

## Chapter 10

# Property Management

Sound property management and sustainable development go hand in hand. A so-called sustainable building will provide employees with a healthy workplace where they will enjoy better air quality and where there is more natural light. The operation of any building has an impact on the environment, but action can be taken to limit the negative impact. A complete life cycle analysis often reveals that, in general, only 20% of a project's costs are connected with building construction and/or renovation, while 80% of the costs are connected with subsequent maintenance and upgrading.

For instance, by investing a little more in purchasing eco-efficient windows and installing them on the south face of your building, you will save on air-conditioning and heating costs. This section provides tools for better identifying the aspects that should be taken into account, such as when doing renovations or during a new construction. Refer to chapter 14 on certifications and audit programs regarding the various certifications available.

Among the tools available is the journal POPYRUS by the *International Association of Museum Facility Administrators*. One of the issues discusses a more environmental alternative for controlling birds in urban settings (<http://www.iamfa.org>).

## 1. Buildings



La TOHU. Photo: © Ville de Montréal.

A building is sustainable if it has been designed, renovated or reused in an ecologically responsible manner; if it is built from sustainable materials, uses resources like energy and water efficiently while minimizing its overall impacts on the environment. The health and productivity of its occupants will also be considered. Its design will allow for efficient changes to the layouts of both the offices and exhibit spaces. The indoor layout will allow as much natural light as possible into the office areas and allow traffic patterns that encourage people to walk.

Below is a summary of information taken from a California website on sustainable buildings (<http://www.ciwmb.ca.gov/greenbuilding/Materials/>):

In general, when selecting building and renovation materials and products, it is suggested that you consider the following five aspects:

1. Resource efficiency. To be efficient, the resources used must be:

- Made from recycled materials
- Made from natural, plentiful or renewable materials
- Produced in a resource-efficient manner
- Locally available
- Salvaged, refurbished or remanufactured
- Reusable or recyclable after first use
- Packaged in recycled or recyclable materials
- Durable, with a long life expectancy

2. Indoor air quality. The materials used must:

- Be low or non-toxic: some can affect the human reproductive system or be irritants
- Have minimal emissions of chemicals such as volatile organic compounds (VOCs)
- Be assembled using methods that involve few or no VOCs
- Be mold resistant to reduce the risk of contaminants
- Be healthfully maintained: products that are non-toxic, VOC-free, etc.

The buildings must also have systems or equipment that improve indoor air quality and eliminate pollutants.

3. Energy efficiency can be improved by using materials and systems that reduce energy use inside the premises.
4. Water conservation: It is wise to use systems and materials that reduce water consumption inside the buildings and watering landscaped areas.
5. Affordability (long-term quality/price relationship): A life cycle analysis is essential for making an informed choice that considers quality and price from a long-term perspective. You should also go beyond the simple comparison between the cost of conventional materials and more sustainable materials if you are at least going to allocate a certain percentage of the budget to the latter.

### **Renewable energy**

The RETScreen Clean Energy Project Analysis Software is a unique decision-support tool. It is free, and can be used to evaluate the energy production, savings, costs, emission reductions, financial viability and risk for various types of renewable-energy and energy-efficient technologies (RETS): <http://www.etscreen.net/ang/home.php>

## **A. New construction**

Green Globes Design

[http://www.greenglobes.com/design/Green\\_Globes\\_Design\\_Summary.pdf](http://www.greenglobes.com/design/Green_Globes_Design_Summary.pdf)

LEED Canada

<http://www.cagbc.org/leed/what/index.php>

Recycled materials for construction

<http://www.ecoconstruction.org/>

Canadian Wood Council on choosing structural building materials

<http://www.cwc.ca/Publications/PDF+Publications/index.htm>

## **B. Renovation**

Natural Resources Canada's Office of Energy Efficiency (OEE) has developed tools to facilitate eco-renovation activities. The following site lists the eight steps to consider during an energy efficiency improvement project:

<http://oee.nrcan.gc.ca/commercial/getting-started/index.cfm>

There are also grant and incentive programs for eco-energy refitting. Visit the Office of Energy Efficiency's site at the following address:

<http://oee.nrcan.gc.ca/corporate/retrofit-summary.cfm>

## Heritage buildings

Roughly 50% of museums are located in heritage buildings, which can make alterations more complex. However, this provides the opportunity to act in a sustainable manner. Even so, attention must be paid to the conservation of heritage buildings: green technologies are not always appropriate; it is necessary to rely on the experts and proceed based on each particular case.

**Here are some tools for guiding modifications made to heritage buildings:**

### 1. Federal government

For cultural resources on national historic sites and parks, you must first refer to the commemorative integrity statement for historic sites, which indicates the location of the values and main items that must absolutely be preserved. The Cultural Resource Management Policy of Parks Canada (especially section 3.4 Conservation) is useful: <http://www.pc.gc.ca/docs/pc/poli/princip/sec3.aspx>

The Federal Heritage Buildings Review Office ([http://www.pc.gc.ca/progs/beefp-fhbro/index\\_e.asp](http://www.pc.gc.ca/progs/beefp-fhbro/index_e.asp)) assesses the heritage value of all buildings belonging to the government when they reach 40 years of age, designates them as classified or recognized if applicable, and advises federal departments when work must be done. The tool used to assess whether the impact of the proposed modifications is acceptable or not is the Standards and Guidelines for the Conservation of Historic Places in Canada. The most useful parts of this document are the four principles given in the introduction as well as the 14 standards. The following sections are just as useful, if only as a checklist, whereas other topics like archeological sites and cultural landscapes are addressed: <http://www.pc.gc.ca/docs/pc/guide/nldclpc-sgchpc.aspx>

Further advice can be obtained from specialists from Parks Canada, the FHBRO or even Public Works and Government Services Canada (PWGSC).

### 2. Provincial government

Each province has its own system. In Québec, the Ministère de la Culture, des Communications et de la Condition féminine is responsible for heritage (see <http://www.mcccf.gouv.qc.ca/> and select Patrimoine under Secteur d'intervention). Many buildings are classified as historic monuments and/or are located within historic districts where certain rules must be followed.

### 3. Municipalities

Each municipality also has its own ways of doing things. At a minimum, there is a permit service. However, some cities will have a "Site Planning and Architectural Integration Program" (PIIA), an urban planning plan and sometimes a heritage policy. For example, here are the policies of Quebec City and Montreal:

<http://www.ville.quebec.qc.ca/publications/index.aspx>

<http://www.operationpatrimoine.com/guide/conseils.htm>

The MRCs (regional government) or smaller municipalities are not to be outdone. Several guides similar to those of the large cities, but geared to the specific characteristics of the place have appeared in recent years, including a particularly successful one for Baie Saint-Paul. Here are two others:

Intervention guide for the built heritage of Bas-Saint-Laurent (French only):  
[http://www.ruralys.org/gestionweb/apercupage.php?titre=portail\\_projets](http://www.ruralys.org/gestionweb/apercupage.php?titre=portail_projets)

Information and reference guide on built heritage, Laurentian Mountains area:  
<http://culturelaurentides.com/patrimoine/guide/>

The Rues principales Foundation (<http://www.fondationruesprincipales.qc.ca/en/>), a not-for-profit organization that establishes service agreements with municipalities that want to establish in sustainable development and revitalization. Among other things, it offers professional expertise for ensuring that development is based on heritage conservation and enhancement. The foundation seeks to improve public spaces and enhance buildings and the environment in general. Its mission is “to promote sustainable development based not only on the cultural, natural and socio-economic assets specific to each neighbourhood, each town, each village, but also on everything that makes it unique.”

## C. Site layout and gardens

The outdoor layout of your institution is just as important as its indoor layout; it is part of your entire organization. Moreover, the outdoor layout of your site is the first contact that your visitors and employees have with your institution. Landscape designs and outdoor environments created in a sustainable manner communicate your values to your customers, as well as providing a healthy, relaxing place for your employees, even in urban settings. For example, it is possible to incorporate green roofs, green walls or even roof gardens.

A thoughtful landscape design can result in savings as well as helping filter out air pollutants and improve runoff water management. They will also benefit the local ecosystems and habitats.

### Example: Musée de la civilisation du Québec

The project, *Growing High on the Rooftops of the Museum*, by Quebec's Musée de la civilisation features nine themed gardens on the museum's roofs in the summer. Garden guides are on site to offer educational programs to visitors. As well as adding greenery in an urban setting, these gardens encourage users to think about the ways to nourish the body, mind, and soul. They also offer visitors access to a place they cannot usually access, which affords a different perspective on the museum. The Museum of Civilization received an Award of Excellence in the Facility Development and Design category from the Canadian Museums Association.  
[http://mcq.org/vertiges/?page\\_id=242](http://mcq.org/vertiges/?page_id=242)

With landscape design, it is important to favour native and regional seeds and to inform the general public about this. Learn about it online, from your garden centre, or from landscape design and horticulture specialists. Again, communicating your actions to your visitors may have a greater impact than you think!

Green gardening references:

- [http://www.ethiquette.ca/index.php?option=com\\_content&task=view&id=1625&lang=en](http://www.ethiquette.ca/index.php?option=com_content&task=view&id=1625&lang=en)
- <http://www.ene.gov.on.ca/en/land/pesticides/greenGardening.php>

## D. Maintenance

Maintenance of heating, ventilating and air-conditioning (HVAC) systems can have a significant impact: the amount of energy used and occupant comfort depend on it. Mechanical HVAC systems and the associated components such as fans, pumps, and so on, are second only to lighting as in terms of energy consumption in most buildings.

The Green Building Book offers a great deal of information about this:

[http://www.dgs.state.pa.us/dgs/lib/dgs/green\\_bldg/greenbuildingbook.pdf](http://www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf)

## 2. Air quality

Indoor air quality affects the health of your visitors and staff alike, so it is important to eliminate as many pollutants from it as possible. The first thing to do is to ensure regular maintenance of the ventilation system, following the manufacturer's instructions.

### References

Health Canada

<http://www.hc-sc.gc.ca/ewh-semt/air/index-eng.php>

National Research Council

[http://irc.nrc-cnrc.gc.ca/pubs/ctus/64\\_e.html](http://irc.nrc-cnrc.gc.ca/pubs/ctus/64_e.html)

Canadian Lung Association

[http://www.lung.ca/protect-protegez/pollution-pollution/outdoor-exterior/pollutants-polluants\\_e.php#VOC](http://www.lung.ca/protect-protegez/pollution-pollution/outdoor-exterior/pollutants-polluants_e.php#VOC)

[http://www.lung.ca/protect-protegez/pollution-pollution/indoor-interieur/work-travail\\_e.php](http://www.lung.ca/protect-protegez/pollution-pollution/indoor-interieur/work-travail_e.php)

## A. Sources of pollutants

According to the Green your Business: Toolkit for Tourism Operators (p90), volatile organic compounds (VOCs) are organic chemical compounds that readily evaporate at room temperature. Some VOCs have distinct odours, while others are completely scentless. They originate from a variety of sources including paints, varnishes, solvents, cleaning products, carpets, photocopying equipment, upholstery fabric, pressed-wood furniture, fuel oil, cosmetics, glues, and many other common household and workplace products. Exposure to VOCs can cause eye and nose irritation, headaches, nausea and dizziness. The fumes can also aggravate asthma and allergies. Some VOCs have been linked to different types of cancers and central nervous system damage.

According to Health Canada, "We spend close to 90% of our time inside; at home, at work, and in recreational environments. Most people, however, are unaware of the effects that poor indoor air quality can have on their health."

Health Canada offers a list of pollutants that should be checked for regularly to ensure good indoor air quality, such as formaldehyde, carbon monoxide, radon, allergens, and so on:

<http://www.hc-sc.gc.ca/ewh-semt/air/in/index-eng.php>

The Green your Business: Toolkit for Tourism Operators discusses the source of various pollutants that contaminate indoor air, such as flooring, walls, windows, cleaning products, etc. Here are a few excerpts from pages 90 to 95:

## Floors

**Carpet:** Carpet provides an ideal environment for dust mites to grow. Furthermore, synthetic carpets can emit VOCs from glues and petroleum-based products. Try to decrease your use of carpet in areas where dampness can create problems with mould growth, such as bathrooms, basements, kitchen areas or near hot tubs. If carpets do get wet, be sure to dry them out completely. Vacuum carpets regularly, preferably using a high-efficiency particulate (HEPA) air filters to cut back on dust. When purchasing new carpet, consider natural fibres, such as wool, silk or hemp that are coloured with natural dyes, or low-VOC-emitting carpet.

**Hardwood:** There are many good options when it comes to hardwood and similar types of flooring, including bamboo and cork, both from renewable resources. When using hardwood flooring, avoid using virgin wood; instead choose a product that has been FSC-certified or recycled. Use low-VOC stains or polishes on hardwoods. When installing flooring that requires an adhesive, look for low-VOC options.

**Tile, stone and concrete:** Polished and sealed concrete floors are becoming increasingly popular, and can be finished with a variety of glosses, colours and textures. Not only are such floors energy efficient, there is very little waste from making cement compared with similar tile and stone floors. Tile, stone, and concrete are all great flooring options for good indoor air quality as they do not promote dust mite growth and are low VOC.

**Vinyl:** Avoid vinyl flooring, both the material and its adhesives can emit VOCs, as well as carcinogenic compounds. Further, the production of the material involves very toxic processes and vinyl emits deadly toxic gases when burned.

## Walls

Look for low or zero-VOC paint, and consider low-VOC wallpaper adhesives. Consider other non-toxic wall finishes. For example, check out National Geographic's Green Guide for reviews of milk- and clay-based wall products. Look for materials that require few or no finishing products, such as wood.

**Paint:** Information on recycled and/or low-VOC paint.

<http://www.thegreenguide.com/>

[http://eartheasy.com/live\\_nontoxic\\_paints.htm](http://eartheasy.com/live_nontoxic_paints.htm)

[http://www.greenseal.org/findaproduct/paints\\_coatings.cfm](http://www.greenseal.org/findaproduct/paints_coatings.cfm)

<http://www.ecohabitation.com/guide/peinture/index.php> (French only)

[http://www.sico.ca/En/Produits\\_Environnement.asp](http://www.sico.ca/En/Produits_Environnement.asp)

<http://www.boomerangpaint.com/philo.asp>

**Lead paint:** If your building is old (built before 1960), there's a chance that there is, or was at one point, lead paint on the walls. It is important to either remove or seal lead paint. Health Canada offers more information:

<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/paint-peinture-eng.php>

## B. Greening indoor spaces

A simple solution for improving the air quality of spaces is to add plants, as they absorb many air pollutants while creating a pleasant, welcoming setting. Refer to p90 of Green your Business: Toolkit for Tourism Operators, as it discusses air filtration using plants.

The Guide de verdissement intérieur en milieu scolaire [indoor greening guide for schools] created by CRÉ Laval, as part of the AVEC project, provides a host of information on the toxic items found in the air of buildings, their impact on human health, as well as several plant species and their purifying ability. It is available here (French only): <http://www.crelaval.qc.ca/doc/pdf/avec/Guide%20du%20verdissement%20des%20écoles.pdf>

## 3. Water management

### A. Water consumption

The best way to start processes for sound water management is to prepare a usage report: identify the services and equipment that use water. Ideally you should install water meters to monitor consumption, zero in on leaks and sources of loss, and so on. Toilets, kitchens and landscape designs are usually the heaviest sources of water loss. It may also be worth examining the way employees use water: for example, perhaps the employees are using work methods that result in taps being on unnecessarily.

The Green your Business: Toolkit for Tourism Operators gives many Canadian water management examples:

[http://www.corporate.canada.travel/en/ca/research\\_statistics/productknowledge/product\\_research/other/green\\_your\\_business.html](http://www.corporate.canada.travel/en/ca/research_statistics/productknowledge/product_research/other/green_your_business.html)

### B. Using rainwater

Catch rainfall using cisterns or barrels to water landscaped areas and lawns. Maintaining landscaped areas and washing vehicles does not require the use of drinking water. This action helps save the energy that is needed for treating the water and reduces the use of chemicals in those treatments.

### C. Site layout

It is during design stage that it is easiest to achieve returns on the construction work:

- Plan to maximize water and energy savings
- Orient structures to make the best use of sunshine, breezes and other passive energy sources. This can help reduce energy costs associated with heating and cooling
- Consider creating shade to reduce cooling costs
- Allow sunshine in and block cold winter winds to reduce heating costs

#### Green roofs

Green roofs help improve air quality and energy performance while reducing heating and cooling costs. They also create habitats for butterflies and birds and facilitate runoff water management by absorbing a great deal of rain water.

These three organizations provide information about green roofs:

- Green Roofs for Healthy Living: <http://www.cca.qc.ca/pages/Niveau3.asp?page=oberlander&lang=eng>
- City of Toronto: <http://www.toronto.ca/greenroofs/index.htm>
- Green Garage: <http://greengarage.ca/greenroofs/>



## D. Water-saving appliances and equipment

There are many water-saving appliances and equipment. You can save water by:

- Using automatic taps
- Using low-flow or double-flush toilets, water volume reducers in all your toilet tanks or pit privies
- Using dry-toilets
- Install a grey-water reclamation system and use the water for watering lawns and landscaping

## 4. Energy management

Energy costs are usually the greatest expense for organizations. However, simple actions such as turning off lights and scanners at night and ensuring that monitors are in sleep mode during extended periods of inactivity, or choosing to purchase Energy Star devices lead to real savings while reducing your energy use. Any improvement or change process requires being aware of the current situation, which is true when it comes to leaning towards energy efficiency or favouring sustainable energy.

A few concrete project examples may inspire you. Below you will find the link for the renewable energy interpretation centre in Richelieu, Montérégie (French only):

<http://www.energie-richelieu.com/Default.aspx?idPage=7>

Natural Resources Canada's Office of Energy Efficiency provides tools, services and financial support to help commercial and institutional organizations reduce their energy use:

<http://oee.nrcan.gc.ca/commercial/index.cfm?attr=20>

[http://www.aee.gouv.qc.ca/en/programs-and-financial-aid/page-programmes/1/?tx\\_nurprogsuv\\_pi1%5Border%5D=energy](http://www.aee.gouv.qc.ca/en/programs-and-financial-aid/page-programmes/1/?tx_nurprogsuv_pi1%5Border%5D=energy)

You can also subscribe free of charge to the Heads Up Energy Efficiency newsletter:

<http://oee.nrcan.gc.ca/commercial/technical-info/newsletter.cfm?attr=20>

## A. Lighting

The lighting at your institution, whether in offices, exhibit spaces or common areas such as restaurants, has a significant impact on your energy use and thus on your ecological footprint. Many technologies help reduce the amount of energy used for lighting: computerized lighting systems, and compact fluorescent light-bulbs (CFLs) are examples. By choosing LED bulbs, for example, you will use less energy and generate less heat, which will also impact your air-conditioning system.

Also, not all lights need to be on at all times: there are automated systems that let you synchronize your lighting systems with your opening hours. There are also systems that work using motion sensors; they can be very effective for lighting bathrooms for example.

The light-emitting diode (LED) technology is another alternative that allows for energy-use savings of roughly 40%. Further, LED lights do not emit any ultra-violet rays, do not give off heat, do not attract bugs, and do not cause artworks or artefacts to fade.

At the Biosphere, Environment Canada's Museum of the Environment, motion sensors have been installed in several rooms such as bathrooms, kitchenettes, and the computer areas. The lights are off any time there is no movement in these rooms. Also, throughout the museum, the lights are controlled by a system that turns them off and on based on opening hours, which means that, during off hours, only the emergency lights stay on.

Moreover, it is important to consider the energy that will be used by the lighting for your exhibits and all the other devices needed for your operations, such as air-conditioning and maintenance of your collections

Lighting references:

<http://oee.nrcan.gc.ca/publications/equipment/lighting/section10.cfm?attr=4>

[http://www.greendesignwiki.com/index.php?title=Energy\\_Use\\_and\\_Lighting\\_Efficiency](http://www.greendesignwiki.com/index.php?title=Energy_Use_and_Lighting_Efficiency)

### **Going with an LED lighting system:**

Changing the conventional indoor and outdoor lighting of a Parks Canada site will help achieve a calculated saving of roughly 40% on the electricity bill and a reduction in annual CO<sup>2</sup> emissions ranging from 5 to 8 tonnes per year. The grant program could achieve 70% and the hiring of a consultant 20%. So, 50% of the initial investment could be absorbed. The annual savings and the reduced maintenance expenses and bulb replacement frequency (the lifespan of LEDs is longer) will help you quickly recoup the portion invested by Parks Canada.

<http://oee.nrcan.gc.ca/publications/equipment/lighting/section10.cfm?attr=4>

## **B. Electricity, cooling and heating**

Here are a few examples of things to do and/or anticipate regarding temperature management in buildings:

- Check if there are leaks or holes in the insulation and around doors and windows
- Is your heating system really efficient? If not, consider replacing it with an energy-saving model that will reduce costs and greenhouse emissions
- Install programmable thermostats to control room temperature; install a programmable thermostat for the hot water tank and achieve savings of 2% for every 1°C decrease in temperature
- Install a heat recovery ventilator that collects heat from the trapped, humid air and uses it to preheat the fresh air coming into the institution. The system can recover 85% of the energy required for heating and cooling

### **Geothermics**

This heating system uses the ground as a source of heat. The energy accumulated in the ground is extracted to heat a building and is renewed by the sun's rays. A geothermal system consists of pipes buried in the ground in which a liquid circulates, a geothermal heat pump used for heating in the cold season and cooling during the summer. The air is then distributed throughout the building with a forced-air system. Geothermics reduces heating costs while reducing greenhouse gas emissions.

### **Energy accumulator**

ThermElect is a heating system for energy management in the commercial, institutional, and industrial sectors. A set of high-density ceramic bricks forms the heart of the ThermElect system. During off-peak hours or when power demand is low, electrical resistance elements heat the high-density bricks to the appropriate temperature, based on the outdoor temperature and the facility's heating requirements. During expensive peak periods, the electric elements shut off, but the unit continues to meet the building's heating requirements using the heat stored during off-peak periods. Overall, the accumulator therefore uses only off-peak, less expensive electrical energy. The ThermElect system can distribute and accumulate heat simultaneously, which covers heating needs at all times.

<http://www.eco-energie.ca/Innovation.html>

## **C. Energy efficiency programs**

Many energy efficiency programs are in effect across the country. We suggest you check the existing programs in your province and at the federal level. A preliminary diagnosis is generally required before undertaking any renovation work, modifications or any other changes in your institutions.

## D. Green energy

According to Natural Resources Canada, using natural, renewable energy obtained from the sun, wind, moving water, the Earth and biomass helps improve the sustainability of energy production as well as having benefits for the environment and human health. While being renewable for future generations, these forms of energy do not lead to any increase in the levels of carbon dioxide or other pollutants in the Earth's atmosphere. Several provinces offer the possibility of obtaining electricity from "green energy suppliers" that use the existing electricity distribution network. By going with this option, you may pay a supplement on your electricity bill, but you will contribute to the development of more sustainable choices by showing decision-makers that there is a demand for renewable energy.

### Solar energy

The Canadian Wildlife Federation has solar panels on its buildings. It is possible to see the amount of energy produced by these panels, as well as the greenhouse gases that they have avoided producing, online, in real time:

<http://view2.fatspaniel.net/PV2Web/merge?view=PV/simple/HostedEndUser&eid=65425>

## 5. Site accessibility

Making a museum accessible to everyone is not always obvious: there are many disabilities that your institutions should take into account (visual, motor, auditory, etc.). In Quebec, the Keroul organization (<http://www.keroul.qc.ca/en/>) provides tools to help you achieve this. Here is the link to the Quebec declaration regarding tourism accessibility for anyone with a disability (French only):

<http://www.keroul.qc.ca/library/pdf/Declaration-1.pdf>

## 6. Examples

Parks Canada posts information about the actions they have put in place. Here are a few examples:

- The operations centre of the Gulf Islands National Park Reserve is the first building in Canada to be certified LEED Platinum.
- Parks Canada went green with its automobile fleet:
  - An electric utility vehicle is now available to employees at the Canal-Lachine National Historic Site
  - An electric vehicle is available to employees at the Riding Mountain National Park
  - The biodiesel project provides a blend made up of 20% biodiesel and 80% petrodiesel to the Riding Mountain National Park. The biodiesel produced in this project is used for operating the fleet's vehicles and lawnmowers
  - Parks Canada's Arctic Field Unit use hybrid vehicles
- The Bruce Peninsula National Park visitor centre uses alternative power:
  - A solar battery and passive solar water heating system have been installed on the roof
  - A heat pump with air exchanger has been installed
  - A hydraulic micro-turbine – a discrete initiative with a considerable impact
- Canada's national historic sites are committed to greening the buildings for the public and operations.
  - At Fort Battleford National Historic Site a geothermally heated floor was installed, and a geothermal system will heats and cools the building, the walls of which are really well insulated
- A project for improved energy efficiency:
  - A solar energy patio produces 5% of the energy needed for operating the visitor centre at Lower Fort Garry National Historic Site
- A set of initiatives have resulted in a greenhouse gas emissions reduction of 66 tonnes per year!
- Vertical fluorescent tubes allow daylight into a room.

### Example: The Biosphère's water treatment system

The wastewater discharged by Biosphère visitors is collected in a well and then pumped into a 45 m<sup>3</sup> septic tank. This tank does a pre-treatment through solids decantation and the removal of light materials that float to the surface. The water then flows into a pumping station.

The water is then sent to the station's first unit: a 400 m<sup>2</sup> ecosystem (Reed Bed Treatment System). It consists of two tanks that can be operated in parallel or serially. The station's first unit is supplied with wastewater by pressure through a perforated pipeline. A second pipe, installed on the other side of the tank, is for collecting the wastewater and sending it to the second treatment unit. The treatment continues via a surface runoff system having an area of 300 m<sup>2</sup>, the first third of which consists of marsh bulrush, and the remaining 2/3 consists of reed mace. The last ecosystem, also surface runoff, has an area of 100 m<sup>2</sup>. It consists of water mint (disinfecting ability) for the first 50 m<sup>2</sup> and yellow Iris for the remaining 50 m<sup>2</sup>. The water ecosystems were chosen because they enable the development of a microfibre and microfauna that are involved in the various treatment processes.

## Example: Lumec: Eco-design as a source of innovation

This is a summary of an article that appeared on the NOVAE site. The full article is available at (French only): [http://www.novae.ca/pme\\_avril09.aspx](http://www.novae.ca/pme_avril09.aspx)

Lumec (<http://www.lumec.com/>) is a Quebec-based Boisbriand company that has been specializing in outdoor light fixtures for over 30 years. Although Lumec has been taking certain environmental concerns into account since the late 1980s, it truly incorporated sustainable development into its business strategy three years ago, focused on two key elements: mobilization of its employees and eco-design.

In the 1980s the International Dark Sky Association ([www.darksky.org](http://www.darksky.org)) put pressure on industry, denouncing the light pollution it generates. Instead of fighting against this movement, the company instead sought to learn from it: they created lights that reduce the amount of light directed towards the sky—a niche that it has since made its specialty. But it was in 2006 that Lumec got involved more strategically with sustainable development.

Lumec employee Johnathan Hardy, a project manager in the new products department, attended a conference where he was very inspired by a presentation by Steelcase, a manufacturer of office furniture known for its environmentally conscious design. In 2007 Hardy prepared Lumec's first internal sustainable development report which profiled the initiatives already in place within the company; he complemented the report with an action plan identifying what could be accomplished in the short, medium and long terms. He notes: "That action plan was even used to set the company's general objectives: sustainable development was henceforth incorporated into our strategy."

Lumec then undertook two huge projects: one to reduce greenhouse gas emissions, and the other to improve its performance in terms of waste recovery. The company set an objective to recover over 80% of its recyclable waste and to reduce its GHG emissions by 20% over the previous year.

Today, Lumec has a corporate image of caring about the environment and strong concerted effort by its employees, who are proud to be involved in this ecologically sensitive development. The company also has many other projects on the table: preparing a complete profile of its CO<sub>2</sub> emissions, obtaining ISO 14000 certification for its factory, emphasizing its community engagement, particularly its support for the next generation, further educating its clients about sustainable development issues, and so on.

### Example: Oak Hammock Marsh Interpretive Centre

The mission of this Manitoba centre is to publicize and support wetlands and their ecosystems. The interpretation centre was established in cooperation with Ducks Unlimited Canada and the province of Manitoba. Sustainable development principles are incorporated into the project for construction, operations, as well as products and services. The programs offered are designed to result in a minimal impact on the environment, to meet the company's needs and be cost-effective. They have been able to implement measures to aim towards energy efficiency, reduce their greenhouse gas emissions, preserve water quality, reduce waste, etc. Also, the architecture of the buildings takes the surroundings into account in order to integrate with it and not impose itself on it.

<http://www.oakhammockmarsh.ca/about-us/index.html>

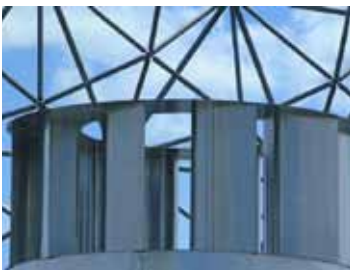


Photo: Environment Canada's Biosphère.

### Example: The Biosphère's wind turbines

In order to increase public awareness of renewable energy sources, the Biosphère has acquired two wind turbines. Wind turbines, or aerogenerators, convert the wind's kinetic energy into electricity. They do not produce any pollution and produce a form of energy that is infinitely sustainable. Installed on the highest platform of the building, inside the geodesic structure, the Biosphère's two wind turbines are each of a different type.

The first, a domestic type with three blades, has a horizontal axis and has an average power output of 1.8 kilowatts (kW), based on an annual average wind speed of 20 km/hour. It produces approximately 4,800 kWh (kilowatt-hours) per year, or 13 kWh per day. This energy production represents approximately one quarter of the electricity consumption, including heat, for three to five people living in a single-family house. The second, a commercial-type turbine, has a vertical axis and has an output of 5 kW. This 5 m diameter vertical-axis wind turbine is noiseless and is safer for birds because it turns very slowly.

### Sustainable buildings located in Ottawa

Rideau Valley Conservation Authority

[http://www.rvca.ca/new\\_building/conservation\\_centre.html](http://www.rvca.ca/new_building/conservation_centre.html)

Mountain Equipment Co-op

[http://www.mec.ca/Main/content\\_text.jsp?FOLDER%3C%3Efolder\\_id=2534374302881714&bmUID=1245429658820](http://www.mec.ca/Main/content_text.jsp?FOLDER%3C%3Efolder_id=2534374302881714&bmUID=1245429658820)

## 7. References and tools

- International Association of Museum Facility Administrators  
<http://www.iamfa.org/>
- APCHQ's ecological renovation options guide  
<http://www.gomaison.com/gomaison/promotion/optionsecolos/>
- Canada Green Building Council's Sustainable Building Information System  
<http://www.sbis.info/index.jsp>
- Greener Buildings  
<http://www.greenerbuildings.com/>
- PBS television  
<http://www.pbs.org/greenbuilders/>
- BOMA certification  
<http://boma-quebec.org/index-e.shtml>
- Environment Canada information on VOCs  
<http://www.ec.gc.ca/cleanair-airpur/default.asp?lang=En&n=15B9B65A-1>  
<http://www.ec.gc.ca/nopp/voc/EN/bkg.cfm?>
- Evergreen's directory of native plants by region  
<http://www.evergreen.ca/nativeplants/>
- Manitoba's Eco-Network Organic Lawn Care Project  
[http://www.mbeconetwork.org/projects\\_lawncare.php](http://www.mbeconetwork.org/projects_lawncare.php)
- City of Toronto Reducing Pesticides  
[http://www.toronto.ca/health/pesticides/pdf/pesticide\\_calendar.pdf](http://www.toronto.ca/health/pesticides/pdf/pesticide_calendar.pdf)
- Flick Off  
<http://www.flickoff.org/>
- EnerGuide (Natural Resources Canada)  
<http://oee.nrcan.gc.ca/english/index.cfm?attr=0>  
<http://www.oee.nrcan.gc.ca/industrial/training-awareness/index.cfm?attr=24>
- Toronto Hydro Electric System Ltd:  
<http://www.torontohydro.com/electricsystem/business/index.html>
- Natural Resources Canada  
<http://www.nrcan-rncan.gc.ca/com/index-eng.php>
- Saskenergy  
<http://www.saskenergy.com/>
- Ontario Ministry of Energy  
<http://www.energy.gov.on.ca/index.cfm?fuseaction=english.main>
- Greenpeace Canada  
<http://www.greenpeace.org/canada/en/>
- Port-au-saumon Ecology Centre (French only)  
[http://www.cepas.qc.ca/autre/ecoguide\\_complet\\_web.pdf](http://www.cepas.qc.ca/autre/ecoguide_complet_web.pdf)
- NBS UK: Construction info  
<http://www.thenbs.com/resources/readingLists/SustainableDevelopment/index.asp>
- Energy consumption  
<http://www.squidoo.com/save-energy-save-environment>

- Environmental assessment and specifications of green building material  
<http://www.ciwmb.ca.gov/GREENBUILDING/Materials/CSIArticle.pdf>
- Ecoconstruction  
<http://www.ecoconstruction.org/>  
<http://www.biobatir.ca/> (French only)  
<http://portailenvironnement.ca/?p=260> (French only)
- California Integrated Waste Management Board  
<http://www.ciwmb.ca.gov/GREENBUILDING/Materials/#Resource>
- Canadian Centre for Architecture  
<http://www.cca.qc.ca/pages/Niveau3.asp?page=environnement&lang=eng>  
<http://www.cca.qc.ca/pages/Niveau3.asp?page=bennyfarm&lang=eng>  
<http://www.cca.qc.ca/pages/Niveau3.asp?page=oberlander&lang=eng>
- The Green Globes system is a sustainable management and design tool (certification program)  
<http://www.greenglobes.com/>  
<http://www.greenglobes.com/design/about.asp>
- Commission de la construction du Québec  
[http://www.ccq.org/Accueil.aspx?sc\\_lang=en&profil=GrandPublic](http://www.ccq.org/Accueil.aspx?sc_lang=en&profil=GrandPublic)
- The Green Building Operation and Maintenance Manual  
[http://www.dgs.state.pa.us/dgs/lib/dgs/green\\_bldg/greenbuildingbook.pdf](http://www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf)
- Athena Institute's life cycle analysis tool  
<http://www.athenasmi.org/about/>
- Environmentally Responsible Construction and Renovation Handbook  
[http://www.solutions.ca/knowledge\\_Bank/Documents/Detailed\\_Handbook\\_-\\_E.PDF](http://www.solutions.ca/knowledge_Bank/Documents/Detailed_Handbook_-_E.PDF)