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Can we live sustainably

An overview of
The Human Factor
section of the Life
Sciences Gallery

Saskatchewan Centennial 2005

Saskatchewan
Culture, Youth
and Recreation

ROYAL SASKATCHEWAN MUSEUM

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Pg. 1, Data courtesy Marc Imhoff of NASA GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC

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ROYAL SASKATCHEWAN MUSEUM

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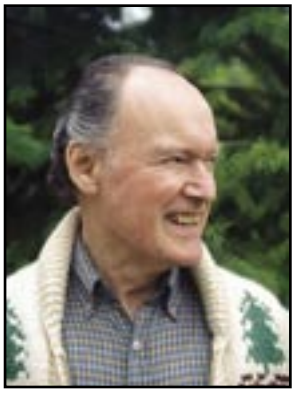
Dedicated to Stan Rowe

Sustainability—An Essential Way of Knowing

A brilliant Canadian voice calling for sustainability fell quiet in April 2004, silenced by a fatal stroke. For many years, Stan Rowe lobbied for commitments, actions, and a collective worldview that would move society onto a sustainable path, first as a professor at the University of Saskatchewan, and more recently as a consultant and private citizen.



Rowe's worldview was an ecocentric one, and he was firmly committed to it. Humanity is on an unsustainable path, he argued, because many Western values, attitudes, policies, institutions, and traditions promote the belief that People and Nature are two separate things, and that Nature ought to be subservient to our needs. Rowe pointed out that neither of these beliefs is valid. People cannot be separated from the living ecosystems that surround and flow through them, including the global Ecosphere. We contribute and respond to these systems with each breath. And rather than being the masters of Nature, we are completely dependent on ecosystems for most of our needs. This can be difficult to appreciate, given our powerful technologies, but it is an undeniable reality. As Rowe noted, even astronauts have to take their ecosystems with them!

Rowe taught and wrote about steps that would help society move onto a more sustainable trajectory. His *Home Place* essays and most recently *A Manifesto for Earth* make it clear that sustainability means working with the head, the heart, and the hands, and at all levels of social organization. They describe a vital "way of knowing" that people need to develop (or rediscover) and cultivate through their choices, communities, policies, and institutions, if sustainability issues are to be addressed.

Much of what Stan Rowe believed and taught about ecology and human society is reflected in the Life Sciences Gallery. This guide to The Human Factor exhibit is dedicated to his memory.

Preface

Planning of the Life Sciences Gallery began in earnest following the devastating museum fire that occurred in the First Nations Gallery on February 16, 1990. The fire did irreparable smoke damage to the upper gallery dioramas and changed the concept of redevelopment from a partial rebuild using many of the existing dioramas to the creation of a totally new gallery.

The prospect of designing a gallery of almost 1,200 square metres, including 250 sqare metres for The Human Factor, was both an intimidating task and a marvelous opportunity. We had an excellent design team and early on we agreed to be guided by two basic principles. Firstly, that we would develop and adhere to a clear and coherent story line, and secondly, that the underlying message of the gallery would be the interdependency of species, and, the integration of the biotic and abiotic components of ecosystems.

Planning of the new gallery was strongly influenced by the teaching of Dr. Stan Rowe, former Professor of Plant Ecology at the University of Saskatchewan, essayist, and mentor. Stan's book, *Home Place: Essays on Ecology* became a critical resource as a plan for the new gallery materialized. Stan's essays contributed the message of humankind's integration within, and total dependence upon, the Earth's ecosphere.

A strong conservation message was always envisioned to be an important aspect of the new gallery but it wasn't until Dr. Paul James joined the museum as Curator of Ornithology that The Human Factor section was conceived in its eventual state. Paul's knowledge of ecological economics and human environmental issues was eventually expressed in several components of the gallery. The museum was fortunate that when Paul moved on, Dr. Glenn Sutter was available to replace him. Glenn brought experience, extraordinary knowledge, energy, and conviction to the completion of this culminating section of the gallery.

The planning of the new gallery was a daunting and enormously rewarding task, and its successful completion is a tribute to those who worked so hard on it. Perhaps, however, none deserve more credit, especially for the successful completion of The Human Factor section, than does the gallery's designer, Blair Fraser.

Natural history museums are object-centred and, traditionally, their exhibits are based on the display and interpretation of these objects. The presentation of human environmental issues and socio-economic concepts is new ground for museum exhibitry and when I insisted that these ideas had to be captured in three-dimensional displays, Blair accepted the challenge without hesitation. His designs of the rotating globes, the human figures, and the tower sculptures successfully translate these concepts into captivating displays that inform and emotionally involve the viewer in The Human Factor.

David Baron, Director, RSM

Comments on the Design

It is always a challenge to turn ideas into three-dimensional forms, especially when the concepts are so important. Our task in the creation of The Human Factor was made more interesting because the scope of the story is so broad and complex. Our first job was to distill all this information into manageable bits and to make them understandable.

This was made possible by the knowledge and dedication of the curatorial team. Led by David Baron, and including Keith Roney, Paul James, and especially Glenn Sutter, this team provided insightful leadership in developing the content of The Human Factor.

Throughout the exhibit, we have tried to create visual images, combined with succinct texts that illustrate key concepts in our presentation. In the first section, Time Tunnel, there are the images of the increasing mechanization of our societies, and across the hall are representations of an exponentially increasing population and other global changes. At the end of the hall we show Earth—and your reflection in it.

In the next section, Living Planet, we show the interconnected and nested layers of ecological systems. We feature a rotating Earth and how the working systems create a closed loop, fueled by the Sun, in a dynamic balance. We indicate how the system is showing signs of breakdown and provide graphic examples, along with population, productive land, and biodiversity clocks. This leads to a three-dimensional labyrinth of ideas and interactive exhibits that we hope will challenge you to think about beliefs, attitudes, and behaviours that are responsible for the ill health of our system.

In the last section of the Gallery, our challenge was to provide positive exhibits, including the benefits of reconnecting with our environment. We have used humour, revisited our Globe, and have left the last word in the Gallery to young people.

I am indebted to Ron Tillie and his brilliant staff of creative people. Each added their thought and craftsmanship to every component of this section, and the Gallery as a whole. Their contributions to the exhibit concepts and inventive ways of presentation and construction have made the Gallery a better, more informative, educational, and we hope, entertaining place to visit.

I would personally like to thank the staff and students of Davin Elementary, Marion McVeety Elementary, and Sheldon-Williams Collegiate in Regina, Pense Elementary, and Souris Elementary in Weyburn for creating such a powerful message in the final Our Dreams display. It was a pleasure watching them work through the creative process.

We have packed an enormous amount of information into this Gallery for you to digest. We encourage you to explore it all and hope that the time you spend here is time well spent. Please enjoy yourself!

Blair Fraser, Gallery Designer

Foreword—Why is this Guide about Sustainability?

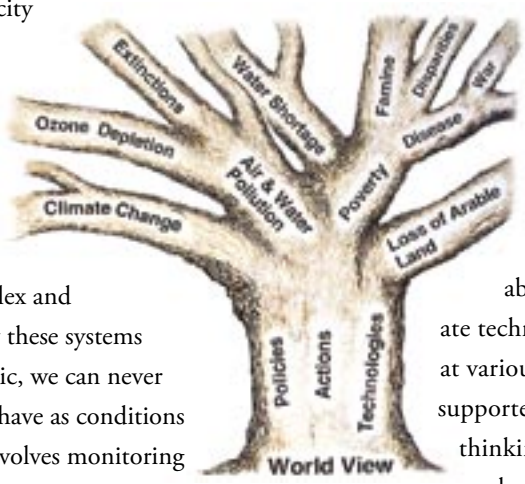
> "…sustainability may someday be about maintaining a hard-won balance between the needs of people, nature's other species, and future generations of both. But we are far from balance today. For this generation, sustainability is about global transformation."
>
> *Alan AtKisson, 2001, Sustainability is Dead—Long Live Sustainability*

This document is a guide to The Human Factor exhibit, a series of permanent displays that make up the final section of the Life Sciences Gallery. It lays out the storyline of the exhibit, which occupies about 250 square metres, and draws attention to key points that are made in each area. These points are backed up by text from the displays in question, providing an overview of the exhibit in both form and content.

The central message of The Human Factor, which examines our species as a "unique and powerful" part of the global ecosystem, is consistent with the "dynamic balance" theme that runs throughout the Life Sciences Gallery. The first exhibit in the Gallery describes how the global ecosystem, or Ecosphere, has maintained a variable balance for millions of years, providing conditions that are ideal for living organisms. This is followed by dioramas that examine how some Saskatchewan ecosystems operate, and a section called Global View, which illustrates how the province is

biologically and climatically connected to distant locations. This sets the stage for The Human Factor, where the focus ranges from regional to global, and many aspects of Western society are shown to be "far from balance."

The Human Factor was conceived as a way to focus attention on environmental and socio-economic problems associated with human activity, but the design team also wanted to address potential solutions, including the notion of sustainable development. Our goal was to shed light on the challenges and benefits of sustainable development, or sustainability, in ways that would leave people both enlightened and empowered. This was no easy task, but the need is clear. Our global footprint is at least 20% greater than the productive capacity of the Earth, and it continues to grow because of our numbers, affluence, and technologies.



Sustainability is elusive partly because we have to pursue it through social and ecological systems that are complex and chaotic. We can understand how these systems work, but because they are chaotic, we can never be sure how they are going to behave as conditions change. The challenge we face involves monitoring how we relate to our physical and social worlds and, in many cases, reducing the scope of our activities to ensure the well-being of current and future generations.

The Human Factor storyline approaches sustainability by reflecting four key principles. First, sustainability is anthropocentric (human-centred), with a sharp focus on defining and meeting human needs. It can be approached from an ecocentric (ecosystem-centred) perspective, where ecosystem health is a primary concern, but the central goal is always to sustain conditions and circumstances that foster the well-being of our species. Second, sustainability is about recognizing and working within limits. This includes biophysical limits, such as the amount of land that can support human activities, as well as our limited ability to manage complex systems. Biophysical limits inspire a sense of urgency, since there is no way to renew some resources or find substitutes in a reasonable timeframe. Our limited abilities suggest that, rather than pursuing options based solely on science and technology, we need to direct most of our attention to understanding and managing ourselves. Third, sustainability has to do with complex interconnections and interdependencies. Issues that appear to be separate, like climate change and poverty, are actually linked by tangible, multi-dimensional factors that are relevant across a range of scales and interact through positive or negative feedbacks. And finally, sustainability involves planning for the future by reflecting on the past. A useful timeframe — sometimes called the seventh generation approach — involves planning for the next three generations by reviewing what conditions were like over the previous three, and how those people adapted.

To foster a culture of sustainability, we need to develop appropriate technologies, policies, and regulations at various scales, but these need to be supported by a fundamental shift in our thinking and actions, ostensibly through education. This has been recognized at the highest levels, prompting the United Nations to identify 2005 as the start of the International Decade on Education for Sustainable Development.

A critical step in sustainability education is to address complex, intangible issues in ways that encourage commitments, decisions, and actions at the personal level. The Human Factor attempts to put a personal face on regional and global issues by exploring their links to the industrialized world view. Our hope is that this approach will give visitors a chance to reflect on how they relate to the world around them, what has meaning for them, and their beliefs about what lies within and beyond their control. It also underscores the need for the ecocentric worldview described and personified by Stan Rowe (see Dedication).

Glenn Sutter, Curator of The Human Factor

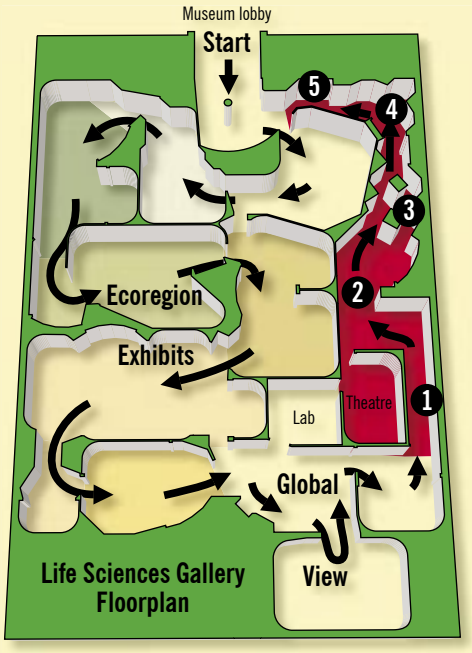
This view of the Earth at night shows the extent of industrialized activities—a global reason for local action.

The Human Factor—A unique and powerful species

Humans are unique members of the animal kingdom, partly because of our mental and technical abilities. Our species appeared over 200,000 years ago, and for all but the last few decades, our collective ecological footprint[1] was far below the productive capacity of the planet. In other words, the Earth could support or recover from effects of human activity with few lasting consequences.

Now, because of increases in our numbers and technological abilities over the last 200 years, our actions are upsetting the dynamic balance of many social and ecological systems. Since the mid-1970s, our global footprint has been bigger than the Earth can support, producing a growing ecological deficit. At the global level, signs of climate change are appearing, the ozone layer has been damaged, and the extinction rate has increased. Regional problems include new human diseases, the collapse of fish populations, environmental refugees, and the widespread use of pesticides.

Problems like climate change are a direct consequence of physical changes in the global ecosystem, but they also have deep social and economic roots. In developing The Human Factor section of this gallery, we have assumed that many of the problems we face are reflections of the industrialized worldview and lifestyles that isolate people from nature and from each other.



The Human Factor is divided into five areas

1. **Time Tunnel** looks at stages of cultural development and temporal changes in the global ecosystem.
2. **Living Planet** describes how the Earth functions as a healthy ecosystem and signs of global stress.
3. **Causes of Stress** examines attitudes and behaviours that are "out of balance."
4. **Solutions** looks at personal and collective challenges associated with sustainable development.
5. **Looking Ahead** considers what a culture of sustainability could include.

1. Ecological footprints are used as a measure of impact throughout the exhibit. An ecological footprint is the amount of space required to provide us with the things we need and want, and to absorb our wastes. Footprints can be calculated for individuals, groups, and organizations. Their size depends on the choices we make and the tools we use.

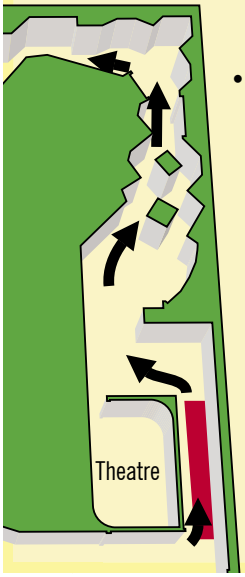
Time Tunnel

The aim of this section is to introduce the human factor by looking at temporal changes associated with human activity. This area also brings the focus of the gallery back up to the global scale (the perspective offered at the start) by focusing on the Earth as a living system. The dioramas that come before this area depict unaltered landscapes, a feature designed to put unique aspects of human activities in sharp focus.

To bring humans into the picture, the Time Tunnel examines biophysical trends that have affected the global ecosystem over time (Wall of Trends), major social and technological changes in hominid history (Wall of Images), and the pace of current human activities (floor).

Key Points

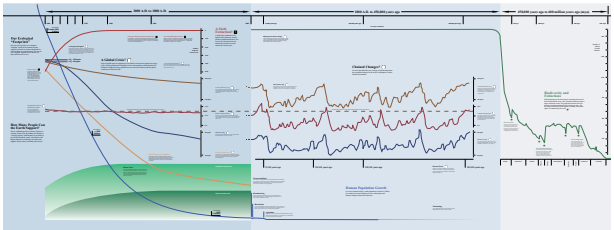
- There have been five major extinction events in Earth's history, and human actions are causing another one.
- The history of the global climate shows a repeating pattern, where brief warm periods develop quickly and then decay into prolonged ice ages. The patterns shown by global temperature and levels of atmospheric carbon dioxide and methane are similar, suggesting that changes in these gas concentrations will affect global temperature.
- Concentrations of these gases have been rising since people began burning fossil fuels, and they are now higher than they have been for over 400,000 years. The global temperature rose by 0.6°C through the 1900s and is expected to increase by another 1.5-6°C by 2100. This is a significant change, given the temperature difference associated with the last Ice Age.
- World population and global energy consumption have been growing steadily since the industrial revolution. World population is expected to fall as death rates exceed birth rates, but our collective ecological "footprints" are huge and growing, even where our numbers are small.



Wall of Trends

The blue "Wall of Trends" shows major changes that have occurred in the global ecosystem over the last 600 million years, including extinction events, and changes in the composition of the atmosphere, global temperature, and human population growth and energy use. Each trend line is a unique colour and three time spans are depicted using different shades of blue.

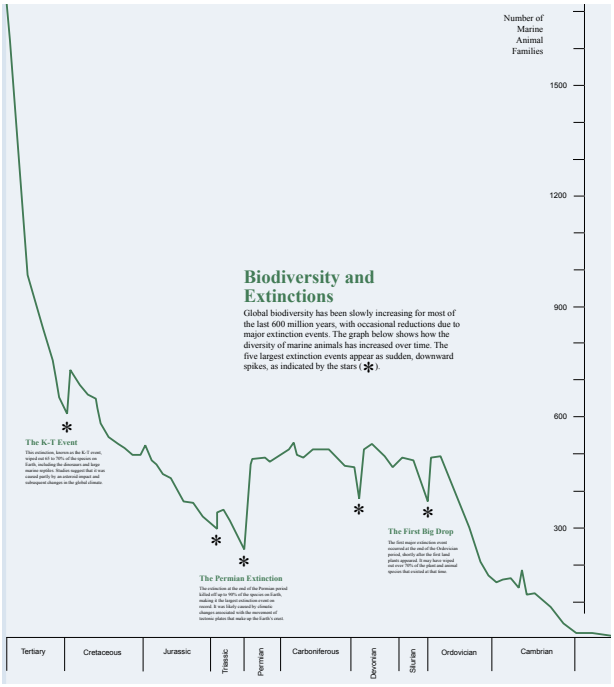
The oldest period (light blue) dates from 450 thousand to 600 million years ago. The middle section (medium blue) is from 1800 A.D. to 450 thousand years ago, a period for which we have reliable data on global temperature and the composition of the air. The last section (dark blue) shows trends dating back to 1800 A.D.



Biodiversity and Extinctions

450,000 years ago to 600 million years ago

Global biodiversity has been slowly increasing for most of

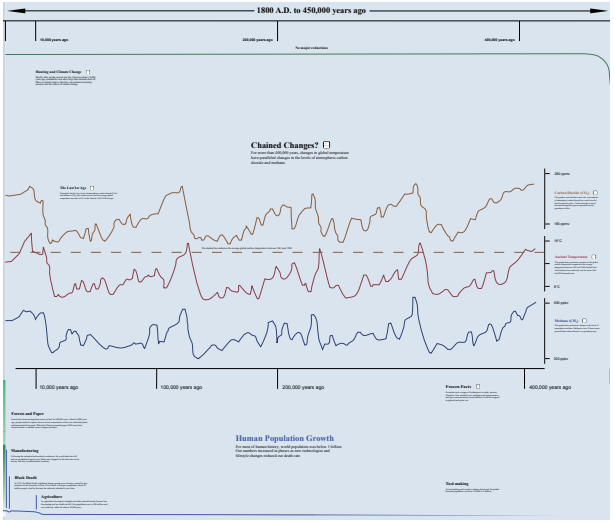


the last 600 million years, with occasional reductions due to major extinction events. The graph on the light blue section of the exhibit shows how the diversity of marine animals has increased over time. The five largest extinction events appear as downward spikes.

Chained Changes

1800 A.D. to 450,000 years ago

The graphs on the medium blue part of this exhibit are based on ice-core data, where scientists estimate past temperatures and gas concentrations from bubbles of old air trapped in glacial and polar ice. Their research shows that for more than 400,000 years, changes in global temperature have paralleled changes in the levels of atmospheric carbon dioxide and methane. Our species appeared about half way

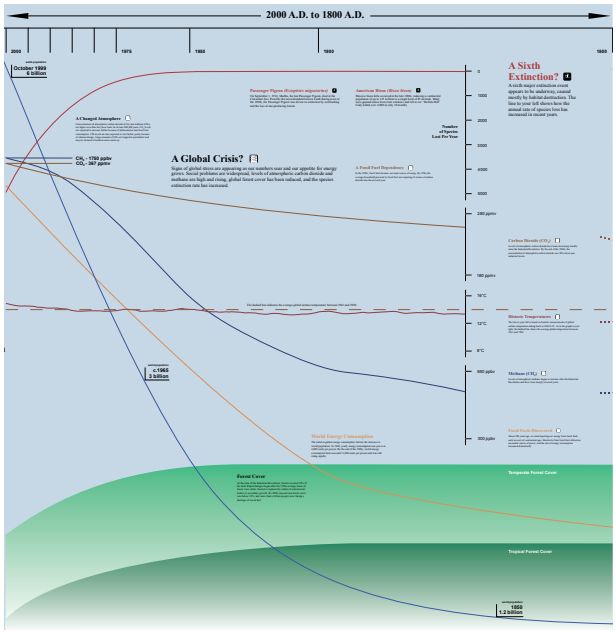


through this period, and for much of human history, world population was below 1 billion. World population increased in phases as new technologies and lifestyle changes reduced the global death rate.

A Global Crisis?

2000 A.D. to 1800 A.D.

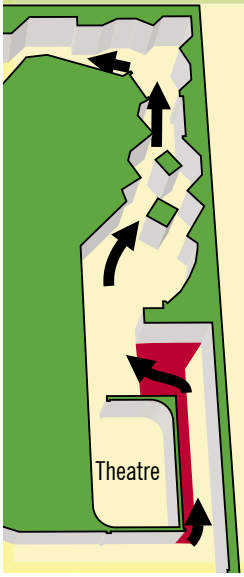
The trends on the dark blue section of the exhibit show what some are calling a global crisis. Signs of global stress are appearing as our numbers soar and our appetite for energy grows. Levels of atmospheric carbon dioxide and methane are high and rising, global forest cover has been reduced, and the species extinction rate has increased.



How Much Can the Earth Support?

This is a difficult question to answer, but there is certainly a limit. Like any habitat, the Earth has a "carrying capacity" defined partly by its ability to grow food and absorb wastes. Our numbers and impacts depend on technology, food and water supplies, human values, and many other factors. Studies conducted since this exhibit was completed suggest that our global footprint has been greater than the Earth's carrying capacity since the mid-1970s, and it continues to grow.

Key Points



- Some transitions in society were sparked by a change in technology, such as the advent of metal working and the invention of the telephone. Others were due to changes in social structures and institutions, including settlement patterns and centralized production.
- Humans have been hunting and gathering for over 200,000 years, and agriculture has been a sustainable form of human activity for most of the last 10,000 years.
- Life-spans have increased in recent decades, but the pace of activity appears to have increased as well. Instead of producing more leisure time and making us happier, new technologies are part of busier, stressful lifestyles. This is reflected by the footprints, tire marks and other impressions in the Time Tunnel floor.
- Some of the things that separate us from nature and from each other have deep social and technological roots.

Wall of Images

This wall examines 4 million years of social and technological development. Massive social and technological changes were triggered by the appearance of agriculture about 10,000 years ago, and rates of change increased in the 1700s with the onset of the industrial age. Today's "global village" is characterized by the intensive use of non-renewable resources, consumerism, and the rapid movement of people, money, products, diseases, and information.

Scavengers

Humans are hominids, a group that appeared over four million years ago. Early hominids lived in small, organized groups. They had few tools and survived mostly by scavenging for food. Important phases in evolution included developing an upright stance, the use of fire, and tool-making.

An Oldowan chopping tool from East Africa. Over 2 million years old

Hunting and Gathering

Our species, *Homo sapiens*, has been around for over 200,000 years. For most of that time, people lived in small groups and survived by hunting and gathering. They had relatively short lifespans, but enjoyed a diverse diet. They also developed intricate tools and spirituality, and complex societies that led to language, knowledge about medicinal plants, and compassionate care for the sick and elderly.

A Clovis point from Saskatchewan. 11,000 years old

The Agricultural Age

People started to raise crops and livestock, guided mostly by women, about 10,000 years ago. Agriculture developed in several major centres around the world, from south-east Asia to central North America. As people gained more control over their food supply, world population grew, and class and gender gaps began to appear. Infectious diseases

spread as people settled in larger, more permanent groups, and the extinction rate of other species increased as land was cleared for crops. This period also saw the development of metal working and written language.

A medical prescription written in cuneiform. Found in Iraq. 2,600 years old

The Industrial Age

By 1700, people began living in large cities and using a fossil fuel (coal) to heat their homes and power their machines. Agriculture boomed and people began to move off the land as a result of more efficient farming operations. World population started to rise again, mostly because of improvements in medicine and sanitation. Other major transitions occurred with the appearance of factories, different types of engines, and the telephone.

Modern Society

Our modern world is fuelled mostly by coal, oil, gas, and consumerism. The global birthrate has declined, but world population continues to grow because of the large number of people in their childbearing years. Industrial activity has given some of us a high quality of life, but it has also degraded ecosystems, sparked conflict, and created large social and economic gaps. We are members of a computer-dominated Global Village that has fostered space travel, a nuclear arms race, widespread diseases, armed conflicts, and explosive growth in genetic research.

Most people now live in bustling cities.

Earthrise

Photographs of the Earth from space, first taken in the late 1960s, are striking because they show how beautiful the planet is when viewed from a distance. They also remind us that we only have one Earth to work with, and that we depend on it for our survival. The famous lunar Earthrise and the following words mark the end of the Time Tunnel.

> We have walked on the Moon, only to look back in awe at the precious blue pearl we call Earth. Against the inky blackness of space, our home appears small and fragile, a living miracle of air, water, soil, and vegetation.

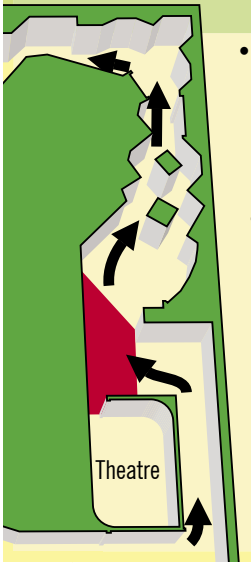
Living Planet

This area looks at how the Earth functions as a global ecosystem and how that system is being stressed by human activities. To the left of a large, rotating globe, illustrated panels examine what we mean when we say that something is alive. One side of the globe points out that healthy ecosystems provide a range of services, such as climatic regulation, which are not considered in most measures of economic activity.

The other side looks at signs of social and ecological stress, including poverty and disease, pollution, and the uneven distribution of wealth and power. There are also digital clocks that show how rapidly world population is increasing, while the amount of productive land and global biodiversity are both decreasing. A panel in the display points out that if everyone had the ecological footprint of the average Canadian, we would need a few more planets!

Key Points

- People and other organisms do not exist in isolation. They are integral parts of larger ecosystems that are considered to be the functional units of life.
- The global ecosystem, or Ecosphere, is a self-regulating entity that relies on smaller ecosystems to maintain itself in a far-from-equilibrium state. We can assess the health of the Ecosphere by how it is organized and how it functions.
- Many lines of evidence suggest that the global ecosystem is unhealthy because of stress associated with human activities.
- Our world population is large and growing, while levels of productive land and biodiversity are falling. Some impacts are due to large numbers of people; others are due to high rates of resource consumption by industrialized nations.



What is Life? — Building Blocks and Nested Layers

The interlocking panels in this exhibit describe the "nested hierarchy" theory of life, where each level includes the ones below it and is affected by the one above it. A central point of this theory is that the functional unit of life is the ecosystem, not DNA, the cell, or the organism. We simply relate best to the organism level because we *are* organisms. Information is also provided about the features

of a healthy ecosystem and the value of services provided by the global Ecosphere.

A Healthy Ecosystem

Healthy ecosystems provide a range of services, including climate regulation, soil formation, pollination, food production, and waste treatment. It would be humbling if these services were included in our traditional measures of economic activity. In 1997, their annual global worth was estimated at a conservative $33 trillion in U.S. dollars, while human activities were worth only $18 trillion!

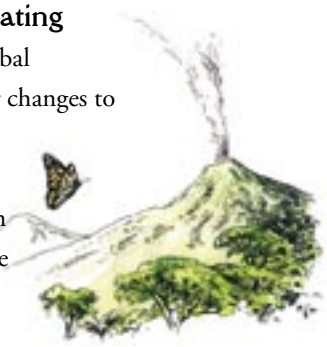
Our Home Is Alive

The panels on this side of the globe form complete arches and the text is written in a complete sentence, reflecting the integration that occurs in a healthy ecosystem. Details are provided about how the global ecosystem is powered, how it sustains itself, and how it is organized.

Powered by the Sun

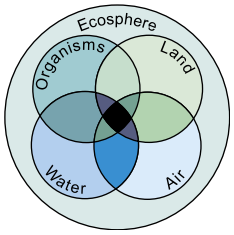
The ozone layer offers protection against a harmful form of invisible light called ultraviolet radiation, while carbon dioxide and other "greenhouse gases" keep the Earth warm by absorbing heat. Heat from the Sun affects global weather patterns, causing air to expand and rise and water to evaporate. At the same time, almost all organisms get their energy from the Sun through complex and dynamic food webs.

Dynamic and Self-regulating



Change is the norm in the global ecosystem, from daily weather changes to ecosystem disturbances that are followed by an increase in biodiversity. Yet there has been liquid water on Earth for more than 3.5 billion years, and for the last 200 million years, the amount of oxygen in the air has held steady at about 21%, which is ideal for land-dwelling plants and animals.

Organized and Integrated



The global ecosystem consists of different "spheres" that are linked together through the climate system and other complex cycles and processes. Organisms play an important role in these cycles by consuming and releasing water, oxygen, carbon, and other elements.

Under Stress

The panels on this side do not loop back to the globe and the content is presented in discrete parts, echoing the fact that some ecological cycles and processes have been altered by human activity. Information is provided about social and environmental issues that represent signs of global stress.

Modern Society: A New Global Force

The growth rate of the global population started to fall in the 1990s, but the total number of people is still rising, especially in low-income areas. In some areas, large numbers of people are trying to survive on limited resources. Other areas are "overpopulated" even though few people live there, because many of these people have big ecological footprints.

An Injured Atmosphere

Some industrial chemicals are harming the ozone layer, causing thin areas or "holes" to develop over polar areas

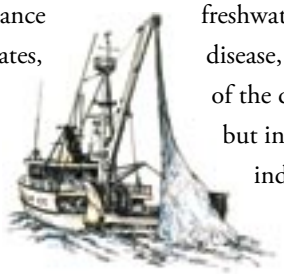
each spring. Scientists also predict that increased levels of carbon dioxide and other atmospheric gases will enhance the greenhouse effect. Based on projected emission rates, the global temperature is expected to rise by 1.5° to 6° C by the year 2100.

Changed Life

Plants and animals are going extinct faster than at any time in our history. People have also introduced plants and animals to new areas, either by accident or on purpose, and are now moving genes between species using biotechnology. Many human cultures are also at risk. In the 1990s, almost 3000 languages were endangered, including the Assiniboin language of southern Saskatchewan.

Circulation Problems

People are creating garbage faster than ecosystems can clean it up, and industries produce or rely on over 70,000 harmful chemicals. Some of these chemicals contribute to smog and acid rain or become concentrated as they move through food webs. At the same time, freshwater is in short supply and often carries disease, especially in low-income areas. Most of the demand for water is due to irrigation, but increasing amounts are being diverted to industries and growing cities. The oceans are also being stressed. Some fish species have been overexploited, causing stocks to collapse and fisheries to close.



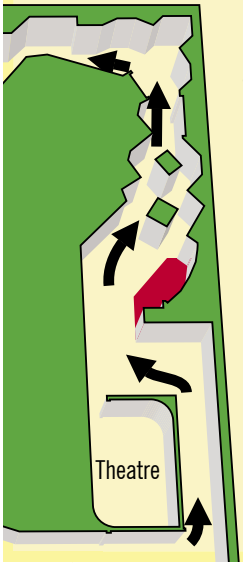
Human Welfare

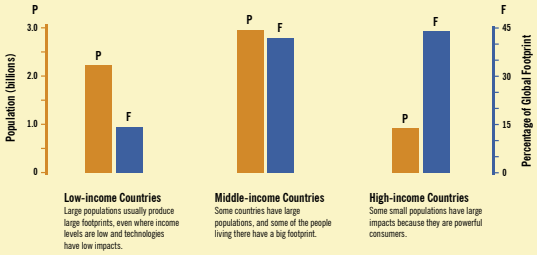
Over one billion people live in absolute poverty, trapped by low employment, a lack of education, and other factors. Poverty continues to be the root cause of many health problems, and diseases can now circle the globe in a few days as people travel. At the same time, governments continue to spend millions per minute on war and war-related activities, corporate power has surged, and the world faces a chronic hunger problem associated with the uneven distribution of wealth and power.

ILC

Interactive Learning Centre

The Human Factor includes an Interactive Learning Centre (ILC) with the same name, for people who want to explore climate change and other issues in depth. The exhibit and learning centre are similar in design, but the ILC provides more details about healthy ecosystems, signs of stress, and ecological economics.





Hands-on!

The Human Factor ILC also houses two hands-on displays. One looks at how systems can be stressed by exponential growth. The other shows where impacts due to population and consumption are occurring around the world.

Out of Balance

This display includes an ecological footprint affecting a coastal landscape and details about how different cultures view the Earth. Also featured are digital clocks that show current changes in world population, the amount of productive land, and global biodiversity based on UN numbers and conservative estimates. A central point is that our large global footprint is partly due to resource consumption in high-income areas.

The Clocks

The population clock shows the size of the human population and how it is changing, based on estimated birth and death rates. The productive land clock shows the loss of productive land, which includes arable land, pastures, and forests. The biodiversity clock shows how many species there are and how quickly they are disappearing. Based on conservative estimates, the biodiversity clock was set at 10,000,000 on Earth Day, 2001, and is decreasing by 5,000 species per year.

Views of the World

Many cultures recognize the value and vitality of the Earth. First Nations cultures often view the Earth as a sacred place imbued with spirit. Many religions describe the Earth as a garden that was created by a higher power and given to people as a gift. Some scientists believe that global conditions are being regulated by complex, automatic processes. They see the planet as a living, self-regulating entity and have named their hypothesis after Gaia ("Guy-ya"), the Greek goddess of the Earth.

Humanity's Impact

Humanity's ecological footprint is enormous and growing. In 2000, the average person had an ecological footprint of over 2.2 hectares, but there was only 1.8 hectares of productive land per person, producing a deficit of 0.4 hectares per person. Given the size of our average footprint, we would need 1.3 Earths to sustain 6 billion people with no deficit. If they all enjoyed the same standard of living as the average Canadian, we would need almost 4 whole planets!

The program in the "Can We Live Apart" tower looks at barriers that separate people from nature and from each other.

Causes of Stress

The displays in this area reflect imbalances associated with the industrialized world view. Each "tower of power" consists of selected objects, brief essays, quotations or facts on the railings, a computer game, and a human figure whose mannerisms and actions reflect the topic.

Towers of Power

There are separate towers for the effects of physical and social isolation (*Can We Live Apart?*), consumerism (*Buy And Be Happy?*), the myths and perils of unchecked economic expansion (*Is Bigger Better?*), the consequences of ignoring ecological limits (*Are There No Limits?*), risks associated with a "blind faith in technology" (*Can Science Save Us?*), the effects of bias towards aggression, competition, and independence (*Ours to Conquer?*), and the effects of social and economic disparities (*All For Some?*).

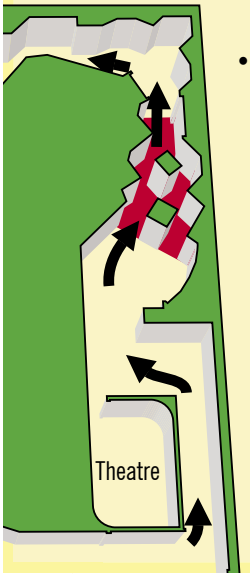
Industrialism: A world out of balance

Industrial activity has had many positive effects, but it has also created imbalances within societies and between humanity and the rest of the world. The industrialized world view supports a range of values and behaviours that are inherently unsustainable.

Can We Live Apart?

With all our modern conveniences, it is easy to forget that we depend on the Earth and each other. Most of us now live in cities, where obvious and subtle barriers separate us from nature. Psychologists have found that isolation from nature can produce a deep sense of loss, and emotions ranging from fear to anger. Some tools, attitudes, and institutions also isolate us from other people.

Key Points



- This section reflects our assumption that many stresses affecting social and ecological systems can be traced back to the industrialized world view. The tower topics are based on assessments of this world view by ecological psychologists.
- The towers are not trying to suggest that the depicted values, attitudes or behaviours are inherently wrong. The intent is to show where concentrations of social, economic, and political power exist in Western society and to raise questions about these imbalances.
- The industrialized world view assumes that:
  - The Earth is made of inert (lifeless) resources,
  - Nature can and should be controlled or transformed for human use,
  - Almost any action is justified if it leads to private financial gain,
  - Economies have to expand for societies to progress, and that
  - Progress is both desirable and inevitable.

The computer game looks at the pros and cons of buying a car.

In the computer game, a farmer is trying to decide whether he should expand his operation.

Buy And Be Happy?

According to countless commercials, financial wealth and material possessions are the keys to happiness. Money and consumerism are certainly powerful forces in our society, partly because of the choices we make. Yet price tags rarely indicate how much a product is actually worth, or the consequences of producing it, including social costs that range from stressful work settings, violence and crime, to growing financial and social gaps.

Is Bigger Better?

Our global footprint is enormous, yet we are still committed to "growth in the name of progress." Many people believe that our economies should keep expanding, despite obvious limits and misleading measurements. Globalization is supposed to be for the common good, for example, yet most of the benefits flow to global corporations and financial markets. These institutions rely on trade, which is an important part of the economy. But the farther things are shipped, the larger our ecological footprints become and the more difficult it is to monitor and regulate harmful activities.

The GDP— a misleading measure of progress

The GDP, or Gross Domestic Product, is an accurate but misleading index. It measures how money flows through an economy, but it says nothing about why money changes hands. It assumes that every financial transaction is positive. It increases when crimes, pollution, and disasters occur, and it rises again when they are cleaned up! It treats the loss of "natural capital" such as native prairie as income. And it ignores things that do not involve money, including ecosystem "services" and household work.

In the computer game, an aquatic ecosystem is eventually overwhelmed by "imputs" due to human activity.

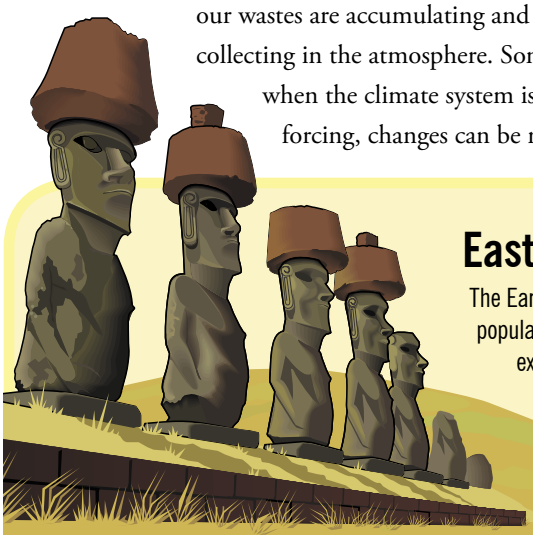
Are There No Limits?

We are taxing the Earth's capacity to provide us with the things we want and need. Supplies of some of the things we need are limited or running out, including non-renewable sources of energy. Current and potential supplies of oil may be exhausted by 2040, or new discoveries and technologies may take us to the end of the century, but we will run out eventually. At the same time, our wastes are accumulating and greenhouse gases are collecting in the atmosphere. Some scientists believe that when the climate system is subjected to this kind of forcing, changes can be rapid and irreversible.

The computer game looks at the limitations of pesticides as a technological "fix."

Can Science Save Us?

Science and technology are essential and effective parts of modern society, but they have limits. Some of the issues we face, including how we treat the land, require laws, ethics, morality, and "ways of knowing" that science can never address. The power of science and technology can also blind us to the fact that many things are beyond our control, leading to management efforts that are short-sighted or naive. Using science and technology, we can manipulate everything from the genes in a cell to the course of a river. The question is whether we should.

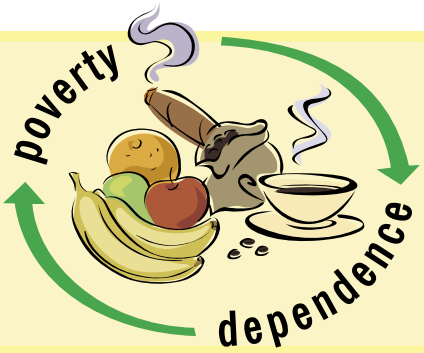


Easter Island

The Earth is an island, since there is no practical way for us to reach other planets. When an island population exceeds the carrying capacity of its habitat, it "crashes" and then recovers slowly or goes extinct. Easter Island off the coast of Chile supported a large human population for 1600 years. From 1680 to 1877, the population fell from 12,000 to just over 100, partly because wood, soil, water, and food grew scarce. The current population is around 2,000.

A "Green" Trap

Some disparities develop when subsistence farmers switch to industrialized agriculture. As part of the Green Revolution in the 1980s, producers in many low-income countries became trapped in a cycle of poverty and dependence. Instead of growing their own food, they became dependent on foreign suppliers and had to start paying off billions in debt by growing cash crops for export.



Ours to Conquer?

Sometimes, by trying to dominate or control nature and people, we create more problems than we solve. In cultures that put aggression, competition, and independence ahead of compassion, cooperation, and community, women and children are often oppressed, exploited, or overlooked. Where women are denied education and economic skills, their best insurance for old age is the number of children they have, so they often have big families. Where conflicts break out, the tendency is to use military force to resolve them or to maintain an uneasy peace.

All For Some?

Humanity uses more than its share of the Earth's wealth, and some people use a lot more than others. People share the Earth with millions of other species, yet every day we use 40% of the solar energy captured by terrestrial ecosystems. Social gaps are also widespread, including disparities based on gender, class, race, religion, and economics. Each year, for example, high-income countries consume 75% of the world's electricity, yet 75% of the world also lacks sufficient food, clean water, shelter, education, medical care, or basic human rights.

The computer game shows how much the world spends on military activity.

The computer game looks at conditions in some third world clothing factories.

Solutions

This area begins by exploring the importance of relationships that link people to the world around them, and to each other. Other displays describe how choices made by individuals, groups, and corporations can make a difference. There is also a growing list of "success stories" aimed at sustainability, and a "tower of hope" where visitors can see how their ecological footprints would change if they made different choices.

The Warm Fuzzies

The Warm Fuzzies exhibit, also called Reconnection, is a juxtaposition of images and thoughts that reflect the value of increased awareness and strong relationships. The off-beat and light-hearted approach is designed to offset the sober tone of the "towers of power" and to make the quotations on the skyline more poignant.

Reconnection

What can one person do about such complex problems? Psychologists have suggested that an important part of healing the gap between people and nature is to recognize and strengthen connections that link us to larger social and ecological communities. All of these communities are based on relationships, with love, laughter, and compassion forming some of the strongest bonds. Attitudes and actions that bring people together often reflect a deeply-rooted affection for nature and human goodness.

Can We Tread Lightly? – A Tower of Hope

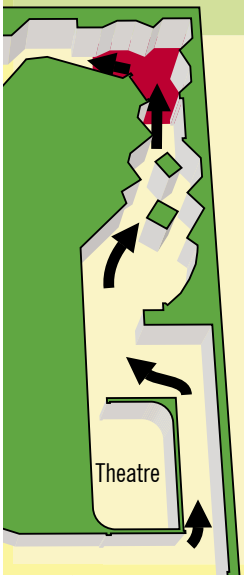
The colourful tower in this area is in marked contrast to the dull grey ones in the previous section. It includes a computer program that allows visitors to calculate their ecological footprint and to adjust it by making different choices. The program also allows people to set aside habitat for other species. The results indicate how many planets would be required if everyone had the footprint of the person playing the game.

Options and Ripples

There are many things we can do to move society onto a sustainable path. A good first step is to consider the size of our ecological footprints and how they would change if we made different choices. A few people can only do so much, of course, but when those people are leading by example, their actions can have far-reaching consequences. One of

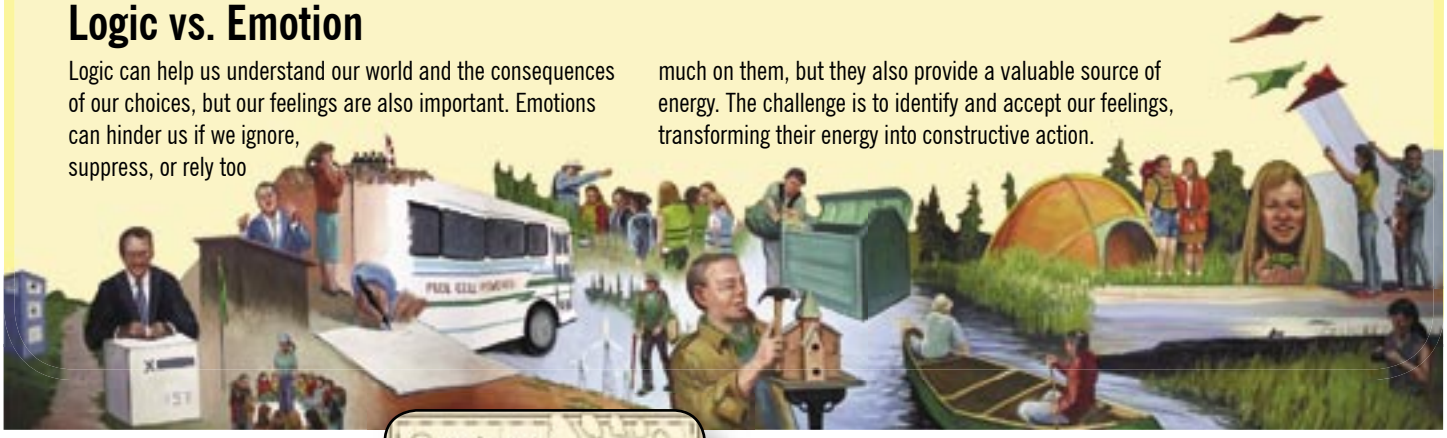
Key Points

- This area is mostly about empowering people who want to live more sustainably. A central point is that the current size of our individual and collective footprints is largely a reflection of the choices we make. It follows that we can alter the size of our impacts by making different choices.
- If isolation from the world around us is part of the problem, then it makes sense to strengthen connections that link people to nature and to each other.
- Sustainability is a universal challenge, and many people and groups are working toward it.



Logic vs. Emotion

Logic can help us understand our world and the consequences of our choices, but our feelings are also important. Emotions can hinder us if we ignore, suppress, or rely too much on them, but they also provide a valuable source of energy. The challenge is to identify and accept our feelings, transforming their energy into constructive action.



The program here allows visitors to calculate and change the size of their ecological "footprint."

the most effective things we can do is to set a good example as individuals, and trust that others will follow our lead.

Our Gyro-Earth

The Gyro-Earth display is a metaphor for dynamic balance, the central theme of the Gallery, since gyroscopes spin and wobble without falling over. The bands on the exhibit provide information about things people can do to live sustainably as individuals and through their communities.

Restoring and Sustaining Balance

Education is a critical part of sustainable development, and the 3 R's (reduce, reuse, recycle) are still a valuable reminder for people who want to "do their part." Other issues require collective action, from saving species and wilderness areas to population programs, debt relief, and ensuring the survival of local communities.

Sustainable Development

Sustainability is a challenging concept that requires us to make fundamental choices as individuals and groups. The challenge is to respect limits and foster an "ecocentric" world view by becoming informed, responsible citizens, reducing our dependence on fossil fuels, improving the quality of local economies, preserving and building on traditional knowledge, finding opportunities in ecological cycles and processes, and developing appropriate scales of technology and governance.

Our Choices Make A Difference

The panels here are similar to those in the Living Planet, with banners that flow towards a rotating globe. The implication is different however, as the content describes a range of options that people can pursue if they want to live sustainably.

Mindful Leadership

We can all make a difference by making mindful choices as individual consumers and citizens, and collectively as groups, governments, and corporations. People in a group can look to each other for leadership, while individuals have to rely on their own knowledge and intuition. Choices that allow us to "reconnect" may help to bridge the gaps that separate people from nature and from each other. Some of our choices and reactions may reflect a deeply rooted, emotional connection that sociologists call "biophilia," which means "attracted to life."

The computer station here asks visitors to tell us about success stories that could be added to the exhibit.

Success Stories

Much is being done to restore or strengthen critical connections, but these stories are rarely given much weight in the media. The presentation here is another series of closed loops, with success stories included as parts of a newspaper called *The RSM Times—Where every day is Earth Day*.

Healthy Air, Water, & Food
- Saving Soil
- Aiming For Lower Emissions
- Freshwater Protected

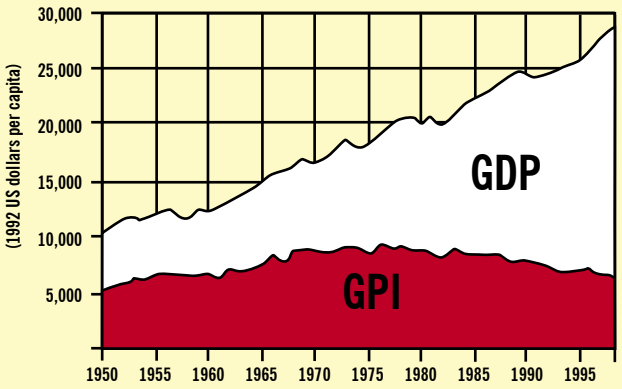
Transportation, Energy & Shelter
- What's in Store?
- Fuel Cells Offer Cleaner Energy
- Living "Off the Grid"

Waste Reduction
- SARCAN Tops a Billion
- Moose Jaw Rewarded for Composting
- Tackling Toxins

Wilderness & Biodiversity
- A Simple Attachment Saves Lives
- Native Prairie Protected
- Keeping Tabs on Purple Loosestrife

Justice & Security
- U.N. Urges Debt Relief
- Nuclear Tests Banned!
- World Bank Sinks Dam

Connection & Contribution
- Mapping Projects Bring Communities Together
- Ecology Camp Recognized
- Edmontonians Band Together



What's the GPI?

The Genuine Progress Indicator (GPI) is a new measure of economic well-being. It is an improvement over the Gross Domestic Product (GDP) because it accounts for financial gaps, damaging activities, and the value of volunteer work and ecosystem services. This graph shows that the GPI began to fall in the last decades of the 20th century, while the GDP was still going up!

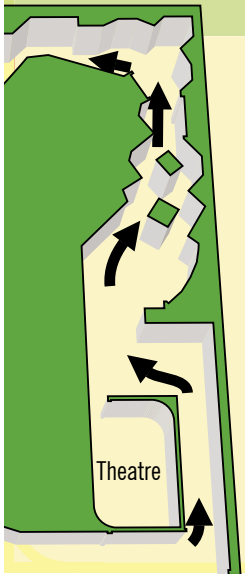
Looking Ahead

The final part of the exhibit, and the Gallery as a whole, considers what might lie in the future, and how people might create it. The aim is to encourage visitors to reflect on the legacy being left for unborn generations. Guiding principles developed by the international community are presented alongside visions of a desirable future designed, created, and interpreted by grade-school children.

Our Legacy — A Lasting Impression?

How large will humanity's footprint be next year? In 5, 10, or 50 years? How big will yours be tomorrow? It is difficult to predict how our impacts might change over time, but some things are certain: the size of our future footprints will depend on the choices we make, and our choices will be guided by what we want for our children and future generations.

Key Points



- The guiding principles from the Earth Charter are included because they reflect a set of critical and comprehensive values. They are also a rallying call for people who want to live more sustainably.
- The last display, called *Our Dreams*, is positioned so the last word in the Gallery goes to the children. It includes a speech delivered by a talking Mother Earth, where the children join in to say the last line.

"Greenhouses are important because we start seeds that we later plant in fields, yards, and gardens. Plants provide oxygen for other living things. This is why we preserve plants in greenhouses."

by Candis Beitel

"A healthy world is what I want my children to grow up in. Let's rediscover the ability animals have in assisting us with our everyday needs. I'm working to make this happen. I need your help."

by Vanessa Krieser

The Earth Charter

The principles presented here are part of the Earth Charter that was developed by the Earth Council and Green Cross International "to inspire a sense of global interdependence and shared responsibility."

March 2000

Respect and care for the community of life

- Respect Earth and life in all its diversity.
- Care for the community of life with understanding, compassion, and love.
- Build democratic societies that are just, participatory, sustainable, and peaceful.
- Secure Earth's bounty and beauty for present and future generations.

Ecological integrity

- Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.
- Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.
- Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.
- Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.

RSM YOUTH FORUM on SUSTAINABILITY

Youth taking action

The Human Factor is used for a number of education programs, including a Youth Forum on Sustainability. Over the course of a school year, the Forum brings secondary students, teachers, and local experts together to foster learning about sustainability issues, to build partnerships between schools and communities, and to help participants become empowered through student-led Action Projects. For details about the Forum and other programs, contact the Royal Saskatchewan Museum by phone at (306) 787-2815 or visit the website at www.royalsaskmuseum.ca.

"Carpooling saves on gas and helps save the environment. It saves money and you can visit on your way to work or school. Carpooling creates savings." *by Colleen Roome and Kristie Lund*

Social and economic justice

- Eradicate poverty as an ethical, social, and environmental imperative.
- Ensure that economic activities and institutions at all levels promote human development in an equitable and sustainable manner.
- Affirm gender equality and equity as prerequisites to sustainable development and ensure universal access to education, health care, and economic opportunity.
- Uphold the right of all, without discrimination, to a natural and social environment supportive of human dignity, bodily health, and spiritual well-being, with special attention to the rights of indigenous peoples and minorities.

Democracy, nonviolence, and peace

- Strengthen democratic institutions at all levels, and provide transparency and accountability in governance, inclusive participation in decision making, and access to justice.
- Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life.
- Treat all living beings with respect and consideration.
- Promote a culture of tolerance, nonviolence, and peace.

See www.earthcharter.org for more information about the Earth Charter.

Our Dreams

To bring this Gallery to an inspiring conclusion, the Museum decided to give the last word to children. After a province-wide call for participation, grade-school students were brought together in May 1998 to talk about their hopes and dreams for the future. Together, they transformed their ideas into these scenes, sculpting them, painting them, and explaining their significance. Some wanted to have their views expressed by a talking Earth, who says:

> Hello,
>
> The children who made this exhibit have asked me to pass along a message. As members of the next generation, they are concerned about my health, and they want your help.
>
> To stop pollution and conserve resources, they urge you to use technology wisely, avoid using harmful chemicals, and reduce, reuse and recycle.
>
> To preserve wilderness and save endangered species, they urge you to respect all forms of life and to protect and restore habitats.
>
> To reduce poverty, injustice and violence, they urge you to treat one another with compassion and understanding. These children see me as their precious home.
>
> In their words, "The future depends on all of us — that includes you!"

Suggested Reading

Books

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◀ Visitors enjoy a close encounter with a mosasaur and a long-necked plesiosaur. This late Cretaceous undersea environment is in the Earth Sciences Gallery, completed in 1989.

Continued from back cover

Explaining what we know

Although natural history specimens were displayed when the museum was established, the first record of the development of educational programs was 1914. In 1955, the RSM moved to its current home. Construction accommodated development of large permanent displays, including dioramas. Self guided audio tours were installed during the 1960s. Nature trails, interpretive programs and exhibits were developed in eight provincial parks from 1965 to 1980.

In 1993 the Museum received a Coat of Arms and name change to the Royal Saskatchewan Museum to better suit its new mandate which now includes early human history.

The RSM website was introduced in 1997. It now features thousands of pages of content and is still growing. A total redevelopment of all permanent exhibits was completed in 2001.

2006 marks 100 years of collecting, preserving, interpreting and sharing knowledge with communities for the RSM … and there is more to come!

For more information

Phone: (306) 787-2815
Fax: (306) 787-2820
Email: info@royalsaskmuseum.ca
Web: www.royalsaskmuseum.ca

Children, from play school to high school, have gotten a new feel for Saskatchewan's history and cultures through the Museum's Education Programming.

Approximately 140,000 visitors a year visit the RSM to take in displays such as this grasslands diorama in the Life Sciences Gallery completed in 2001.

Representative collections provide the foundation for RSM research on species in Saskatchewan.

The excavation of the Gull Lake site in 1960–61 uncovered repeated use of this Bison kill site over a 2000 year period.

The RSM uncovered "Scotty," one of 13 known T. rex skeletons, near Eastend, Saskatchewan in 1994.

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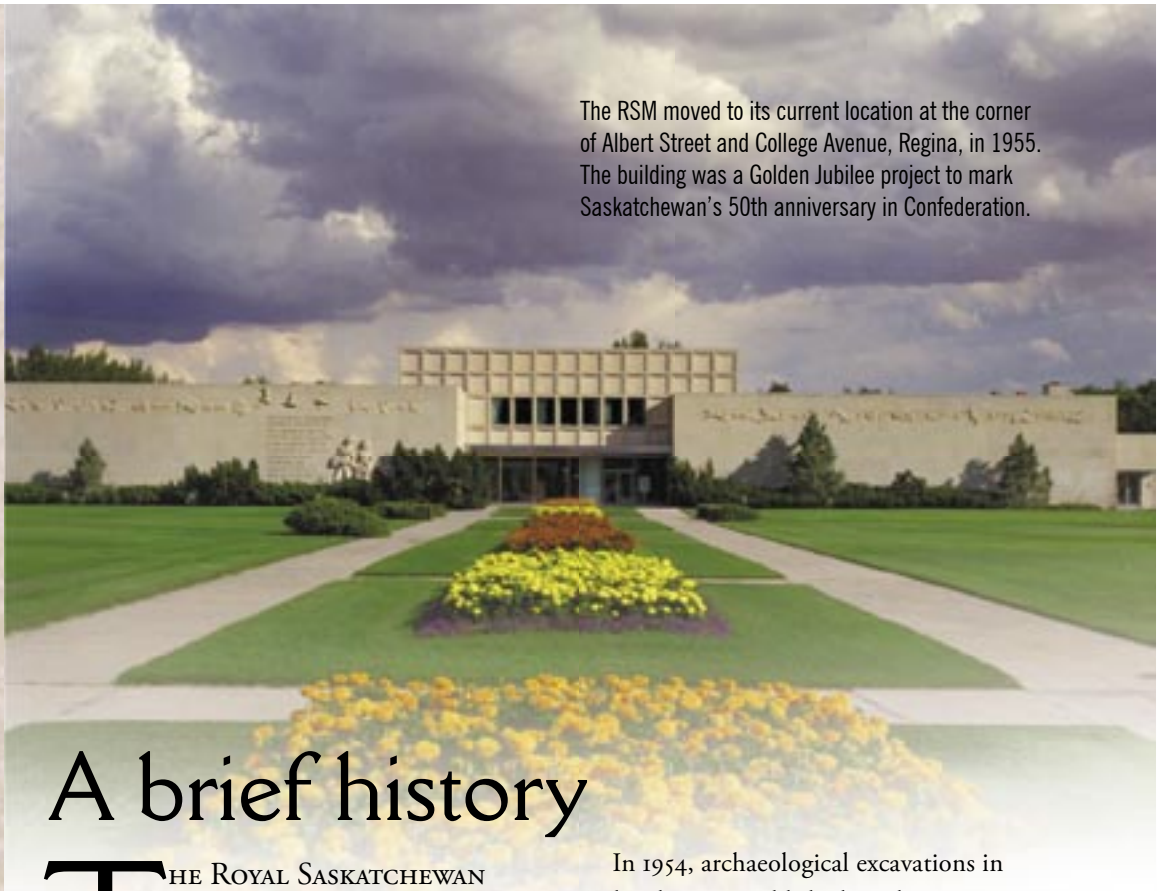

The RSM moved to its current location at the corner of Albert Street and College Avenue, Regina, in 1955. The building was a Golden Jubilee project to mark Saskatchewan's 50th anniversary in Confederation.

Celebrating 100 years of "collecting, preserving, interpreting and sharing knowledge with communities."

A brief history

The Royal Saskatchewan Museum (RSM) was initially a "no name brand." It was simply "the museum" when it was established in 1906 with $577.70 from the Department of Agriculture. It has had three name changes, and six location changes. In spite of a violent tornado in 1912 and a devastating fire in 1990, the RSM is more vibrant than ever.

The Beaver Hills Petroglyph was the first artifact donated to the Museum.

Collecting and research

The first donation in 1906 was the Beaver Hills Petroglyph. Since then the collection has grown to more than two million artifacts! Many scientific facts about Saskatchewan have been established through field research initiated by the RSM.

In 1954, archaeological excavations in Saskatchewan established a culture sequence covering the past 3500 years. From 1961 to 1991 a project was put in place to monitor and protect White Pelicans, Double-crested Cormorants, endangered Whooping Cranes and Burrowing Owls.

The period from 1976 to 1980 saw Archaeological excavations at Fort Pitt, Fort Carlton and the Skovold Site. "Scotty" the fossilized remains of a T. rex, and the discovery of the first known T. rex coprolite (dino poop), were excavated in 1994–95. A fossil research station was established in the town of Eastend, Saskatchewan in 1995.

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This 44 cm long T. rex coprolite provided new evidence of this dinosaur's eating habits and diet.

This Old Maid underwing moth is a recent donation. It measures 5.5 cm across and is the furthest west known record of this species.