manitoba and Saskatchewan

- Parks Canada Species at Risk Teaching Materials on CD-Rom
- Art competition contest and poster
- Five Videos in DVD format, including:
 - Hinterland Who’s Who wildlife video collection
 - Shadows of the Forest: Managing Woodland Caribou
 - Our Changing Land: Burrowing Owls, a Species at Risk
 - Return of the Swift Fox
 - Going Underground: The Natural History of Burrowing Owls
- Species at Risk Calendar 2008–2009 featuring:
 - Pictures of the species
 - “Fascinating Facts”: information about the species
 - Life Cycle Wheel: phases of the species life cycle
 - “People’s Connection”: the species’ relationship with First Nations culture
 - “Action for Species”: suggested classroom activities
 - Recovery Measures: First Nation recovery efforts
 - Important dates for First Nations people

3.12.2

Supporting Sustainable Approaches in First Nations Education

Presenters: Frank Deer, Betty Lynxleg, Andy Thomas, Rudy Subedar and Wilfred Buck, Research and Development Team, Manitoba First Nations Education Resource Centre (MFNERC)

An overview of Aboriginal education in Manitoba and its impact on the sustainability of the province was examined through a series of presentations. The presenters offered successful strategies that have proved to increase Aboriginal student retention and graduation rates; First Nations sustainable education projects and approaches; and an examination of the incorporation of Aboriginal traditional teachings into education processes.

Presenters noted the challenges facing aboriginal youth. The youth crisis is a problem of social positioning, marginalization and poverty. It is a reality of inequality, due to a lack of employment and education, as well as racism. Further, aboriginal identity is built on language and a perspective that is intertwined with the environment. Elders have a respect for environment, people and wildlife. But this relationship is not apparent in the current lifestyles for aboriginal youth that has continued colonial influences such as types of food, housing and technology.

Current low Aboriginal high school and university graduation rates are affected by limited access to funding for post-secondary education, waiting lists and distance costs. It would take 28 years to close the gap between total Canadian high school graduation and the Aboriginal rate of graduation.

Presenters observed that community-based, spiritual education improves the low rate of graduation. Our approach to teaching is sustainable. Learning means nourishment: social, environmental and economic. Education makes citizens and leaders that make smart decisions. Manitoba First Nations Education offers 29 credits and 11 school-initiated courses and optional courses of local language, history, Aboriginal governance and law. These courses reflect student and community interests and relevant issues. They inform students about cultural relationships and rights, which improves awareness and quality of life in the community. These courses enhance student’s person, family, community and country.

Manitoba First Nations Education Resource Centre (MFNERC) has introduced ESD project-based and land-based learning. Our strategy to reach children is a creative approach to local, relevant topics. We need to keep the context intellectual (value traditional knowledge) and physical (environment).

ESD should be project-based. Teachers and students should identify local problems to address. Co-researchers integrate traditional areas of study (writing, math, etc.) with environment, traditional activities and traditional knowledge. Investigation of a real life topic leads students to go further, here and now.

We also have formal structured content: community studies, hunting, trapping and fishing. Course examples include ice fishing (catch fish, clean, treat fish), snowshoe making and a canoe quest group trip to learn guidance. When schools adapt their curriculum to local needs it brings the community into the school. Aboriginal students learn by doing. When education occurs within this framework, students take ownership and responsibility. Environmental stewardship is part of sustainable development and part of our culture and project context.

When planning courses, educators need to remember the interests of students, the importance of community and the constraints of resource availability. Benefits of adopting this approach include motivated students, the freedom of open questions, discussion of locally relevant issues, context maintained, increasing self-esteem, empowering students, instilling responsibility, building teamwork, involving community, extending curriculum and increasing positive feelings towards school. Success breeds success.

Our pedagogy is holistic, oneness, interconnectedness and total impacts. The current system is not working; standards are not being met. Beliefs lead to recognizing human vulnerability. Education for sustainable development requires a change of thinking that can happen by using traditional knowledge. Students can adapt; lack of success it is not an inability to learn, but a lack of access and recognition. Respect for traditional knowledge needs to be present. There is an idea that traditional knowledge is not as good as western science. Students need to know our way is just as relevant. There is resistance to First Nations taking the lead in educating our youth but it is a responsibility we must not back away from.

The mysterious nature of stars, trees and land need to be recognized and connected with the use of language and Aboriginal teachings. Translation can capture what things say but not what they mean. There is a growing idea of school for community: to not just see the school as a building, but a spirit alive, experienced for us, by us.

3.12.3

Anishinabe Philosophies

Presenter: Tobasonakwut Kinew, Elder, Manitoba First Nations Education Resource Centre (MFNERC)

This session offered traditional teachings from an Ojibway Elder, Tobasonakwut Kinew, who has spent his life learning and living the philosophies of the Anishinabe. Through his presentation, Tobasonakwut enlightened participants on the Anishinabe way of thinking and need for mainstream society to begin to awaken to this approach. The Elder related the traditional way of thinking to the contemporary world and the importance for the global population to adopt these principles within their daily thoughts and actions. What follows are the key elements of his story:

“I always speak first in my language of birth. It was what I heard before I was born. I speak everyday conversational Ojibway and the four higher levels that are less common. The older people taught me and I am happy to find others and practice with them.

Anishinabe know about summer flyers returning. When the geese leave it is the beginning of storytelling time and when the crows returns, it is the end. It is critically important to watch and adhere to this.

I got a phone call from my brother who told me of the death of an Elder. My reply was ‘I wonder who is next?’ People leave in clusters of 4–7 then they stop. This tends to happen together, to die and also to think in clusters.

Philosophy programs in university are stuck on logic and get their funding cut if they have a different way of thinking. We need to preserve language, observations and ceremonies. There are words that cannot be translated into English as the concepts are unknown, such as ‘negative clusters are balanced by positive clusters,’ ‘thought I saw but looked closer and it was not there’ and ‘it is forbidden.’

What is thinking in clusters? While at a sweat lodge, a lady asked to go for a walk with me and ask me questions. We walked holding hands and she told of her recurring dream that involved a fox. While we were walking a fox crossed the road 500 feet away. She felt the impact of this because an inside event and an outside event were coupled. Events couple maybe because time is not operating, is not of importance. The events are not constrained by time: ‘Thought I saw but looked closer and it was not there.’

My grown children are in university, working in communications. They are lawyers and they want to know 'why' in the physical sense. This forces Elders to be on their toes. We can't subject the young generation to a 'magic system.' This forces everyone to make a lot of rational sense.

There is a story told of a character who has many names and who has animals and spirits speak to him through his journey. The meaning is to give recommendations on how to live a good life. The story includes 64 laws and teachings. When a grandmother tells these stories, the journey story continues for 27 nights. On each night she asks if the audience remembers the stories of the nights before. She makes sure they know how each story is connected to the others. This allows the listeners to learn to think in concrete terms but to know the connections as well.

Law school operates by discussing case connections. Residential schools tried to wipe out this kind of thinking. When I was at residential school I saw the hierarchy of nuns and priest. I made the connections of these roles, but nothing ran with thinking in clusters.

I moved to the city and learned quickly that people don't think like me. I had some schooling but imagine the shock my grandparents would feel with city living! We think differently, in a particular way. We think 'What is the pattern?' We think in terms of physics and spirituality: How can I bring them together? Can they meet half way?

At a Michigan conference, Aboriginal people fluent in their language were asked to translate the speed of light. Many think that only English speakers can make equations, formulas. This leads to robbing the world by forbidding other ways of thinking.

My language has four ways of talking about the past and the present and the future. Physics should try to explain and study how that can be. Many are good at communicating in their own language but are seen as failures in English speaking situations.

I think that meeting half way is good. The cluster thinking idea is important. It is also important to seek your dream. Examine your part in everyday things. Spirit has one function, to live a good life. My spirit is not a devil, he is good.

Examination leads to absolute knowledge, insight, power and ceremonies. Teachings are often seen as myths, quaint. The sun, stars and mountains choose to be this way. Physical and religious knowledge don't need to be written but sung in a song: I inherited this song."

3.13

Natural Resources (Water, Energy and Consumption) (double session)

3.13.1

"Our Lakes, Our Community": Lake Winnipeg Research Consortium

Presenter: Al Kristofferson, Managing Director Lake Winnipeg Research Consortium

This session discussed an educational program being conducted by the Lake Winnipeg Research Consortium (LWRC). Lake Winnipeg is one of the largest lakes in the world yet there is very little research conducted about it. The LWRC is a non-profit body formed by the cooperation of government, universities, corporations, cottagers, boaters, etc., to facilitate research on Lake Winnipeg and provide educational and outreach programs. Research on Lake Winnipeg is important because there are a number of ecological problems that have adversely affected aesthetic, economic and recreational aspects of the lake. The primary source of these problems is eutrophication, or nutrient enrichment, of the lake. The main nutrient culprits are phosphorous and nitrogen, which have led to widespread algae blooms all over the lake. This is a serious problem that the LWRC is trying to address with scientists and by developing educational programs about the lake.

In some of the lake surveys conducted by the LWRC on their research vessel, students have accompanied for short legs of the trip (groups of about 12 students) as part of their school science program. The program as so successful at

engaging students that the LWRC found that there was demand from the students and teachers to develop the program even more.

The LWRC's educational program has now developed a few objectives:

- To develop and deliver Web-based resource materials on how the lake ecosystem functions to be available for students and teachers;
- To develop the field program by providing hands-on experiences to youth on board the research vessel;
- To establish a geographic information system to link the student's findings with Web-based resource material.

Currently, funding for the educational branch is a problem, and has not yet been secured. The cost is approximately \$5,000/day to run the ship. The goal is to dedicate four days a year to take out students, with approximately 60 students per day.

3.13.2

Energy Education

Presenter: Brendan Carruthers, Environmental Education Specialist, Manitoba Hydro

Mr. Carruthers spoke about Manitoba Hydro (MH)'s sustainability initiatives. He noted that Canada has one of the most diversified bases of electricity in the world including hydro, coal and nuclear power. MH has integrated a comprehensive sustainable development policy into its mandate by sampling from the province's policy guidelines on sustainable development. Introducing something like that in a Crown Corporation is a huge feat and it is astounding how quickly it has come about. MH is a massive component of Canada's electric generation (60.2 per cent in 2005).

The objectives of MH are:

- Environmental leadership
- Aboriginal relations
- Export revenues for Manitoba
- Economic development for Manitoba
- MH has developed many grants, programs and initiatives regarding ESD with many outside organizations.

3.13.3

Sustainable Resources: The energy to change

Presenter: Mary Ferguson, BC Hydro and Paul Lukaszek, BC Ministry of Education

Energy conservation and environmental education have been at the forefront of the education programs of BC Hydro and BC Ministry of Education for many years. Last year, people from the provincial government were brought in to develop a sustainability framework in BC. The program development was comprised of courses for about five major BC resource areas for grades K–12.

For the past five years, due to increased population growth in BC and increased demand, BC has become a net importer of electricity. Because BC Hydro (BCH) is a Crown Corporation owned by BC, central in its energy plan is for BC to be energy self-sufficient by 2016. Conservation and education about conservation plays a large role in getting BC there.

BCH has developed educational programs for grades K–12:

- Energy detectives for grades K–3. Smarty the Superhero is the character on all handbooks, bookmarks and posters.
- Energy campaigns for grades 4–12. Consists of interactive workshops, with students teaching their own school about what they have learned.
- Energy ambassadors: for grades 10–12. Students partner with mentors and make energy efficiency recommendations to school boards.

BCH manages all training, coordination, recruitment and orientation for these programs. The main purpose of these programs is to give students a chance to make a real difference.

3.13.4

Climate Change in the Canadian Science Curriculum: Chance, challenge and change

Presenter: John Murray, Science Consultant, Curriculum Development Unit, Manitoba Department of Education

The science of climate change, and its importance to broader understandings of global systems thinking, presents a challenge to curriculum that can no longer be ignored. Undeniably complex, interdisciplinary in nature and extending its reach beyond the traditional science curriculum, climate science offers the promise to cultivate education for sustainability within the context of one of most urgent planetary-scale issues of the age. The challenge is designing curriculum that encourages student engagement of the science in an accessible way (making personal and collective sense of climate science), seeking relevancy to one's immediate environment (appropriate scale), foster resistance to instilling an unwarranted fear of an uncertain future (adaptive capacity) and developing the capacity to be solution-oriented (adaptation to risk).

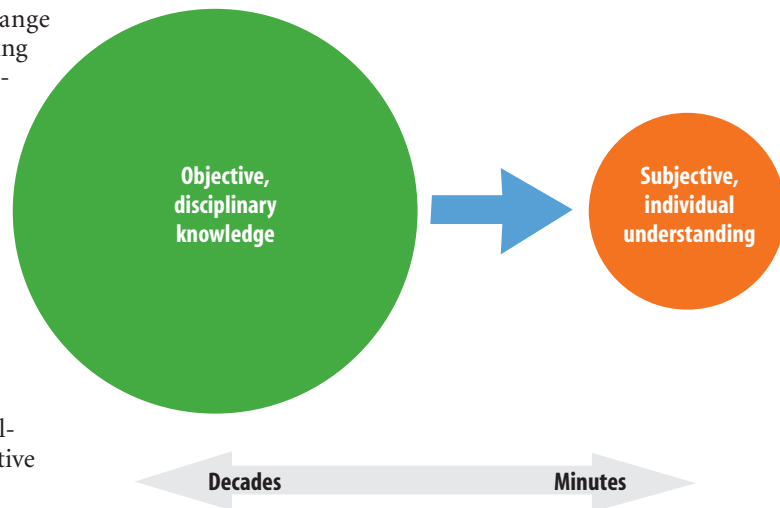
Any transformative change towards sustainable living practices includes an education for adaptation to the risk society, and that invites adaptive thinking in relation to a changing climate. This session examined current trends and developments in science curriculum in Manitoba and elsewhere in Canada that seek to accept the chance, challenge and change that climate science will contribute to a science education towards understanding—both philosophically and practically—issues of sustainability. The public understanding of seemingly synonymous terms as climate change and global warming are increasingly influenced by demographic characteristics (language, culture and region) and socio-political motivations that are appropriately outside of a balanced treatment of current climate science. The competition for adopting a particular position on issues of global climate speaks to multiple futures as opposed to a common future.

The public understanding of climate change often groups individuals according to attitudes and beliefs (using classifications such as “believer,” “agnostic” and “denier”) as if the issue were more related to dogmatism and faith as opposed to reason and evidential science. Climate change science constitutes one of the fastest-growing areas in the scientific literature, with exponential growth in publications in the last 30 years. These situations alone provide enough impetus to acknowledge climate change science as having an appropriate place in any science curriculum that seeks to accomplish the following: increased emphasis in science education on the roles of evidence, argumentation, appreciation of the nature of science, the development of scientific knowledge and the importance of how major conceptual shifts revolutionize scientific discourse.

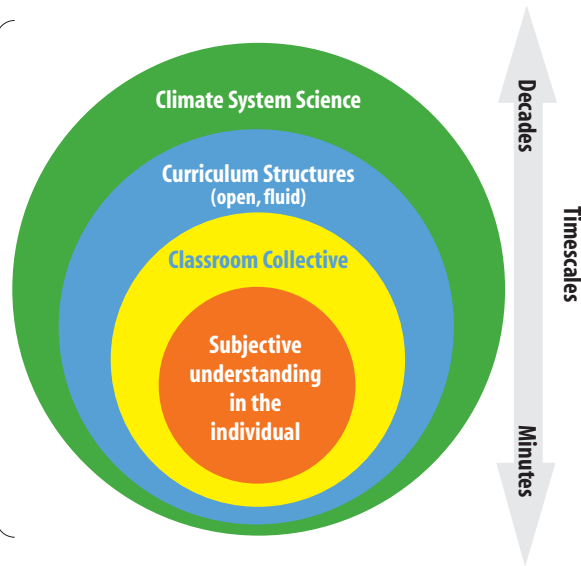
One question that was addressed is whether the current contexts of climate science and climate change are appropriately designed for students in the science curriculum.

For instance, certain Canadian jurisdictions have recently moved to address climate change through slight re-orientations to pre-existing curriculum units that initially had a meteorological focus. The media representations of climate change issues are increasingly relying less on the pronouncements of working groups such as the Intergovernmental Panel on Climate Change (IPCC), and this provides an important window for students into the nature of scientific discourse. Moreover, students of today risk developing a “latent environmental depression,” and could adopt symptoms of a generation that is well informed on the issue, but disillusioned and lacking in hope for a positive environmental future.

A teaching and learning model was presented that relies upon certain principles from *complexity thinking*. To complexivists working in a classroom setting, students



Categories of knowing • Categories of new knowledge structures
(Treated as dynamic, volatile, responsive, to new conditions, adaptive, emergent)



engage each other and scientific information, but are not passive recipients of inert scientific knowledge. They act as “agents,” forming positions, understandings and opinions that are considered “emergent” and perhaps unexpected. The traditional transmission model of scientific knowledge can be diagrammed as follows: the disciplinary knowledge from the scientific community, refined over decades to centuries, is now operationalized on the order of minutes to hours among students (see diagram on page 42).

An alternative approach is to immerse students in the science (at an age-appropriate level of treatment) such that it is current, less inert, creates a dynamic and sometimes unexpected learning among students, and is curricularly fluid (see diagram on the left).

In this new model, students’ subjective individualized knowledge structures are developed in a manner that has them operating as change

agents in a “collective” (the classroom of peers and teacher[s]), all the while being embedded in structures that have existed for longer periods of time (e.g., curriculum that spans years and scientific research that occupies decades of space).

The primary source of the problem in curriculum design for climate change is that we have a large body of objective disciplinary knowledge, but we have a narrow temporal window within which to develop students’ understandings in rich and meaningful ways. The complexity model takes on this challenge by recognizing that the science is increasingly complex, but is always in flux and changing its inclinations. The classroom and curriculum structures for science need to be opened up, maintain more fluidity and adaptation to these changing research and reporting conditions.



John Murray, Science Consultant,
 Curriculum Development Unit,
 Manitoba Department of Education
 with Darryl Gervais, Acting Director,
 Instruction, Curriculum and
 Assessment Branch, Manitoba
 Education, Citizenship and Youth

Among the outcomes that the model foresees, the following were deemed significant:

- Students become “solution-oriented” and gain confidence at the prospect of living in the “risk society” of their own, hopeful future
- Understandings related to climate change are brought into a broader context of sustainability principles as permanent features in students’ personal and public relationship with science
- Students provided with *legitimacy* for their views; teachers open to novel responses to a complex scientific issue
- Students encountering many new, unanswered questions about Earth’s systems behaviour; creating new avenues for further research and personal/collective discovery
- Students embracing with enthusiasm adaptation to change as both expected and normative, and avoiding pressing issues of mitigating climate change or looking for ways to control the climate system
- Students are immersed in local and regional contexts that give familiarity to the possible changes that may occur in their lifetime and a few generations hence
- Students examine closely, collectively, how climate change science is portrayed in the popular press, in documentaries and film and in accessible summaries from the scientific community (where appropriate)

To summarize, it was argued that there needs to be a curriculum focus that relies more on models of human and environment adaptation to climate change, while at the same time developing improved prudence, personal and collective decision-making and solution-oriented stewardship.

3.13.5

Manitoba Model Forest

Presenter: Bob Austman, Education Coordinator, Manitoba Model Forest

In 1991 the Government of Canada’s plan to deal with the forest crisis was to create a model forest and bring stakeholders together to deal with forest management. They created a living laboratory to study how to harvest and ensure regeneration, how to maintain species diversity and how to protect water quality. There is now a network across Canada of model forests, with the largest eco-system in Manitoba.

Kinds of research the Manitoba Model Forest (MMF) undertakes:

- Flagship projects: woodland caribou habitat needs as an indicator species.
- Stream monitoring and watershed management
- Biomonitoring
- Socio-economic: non-timber forest products
- First Nations land use planning

In order to engage youth in the project, the MMF educators have used a multi-faced program with hands-on science. The MMF hosts youth forest symposiums where students are brought out to the forest to meet staff and learn about forest management. Other ways in which the MMF has brought education into the community include:

- National Forest Week
- The Canon Envirothon
- Student involvement in the biomonitoring program
- Students hired as research assistants
- Participation in school outreach programs
- Involvement of Aboriginal Elders to share traditional ecological knowledge
- A Junior Rangers program

- Partnership with the Butterfly Model Forest in Mexico
- First Nations forestry training.

The goal at MMF is to apply hands-on science experiences to compliment theory in the classroom. Since 85 per cent of students live in urban areas, they are losing the connection to the forest. We need to instill a sense of hope and reconnection.

3.13.6

Role of Watershed Management in Addressing Lake Winnipeg's Declining Water Quality

Presenter: Bryan Osborne, Project Manager for the Tobacco Creek Model Watershed initiative and IISD Associate

The Red River Watershed reaches west to the Rockies, south to South Dakota, east to Ontario, north to Northern Manitoba and is equal to 1 million km². It can be subdivided into smaller areas: Lake Winnipeg, for example, is 25,000 km², approximately the size of Israel.

Our challenges in terms of watershed management include jurisdictions, politicians and land use planning. We must link what is happening in the landscape to the lake; this includes nutrient loading into water. The concept we are looking at is integrated watershed management. For example agriculture, hog barn management and sewage treatment all play a role in watershed management. We do not know what the outcomes of integrated management regulations will be, but we must try.

An effective model for watershed management or catchments solutions is community-based solutions. There is the realization that people are trying to make a living on the landscape, but there must be control over nutrient loading into the watershed. To fix a downstream problem we must look upstream. The creation of conservation districts and watershed authorities has now occurred. Manitoba is behind Ontario and Saskatchewan, but is developing momentum.

3.13.7

Reaching out to Culturally Diverse Audiences: Wetlands and the world

Presenter: Barb Hanbigde, Ducks Unlimited Canada, Saskatchewan Education Specialist

Ducks Unlimited Canada (DUC) is a not-for-profit organization founded 1938 to protect wetland habitat, and invests CDN\$75 million dollars per year in conservation. One program it has developed focuses on conservation education for new Canadian immigrants. Every year, 250,000 immigrants come into Canada. Inner city schools in Toronto may have 400 students with over 50 languages spoken. Conservation must cross cultural boundaries to remain a core Canadian value.

DUC's objective in this program was to produce new resources to teach English as a second language (ESL) students about conservation, creating a bridge to reach their parents and extended family. DUC wanted to cover basic conservation education and what types of lifestyle changes the average Canadian can choose to make a difference.

The challenges to this project have included overburdened teachers lacking sustainable development training, and the fact that conservation is of secondary importance when families are faced with poverty. There is a large amount of biophobia (fear of the natural world) in the inner city, a lack of familiarity with local flora and fauna. Many immigrant children are dealing with culture shock, conflicts between home and peer values and language translation issues; there is a lack of similar vocabulary in many languages.

This being said there are still opportunities to be had; students are able to have hands-on interactions with their environment, and the program also promotes conversational language and improves literary and numeracy.

Recommendations that have come out of this project include working directly with a translator, having work reviewed by a native speaker, simplifying vocabulary as much as possible, and realizing it won't be perfect the first time.

3.13.8

Water, Climate and Moopher: Developing free educational materials from Partners for the Saskatchewan River Basin

Presenter: Jennifer Nelson, Communications Officer for Saskatchewan, Partners for the Saskatchewan River Basin

Partners for the Saskatchewan River Basin have developed three educational programs targeted at grades 3–8. This presentation highlighted these educational programs.

1) Moopher, The Mischievous Gopher:

- i. “Moopher’s Amazing Journey to the Sea” is an exciting new board game designed for children ages 7–12+. By helping Moopher (a mischievous gopher) travel to the sea, children learn about their place within the Saskatchewan River Basin, its diverse culture and how their actions can influence the greater watershed basin. In the game, players can travel through time or visit different ecosystems. Each game includes one large 20 x 29 game board with a diorama showcasing four different ecosystems, one instruction booklet with diorama pictures, three decks of memory cards (for playing as part of the game, or on its own), one deck of river cards (trivia), four river rocks, dice and one evaluation form. The booklet contains two additional activities with associated games.
- ii. “Moopher’s Travels through Time” examines how society has changed over time by comparing drinking methods, housing, transportation, important animals and tasks through four time periods (aboriginal community prior to contact with Europeans, time of the fur trade and Metis communities, arrival of settlers from other parts of the world, present day communities along the river).
- iii. “Moopher’s Visit to Different Ecosystems” examines the types of animals and insects associated with the mountains, forest, grassland, aquatic ecosystems.

2) Water Watchdog:

Water Watchdog is a hands-on water monitoring program for youth that increases awareness about water and water management issues. It encourages individual actions that will contribute to healthier ecosystems. It is a ready-to-go water monitoring and education kit to test for basic water quality parameters. It does not require the adult leader to have extensive prior environmental knowledge, and contains workbooks, information guides and field testing equipment. Activities include field data collection, data analysis and an indoor component where a child’s “water footprint” is calculated.

3) Field Day – The Main Event:

The main component of the program is a field day, in which you can choose which activities you want to run. The actual field trip requires minimal onsite setup time and can be constructed in a variety of locations and seasons. Time requirements are also flexible and the program can easily be adjusted for an afternoon or a few days. You may use this program for a Scout or Guide group, a class, a camp, a watershed group, a special event, or with children in your family.

While each kit is designed for one leader and five children, the program can be used with larger groups. The various activities are grouped into stations. For larger groups, each group of participants could rotate between stations. These sets may also be used as independent units for shorter time frames.

What is in the Kit? The program is designed to be reusable.

- Originals (Masters) of the Climate Change Challenge and the Logbooks are included for photocopying purposes.
- Leaders Program Setup: If you are planning on using the Click on Climate program, this is the book to start with. This book contains information on how to plan a Click on Climate program. It also contains information for additional activities that you may wish to do before, during or after the field trip.
- Leaders Field Guide: This book contains the pages of the participant’s Logbook paired with the instructions for leading the activities. It also contains tips for success and additional information. There is a program organizer at the back to help organize larger groups.

- Information Files: This is a mini text-book on climate change. Kids can use it to help them in answering the Climate Change Challenge (a set of brainteasers). Keep these booklets to reuse the kit.
- Participants Logbooks: Each child will need his/her own logbook. This book contains the journal pages, data sheets and pledges for the field day. It also contains Internet links they can go to afterwards.
- Masters Envelope: This contains the originals of the Climate Change Challenge (a set of brainteasers) and the participant's Logbooks. You can photocopy these to reuse the program.
- Field Trip Supplies: The kit comes with most of the supplies needed for the field trip. Additional supplies such as empty pop containers may be needed depending upon the activities chosen to do.



Jennifer Nelson and Lis Mack,
Saskatchewan River Basin Booth

3.14

Current ESD Research II

3.14.1

Choosing Goals: Integrating SD into school subjects

Presenter: Michael Moreau, Student teacher, University of Manitoba, Faculty of Education

We desire much more than educational effectiveness with our best examples of ESD lessons. We need to portray our ideals as well as our effectiveness. But what are the ideals that we want to build into the exemplars that will demonstrate the potency of integrating ESD into existing school content?

- Regarding sustainable development itself
- Regarding the subject in which we have embedded the lesson
- Regarding the applicability and practicality: can teachers with fears regarding their expertise in ESD imagine using our lesson exemplars in their classrooms be successful?

By viewing a particular example of a high school mathematics lesson with an ESD theme, participants were invited to express their ideas regarding lesson exemplars. The presenters advanced the ideal that ESD must embrace a pedagogy of hope, not despair, as students are engaged.

Integration with integrity

The presenter used the example of “White Rhinos in Pre-Calculus” as a way to integrate biology and ecology into a math lesson. The purpose of SD in the classroom is to integrate subjects while keeping the integrity of other subjects, our integrity in relation to students, and the integrity of the cause.

A lot of math teachers have difficulty in bridging the gap between sustainability and math. The researchers approached this through population dynamics.

Population dynamics

A Free Press article stated there were only 50 to 100 white rhinos in 1925. Today there are over 8000. The inquiry question for students was: how might the population have changed?

Conjecture 1: The increase for each decade might have been the same. What *constant increase* might have occurred each decade?

Conjecture 2: Increase in each decade depends on the population at the time. What *constant percentage increase* might have occurred each decade?

Teachers are asked to introduce spreadsheets as not only cool and fun but also for their usefulness as a tool for modelling. The wow factor comes when the formulas are entered into the spreadsheet and the computer does the work. This activity teaches the students to use the various spreadsheet functions, running a test model with different numbers to get a specific percentage.

Students then produce graphs, noting the problems of calculating decimal points (representing fractions of rhinos—e.g., .2 rhinos). In the process, they learn that with Conjecture 1, a constant rate of change, one cannot make 8,000 rhinos from an initial population of 75.

The presenter observed that there are two different kinds of students, some look at the shortest distance between points 1 and 2, and some take the biologist’s view.

Integration of subjects while maintaining the individual integrity of subjects:

- *The math:* This exercise speaks to the content and process goals of mathematics.
- *The technology:* Use of spreadsheets is modern and dynamic
- *The science:* Math and technology used for ecology and population dynamics.

Our integrity and the integrity of the cause: We teach. We do not preach. We invite. We do not convert. We engage students with possibilities, instead of playing on their fears.

3.14.2

Developing Local Leadership through Hands-on Learning

Presenter: Ryan Canart, Upper Assiniboine River Conservation District & Fort La Bosse School Division, Assiniboine Community College

The need

Education and understanding of our natural resources is the single most important tool available to protecting our environment. There were no real opportunities for students to get real world field exposure to integrated resource management or exposure to the career options in these ever increasing fields.

Background

The Conservation District (CD) and local ESD committee applied for SEED funding from Water Stewardship and Manitoba Conservation (\$35,000). One teacher administered the course materials and the online curriculum was devel-

oped. Now in its third year, students from three schools within the school district are enrolled in the program. The school contributes one position, the CD contributes five days per school year, and equipment and supplies for field days.

Course content

- Components of an ecosystem
- Pesticides and fertilizers
- Effects of human activity on water quality and land management
- Taxonomy and classification
- Career planning

Field Component

- GPS – GIS technology
- Water studies
- Soil studies
- Vegetation studies (Ecosystem monitoring)
- Macro invertebrate studies
- Riparian Health Assessment
- Global Positioning System (GPS)
- 2008 GPS Exercise
- Students go out into the field, record their surroundings and come back
- Students had access to different kinds of GPS tools

Managing the water edge

A riparian health assessment ties all sections together and focuses on land management impacts. Students can understand the negative and positive impacts of land use.

3.14.3

Environmental Education Views on Teaching About, For and In the Environment

Presenter: Don Metz, Associate Professor, University of Winnipeg

The primary purpose of this presentation is to report on curriculum perspectives and practices of environmental educators who teach from different perspectives and across cultural borders. Metz presented research comparing the “islands of excellence” model of environmental education versus a “whole school approach.” The Colegio Ambientalista Isiah Retana Atias (CAIRA) in Pedrogoso, Costa Rica (CR) and best practices in Manitoba serve as a backdrop for this comparison. CAIRA is a high school located in a rural setting that is implementing a compulsory, school-wide, multi-grade environmental curriculum. One goal of this presentation is to compare and contrast Manitoban current educational practices in the environmental education field with alternative approaches such as those found at CAIRA.

The “Islands of Excellence” model includes well-qualified and committed teachers, a supportive ministry of education, third-party support and special events. The “whole school” approach includes schools practicing what they teach, leading to values being reinforced by action. The content of the curriculum explores local SD.

The CAIRA School is on a 40-acre site, with outdoor classrooms where ESD students meet. All students take environmental classes every year. Teachers are all specialists in SD and they develop new projects every year (butterfly garden, make trails, etc).

Some curriculum comparisons

In Costa Rica, there are some national curriculum courses still under development. Teachers develop the courses at CAIRA. In Manitoba, provincial learning outcomes for ESD have been established within the individual disciplines of

science, social studies and health. In both approaches, teachers enhance the curriculum. A major difference exists in how learning outcomes are related across disciplines, with CAIRA demonstrating a more integrated approach.

Teaching strategies in the classroom in Costa Rica

Manitoba teachers teach ESD within different courses for varying amounts of time, from one to ten hours per week. Teaching in the outdoor environment averages at one hour per week in Manitoba, compared to 16 hours per week in CAIRA. CAIRA has more hands-on activities and fewer classroom lessons. Teachers have more experience in the outdoor fields. In Manitoba more use is made of hands-on computer technologies than at CAIRA.

How is the environmental curriculum developed?

In Manitoba this occurs through collaboration between teachers, and at CAIRA courses are built around projects.

Barriers to teaching ESD

In Manitoba there is a lack of funding to bring students to an outside experience/classroom. At CAIRA they do not have funding to build schools and classrooms and therefore most of their lessons are, by default, in the outdoors.

Supports for teaching ESD

Manitoba has support from the educational administration; CAIRA uses 17 acres as a classroom.

Goals

The goals for ESD are the same in Manitoba and CAIRA.

3.14.4

Students' Decision-making Process While Involved in a SD Project

Presenter: Diane Pruneau, University of Moncton

In Dieppe, a new residential subdivision has been planned according to the principles of conservation design. Before the construction, sixth grade students played the future residents' roles and had to make decisions based on critical aspects related to their way of life. While the students were involved in making choices, researchers investigated their decision-making process. The students always had to make two decisions: one without guidance and the second after reading ecological information and discussing it with their fictional families. At all times, the students considered the present and the short-term future in their decisions. It seemed possible to progressively educate the students to make more environmental decisions but the process asked a lot out of them.

An environmental decision-making process includes the way individual groups and organizations proceed to make choices involving the environment. The importance of decisions where the future and well being of ecosystems is taken into consideration is critical. There has been very little research done in this field.

Difficulties in environmental decision-making processes include complex and ill-defined problems, incomplete environmental knowledge to help with decisions, uncertainty about the future of situations, conflicting values between the people involved in an issue, time and money pressures, and that people not used to thinking over the long-term or about the natural environment.

The decision-making process includes identifying your goals, listing many alternatives, evaluating the consequences of all alternatives, making a choice and taking action, and auto-regulating your decision-making process.

Elements that influence people's decisions (in general) include personal interests such as health, security, satisfying relationships, careers, personal development and leisure activities, but not the needs of others or of the society. Sometimes religious beliefs, family values, honesty, justice, compassion and loyalty can influence people's decisions. And the affective is always found in the cognitive: people foresee the emotions that will be felt if they make one choice or another.

Decision-making limits among adults include preservation of the initial choice even in the presence of conflicting arguments and limited human capacities at the memory level. Difficulty in clarifying the objectives, in identifying several alternatives and in structuring the decision-making process is another limit. Choice of the first option is satisfactory and an overestimation of the weak probabilities.

Characteristics of the decisions usually taken by students focused on the present time, impulse, personal bias, omitting consideration of many alternatives and probabilities not taken into account. However students can be taught to make better decisions, particularly by allowing them to practice with make-believe scenarios.

The project we introduced with students included *conservation design* of a residential area where half or more of the land remains natural and becomes a permanent public space which helps to protect watersheds and habitats of animals and ground water.

Students made “pre-decisions” and “real-decisions” on the subjects of:

- The types of plant cover for their lot
- The plants for their flower beds
- The presence of domestic animals
- Energy conservation
- Mosquito management

Through this process the students were introduced to four steps in the decision process:

- goals
- alternatives
- consequences of the alternatives
- reflection through journal writing

The research objectives of this project were to analyze the spontaneous process (initial) in environmental decision-making of sixth grade students and observe how students’ decision-making processes evolve in the course of a project in which:

- They take many decisions;
- We teach them four steps in a more reflexive decisional process;
- They receive ecological information; and
- They build a relationship with the natural environment.

Research tools

Students documented their decision process in their reflective journal at the end of each activity. Interviews with the students occurred twice during the project. Two researchers analyzed the data, and narrative was written for each student.

Evolution of the students’ decisional process during project

Students are able to better state their goals. The number of considered alternatives increased throughout the project.

Students want to make good decisions.

Students deliberated in their decision processes. Students tended to make compromises and aim at protecting the environment. Students did not consider long term, but short term they talked about impacts on animals instead of plant and physical elements.

Students began to think more about the consequences.

Students really wanted to make good decisions and therefore the deliberation process was longer. It seems possible to teach students to take better environmental decisions, however the process must be done in a very progressive way and requires a lot of effort from students.

Outputs from the project include a student-published list of recommendations about ecological city living in a local paper and the students spoke of their experience at a town council meeting.

3.15

Climate Change (International Polar Year) (double session)

3.15.1

Climate Change and Sea Ice: What's the connection?

Presenter: Dr. David Barber, Professor, Associate Dean of Research, Project Lead of IPY, Circumpolar Flaw Lead System Study (CFL), Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Dr. Barber's presentation focused on sea ice. Like trees in the rainforest, ice controls the exchange of heat and moisture in the Arctic. An increase of 3.5 degrees Celsius in Arctic temperatures in past decades is causing sea ice to grow back at a slower rate each fall.

The Circumpolar Flaw Lead System Study

The Circumpolar Flaw Lead (CFL) System Study is looking at marine systems and changes in the Arctic. In the Beaufort Sea this past winter, the ice was only three metres thick, half the thickness that multi-year ice should be. The thick snow that covered the multi-year ice last winter insulated the ice, causing ice to be thinner than it should be. We are losing 70,000 km² of sea ice per year, and the rate of reduction is accelerating. A seasonally ice-free Arctic was expected to occur between 2020 and 2050, but due to the more rapid loss of ice, we are now predicting a seasonally ice-free Arctic by 2015.

With the ice-free season, the Arctic's natural resources—gold, diamonds, natural gas, uranium, iron and so forth—will become more accessible. Oil and gas development projects are underway, such as the Mackenzie pipeline. Loss of sea ice also opens up transportation routes. The Northwest Passage has been open four of the last seven years, making a shipping route over the pole a possibility. The Port of Churchill is increasing transportation opportunities in northern Manitoba.

We will always have first year ice in the north as long as the earth tilts and the Arctic remains dark in the winter. Reduction in multi-year sea ice is accelerating in the last five to eight years. It is real and it is happening.

3.15.2

Climate Change and Weather: Storm studies in the Arctic (STAR)

Presenter: Dr. John Hanesiak, Associate Professor, Project lead of STAR, Principal Investigator for IPY-CFL system study, Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Blowing snow and high winds (70 km/hr or more) are occurring more frequently in the Arctic, causing a loss of life and infrastructure. The Inuit have reported that the weather is now unpredictable and they are experiencing more fierce storms in the fall.

Storm activity

There is an upward trend in Arctic storm activities and a north migration of polar jet streams. More storms from the mid-latitudes are travelling into the Arctic. Though there are fewer storms today, studies are showing that, globally and in the Arctic specifically, they are growing more intense over time. Storms are tending to be more intense over time in some studies.

Forecasting issues in the Arctic

Most people are concerned about blizzards/strong winds, heavy snow, freezing precipitation and the fact that melting sea ice means that open water is occurring longer in the spring and fall. Many northerners hunt and trap and need sea ice as a platform. They have come to depend on the predictability of the sea ice for their livelihoods, but changes in sea ice melting means they are longer able to predict the condition of their hunting grounds like they used to.

Objectives of the STAR program

The majority of the field project is in Iqaluit and Panqirtung, Nunavut mainly because they are experiencing a lot of storms right now. The objective of the STAR program is to better understand severe Arctic storms and their hazardous conditions in order to facilitate more accurate prediction of strong winds, precipitation, blowing snow, blizzards and water/sea ice.

The STAR program used several tools in order to study the various weather patterns affecting the North:

- The program used a research aircraft that can fly over storms. A hurricane occurred in the tropics November 5, 2007 and moved up to the Arctic. In order to better understand the physics of Arctic weather systems the aircraft was flown over the storm front. Cylinders were dropped out of the plane to measure wind and other effects of the storm to understand storm behaviour more fully. Information was gathered on low level convection observed in Hudson Strait and Foxe Channel as well as unexpected highly rimmed precipitation.
- STAR set up ten weather stations outside of Iqaluit with a helicopter to get a sense of the weather system and to map precipitation through the different terrains around Iqaluit. When the study was complete, three stations were left for the communities to use in the future.
- The STAR project also has a Cloud Satellite, which uses satellites for broader coverage and spatial differences in weather characteristics. The aircraft flew along the satellite tracks to make direct comparisons of observations to the satellites observations. In many cases, the airplane observations have been much more accurate.

We are trying to better predict wind in the Arctic with a combination of computer modelling and observations. The study implemented a new lower atmospheric scheme, and we are beginning to learn about controlling processes. Wind models and prediction will be good for aircrafts trying to land in these northern Arctic communities.

3.15.3

Communication, Education and Outreach Efforts Related to IPY

Presenter: Lucette Barber, Program Coordinator of Schools on Board. Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Schools on Board is an outreach program of ArcticNet, based at The Clayton H. Riddell Faculty of Environment, Earth and Resources at the University of Manitoba (Winnipeg, Canada). It was developed to bridge Arctic research with science education in high schools across Canada, to increase awareness of issues related to climate change in Canada and to excite young Canadians about the challenges and career opportunities of Arctic research. The main thrust of the program is the Field Program “on board” the CCGS *Amundsen*. Schools are given the unique opportunity to send students and teachers to the Arctic, on board the CCGS *Amundsen* to participate in an educational experience completely integrated into the research activities of the ArcticNet science team.

Arctic Climate Change Youth Forum (ACCYF)

Every two years, Schools on Board will co-host a youth forum that will coincide with an international science meeting or conference. This event will include one day of interactive presentations and workshops delivered by scientists and researchers, aimed at introducing secondary high school students and their teachers to the sciences involved in Arctic climate change research. In addition to science, the program will also include the northern perspective on climate change, and political discussions on the role of science and Inuit knowledge in policy- and decision-making.

Special features of the forum include dedicated teacher sessions, and a research stream inviting students to submit a research poster of a science experiment related to our poster competition. All submissions will be posted at the forum. All participants of the research stream will be invited to attend the morning of the science meeting. Winners of the poster session will be invited to participate in the poster session of the science meeting. This integration into the science conference will give students and teachers an opportunity to connect with graduate students and researchers, attend lectures and discover the diversity of opportunities that exist in the field of Arctic research. Participants from the previous field program will be invited to attend and share their Arctic research experiences.

On the research vessel, areas of study include:

- Meteorology
- Oceanography

- Marine geology
- Climate change
- Sea ice
- Sea birds
- Mammals
- Contaminants
- Biology
- Zoology
- Sociology of northern cultures
- Politics
- Northern sovereignty
- Learning the “two ways of knowing”
- Traditional knowledge
- Scientific knowledge

Ares of study are taught through inquiry, critical thinking, critical reflection, creating dialogue and project-based, hands-on fieldwork delivered by scientists, researchers and Elders in the field. Teachers try to integrate new knowledge with what they are teaching their students. The basis of this program is to teach about the Arctic in the Arctic.

Schools on Board hosted three International Field Programs this year in celebration of IPY and included Canada, Spain, Germany, Scotland, the UK, USA, Norway, Sweden, China, Russia and Greenland.

3.15.4

Climate Change and the Water Cycle: Regional impacts

Presenter: Dr. Ronald Stewart, Head of Department of Environment and Geography, Lead of Global Energy and Water Cycle Experiment (GEWEX), Extremes Group, Faculty of Environment, Earth and Resources, University of Manitoba

The biggest impact of climate change is the extremes we are experiencing. To understand extreme water conditions, we need to understand the water cycle. We know the water cycle conceptually but still do not completely understand the processes integral to understanding water issues in the future.

As our climate warms, more water vapour can be held in the atmosphere. More water vapour in the atmosphere combined with warmer temperatures leads to bigger storms. With global warming will come an increase in the holding capacity and higher evaporation capacity from the seas. This will lead to higher atmospheric holding of water vapour and precipitation.

This increased atmospheric holding of water will not increase precipitation everywhere, however. There will be anomalies: while there will be more precipitation in the north (Arctic), Manitoba’s precipitation might be similar, but the province may experience higher temperatures.

There is a balance that needs to be maintained between precipitation, which wets the surface of the earth, and evaporation, which dries the surface of the earth. In a warmer climate, precipitation might not change, but because evaporation increases, it will be dryer (the warmer the atmosphere, the more water vapour it can hold before precipitation occurs). This drying of the land is a shared concern among all the continents.

When considering the balance, we need to look at surface features as well. More precipitation in the spring/winter can change the weather and its effects in the summer. More anomalies in precipitation will occur, meaning more precipitation in certain regions and less in others. More precipitation means greater evapotranspiration, which means production of more clouds. In dryer places less precipitation will occur, therefore less evapotranspiration—and therefore less precipitation— will occur. These anomalies can cause extreme weather.

Society is strongly affected by impacts of extreme dryness/wetness. In the future, our planet will probably be dryer and there will be more variability because climate change feedback is acting to maintain extreme climate conditions.

3.15.5

Air-surface CO₂ Exchange and Carbon Dynamics of the Arctic Seas

Presenter: Dr Tim Papakyriakou, Associate Professor, Principal Investigator for IPY-CFL system study, Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Dr. Papakyriakou provided an overview of the science of air-surface carbon dioxide exchange and carbon dynamics in the oceans, observing that it is difficult to understand carbon exchange in polar seas due to the ice cover. Sea ice is a complex, heterogeneous medium. It has temperature and salinity gradients and allows transport of gases through it. Dr. Papakyriakou is looking at a non-linear impact of ice on air-water exchange of carbon dioxide. He hypothesizes that carbon geo-chemistry links atmosphere to ice and upper ocean systems. His studies have shown carbon uptake, indicating that:

- we cannot deal with ice environment (fast/marginal)
- CO₂ fluxes in sea ice appear to be significant
- the earth may have a potential feedback (returning CO₂ to the atmosphere) as sea ice disappears.

3.15.6

Contaminant Cycling in the Arctic and Effects of Climate Change

Presenter: Dr. Gary Stern, Research Scientist, Freshwater Institute, Fisheries and Oceans Canada, Co-Lead for IPY-CFL system study, Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Organic contaminants such as PCBs and DDTs are found in the Arctic and in the Arctic's top predators. These toxins accumulate within species, are transported from the south (or north depending which pole you are at) by air and ocean currents and they accumulate up the food chain. Less volatile compounds can still make it to the Arctic, although it might take a longer period of time.

Bioaccumulation and biomagnification

Mercury is a natural element, and is a component of coal. Humans release mercury into the atmosphere by burning coal. Precipitation removes mercury from the atmosphere and delivers it into the local environment. Once mercury is in the water, it bio-accumulates. This means that bigger and older fish will have more mercury because they have accumulated it over their lifetime. When they eat smaller fish, they accumulate the mercury that was in the fish they consumed.

When a Beluga whale eats 50 fish, it accumulates the contaminants of those 50 fish. Mercury in the liver of a Beluga is much higher now than in the 1980s. Levels of mercury in animals are extremely high in the Arctic. Levels of accumulation are dependent on speciation and trophic level for toxicity.

Beaufort Beluga Whale: Mercury, habitat use

In open water, female Beluga whales stay closer to the ice edge, while males are usually found in heavy ice (multi-year ice). There are different feeding habits for male and female Belugas, therefore the pattern of mercury uptake varies. There is a need to study where animals are feeding and where they are being introduced to more mercury because of changing ice structures.

The Sherba Drift 1997–1998

Recent changes in ice cover and distribution in the western Arctic may provide means to change forage ranges in a way that alters mercury exposure in these top predators by a factor of four or more. If Beluga feed in more productive areas because there is more fish and these areas have become more readily available, and if they access regions that they previously did not have access to, they will have higher mercury levels in their bodies.

Ring Seals

The ring seal's primary diet is Arctic Cod. Mercury is measured in the muscle from animals harvested in June-July representing the feeding that occurred in October-November. With more ice-free days, ring seals will be more active,

they will consume more cod and will be exposed to higher levels of mercury. Increased ice loss means increased mercury levels in ring seals.

Conclusion

Contaminants end up in the Arctic through ocean currents or the atmosphere. People in the North still want traditional foods but sources are becoming harder to hunt and riskier to eat. If we stopped mercury emissions now, it would take 100+ years to see a response or change in the ecological system. We need cleaner coal and cleaner emissions now.

3.15.7

Effects of Climate Change on Arctic Marine Mammals

*Presenter: Natalie Asselin, Graduate Student, Centre for Earth Observation Science,
Faculty of Environment, Earth and Resources, University of Manitoba*

The purpose of Asselin's research is to study the effects of climate change on Arctic marine mammals, through a case study of Belugas' use of ice-edge habitats.

Background information on Beluga Whales

- Small whale, about 3-5 metres
- Does not have a dorsal fin, it can easily get under ice to feed
- Between 900-2200 pounds (400-1000 kg)
- Has a bendable neck (one of only two whale species with this characteristic, the Narwhal Whale is the other species, which is also an Arctic species)
- Found in full ice cover areas in the Arctic

Asselin's thesis is based on Beluga use of the circumpolar flaw lead (CFL), in the Banks Island and Amundsen Gulf Region. The flaw lead is an area of constant ice movement and openings where Belugas can come up to the surface to breathe through the winter ice cover months. Their range is quite extensive, and males are able to travel further up north through heavier ice. Asselin tagged a number of whales for her research.

Methods

- Five aerial surveys (May-June 2008)
- Digital camera; infra-red radiometer; hyper-spectral sensor
- Linking characteristics between ocean colour/temperature to determine where Beluga whales are and to compare this with sea ice characteristics
- Multiple helicopter surveys, to document behaviour at the ice edge
- Part of a larger multi-disciplinary project (CFL system study)

The potential effects of climate change on the Beluga whale include:

- Predator invasion: Orcas currently cannot get into ice covered areas so Beluga Whales can escape them by hiding under the ice cover.
- Less access to prey such as Arctic cod. The timing of migration will change and change in sea ice will affect cod distribution, which in turn will affect Beluga whales.

Timing and migration is determined by ice conditions. Timing may change in light ice conditions created through climate change. Implications of this study include trophic relationships (place within the food chain) and the role of Beluga whales within those relationships relevant to the Inuvialuit people and development of oil and gas resources.

3.15.8

Climate Change, Communication and Communities: People and the International Polar Year

Presenter: Robin Gislason, Assistant Program Coordinator, Schools on Board, Centre for Earth Observation Science, Faculty of Environment, Earth and Resources, University of Manitoba

Many people think of Canada's Arctic as the road to nowhere, that it is barren and that there is nothing there. Contrary to this stereotype, there are Inuit communities all across the circumpolar regions – Russia, Europe, Canada, Alaska and Greenland. There are four geographic regions across northern Canada. These regions are based on the Inuit land claim settlements:

- Inuvialuit settlement region
- Nunavut
- Nunavik
- Nunatsiavut

Inuit in Canada have a very traditional communal lifestyle that includes hunting and gathering on the land. Intertwined with this traditional way of life are the modern conveniences of the west. Inuit are owners of airlines and grocery stores. Jordan TooToo is a famous NHL hockey player from Nunavut. The Inuvialuit Regional Corporation is in charge of millions of dollars of resources such as oil and diamonds. The traditional lifestyle is juxtaposed with modern conveniences.

Along with these two ways of life comes many social problems in Inuit communities related to the effects of colonialism, including: poverty, housing (Inuit suffer 54 per cent overcrowding in homes, eight times more than the national average) and education (only 25 per cent of Inuit students who enter the education system graduate from Grade 12). The Inuit suicide rate is 11 times higher than the national average.

The 2008 Schools on Board Circumpolar Inuit Field Program brought together Circumpolar Inuit youth to learn about Arctic climate change research. These youth conducted Traditional Knowledge interviews in their home communities before joining the field program to discuss the results of their research. Many of the Elders and knowledgeable hunters interviewed spoke about how travel on land is changing. Travel is becoming increasingly dangerous as the land, ice and weather become increasingly unpredictable. Trails that have been used over many generations are changing and people are dying because of the unpredictability of the ice and trails.

Erosion and permafrost degradation is also becoming a serious issue. One of our students from Shismaref, Alaska shared photos of his community with us. Erosion underneath their homes is causing their buildings to literally fall into the ocean. They are now facing the inevitable reality of moving their entire community to a safer location.

Contaminants are another serious issue facing Inuit communities in Canada. The Northern Contaminants Program, established in 1991, found substances in wildlife consumed in a traditional diet that did not originate in the Arctic, and some that did not even originate in Canada.

Adapting to change

It is important to note that the Inuit have always adapted to change, and they believe that they will be able to adapt to this new change. Adaptation techniques include creating and using new trails on the land, using different hunting and fishing techniques, changing methods of travel and networking with other Inuit and researchers across the circumpolar world.

Conclusion

Canada's North is the road to Inuit communities that are alive and well in Canada. Education has come a long way in helping people understand that the Arctic is not simply a barren land and that stereotypes are changing.

3.16

Scientists for Social Responsibility (Human Rights)

3.16.1

Facilitating Education for Sustainable Development within Real-life Contexts

Presenter: Laura Sims, CIDA Tier 2 Project: Community Development Team Leader, University of Manitoba

Integrating an educational approach to development activities can enable learning forums that engage marginalized voices in natural resources management decisions that facilitate a transition towards sustainability. The learning forum was a community-based strategic environmental assessment (CBSEA) whose purpose was to engage farmers in the planning process between the first and second phases of the Instituto Costarricense de Electricidad's (ICE) watershed management agricultural program (WMAP) in Costa Rica

For this qualitative case study, communities from two Costa Rican watersheds were involved (three in Reventazón, five in Sarapiquí). A total of approximately 100 people were involved in some way in this research. Participants were primarily small-scale farmers, but community members, ICE WMAP teams and related institutional representatives were also involved.

ICE is a publicly-owned electrical and telecommunications company that generates all of Costa Rica's electrical needs, mostly through hydro production. ICE created the WMAP for many watersheds where they have hydro projects to address erosion and contamination problems caused by conventional farming practices. Through the WMAP, ICE proposes a more sustainable approach to farming through the implementation of a variety of agro-conservation projects at an individual farm level. They promote the semi-stabling of animals which involves using a biodigester or vermi-composting for waste management; and forage crop and reforestation to reduce erosion.

Transition to Phase II

During this field research, ICE was in the process of planning their second phase of the WMAP. This, in conjunction with farmers wanting to participate in a more inclusive community-level planning process, offered a unique opportunity to do a CBSEA. A CBSEA is a strategic environmental assessment at a program or policy level that has been adapted to community-based programs.

CBSEA workshops and approach

In approaching this process from an educator's perspective, the goal was to create a CBSEA that acted as a real-life learning forum that could lead to sustainability. The CBSEA process was broken down into four components that were addressed in four half-day workshops in each of the watersheds.

1. Assessing the program and identifying alternatives

Real and potential social, economic and environmental impacts that the components within the new modified proposed program would have if they were implemented were identified. Mitigation strategies were also considered to minimize negative impacts and create strategies to enhance positive ones. The CBSEA process and results had to be shared and discussed with the proponent.

Sims's goals were to engage marginalized voices, create an empowering experience and facilitate a transition to sustainability by meaningfully engaging people in a learning process. According to transformative learning theory and critical education, in order to include marginalized voices, we as adult educators must create a safe space, allow people to express themselves in a variety of ways, and be inclusive of different ways of knowing and experience.

To foster transformative learning in the learning setting we should:

- promote openness and trust;
- provide a learner-centred approach with personally-engaging experiential learning activities;
- stimulate reflection upon experience;
- encourage student autonomy, participation and collaboration;
- allow for solitude and self-dialogue; and
- promote the exploration of alternative personal perspectives via problem-posing and critical reflection.

Throughout the CBSEA process, a variety of activities were used to encourage participation and inclusive dialogue; generate, discuss and assess ideas; and enhance learning. These activities included small-group discussions, facilitated full-group discussions and individual presentations.

In order to create an inclusive, supportive and safe environment, Sims:

- made participation open to all community members;
- involved farmers in logistical decisions;
- provided opportunities to “break the bread” in order to create a more amicable environment;
- provided structured educational activities so that differences of opinion could be discussed constructively;
- got participants to develop and assess their ideas thoroughly before sharing them with the proponent;
- provided opportunities for participants to work with people they knew and did not know in order to avoid exclusion, build a broader sense of community and to allow for more diversity of views in the sharing of experiences; and
- guided participants through a SEA process, explicitly teaching certain analytical skills to allow for a more full participation in activities.

2. Explaining the CBSEA and presenting the program: Farmers and ICE involved

The CBSEA process was explained to participants and ICE explained what their proposed WMAP Phase II was. Farmers were able to ask questions about the program and about the CBSEA process. In the community visioning activity, participants worked in small groups envisioning what they would like their communities to look like in five years. These ideas were then shared with the whole group.

3. Assessing the program and identifying alternatives: Farmers

Community participants collaboratively assessed the proposed program to see how it could be improved and suggested alternative components that they thought should be part of this program. As a whole group, participants were asked to envision what they would like to see in this program based on their communal goals discussed in the first workshop.

4. Identifying real and potential impacts of the proposed program components including the identified alternatives: Farmers

First, the whole group brainstormed the potential impacts of implementing a physical-works component such as placing more biodigestors in the community. This collaboration was intended to share the skills needed to do an impact assessment (IA); the large group subsequently broke into smaller groups to do the IAs of the other components. Their IAs were shared with the whole group. Often the revisiting of the components and the IAs as a whole group generated a lot of high level, abstract thinking (for example, making links between their using biodigestors, self-sufficiency and freedom from the market economy). The creation of mitigation strategies was done in a similar fashion.

CBSEA Learning results:

Participants learned about the SEA process as a whole and learned specific skills related to systematically assessing real and potential impacts of the proposed components, creating mitigation strategies, and facilitating more participatory and effective ways for working collaboratively. They also learned a variety of information related to the proposed program, their community, the environment and the impacts of the projects.

Negotiating ideas related to livelihoods and the environment led to:

- A greater critical self- and communal awareness
- A recognition of the value of conserving the environment.
- A recognition of the power and utility of working together
- Institutions learning to engage differently with communities

In terms of enabling sustainable development, findings clearly show that participation in this CBSEA process does enrich both ecosystem and community viability through the facilitation of a greater understanding of the environment, capacity building and community building.

3.16.2

The Importance of Scientific Literacy for Non-scientists

Presenters: Dr. Randy Kobes, Vesna Milosevic-Zdjelar, Ph.D. & Kevin Chief University of Winnipeg

With rapid advances in technology, issues such as global warming, human cloning, Internet censorship and genetically modified foods gain a level of public attention that was unheard of a few short years ago. Such issues are controversial and complex and unfortunately are often dealt with at the level of the general public by either deferral (“let the experts decide”) or on a purely emotional level. This situation emphasizes the need for increased science education, particularly for development of critical thinking skills. This is hampered by significant distrust and/or fear of science. This session explored some issues surrounding distrust, with an emphasis on how science literacy is becoming increasingly important for non-scientists. Such changes in culture and society are often best accomplished by introducing attitude shifts at an early age.

UNESCO has created an initiative to increase the scientific literacy level of the general population. UNESCO’s 18th conference gave recommendations for ethical responsibilities and rights that needed to be established. Ethics and responsibility must be a part of ethical teaching and education. In 2001, the National Council of Science started the Scientists for Global Responsibility Program. The program asked how schools could make science more exciting and relevant, how to increase general knowledge, and how to improve and professionalize engagement thereby influencing schools and curriculum.

The University of Winnipeg (UW) is taking these questions to the next level by reaching the youngest generation and fostering an appreciation of science. The goal is to increase science literacy because understanding basic facts and concepts about science, thereby is important for increasing trust in science.

Problems with public perceptions of science include media overplaying meanings of scientific findings and perpetuating errors of fact. Media is appealing to people’s fear and excitement. This is counterproductive when the public is trying to understand complex issues like stem cell research. Pseudoscience can be manipulated to help people make choices. Pseudoscience big boxoffice movies such as Armageddon and news of asteroids can misinform the public.

Best Practices for scientific communication

Science needs to be related to the real world for the public to see the relevance. The UW’s “Let’s Talk Science” Outreach Program has been created to introduce science to the K–12 system. The program promotes science education and prepares young people for a rapidly changing world. Students can begin to have a fear of science as early as Grade 4.

In this program, university students go to schools for classroom visits and K–12 students come to UW for lab tours. Let’s Talk Science is also involved with inner city schools during the summer for summer science camps, and at First Nations schools, judging science fairs.

The Innovative Learning Centre at the UW is involved in science and the environment outreach. A new CDN\$30 million science building is helping to find ways for the university to build momentum so that schools and community organizations can access facilities. Eco-Kids on campus is extending out to K–12 schools and hiring inner city youth to deliver science initiatives to students through after-school, summer and weekend programming. Forty youth learned science for credit on campus last year. Most of them were awed because they were new to a campus and being taught by professors. It is a whole new experience. Eco-Kids is interested in finding different ways to start teaching youth in the university setting during the school day.

The number one reason youth do not attend a post-secondary institution is because they haven’t been asked to in a meaningful way or told that university is for them. When we look at the graduation gap of those who come from families of lower socio-economic backgrounds, the absence of science graduates is even more pronounced. Many community organizations want to increase the overall high school graduation numbers for First Nations students and immigrants. But should that be the only goal?

The largest challenges we face are how to get families engaged with their children’s education. For some of these students, it is their first positive experience in school. The attendance at Eco-Kids is quite high: 97 per cent of the youth who attend do not miss one single class. The difficulty now lies in follow up with these students. Many students leave the program with few post-secondary education opportunity reminders.

4

2008 Manitoba Excellence in Sustainability Awards

To recognize Manitobans who embrace the spirit and principles of sustainable development, the Manitoba Round Table for Sustainable Development established the Manitoba Excellence in Sustainability Awards. The Awards recognize and honour people, projects and ideas that successfully apply the Principles and Guidelines of Sustainable Development into concrete and lasting achievements.

The Manitoba Round Table for Sustainable Development announced the 2008 winners at an awards reception on November 27, 2008 at the Delta Winnipeg, during the Manitoba Education for Sustainable Development Conference.

4.1

Winners

Contributing to a Sustainable and Prosperous Economy and a Green and Healthy Community:

Outstanding Achievement in Sustainability Award

Winnipeg Humane Society in association with Number TEN Architectural Group, Winnipeg
Winnipeg Humane Society designed and developed new sustainable facilities and a green building.

Individual Award

Amanda Tetrault, Winnipeg
Amanda is an ambassador for sustainability as a public school teacher who has integrated sustainability into her classroom for 10 years

Business Award

Enviro Safe Cleaning, Winnipeg
This worker co-operative uses only environmentally responsible cleaning products and practices.

Institution or Organization Award

Centre for Sustainable Transportation, Winnipeg
This organization works proactively to achieve sustainable transportation for people and goods in Canada.

Community Group Award

Youth Community Partnership, Gimli
This organization demonstrates leadership and environmental stewardship through various initiatives such as water conservation and community enhancement.

Youth Award

Vincent Massey Sustainable Development Committee, Winnipeg
This group developed and fundraised for their Alternative Energy Array project—a small-scale wind turbine, solar cells, green roof and greenhouse.

Action on Climate Change, Air Quality and Energy Efficiency Award

Granny's Poultry, Winnipeg
Granny's constructed a new energy-efficient hatchery by integrating heat recovery, geothermal and energy management technologies.

Sustainability in Water Stewardship and Natural Area Protection Award

Keystone Agricultural Producers and Delta Waterfowl, Winnipeg
These organizations are actively involved in the Alternative Land Use Service (ALUS) agricultural conservation project in the RM of Blanshard.

Sustainability in Pollution Prevention and Product Stewardship Award

Town of Leaf Rapids, Leaf Rapids
The town implemented a bylaw banning single-use plastic shopping bags.

Education for Sustainability Award

Village of Dunnottar, Dunnottar
The village partnered with a University of Manitoba course on water resource management to develop a water conservation education program for the area.

Research and Innovation for Sustainability Award

Scott Nicol, The Pas
Scott developed a plan for product stewardship of refrigerators and white goods management.



2008 Sustainability award winners

5

Science Teachers Association of Manitoba Awards

Nominations were made by STAM members and the STAM Board of Directors made the final selection.

STAM would like to congratulate the following recipients:

- Mr. Robin Edwards, Science Teacher Achievement Award
- Mr. John Jack, Science Achievement Award
- The Manitoba Museum, Science Achievement Award



Mr. Robin Edwards presented by Melanie Gertley, STAM Board of Directors (Science Teacher Achievement Award)



Mr. John Jack presented by Tina Helmuth, STAM Past President (Science Achievement Award)



Mr. Scott Young (left) on behalf of The Manitoba Museum, presented by Jason Braun, President of STAM (Science Achievement Award)

6

Closing Remarks

Dr. Rick Wishart, Chair of the Manitoba Education for Sustainable Development Working Group (MESDWG)

This conference has helped solidify Manitoba's leadership in ESD. We must take away from this conference the seven generations approach from the Aboriginal peoples with concern for the future health of the planet. At first it seems counter intuitive that by protecting our environment that we can also create jobs generate profits for shareholders and assure that even our weakest citizens live safe and productive lives. Our amazing team of exceptional speakers helped us to understand how this actually can be done.

Healthy ecosystems act as a tremendous reservoir of natural capital for the world. These systems not only provide beautiful places to live and learn, they also provide a wide array of ecological goods and services that would cost billions of dollars to duplicate.

Wishart provided examples of sustainable development that protect the environment while providing huge economic benefits like New York City's water supply based on source water protection versus developing bigger and more expensive water treatment plants. In contrast is the CDN\$700M project to enlarge the Red River Floodway versus restoring drained and damaged wetlands in the drainage basin to reduce major flood events downstream. A recent study at Broughton's Creek north of Brandon has shown that wetland conservation can provide huge benefits to water quality in Lake Winnipeg while significantly reducing greenhouse gas emissions. Politicians are just beginning to realize these possibilities and considering enacting new legislation to protect Manitoba's wetlands and watersheds.

A huge thanks to the many volunteers, the major sponsors, speakers, displayers, delegates the co-chairs Christina McDonald and Bob Adamson, the Master of Ceremonies John Murray and the Deputy Minister, Dr. Gerald Farthing. Finally thanks to Environment Canada and Learning for a Sustainable Future for their support of the MESDWG.

The Choose the Future: Education for Sustainable Development Conference was held in Winnipeg, Canada, November 26–28, 2008. This international conference was planned for everyone who understands that education is required to sustain our future. “Choose the Future” stands as a major contribution to Canadian activities supporting the United Nations Decade of Education for Sustainable Development (2005–2014).

These proceedings present abstracts of the keynote presentations and the concurrent sessions that took place over the three days. This conference was a project of the Manitoba Education for Sustainable Development Working Group. The Science Teachers Association of Manitoba (STAM) was a major sponsor and partner in the Conference.



Creating, Supporting &
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