

Sustainable Historic Places



A Background Paper for the Historic Places Branch, Parks Canada

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1. INTRODUCTION

This paper was written by Susan Ross and Andrew Powter, both conservation architects with Heritage Conservation Directorate (HCD), Professional and Technical Programs, Public Works and Government Services Canada (PWGSC),¹ as part of a service agreement with the Historic Places Program Branch, now the Historic Places Branch (HPB), Parks Canada, to provide a background paper regarding the integration of environmental and cultural sustainability and particularly, integration of sustainable development and the conservation of historic places.

Originally written in 2004-2005, the paper has been updated by HPB and HCD, in January 2008, in particular with respect to background events (described in section 1.3) and web-based references provided in the endnotes and bibliography.

1.1 Objectives

This discussion paper was intended to provide an overview of recent developments of the application of sustainable development principles to built heritage, recognizing current federal and international trends. Working from core principals of sustainability, it considered the opportunities and problems of applying these principles to buildings and in particular to historic places. Specific consideration was given to assessment systems that had recently been developed to measure the environmental performance part of sustainability of buildings. The implications for historic places were considered.

This paper contributed, and still contributes, to the HPB's ongoing work to foster broad engagement in heritage conservation through the Historic Places Initiative by identifying opportunities for the further development of appropriate sustainable building practices for historic places. It also allows to identify avenues that HPB could follow to achieve its goals, for example, by influencing existing programs related to sustainable development in order that they take into account the objectives of HPB and include in their process consideration of the *Standards and Guidelines for the Conservation of Historic Places in Canada* during any intervention that could affect historic places.

1.2 Definitions

For definitions of “historic place,” “heritage value” and “character-defining elements,” terms used throughout this document, refer to *the Standards and Guidelines for the Conservation of Historic Places in Canada*.

Sustainable Development: A broad definition now used by general consensus derives from the Bruntland Report, *Our Common Future*, in 1987. It defines sustainable development as that which

“meets the needs of the present without compromising the ability of future generations to meet their own needs...”²

If, initially, the concern was mainly with limiting the impact on the environment, natural resources and related economic activity, Agenda 21 at the Rio Earth Summit expanded the definition to encompass social, cultural and community development factors, including “intangible heritage.” Achieving sustainability involves a large range of human activity. It is a global cultural problem of which building is but one part.

Sustainable building, including green building/design: Sustainable buildings avoid or minimize negative impacts on the environment through the conservation and efficient use of resources, and respect for biodiversity and ecological harmony. They also recognize the role construction and buildings play in fostering regional and local culture and traditions, and community life. Sustainable buildings require balancing economic, social, cultural and financial demands with the need to responsibly manage our environment so that their carrying capacity does not exceeded by human activities. “Green building,” another term that is also used, tended originally to be more directly focused on the natural environment, including consideration of: site impact, water and energy consumption, green house gas production, indoor air quality and waste management.

Expanding definitions of sustainability and of heritage: As described above, sustainability is now generally understood to depend on more than just environmental and economic objectives. This shift can be traced over the course of a number of world meetings.³ In addition to addressing environmental challenges and generating economic empowerment, sustainable projects are expected to enhance social capital and build institutional capacity. The environment, the economy, society and institutions are commonly referred to as the four pillars of sustainability. It is increasingly recognised that sustainability depends upon adopting a holistic or integrated approach to achieving any particular goal.

The concept of heritage has also expanded considerably in the last decades. Heritage has evolved beyond monuments, architectural masterpieces, or historic artefacts, to also include landscapes, industrial and engineering works, vernacular constructions, urban and rural settlements and intangible elements like temporary art forms and skills. This expansion reflects an increasing interest in heritage across society, and the recognition that what has value will continue to evolve with changing social ideals and increased respect for alternate perspectives. This broader view of heritage is reflected in the *Standards and Guidelines for the Conservation of Historic Places in Canada*.

These common trends of expansion and interest in holistic or integrated processes are helping to bridge between heritage conservation and sustainable development.

Cultural Sustainability: Cultural sustainability, also referred to as socio-cultural sustainability, is often treated as a sub-category of social sustainability, but it is also related to each of the other pillars. The objective of cultural sustainability is the protection of the diversity of both living and traditional cultures. It is one of the areas of sustainability that most directly relates to heritage conservation. The means of achieving cultural sustainability, through education, training, research, documentation, institution and public activity development, and informed and integrated decision-making processes, are all means familiar to heritage conservation.

The definition of cultural sustainability continues to evolve. Some definitions do not refer explicitly to the preservation of built heritage. There is an opportunity for advocates of heritage conservation to encourage its inclusion in the definitions being promoted by others.⁴ HCD's preliminary work in this area suggests that socio-cultural sustainability be evaluated in terms of community participation and user satisfaction, public access and amenities, integrated conservation (urban, rural, natural), education, skills and employment opportunities, and conservation of heritage value, knowledge, skills and materials.

The objectives of the larger category of social sustainability of which cultural sustainability is a part begin with such basic elements as human rights, and include important economic objectives, which may be measured in terms of factors like employment and access to affordable housing. These areas also offer important areas for the integration of the objectives of heritage conservation, whose economic benefits can play a critical social role. The potential importance of heritage conservation for economic sustainability is further developed in this paper.

1.3 Context

This section provides an overview of the federal commitment to sustainability that provides the policy context for this paper, and presents a number of related national and international initiatives as surveyed up to February 2005. Since then, the number of related initiatives and projects in Canada, the USA and elsewhere, has grown exponentially. A brief overview of these additional activities is provided in Appendix A. Related new references are located in Appendix B.

Canadian/Federal commitment to sustainability: Through policy and the adoption of international protocols, the Canadian government has already made explicit commitments to sustainability. Some key elements include:

- On December 16, 2002, the Government of Canada ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The protocol entered into force on February 16, 2005.
- In June 1995, with the publication of the guidance document *A Guide to Green Government*, federal departments were directed to take actions to "green" their operations, policies and programs.
- Created in June 1992, the *Canadian Environmental Assessment Act*, included provisions for the protection of physical and cultural heritage.⁵
- Individual federal departments, including PWGSC, Environment Canada, Parks Canada and Canadian Heritage, have all developed sustainable development strategies (SDS). A number of interdepartmental committees exist to provide horizontal integration in this area.⁶
- Canadian Heritage's initial role in developing strategies for socio-cultural sustainability included research and workshops.⁷ The Canadian Heritage SDS 2004-2006 referred to a Working Group on Social & Cultural Sustainability aiming to explore social and cultural dimensions of sustainable development.⁸

- As provider of Real Property Services to all departments, PWGSC is developing tools to measure the environmental performance of federal properties, including an environmental building assessment system adapted to heritage buildings.⁹

Related federal funding has included Environment Canada's EcoAction Community Funding Program, which has provided, since 1995, financial support to community groups for projects that have measurable, positive impacts on the environment. EcoENERGY Retrofit grants were put into place to help homes; small and medium-sized businesses; public institutions and industrial facilities owners, to implement energy saving projects that reduce energy-related greenhouse gases and air pollution.¹⁰

Funding for sustainability related work on commercial properties has mainly been limited to projects intended to lead to energy or water savings. Newer funding in this area includes the Energy Innovators Initiative (EII), launched by Natural Resources Canada's Office for Energy Efficiency (NRCan / OEE), which provides funding to commercial businesses and public institutions for Retrofit Planning Activities or Retrofit Implementation Projects, as well as useful calculation tools to estimate energy consumption and potential energy savings. This model recognizes that both planning and projects are critical but separate phases of accomplishment.¹¹

Related federal research initiatives include:

- National Research Council Canada (NRC-IRC) funding for research and development in construction including renovation, energy efficiency and other elements of sustainability
- Canada Mortgage and Housing Corporation (CMHC) funding for housing research and development including renovation and energy efficiency. This research /case studies on energy-retrofits or green-designed housing projects involving heritage properties.

These programs include new construction and renovation (according to one report, an increasing amount of research funded in relation to construction deals with renovation) but although this might include a historic property, heritage issues are not necessarily explicitly addressed.

Related national initiatives: Across Canada, the Heritage Canada Foundation has encouraged the development of the discussion through a research paper "Exploring the Connection Between Built and Natural Heritage," as well as its conference on Heritage Conservation and Sustainable Development (Regina, September 15-17, 2005) and an online advocacy campaign. The annual conference of the Association for Preservation Technology International (APTI), held in September 2005 in Halifax, also included a symposium on sustainable heritage conservation.

Related international initiatives: There are a number of important international contexts for the development of new ideas of sustainability, and green building design.

In Europe, the integration of heritage conservation and other social, economic and environmental has been addressed for some time at the level of cities, settlements and landscapes.

- The Declaration of Amsterdam from the European Architectural Heritage Year of 1975 was one of the first documents to promote the idea of integrated conservation, identifying key links of heritage conservation to social and economic sustainability.¹²
- The Aalborg Charter- European Cities and Towns towards Sustainability from 1994 is a critical further reference.¹³
- In 1995, the National Trust (U.K.) devised a Statement of Environmental Principles, and fostered the development of a number of research and policy papers on environmental issues in relation to cultural heritage.
- S.U.I.T., the “Sustainable development of Urban historical areas through an active Integration within Towns” was a European research project that fostered a number of significant workshops and papers on this theme.¹⁴

Many countries have national initiatives, such as the US Green Building Council, or its Canadian counterpart.¹⁵ A major player in 2005 was the International Initiative for a Sustainable Built Environment (iiSBE), a non-profit organization headquartered in Ottawa. The iiSBE managed:

- the Green Building Challenge, “an international collaborative effort to develop a building environmental assessment tool that exposes and addresses controversial aspects of building performance and from which the participating countries can selectively draw ideas to either incorporate into or modify their own tools.”¹⁶
- the development of GB Tools, an assessment tool adaptable to local contexts and needs, and therefore potentially affected by socio-cultural factors such as heritage.

The discussion of the integration of sustainability and heritage conservation objectives is spreading in a number of contexts:

- The APTI created a Technical Committee Sustainable Preservation and developed one session devoted to sustainability for the APTI’s 2004 conference in Galveston Texas.
- English Heritage produced a series of reports, including *The Historic Environment: A Force for Our Future* (2001) and *Sustaining the Historic Environment* (1997) to help the English government develop a heritage policy that integrates heritage conservation within larger social, economic and environmental goals.
- In 2004, New South Wales (Australia) heritage office released a discussion paper on heritage and sustainability for public comment.¹⁷
- In the USA “Smart Growth”, a concept of community planning related to sustainable development, is being discussed in relation to managing cultural resources.¹⁸

The University College London (Bartlett) Centre for Sustainable Heritage offers a graduate studies program related to this area.¹⁹

2. SUSTAINABLE HISTORIC PLACES

In this section of the paper, the basic strategies of sustainable design are introduced and related to those of heritage conservation, in order to identify potential areas of convergence or conflict. The adaptive reuse of historic places that respect their heritage values and character-defining elements while reflecting sustainable building practices contribute to sustainable development. The issues covered tend to relate more to historic buildings rather than the full range of historic places (archaeological sites, landscapes, districts).

2.1 Elements of integration

Elements of sustainable/green design: Green design refers to design strategies now being adopted as part of project planning, which can generally be related to environmental and some related economic goals of sustainable development. Most of those strategies that are now in current use can be described in terms of technical improvements and can be related to energy, water or other resource (sites, materials, finances) savings, as well as to waste and pollution reduction. In addition, a number of strategies address questions of human health and well being, particularly with regards to the interior environment.

Resource-saving strategies include:

- Reuse of existing buildings, reuse of already serviced and /or developed sites, including intensifying density through subdivisions and additions;
- Optimized use of locally available renewable or salvaged materials;
- Optimized use of high durability materials with low embodied energy, and no toxic or health-damaging “gassing off”;
- Incorporation of waste recycling facilities, both exterior and interior, including kitchen related wastes and composting.

Energy-saving strategies include:

- Building envelope design (including added insulation, thermal glazing, air-sealing, green roofs);
- Energy saving and pollution reducing heating, ventilation and air conditioning (HVAC) equipment design (by integrating natural ventilation, etc.);
- Use of renewable energy sources like solar and wind power.

Water-saving strategies include:

- Water conservation design through low-consumption equipment, gray water reuse systems, soft/ native landscaping and green roofs.

Site-related strategies include:

- Climate adapted site development and building form, including the use of vegetation for wind and sun control;
- Landscaping that avoids the need for watering, pesticides, and mowing or similar energy-consuming and polluting equipment;

- Proximity to public transport network and provision of cycling-related facilities

Strategies related to the interior environment include:

- High quality interior atmosphere including access to daylight and fresh air;
- Flexibility of building design for future reuse potential.

Most of the above strategies are applied in new projects, but as will be suggested below, some of them reflect a renewed understanding of old ideas still found in many historic buildings. On the other hand, others have a potential impact on heritage character.

Some examples of negative impact include:

- The removal of historic windows, either to block openings, or to replace with inappropriate replacement windows as part of energy-saving strategies;²⁰
- The alteration of the thermal performance or humidity levels of walls to the detriment of the historic materials;
- The use of new materials that are incompatible with the historic fabric;
- The subdivision of character-defining spaces, including addition of dropped ceilings;
- The loss of opportunities to re-use traditional systems that would otherwise remain viable.

Sustainable Characteristics of Heritage Conservation: Intuitively, it appears that protection and continuing use of historic buildings has a lot in common with environmental sustainability. Not only is historic preservation preoccupied with protecting cultural objects which are in limited supply that once gone, are gone forever, but it also contributes directly to sustainable development and sustainable communities.

“The first guideline for sustainability is - use what already exists. When you start from scratch you can achieve environmental efficiency but it’s more sustainable to adapt existing buildings and how we live in them.”²¹

In as much as heritage conservation promotes the reuse of existing resources, the preservation of embodied energy, and the life-cycle analysis approach to economic decisions, one might say that heritage conservation is inherently sustainable. Some of the basic principles of heritage conservation, as enunciated and explained in the *Standards and Guidelines for the Conservation of Historic Places in Canada*, such as adopting a minimum intervention approach, and promoting a culture of repair rather than replacement, are also eminently sustainable.

Environmental benefits of renovation versus new construction include:

- Conserved resources, including building materials and their production;
- Reduced environmental impact (impact happened but in the past);
- Energy invested in existing buildings by conserving embodied energy;
- Energy efficiency through existing features such as masonry walls, smaller windows;
- Reduced volume of waste in landfills and energy required by demolition;
- Reduced suburban sprawl while helping rejuvenate old neighbourhoods;
- Changes in attitudes by example, encouraging recycling on a large scale;
- Use, in some cities, of an abundant supply of underused or emptied buildings;
- Use of existing buildings as a resource base for building materials.²²

Beyond the environmental part of sustainability to the objective of social, and institutional sustainability, heritage conservation can contribute to maintaining or improving local industries, materials and skills. It promotes the preservation of local, community-defined values. Some of the broader socio-economic benefits of heritage preservation are those associated with the concept of “smart growth” and include that heritage preservation:

- promotes the use of existing public infrastructure and transportation;
- may generate higher tax revenues for municipalities from already developed sites;
- can encourage a reduction in automobile use;
- provides models of successful mixed use development;
- is a form of economic development;
- helps encourage the revitalization of abandoned urban districts;
- provides lower cost rental space for smaller businesses and housing;
- encourages diversified uses and rental levels and types;
- is more labour intensive and therefore more job-creating than new construction;
- provides models for planning in new areas;
- is frequently densely developed.²³

Beyond the preservation of buildings, heritage conservation contributes to the preservation of communities, landscapes and natural heritage. The concept of *cultural landscapes* has contributed to our understanding of the interdependence of human settlement and nature throughout history.²⁴ Study of how the management of Cultural Landscapes has balanced related environmental goals with conservation would be helpful but has not been included in this paper.

Sustainable Characteristics of Heritage Buildings and Sites: While it is difficult to generalize about the sustainable characteristics of heritage buildings and sites, characteristics can often be identified when considered in terms of modern green design strategies. For example, some building types, such as former warehouses or large residences, have proven to be relatively easy to adapt to new uses.

Many heritage buildings already incorporate “green ideas” in their original design or construction. Looking at the specific strategies listed in the previous section some of the other potential areas of harmonization, i.e. characteristics of heritage buildings that could be considered sustainable, include:

- The use of durable materials that age well by developing patina;
- The use of local traditional materials and skills;
- Energy saving features like massive masonry walls, smaller recessed windows, storm windows, awnings and shutters;
- The use of natural ventilation (operable windows or ventilation grilles) and daylight;
- The use of vestibules, porches and other buffer spaces;
- Development in dense urban forms, often easily accessible by public transportation or with little provision of parking.

Environmental Performance of Heritage Buildings: Despite some of the potential characteristics noted above, it is difficult to generalize about the environmental performance of heritage buildings, which vary greatly in site, size, materials, systems and condition of repair. A common focus of projects on heritage buildings is improvement of operating energy performance. This is commonly extrapolated to thermal performance. Buildings constructed in the period 1940s to 1970s are considered to be the poorest performers from an energy point of view.²⁵ The most effective energy performance improvements often relate to heat source efficiency, delivery, controls and air barrier performance. With the exception of openings like windows and air barrier performance the thermal performance of historic envelopes is not usually a major concern.

In order to be able to better discuss this, environmental building rating systems adapted to heritage buildings are required. This is the subject of section 3 below, and is an area requiring further research.

The Economic Costs and Benefits of Heritage Conservation: While the development and the implementation of both sustainability and heritage preservation related strategies may introduce costs at the earlier stages of planning of projects, in their promotion of the efficient and non-wasteful use of resources, the life-cycle costing/ analysis of buildings and projects, and other longer-term analysis of benefits or costs, they may also contribute to longer-term savings.

Cost saving associated with the reuse of existing buildings vary depending on the condition of the building and amount of adaptation required by the new use. Approaches promoting minimum intervention and repair instead of replacement are generally more cost effective.

Some of the potential economic benefits of renovation versus new construction include:

- Savings on demolition costs, including related safety concerns
- Savings on land costs, including initial development of infrastructure
- Reduction in construction time, and greater seasonal flexibility for projects involving less excavation and un-sheltered exterior work
- Advantages of staged construction, such as ongoing use of part of a facility, decreasing lags between construction and occupancy
- Greater market value of buildings with unique character and features
- Greater market value of locations with character and established services.²⁶

It has been argued that heritage conservation can be related to economic development through job creation and heritage tourism, to neighbourhood stabilization and downtown revitalization.²⁷ While heritage conservation often leads to improved property value, older properties are usually still more affordable than new construction, ensuring for example, that more affordable housing or commercial rental space is available.

2.2 Key elements for further integration

This section will provide basic information about concepts and strategies that have important potential for the integration of heritage conservation and sustainable design and development, including the integrated design process, life-cycle assessment, operating and embodied energy, durability of building materials and assemblies, construction and demolition waste management, and the mitigation of hazardous materials.

Integrated design process: The integrated design process is a collaborative process that involves all the interested disciplines as early in the process as possible, in order to ensure that all goals and objectives of a building project are clearly defined and considered. In sustainable design this means for instance, including the environmental consultants from an early stage.²⁸

The value of early consideration and discussion of heritage in project planning is already well understood in heritage conservation. In particular in cases that may later involve approvals by authorities that can lead to delays or major changes, earlier integration can help avoid wasting human energy and time. Adaptation of the IDP to a project involving a historic place should be fairly straightforward, meaning involvement of heritage goals, information, and expertise from the beginning.

Life-cycle assessment: Life-cycle assessment (LCA) is a methodology for assessing the environmental performance of a building over its full life cycle, also called a “cradle-to-grave” analysis. It expands the analysis of benefits or issues from the short-term to the longer term, and considers the impact at every stage, from the extraction of raw materials, to manufacturing, transportation, assembly and construction, use, maintenance and disassembly and reuse or disposal, with respect to energy used, greenhouse gases emitted, water polluted, etc. It is based on actual material and assembly life cycles, actual maintenance and recap investment cycles.²⁹

LCA is critical to informed sustainability decision making, particularly with regard to heritage buildings, however it is an enormously challenging topic, which has not yet been resolved, and is directly related to the need for more data and research in areas like embodied energy and other effects and durability. The Athena Institute is devoted to research in this area. Their work should be studied to see if it includes studies of historic places, and to evaluate how well the assessment tools they are developing are adapted to historic buildings.

Operating energy: Operating energy is the energy consumed by heating, cooling, ventilation, lighting, equipment and appliances. It is a key performance issue for sustainability because of the direct connection to consumption of non-renewable resources and greenhouse gas emissions. Operating energy modelling (computer) enables straightforward comparisons between various building technologies.³⁰

Because potential savings in operations energy are the justification of a great number of major building envelope and system retrofits, understanding this area is critical for heritage conservation. Typical projects include the improvement of thermal properties

through added insulation and vapour barriers or the installation of double glazed windows, which may have a negative impact on heritage value.

Embodied energy: Although operating energy is very critical, essential for life-cycle assessment is the concept of embodied energy. There are two main forms of embodied energy to consider:

Initial embodied energy - the energy consumed in the extraction, processing, transportation, manufacture and assembly of materials into buildings and

Recurring embodied energy – the energy consumed to maintain, repair, or replace during the service life of the material, assembly or building.

Due to recurring energy, the energy investment in a building increases over time while the initial energy remains the same. As buildings become more energy efficient the ratio of embodied energy to lifetime consumption (including operating energy) increases.³¹

When a building is demolished the benefits of the embodied energy are lost and energy is consumed in the demolition process. While a replacement building might lead to lower operational consumption, a total energy consumption calculation would include a calculation of the embodied energy lost in the “cradle to grave” process.

As the age of a building increases the recurring energy increases and come to triple the initial energy depending on the service lives and maintenance investment of durability of materials, components and assemblies. The durable materials of well-built historic buildings may mean lower recurring energy, and should therefore not be replaced by initially cheaper but ultimately more costly alternatives.

Other embodied effects besides energy that need to be considered include the original effects on the environment, through depletion of natural resources, pollution or any of the other impacts measured today.

Calculation of embodied energy is complex as the component factors can vary for the same material in different places.³² Because embodied energy is difficult to calculate it tends to be overshadowed by calculations of operating energy.

Durability of building materials and assemblies: The concept of durability in the context of a building refers essentially to the ability of a building and any of its parts, components and materials to perform their required function/ to resist the action of degrading agents over a period of time. Older building materials are often much more durable than those used today. Related concepts include service life and design life. The durability of the original building materials and assemblies has an important impact on the life-cycle assessment of the building. Two concepts to understand with respect to heritage conservation are differential durability and service quality:

The concept of differential durability addresses the fact that different materials or components of a building may have different service lives. The elements with the

shortest service life will usually define when interventions are required as a whole.

Service quality is a concept related to durability that goes beyond the purely functional performance of a product, component, assembly or construction to include attributes such as aesthetics. Two materials might have the same service life, but one of the two might age in a more acceptable way, for example by developing an acceptable patina.³³

Construction, renovation and demolition waste management: Construction, renovation and demolition (CRD) waste management is intended to reduce the amount of landfill by reduction, reuse and recycling activities. The federal government has developed a National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Strategy. Some of the case studies carried out include renovation to federal heritage buildings and demonstrate high levels of diversion from landfill through reuse and recycling.³⁴

One of the strategies to reduce the materials and waste associated with construction and demolition is the re-use of building elements and materials that are salvaged from buildings being demolished. This includes everything from doors and hardware, to bricks and tiles, to boards and beams, to fireplaces and bathtubs. From the heritage conservation perspective, there are some obvious dangers in the development of the salvaging industry. First, it can lead to a false or confusing sense of place. Second, it can lead to the encouragement of demolition.³⁵ Finally, it can lead to the loss of architectural fragments that might otherwise be valued for what they are in their own context. The *Standards and Guidelines for the Conservation of Historic Places in Canada* explicitly discourages the falsification of history and encourages the appropriate conservation of archaeological resources.

The solution to such issues should perhaps be developed in conjunction with the field of archaeological conservation, where consideration of standards for disposition of fragments probably first developed.

Mitigation of hazardous materials: Renovations to existing buildings often involve dealing with hazardous materials that are no longer used. The removal and disposal of these materials requires special planning and resources. In historic properties, the mitigation of the removal of building materials like lead paint and asbestos in plaster and insulation, now known to present dangers to human and animal health, is an ongoing challenge.

Although removal is generally recommended, the measures being developed in heritage buildings are designed to reduce the impact on the heritage value of the place and its character defining elements. It may for example, be better at times to consider encapsulation, as opposed to complete removal. Careful planning must determine the risks and consider available resources. Care must be taken not to endanger the potential users and also the construction workers. Accessible records must be kept recording the location of remaining materials.³⁶

3. SUSTAINABLE BUILDING ASSESSMENT SYSTEMS

This section provides an overview of sustainable building assessment systems, identifies their benefits and limitations, and highlights the particular problems of these systems when applied to historic places. Note that the systems being discussed are limited in their application to buildings and their sites.

Sustainable Building Assessment Systems: In recent years a number of tools have emerged to help include consideration of environmental impacts in design and construction decisions. These include construction and demolition waste calculators; diversion/landfill calculators; building assembly performance calculators; life-cycle optimization; energy performance modelers and overall environmental or sustainability rating systems for buildings. Systems like LEED, BREEAM, Green Globes, GB Tools are all examples of green building design assessment systems which have made it possible to measure the environmental performance of operating buildings and to guide designs for new ones toward higher standards of sustainability.³⁷

Owners, designers, builders and governments all over the world are using these rating tools to help define and set sustainability performance targets, measure progress toward meeting them and verification of post project performance. The best known of these rating tools is probably LEED™ (Leadership in Energy and Design) but there are others that are widely used. The Building Research Establishment in the UK developed BREEAM, and the international Green Building Challenge uses Green Building Tools developed in Canada and internationally. In Canada LEED and Green Globes are increasingly used.³⁸ There are others: some major institutions and associations (Canadian Wood Council, Sustainable Forests Council) have developed rating systems of their own to ensure their particular circumstances are considered.

Since this paper was written in 2005, the Canada Green Building Council (CaGBC) launched LEED Canada NC (New Construction) and CI (Commercial Interiors), and there are now about eighty (80) LEED certified building projects across Canada. In parallel, BOMA Canada has launched Go Green Plus, a version of the Green Globes rating system for existing building. The use of rating systems is now identified as a strategy in many departmental Sustainable Development Strategies.

These systems all provide a means of assessing a building's or project's impact on the environment, by rating its environmental performance across a broad range of environmental considerations such as environmental management policy, site usage, water, energy, green house gas emissions, materials and resources, indoor environmental quality (IEQ), workplace quality and other factors.

The merits and value of these rating systems is the subject of lively debate, however, there are several direct benefits of using them. They:

- Provide a common and verifiable set of criteria and targets that building owners can use to measure and demonstrate that they are reaching higher standards;

- Encourage the use of common language and measurement units;
- Help to institutionalize environmental awareness and build understanding of means of achieving sustainable development;
- Provide a means of making informed design decisions in which a consideration of potential environmental impact is an integral part of design;
- Contribute to stronger communication and teamwork integration; and
- Identify areas of required research and development.

Concerns about Sustainable Building Assessment Systems: These rating systems are not “expert systems” or “deciding” tools. They do not replace well-informed, creative, reasoned decision making by an integrated team of designers and a motivated owner. They are designed to guide designers toward problem areas, highlight issues and help with problem solving. The assessment required to obtain real and useful measures of sustainability is enormously complex. To make assessment available and useful, the systems currently in use remain quite simplistic and must be properly used in the process of producing sustainable designs. Some of the concerns about these systems include:

- Overall ratings (LEED certified, bronze, silver, BREEAM 3, 4 or 5 leaf, etc.) are assigned on the basis of points achieved. This may encourage “point chasing” rather than focusing on actual and overall environmental performance achieved.
- While the systems encourage integration, there can also be a tendency for the opposite to happen, if design team disciplines focus on achieving performance related to their concerns rather than the performance of the overall building system. The environmental disciplines may still be regarded as an “add-on” to the design team rather than an integral part of it.

More critical for the integration of heritage conservation concerns:

- Specific systems are usually designed for a selected segment of the industry (eg. new commercial construction over 10,000 M²).
- Specific systems are usually are not regionally specific, or adaptable to local issues. While GB Tools is designed to be adaptable to national or regional priorities or conditions, the more widely used LEED is not.
- The emphasis on quantifiable values provides a difficult field for the integration of the more qualitative issues associated with the heritage values and character-defining elements of historic places.

In this context, PWGSC is addressing these concerns by developing a version of one system to heritage buildings and projects. This system, based on the Green Globes rating system, is intended to provide an easy to use and cost-effective tool to guide property and project manager on management and projects on federal heritage buildings and sites. It does this by introducing new heritage and socio-cultural sustainability indicators (rated questions), by modifying existing types of indicators to take principles and practices of heritage conservation, like minimum intervention, and repair before replacement, into consideration.

Sustainable Building Assessment Systems and Historic Places: Other concerns arise when existing rating systems are applied to heritage property. A review of major assessment systems on operating heritage buildings and for projects on heritage buildings and a check with the broader heritage community indicates that these objectives are not as synchronized as one might think.³⁹

Generally, these tools contribute to environmental performance by measuring improvement in the environmental performance of buildings relative to current practice or standards, many of which were written for new buildings. Retroactive application of new building standards to historic buildings is usually challenging, requiring creative use of equivalencies and alternatives to meet performance goals.

Some initial observations:

- Heritage projects that would seem to be environmentally appropriate (reasonable energy standards, minimal waste) may not do well under these systems. Many LEED and Green Globes criteria have been found to be “not applicable” resulting in areas of “non-assessment”. Conversely, points are often awarded in project areas of minor significance.
- Some heritage projects that have received good environmental sustainability ratings have had an extensive impact on the heritage character of the building and its built environment (and would seem to have produced a lot of landfill in the process, see Example A in the appendix C).
- While the considerations within existing assessment systems go beyond site boundaries, they rarely consider the impact of building projects on the tangible and intangible aspects of communities.
- Most of the widely used systems include little of the more qualitative aspects of sustainability, social and cultural sustainability.
- Most systems address site location, awarding points for the redevelopment of “brownfields,” for sites located within more dense areas (usually urban) and for the redevelopment of an existing structure. However these criteria may be mutually exclusive and do not address the fact that the existing site may have archaeological potential or that the existing building may have heritage value or be situated within a historic district.
- Several important aspects of sustainability where we would expect heritage buildings to perform well, such as durability, embodied energy and life-cycle assessment, are not factored in.
- Materials and assemblies, durability characteristics and investment cycles that are patterned differently from the industry standards, are not easily accommodated.
- The existing sustainable characteristics of heritage buildings and their often-unique operating parameters are not considered.
- In order to achieve higher ratings, emphasis may be placed on doing more work than required, instead of encouraging the minimum intervention approach favoured in heritage conservation.
- Finally, none of the assessment systems now in use accommodate “cradle-to-grave” or “seed-to-soil” life-cycle assessment.

Adapting Sustainable Building Assessment Systems to Historic Places: There is recognition in the heritage conservation field of these weaknesses, and work is underway to fill the gaps by various groups, including PWGSC, in the work mentioned above. Considering these initial observations, one might ask whether exemptions from sustainable performance standards are a good strategy. Some jurisdictions have approached the sometimes inadequate environmental performance of heritage buildings by seeking exemptions while others have relied on planning approval processes or less rigorous application of standards to deal with intrusive retrofit proposals.

Allowing some heritage buildings to fall short of some standards of performance is perhaps acceptable, but this approach could be risky if broadly applied. Exceptional treatment might not be required if we are applying suitable measures of performance, and approaching performance problems in an integrated way. Heritage buildings and the projects affecting them should be as environmentally sustainable as they can possibly be while retaining their cultural significance.

In order to deal with some of the concerns identified above, it is suggested that these rating systems should be:

- Comprehensive, that is, able to accommodate key heritage, social, cultural and administrative sustainability indicators and integrate them with resource depletion and environmental degradation indicators.
- Based on a concept of integrated design that includes heritage conservation as well as environmental performance, assessing environment and culture together, by creating new categories which include for heritage sensitive project management, developing and assessing against heritage specific criteria, and establishing prerequisites.
- Appropriately weighted, placing emphasis on areas that are truly critical, and recognizing such factors as embodied energy and life-cycle assessment
- Based on life-cycle assessment, as much as is currently feasible, for example, by considering the essential elements with respect to actual maintenance and recap investment cycles in place of industry standards. To be realistic, LCA should consider the nil investment in previous years when considering the feasibility of investment and future maintenance, i.e. taking into account the pre-condition of buildings including effects of deferred maintenance.
- Based on an understanding of historic or existing green aspects of heritage buildings.
- Emphasizing location - favouring urban, serviced, brownfield sites.
- Favouring in-situ reuse vs. recycling - stronger consideration of material retention in situ as opposed to demolition, reuse, recycling and waste. The demolition of heritage buildings that preceded the design of a new green project on an “empty” site should also be taken into account.
- Respectful of archaeological resources. Example C in appendix C illustrates how one rating system was adapted to incorporate archaeological assessment of an existing site, and consideration of the potential for archaeological resources as part of a brownfield rehabilitation.
- Respect for tangible and intangible aspects of community fabric, society and economy.
- Coordinated with other jurisdictions, including other related assessments.

- Accessible, involving occupants and management awareness and management commitment to sustainable operations.

Some of the adaptations required to integrate heritage conservation objectives may in fact be of value to the improvement of these rating systems as a whole.

Information, research, data and tools required for effective rating systems: These rating systems could be more effective if they integrated information in a number of areas of specific interest to heritage buildings, including:

- Tools with appropriate data to support assessment of performance of traditional materials and assemblies;
- Regionally based data on embodied energy in traditional materials in situ;
- Regional data on durability of materials and assemblies;
- Data on energy performance of building inventories;
- Information on environmental impacts of conservation materials and procedures;
- Better tools for life-cycle assessment;
- Tools for consideration of cyclical maintenance requirements; how to factor in deferred maintenance, for how long;
- Application of state of the art modeling tools to heritage buildings.

Sustainable design for historic buildings and places

“The environmental agenda will require architects and other design professionals to develop new skills, knowledge, and attitudes to support renovation work and to learn to be more curators of the built environment rather than creators...”⁴⁰

Since sustainability promotes the reuse of existing buildings in general, “green renovation” will be a critical strategy in general for sustainable development. The adaptation of green strategies to historic buildings and places will require specific additional integration of the related goals of sustainability and preservation, and the resolution of areas of conflict.

There are a number of projects involving heritage buildings that have been assessed using the LEED system, in particular in the USA. See Appendix A for a list of examples. The strategies adopted so far should be analysed, to see if there are any general conclusions. Are there model examples of buildings and projects that are sustainable and preserve the heritage value and character-defining elements of historic places?

As suggested earlier, understanding the environmental performance of heritage buildings is a critical part of this process. This is one of the areas requiring further work.

4. CONCLUSION

This paper provides a very broad introduction to the potential integration of sustainability and heritage conservation. In particular, it provides an overview of the Canadian and international contexts, and a critical look at the strategies of sustainable building design and the sustainable building assessment systems that are increasingly used to assess existing buildings and projects that involve historic places. Many areas requiring further investigation and some of the more pertinent stakeholders have been identified. The following is a brief summary of some of the more critical points and the suggestion of some key opportunities to engage in shaping this evolving agenda.

Some of the principal observations include:

- There is considerable common thinking between heritage conservation and sustainable development. Support for preservation of the built heritage is widely recognized as an element in sustainability of the natural, social, community and cultural environment both in Canada and internationally.
- Simultaneously, heritage conservation is often omitted from consideration as sustainability under green building, being more equated with social policy and sustainable communities.
- Indicators, measurement and scientific data are important in the sustainability field. Heritage conservation is weak in scientific data and measurement.
- There are significant gaps in existing green building indicators of sustainability and sustainability assessment tools, which do not address social and cultural indicators of sustainability. These include consideration of durability, embodied energy, and life-cycle analysis.
- The federal government has many initiatives in the area of sustainable development, some of which could be more inclusive of heritage conservation. Although SD is a complex subject (which encompasses all human activity) there is a tendency to consider various aspects separately. Lines of investigation and development could be more integrated than they are. Culture and heritage are two of these.

Areas requiring further work include:

- Information on related provincial and municipal initiatives
- A comparative table highlighting the differences between the different assessment systems in development
- Assessment tools and data adapted to heritage buildings and projects, in order to be able to improve historic places while preserving heritage value. Refer to the conclusions in section 3 for specific information, research and data required for improving sustainability assessment tools.
- The development of case studies (for some preliminary ideas see the Appendix), for example:
 - Review existing case studies involving heritage buildings, where heritage conservation was not explicitly addressed.⁴¹

- Cases that permit that broader exploration of the integration of environmental and cultural sustainability consider the particular issues raised in non-urban, rural or wilderness contexts⁴².
- Cases of sites with a traditional economic use
- Case studies of the environmental impact of demolition.
- Case studies involving the reuse of architectural fragments.

Principal stakeholders for collaboration are suggested in the text, and in the first instance, in consideration of HPB's mandate and broad connections to the Canadian heritage community, it might be recommended to limit the development of further linkages to the Canadian context. Within the federal government, potential areas of collaboration include research, policy development, and funding case studies.

Other government related linkages might include those agencies funding research and projects related to energy and water saving such as the National Research Council, Natural Resource Canada's Building Group, the Office for Energy Efficiency, and the Canada Mortgage and Housing Corporation. The objectives of heritage conservation could be integrated into existing programs related to sustainable development and include in their process the respect of the *Standards and Guidelines for the Conservation of Historic Places in Canada* during any intervention that would affect Historic Places. Integration may lead to the need for a review of the *Standards and Guidelines*, to give more direct attention to sustainable development practices.

In relation to outside heritage organizations, potential areas of collaboration include in participating in joint conferences, workshops and symposia, identifying research priorities, developing criteria for related research or project funding, and developing training and public awareness materials.

Beginning with the national organizations like the Canada Green Building Council linkages with the sustainability milieu should respond to some basic educational needs: informing the sustainable development/ building community about the benefits of heritage conservation. A complimentary objective is the education of the heritage conservation community about sustainable design strategies, and the need for research or case studies in some of the potential areas of integration identified in this paper.

Since 2005, HPB has developed public awareness materials related to this subject that are posted on the internet, and helped to foster an issue of the environmental magazine *Alternatives* devoted to built heritage. As this paper is being updated, HPB is planning a first meeting of national organizations active in related areas; revisions to the second edition of the *Standards and Guidelines for the Conservation of Historic Places in Canada* to integrate principles and guidelines related to sustainability; and a Lifecycle analysis of a selection of projects that received funding from the Commercial Heritage Properties Incentive Fund (CHPIF). As this paper is being revised, awareness of how climate change is already having an impact on historic places is growing and a discussion on what immediate strategies are required, beyond the types of longer-term sustainability strategies, is beginning.

5. KEY REFERENCES

In addition to the references and web links provided throughout the document, the following are some of the key or particularly interesting readings in this area. Appendix B provides an overview of additional references to become available since the 2005 edition of this paper.

Victoria Coleman, Australia's New South Wales Heritage Office, *Heritage & Sustainability, A Discussion Paper*, January 2004.

Cynthia Gunn "Exploring the Connection Between Built and Natural Heritage", Research Report, Heritage Canada 2001.

Donovan D. Rypkema, *The Economic Benefits of Heritage Conservation*, Keynote speech of the CAMA conference, May 27, 2003.

Donovan D. Rypkema, *Heritage Preservation is Smart Growth*, Conference on Smart Growth, National Audubon Society of New York, March 3, 1999.

Ted Kesik, "Perspectives on Sustainability" and "Enclosure Durability" in *Canadian Architect* web site's Architectural Science Forum. See http://www.cdnarchitect.com/asf/arch_science_forum.htm

Baird M. Smith, *Conserving Energy in Old Buildings*, Preservation Brief 3 (Technical Preservation Services for Historic Buildings, National Parks Service, 1978). See <http://www.cr.nps.gov/hps/tps/briefs/brief03.htm>

Wayne Trusty, *Sustainable Building: A Materials Perspective*, one of the OAA-CMHC continuing education papers for architects, is a good source on general principles. See <http://www.cmhc-schl.gc.ca/en/imquaf/himu/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=64305>

Ray Cole and Anne Auger, *An Architect's Guide for Sustainable Design of Office Buildings*, PWGSC, 1996 (rev. 1999). See http://www.pwgsc.gc.ca/rps/docs/pubs_archguide-e.pdf

Chris Wood and Tadj Oreszcyn, *Building Regulations and Historic Buildings, Balancing the needs for energy conservation with those of building conservation: an Interim Guidance Note on the application of Part L*, English Heritage, 2002. http://accessibility.english-heritage.org.uk/Filestore/publications/pdf/free/interim_part_1_guidance.pdf

Standards and Guidelines for the Conservation of Historic Places in Canada, Ottawa: Parks Canada Agency, 2003.

ENDNOTES

¹ HCD brought to the paper experience in adapting a sustainable building assessment system for federal heritage properties, as well as participation in the developing network of heritage professionals preoccupied with these issues. Andrew Powter retired from HCD in 2006. Bianca Lagueux, also from HCD, contributed to the review of this version of the paper.

² Gro Harlem Brundtland / World Commission on Environment and Development, *Our Common Future*, Oxford University Press, 1987.

³ “The discourse of sustainable heritage development is derived from two main streams of conservation in development. The first is from the Rio Earth Summit, Agenda 21 and the subsequent World Summit on Sustainable Development (Rio10) in Johannesburg in 2002. The second stream is the final report of the World Commission on Culture and Development, *Our Creative Diversity*, and its operationalisation through the Stockholm Action Plan in 1998. At the Jo'burg Summit a critical shift took place in the sustainable development discourse. It is summarized in the argument of Professor Arjun Appadurai that 'cultural diversity', 'heritage - both tangible and intangible' and 'sustainable development' are elements of the same endeavour. From there, the discourse of sustainable development matured into a sophisticated paradigm at the Stockholm + 5 meeting on culture and development where the above argument was further developed: that one could only work on the pursuit of sustainable development if cultural diversity planning and associated heritage values were embedded in the approach, whether at the local, national or international level.” Dr. Amareswar Galla, Director’s Message, Australian National University, Graduate Studies in Sustainable Heritage Development, February 2005. (Note that this graduate studies program was discontinued since 2005, so the original web source is gone.)

⁴ The Canadian Heritage Sustainable Development Strategy 2007-09 (SDS), suggests that Canadian Heritage sees themselves as a leader at the forefront of efforts to identify, describe and promote social and cultural dimensions of sustainable development.

⁵ Canadian Environmental Assessment Agency, *Canadian Environmental Assessment Act-Reference Guide on Physical and Cultural Heritage Resources*, April 1996, Minister of Supply and Services Canada, http://www.ceaa-acee.gc.ca/017/images/cea25_2e.pdf

⁶ Environment Canada led the development of a new, coordinated and more accountable approach for the fourth round of sustainable development strategies. See http://www.sdinfo.gc.ca/s12_e.cfm

⁷ The results of Canadian Heritage strategic research in this area were presented at a Canadian Heritage-hosted workshop on social and cultural sustainability held on January 26, 2005. See Canadian Heritage - Strategic Research and Analysis. Reader #17: *Heritage & Sustainable Development: Positioning Canadian Heritage*, January 26, 2005 SRA-894.pdf, including papers by Donna Mandeville, Maureen Williams and Sherri Torjman.

⁸ Social and Cultural Sustainable Development working group
http://www.pch.gc.ca/pc-ch/pubs/sdd-sds/2004-2006/6_e.cfm

⁹ Refer to Performance Report FY 05-06 (Public Works and Government Services Canada's Sustainable Development Performance Report Fiscal Year 2006-2007).

¹⁰ EcoENERGY Retrofit grants <http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/retrofitsmo-renovationpmo-eng.cfm> <http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/retrofithomes-renovationmaisons-eng.cfm>

¹¹ Mentioned as a counterpoint to the CHPIF, which combines planning and construction costs in a potential funding system.

¹² Declaration of Amsterdam <http://www.icomos.org/docs/amsterdam.html>

¹³ Sustainable development of Urban historical areas through an active Integration within Towns (SUIT), <http://www.lema.ulg.ac.be/research/suit/>

¹⁴ Aalborg Charter- European Cities and Towns towards Sustainability
http://europa.eu.int/comm/environment/urban/pdf/aalborg_charter.pdf

¹⁵ Canadian Green Building Council website <http://www.cagbc.org/>; US Green Building Council website <http://www.usgbc.org/>; Australia Green Building Council website <http://www.gbcaus.org/>; World Green Building Council website <http://www.worldgbc.org/>

¹⁶ <http://greenbuilding.ca/iisbe/gbc2k5/gbc2k5-start.htm>

¹⁷ Victoria Coleman /NSW Heritage Office and Heritage Council of NSW, *Heritage and Sustainability, A Discussion Paper*, 12 January 2004, <http://www.heritage.nsw.gov.au/docs/sustainability.pdf>

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- ¹⁸ Donovan Rypkema, *Historic Preservation is Smart Growth*, <http://www.wisconsinhistory.org/hp/smartgrowth/rypkema.asp> and Richard A. Bernstein, editor, *A Guide to Smart Growth and Cultural Resource Planning* Division of Historic Preservation, Wisconsin Historical Society, <http://www.wisconsinhistory.org/hp/smartgrowth/SmartGrowthGuide.pdf>
- ¹⁹ <http://www.ucl.ac.uk/sustainableheritage/>
- ²⁰ The impact of this and other types of energy-savings related strategies on heritage buildings is explored in Chris Wood and Tadj Oreszcyn, *Building Regulations and Historic Buildings, Balancing the needs for energy conservation with those of building conservation: an Interim Guidance Note on the application of Part L*, English Heritage, 2002. www.english-heritage.org.uk/upload/pdf/ign_partl_buildingregs.pdf
- ²¹ Jegou and Manzini, "Making a Habit of Sustainability," *Dwell*, October-November 2004.
- ²² Ray Cole and Anne Auger, *An Architect's Guide for Sustainable Design of Office Buildings*, PWGSC, 1996 (rev. 1999).
- ²³ Donovan D. Rypkema, *Heritage Preservation is Smart Growth*, Conference on Smart Growth, National Audubon Society of New York, March 3, 1999.
- ²⁴ The Parks Canada definition of Cultural Landscape is: Any geographical area that has been modified, influenced, or given special cultural meaning by people. (Parks Canada's Cultural Resource Management Policy, Glossary, 1994)
- ²⁵ Baird M. Smith, *Conserving Energy in Old Buildings*, Preservation Brief 3 (Technical Preservation Services for Historic Buildings, National Parks Service, 1978), <http://www.cr.nps.gov/hps/tps/briefs/brief03.htm>
- ²⁶ Ray Cole and Anne Auger, *An Architect's Guide for Sustainable Design of Office Buildings*, PWGSC, 1996 (rev. 1999), http://www.pwgsc.gc.ca/rps/docs/pubs_archguide-e.pdf
- ²⁷ Donovan Rypkema, *Economic Benefits of Heritage Conservation*, Keynote speech of the CAMA conference, May 27, 2003.
- ²⁸ *What is the Integrated Design Process*, Buildings Group, Natural Resources Canada http://www.sbc.nrcan.gc.ca/buildings/idp_e.asp
- ²⁹ Athena Sustainable Materials Institute, <http://www.athenasmi.ca/index.html>
- ³⁰ Ted Kesik, *Measures of Sustainability*, Canadian Architect-Architectural Science Forum, http://www.cdnarchitect.com/asf/perspectives_sustainability/index_frameset.htm
- ³¹ Kesik, *Measures of Sustainability*.
- ³² A few examples in MJ/kg: straw bale 0.24; brick 2.5; asphalt shingles 9.0; steel 32.0; copper 70.6; aluminium 227, Kesik, *Measures of Sustainability*.
- ³³ Ted Kesik, *Enclosure Durability*, Canadian Architect-Architectural Science Forum, http://www.cdnarchitect.com/asf/enclosure_durability/index.htm
- ³⁴ This strategy is not currently available online.
- ³⁵ Similar to what happened for old cars and books, that are taken apart for their parts and illustrations. This issue is also discussed in Cynthia Gunn, *Exploring the Connection Between Built and Natural Heritage*, with respect to a CMHC study on housing deconstruction.
- ³⁶ An example of dealing with lead paint is covered in Sharon Park, *Appropriate Methods for Reducing Lead Paint Hazards in Historic Buildings*, <http://www.cr.nps.gov/hps/tps/briefs/brief37.htm>.
- ³⁷ Although a comparative table highlighting the differences between these systems with respect to heritage conservation objectives would be useful, it is not currently available.
- ³⁸ LEED Canada was launched by the Canadian Green Building Council (CaGBC) on December 1, 2004
- ³⁹ These observations are based in particular on the experience of HCD in adapting the Green Globes system for heritage buildings for PWGSC, and the exchange through the APTI sustainable heritage conservation committee about LEED.
- ⁴⁰ Cole and Auger, *An Architect's Guide*.
- ⁴¹ For example, reviewing if and how conserving heritage value is addressed in the case of the Seville Theatre Redevelopment Project. A CMHC funded example of the Integrated Design Process See <http://www.cmhc-schl.gc.ca/publications/en/rh-pr/tech/03-102-e.pdf>
- ⁴² An example might be the issues around the management of Banff National Park of Canada, a World Heritage Site that must meet the highest standards of environmental stewardship while protecting the archaeological and heritage resources associated with 11,000 years of human settlement.

APPENDIX A- RELATED INITIATIVES SINCE 2005

Since the original version of this text in February 2005, the number of related initiatives and projects in Canada, the USA and elsewhere has grown exponentially. The following preliminary list provides an overview.

Symposia, Workshops, Seminars, Conferences, Lectures, Courses:

- Association for Preservation Technology - Symposium on Sustainable Heritage Conservation, Halifax, NS, September 2005 (see related special issue of the APT Bulletin under publications)
- Heritage Canada Annual Conference, Heritage and Sustainability, Canadian Communities and Kyoto, Regina, Saskatchewan, September 2005 (see proceedings under publications)
- American Institute of Architects, Roundtable on Sustainable Design IV: Preservation and Utilization of the Existing Built Environment, Washington, DC, June 22, 2005 (proceedings available online)
- Green Building Alliance and Pittsburgh History and Landmarks Foundation, Greening Historic Properties National Summit, Pittsburgh, PA, November 2006 (see related white paper)
- Federal Energy Management Program (FEMP), Workshop on Historic Preservation and Energy Efficiency in Federal Buildings, December 2006, Washington, DC (see related proceedings under publications)
- Government Historic Estates Unit (GHEU) Annual Seminar, “Cutting Down on Carbon, Improving the Energy Efficiency of Historic Buildings,” English Heritage, / Buildings Research Establishment (BRE), Garston, UK, October 2007 (see related proceedings under publications)
- Royal Architectural Institute of Canada (RAIC), continuing education seminar “Integrated Sustainability Assessment of Heritage Buildings and Sites,” OAA/RAIC annual conference, Toronto, June 2007
- Ontario Heritage Trust –continuing education workshop “Architectural Conservation: Sustainable by Design,” OAA/RAIC annual conference, Toronto, June 2007
- Real Property Institute of Canada (RPIC) workshop “Integrated Sustainability Assessment of Heritage Properties” at annual conference, November 2006 (Powerpoint available on RPIC website)
- SFU City Program with BC Heritage Branch annual workshop “The Challenge of Sustainability for Heritage Conservation,” February 16, 2007, (audio files available on SFU website, http://www.sfu.ca/city/city_pgm_mp3.htm)
- National Preservation Institute/ AIA- Green Strategies for Historic Buildings Seminar, San Antonio, Texas May 2, 2007
- ICOMOS Scientific Committee meeting on Heritage and Global Climate change, October 2007, Pretoria, South Africa
- National Conference of State Historic Preservation Officers Annual Meeting Square Table Discussion on The Greening of Historic Properties and LEED, Washington DC, Feb.26, 2007 (agenda and background materials <http://www.ncshpo.org/HPFPreservation/LEED.htm#Next>)

Websites :

- Historic Places Initiative- fact sheets on Energy, Climate change, Jobs, etc
http://www.historicplaces.ca/protect-proteger/pro_e.aspx#climate
- Heritage Canada advocacy site –Heritage conservation saves energy
<http://www.advocacyaction.org/english/conservation/introduction.htm>
- National Trust for Historic Preservation advocacy site – Sustainability
<http://www.nationaltrust.org/green>
- English Heritage / HELM – Protecting the Historic Environment
<http://www.helm.org.uk/server/show/nav.9255>
- Whole Building Design Guide –Sustainability and Historic Preservation case studies
- Canada Mortgage and Housing Corporation Case Studies –Residential Intensification, energy retrofits period houses, etc involving existing housing / historic buildings and neighbourhoods

Projects (Funding sources):

- Brownfield Case Studies (Province of Ontario/ Ontario Municipalities)
 - 51 division – Toronto Police Service
 - Kaufman Footwear Building, Kitchener, Ontario
- Brickworks Don Valley, Toronto (Evergreen, federal)
- Red River College, Exchange District, Winnipeg (provincial, C-2000)
- Benny Farm, Veterans Housing, Montreal (CMHC)
- Now House, Veterans housing, Toronto (CMHC)
- Rupert Building, Winnipeg (CIER)
- Mole Hill housing, Vancouver (BC and Vancouver Housing)
- Toronto residential towers (Clinton fund)
- LEED certified projects involving “historic preservation” in the USA, including:
 - Presidio, San Francisco, CA
 - Lincoln’s Cottage, Washington, DC
 - Trinity Church, Boston, MA
- AIA Cote Top Ten Green Award winners involving “historic preservation, including:
 - Immaculate Heart of Mary motherhouse, Monroe, Indiana
 - Philadelphia Forensic Science Centre, Philadelphia, PA

Research:

- BC Government Heritage Branch with U. Victoria and Athena Institute: studies on LCA/ embodied energy of historic buildings and energy efficient window repair (contact Jennifer Iredale)

APPENDIX B- LITERATURE REVIEW SINCE 2005

Conference Proceedings:

Heritage Canada annual conference proceedings, Heritage and Sustainability, Canadian Communities and Kyoto, September 2005

http://www.heritagecanada.org/eng/news/archived/conference_proceedings/Heritage5-En-final.pdf

Government Historic Estates Unit (GHEU) Annual Seminar, “Cutting Down on Carbon, Improving the Energy Efficiency of Historic Buildings,” English Heritage, Résumé of Presentations, Buildings Research Establishment (BRE), Garston, UK, October 9, 2007

<http://www.helm.org.uk/upload/pdf/BRE-seminar.pdf>

Federal Energy Management Program (FEMP), “Proceedings of the Workshop on Historic Preservation and Energy Efficiency in Federal Buildings,” Dec.6-7, 2006, Washington, DC. http://www1.eere.energy.gov/femp/pdfs/ee_historicbldgs_report.pdf

Green Building Alliance and Pittsburgh History and Landmarks Foundation, Greening of Historic Properties National Summit- “White Paper: Pinpointing Strategies And Tactics For Integrating Green Building Technologies Into Historic Structures,” November 2006 <http://www.gbapgh.org/GreenHistoric.pdf>

APT Bulletin, The Journal of Preservation Technology, Special issue on Sustainable Preservation, 2005, 36-4, including:

Cavallo, James, “Capturing Energy-Efficiency Opportunities in Historic Houses”

Elefante, Carl, “Historic Preservation and Sustainable Development: Lots to Learn, Lots to Teach”

Jackson, Mike, “Embodied Energy and Historic Preservation: A Needed Reassessment”

Helena Meryman, “Structural Materials in Historic Restoration: Environmental Issues and Greener Strategies”

Powter, Andrew and Susan Ross, “Integrating Environmental and Cultural Sustainability for Heritage Properties”

Rose, William B., “Should the Walls of Historic Buildings be Insulated?”

Sedovic, Walter and Jill H. Gotthelf, “What Replacement Windows Can’t Replace: the Real cost of Removing Historic Windows”

Alternatives, Canadian Environmental Ideas + Action, Double Issue: Measuring Progress and Building Heritage, Volume 33, Numbers 2 & 3, 2007, including:

Robert Shipley and Jason Kovacs, “Editorial- From Bottles to Buildings”

Marc Denhez, “Reusing Cities, We have reuse policies for beer bottles, so why not for buildings, neighbourhoods and entire cities? / Codes of Best Practice”

Rodney Wilts, “Rehab It, Making the most of existing resources / Six Ways to Maximize Reuse Opportunities”

Sue Carter Flinn, “Greening on a Shoestring, The Ecology Action Centre’s new green home is now a retrofit demonstration.”

Sheryl Boyle, “Borrowed from Barns and Churches, Retrieving good design principles from early industrial architecture.”

Edmund P. Fowler, “Heritage in the ‘Burbs, How to make suburbs a lasting legacy.”

Valentin Schaefer and Eric Higgs, “Modern Babylon, City parks can be celebrated treasures, but the real trick is to integrate ecological heritage into urban life.”

Teutonico, Jeanne Marie and Frank Matero, *Managing Change: Sustainable Approaches to the Conservation of the Built Environment*, Getty Conservation Institute, 2003.

Susan Balderstone, “Built Heritage: A Major Contributor to Environmental, Social and Economic Sustainability,” SUSTAINABILITY FORUM DISCUSSION PAPER, Heritage Victoria, March 2004,

http://heritage.vic.gov.au/pages/pdfs/Sustainability_Heritage_paper.pdf

Peter Wils and Chris Eves, “Economic and Social Benefits of Heritage Property,” Research Paper, New South Wales Heritage Office, 2005

http://www.heritage.nsw.gov.au/docs/benefits_heritage05.pdf

Ross, Susan, “Saving Heritage is Key to Sustainable Development,” *Heritage*, Spring 2006, <http://www.heritagecanada.org/eng/news/archive.html#mag>

Sims, Craig and Andrew Powter, “Improving Thermal Performance of Historic Windows,” *Heritage*, Spring 2007,

<http://www.heritagecanada.org/eng/news/archive.html#mag>

+ other similar articles

Roberts, Tristan, “Historic Preservation and Green Building: A Lasting Relationship,”
Environmental Building News, Vol.16, no.1, January 2007,
<http://www.buildinggreen.com/articles>

Alex Wilson and Allyson Wendt, The Challenge of Existing Homes: Retrofitting for
Dramatic Energy Savings,” *Environmental Building News*, July 2007,
<http://www.buildinggreen.com/articles>

Richard Moe, president National Trust for Historic Preservation “Sustainable
Preservation: Historic Preservation’s Essential Role in Fighting Climate Change,”
presentation notes, Washington, DC, December 2007,
http://www.nationaltrust.org/news/2007/20071213_scully.html

Magazine of the National Trust for Historic Preservation, *Preservation*, The Green Issue,
Jan. Feb. 2008, <http://www.nationaltrust.org/Magazine/current/feature1.htm>

English Heritage, Micro Wind Generation and Traditional Buildings, 2007,
<http://www.helm.org.uk/upload/pdf/MicroWind.pdf>

+ other similar documents

APPENDIX C- EXAMPLES

The following examples selected for the first version of this paper, are presented to suggest a range of issues raised by the integration of sustainable development objectives with the conservation of various types and locations of heritage sites and buildings.

Example A- federal heritage building

Observations on the application of an environmental building assessment system for a project involving a heritage building.

When this paper was originally written in 2005, the former USA Embassy was being adapted to accommodate the new Portrait Gallery of Canada. The adaptive reuse project included construction of a new addition of similar size to the heritage building. The former USA Embassy is a Classified Federal Heritage Building. The design included retention of all structure, exterior facades and most of the plan and interior fabric, finishes and fittings, seismic reinforcement, thermal upgrading of the envelope, and major changes to the interior environment particularly elevated relative humidity. The rating system been applied at the time was the USGBC LEED –NB (new buildings).™

Observations in relation to this project include:

1. The design is generally respectful of the heritage character of the building.
2. The LEED-NB™ sustainability assessment system is being used to guide sustainable decision-making as the design develops.
3. At the Design Development stage the project would not achieve the LEED silver target and might not be rated LEED certified, the lowest rating.
4. The design was generally considered to be sustainable in terms of energy use during construction and operational energy, use of resources, production and management of waste, and new materials selection and supply. The downtown location and lack of parking made use of public transit the only feasible transit choice for occupants.
5. The project was not awarded points for high continuity of embodied energy and extended life cycle of materials and assemblies. Points in other significant areas were minimal. A number of points were not applicable to a conservation project on heritage building.
6. The project was not awarded several points for inherent characteristics as an existing building with heritage qualities. For example, it is located in a previously serviced, dense downtown area without open space or requirement to water landscaping.
7. The project was awarded several points for inherent characteristics as an existing building with heritage qualities. For example, its location on public transit routes and accessibility by bicycle.
8. A number of rating criteria conflicted with the functional program (For example, display galleries).

Conclusions:

The environmental sustainability rating did not contribute to rating the project's cultural or social sustainability or acknowledge its cultural significance

The LEED NB rating system, designed for new construction or major rehabilitation (strip to the skeleton) type projects was not a suitable tool for measuring and guiding the sustainability of this heritage building. However, it was actively used for making decisions about systems, heat and cooling sources, wastewater treatment and other aspects of the design. Some aspects of the project were not pursued (eg. green roof). Heritage impacts influenced consideration of several points. Capital cost was a major consideration in decision-making.

Example B- A development in an urban/ historic district- integrated conservation

Observations on a federally funded, community development oriented, for green project involving several heritage properties. The project required balancing the socio-economic and cultural objectives of urban conservation.

The new campus for Red River College in the Winnipeg Exchange District (a National Historic District) was completed in 2003 with funding from the federal government from the C2000 programme. The project incorporated a row of five municipally listed commercial heritage buildings on Princess Street. The design included retention of the facades, reconstruction of the party walls and back facades, and integration of some salvaged interior elements in new locations. A further warehouse building outside the historic district and not listed by the city was also rehabilitated.

The project has been widely recognised for its “green design”, including the reuse of existing heritage properties, and many features related to the new parts of the project (envelope performance, green roofs, daylight design, etc.). It was chosen as one of the three Canadian entries at the 2002 Green Building Challenge. The project is also seen as an important contribution to the potential economic revitalization of the Exchange district as a whole.

Issues to consider in relation to this project include:

1) The standards applied to conservation work in the context of a federally funded project with sustainability objectives are not consistent with the *Standards and Guidelines for the Conservation of Historic Places in Canada*. The project would probably not have been certified as eligible for CHPIF funding because of the loss of heritage value due to demolition and reconstruction work. As examples: the project included replacing windows in repairable condition to meet energy-efficiency goals, and reuse of fragments of character-defining elements in new areas of the building.

2) Balancing the socio-economic and cultural objectives of urban conservation, or the benefits of the new use of the site for the district as a whole with the appropriateness of the interventions at the scale of specific buildings

Example C- Integrating heritage conservation in existing sustainability building assessment systems

The integration of heritage conservation objectives with respect to potential archaeological resources on a site being assessed for its sustainability.

The following examples are questions taken from the draft version of the guide for the Green Globes for Operating Heritage Buildings questionnaire currently in development by PWGSC.

Heritage Site (new question)

D.2.1 Has an archaeological assessment of the site been completed?

Archaeological features include structures and artifacts, soil, and botanical samples such as animal bones and pollen. Provinces and territories have laws that relate to the exploration, discovery and disturbance of archaeological resources. Refer to the Canadian Environmental Assessment Act (CEAA).

Requirement: Verify that the building site has undergone an archaeological investigation to recover and preserve any valuable structures, features or artifacts.

Heritage Site (revised question)

D.2.2 Is the building site free of contamination?

There should be evidence that the site is free of contamination; or that it has been remediated to an acceptable level. *If decontamination of brownfield is needed, it should be carried out with caution, as there may be character defining built or archeological elements that should be preserved in the process.*

Requirement: Review evidence that the site is free of contamination. If unknown, mark “No”.

Note that the guide includes reference documents, and in this case, reference is made to the related *Standards And Guidelines for the Conservation of Historic Places in Canada*.