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health from these climate-related hazards can have significant implications for the demand for health care facility services.

Are you ready for the climate change impact?

Canadian health facilities are becoming increasingly vulnerable to the negative impacts of climate change, which can disrupt facilities' services and care delivery. Extreme weather events (e.g. storms, floods, wildfires, heat waves) can create emergencies by damaging infrastructure, compromising access to critical resources (e.g. medical supplies and equipment; transportation; food; and water) and threatening the safety of patients, visitors and staff. Climate change also increases risks to Canadians from some vector, water and food-borne diseases and it is expected to worsen air quality in many communities. Taken together, the impacts on

The World Health Organization (WHO) has asked decision-makers to prepare for the impacts of climate change through efforts to increase resiliency in the health sector.¹ This entails mainstreaming climate change into risk assessments, considering climate change when developing plans and programs and engaging in broader community discussions and initiatives around climate-related issues.

For example, health care and public health officials can prepare by assessing the risks from extreme weather events, increasing their readiness to manage climate-related infectious disease outbreaks or atypical cases and increasing their understanding of how gradual shifts in weather can impact an institution's risk profile.

We have only to look to southern Alberta for tangible evidence of what can happen when an extreme weather event strikes. In late June 2013, several hospitals and tertiary care facilities were shut down due to the flooding in and around Calgary. Alberta Health Services closed the hospital in High River and ordered an evacuation; minor injury nursing services were offered at the fire hall. Surgery schedules had to be scaled back, and many elective surgeries were cancelled. Residents from some of the area's facilities were transferred to safer operational sites until the hospital was able to reopen. In all, it appeared over 100,000 Albertans were forced from their homes due to the flooding and three residents of High River lost their lives. It was reported by the Canadian Press that the Canmore Hospital was entirely surrounded by a moat and the basement had flooded, putting an end to all food service from the kitchen, which was located in the basement.²

During extreme weather events and disasters, organisations can reduce the risks of climate change through proper planning and careful management of critical resources. A resilient health care organisation also commits to sustainable practices, such as water and energy conservation, and promotes active transportation, and local food procurement. Investing in such activities can reduce operating costs and increase resilience in the broader community.

Toolkit

To help health organisations evaluate their preparedness and become more resilient to climate-related risks, the Canadian

Coalition for Green Health Care, together with Nova Scotia Environment and Health Canada, developed the 'Health Care Facility Climate Change Resiliency Toolkit' which includes three components: a resiliency assessment checklist, a facilitator's guide and numerous online resources. The free and easy online registration, at www.greenhealthcare.ca/resiliency, grants users access to national and international climate change articles and links, resiliency profiles on forward-thinking health care organisations that have already faced the reality and hardship of climate change impacts, and publications from leading authorities including the WHO.



Kent Waddington

Kent Waddington is co-founder and Communications Director of the Canadian Coalition for Green Health Care and an executive leadership coach. He has spent much of the past 16 years engaged in helping members of the Canadian health services sector as they develop and adopt more environmentally-responsible practices within their organisations. He has developed program content and collateral for numerous provincial and national environmental initiatives and is the environmental advisor to one of Canada's largest Fortune 500 companies, supporting health care sites across Canada.



Linda Varangu

Linda Varangu is the Canadian Coalition for Green Health Care's Executive Director and has been empowering health care facilities to improve environmental stewardship since the 1980's.

Linda has led projects to reduce waste and use of toxic chemicals, provide healthy local foods, save energy and water and help facilities prepare for the impacts of climate change.

She has contributed to a healthier planet by helping build coalitions, networks, social enterprises and not-for-profits with an environmental purpose.

The Assessment Checklist includes questions to aid the measurement of resiliency in many organisational areas including emergency management, facilities management, health care services and supply chain management. Completion of the checklist, by officials with the necessary information and experience in these areas, can identify gaps in preparedness and inform resiliency activities to reduce climate change risks. The online version of the checklist provides a facility resiliency score and can help identify areas for improvement.

The Facilitator's Guide is an electronic presentation deck for hospital officials leading the assessment, which can be tailored to the specific needs of their organisation. It provides instructions for conducting a resiliency assessment and can be used to engage facility officials, promote discussion around questions and results, and capture information.

The Assessment Checklist was developed using information obtained from an international literature review and input from an advisory committee of Canadian health care executives; facility managers and engineers; and climate change 'impacts and adaptation' experts. It was designed for use by officials within the health care setting to obtain data on current efforts to prepare for the impacts of climate change.

The checklist questions are based upon key indicators of resilience and respond to the needs of specific health care facilities. To ensure the checklist was formatted and presented so that it could be completed by officials with relevant expert and practical knowledge, a draft version of the checklist was piloted in six Canadian facilities including St. Martha's Hospital (Antigonish, NS), Soldiers Memorial Hospital (Kentville, NS), the Queen Elizabeth II Hospital (Halifax, NS), Aberdeen Hospital (New Glasgow, NS), the Ottawa Hospital (Ottawa, ON) and the Stonewall and District Hospital and Health Centre (Stonewall, MB).

"Participating as a pilot site has been an invaluable experience for our team," said David MacKenzie, VP - Operations with the Guysborough Antigonish Strait Health Authority. "The toolkit challenged how we are planning for events and with the recent experience of Sandy in New Jersey and New York, reinforced our conviction in these strategies. Extreme weather events are happening more frequently and can be catastrophic for communities that don't understand or prepare appropriately."

Support for the initiative was also received from the Maritime Chapter of the Canadian Healthcare Engineering Society (CHES). Representative Robert Barss, who was Manager, Facility Services, South Shore District Health Authority at the



time, spoke on their behalf. "As the managers of health care's infrastructure, CHES Maritime was excited to help the Coalition and its partners develop the assessment tool and explore opportunities to make our hospitals more resilient and more sustainable in the face of growing climate change and worsening climatic incidents. It is incumbent upon us to be as prepared as possible and to be ready to deliver the best possible patient care from a safe and functional healing facility during times of disaster."

Climate change

Some health care facilities have already begun to factor climate change into their strategic planning and are making strides in efforts to increase resiliency.

A few years ago, the Ottawa Hospital (TOH) had an incident where a main sprinkler line in a service tunnel ruptured and water began to fill the tunnel, rapidly encroaching upon the room housing their backup emergency generator and main electrical distribution system. The City of Ottawa repair crew was able to stop the leak and restore service just short of the water breaching the doors to the emergency generator set, which, if it had, would have resulted in the loss of emergency power to 17 operating suites, curtailed the emergency provision of water and sewer services to two million square feet of building space, and would have shut down the HVAC services for 100 percent of the campus. Patient care would have been seriously impacted by a forced shut down of all power. This incident got TOH engineering staff thinking about the far-reaching implications of the loss of emergency power and their preparedness for other serious disaster response necessities and was a catalyst for the rethinking of future generator placement.

TOH's Director of Engineering & Operations at the time had attended a

conference where one of the speakers presented on the impacts Hurricane Katrina had on his hospital in New Orleans sharing that their generators were in a bunker twenty-one feet above sea level but when Katrina hit, all he could see were the exhaust stacks poking out above the water. The net effect was the complete evacuation of the building. TOH's generators are now being housed on the third floor of their powerhouse, well above any anticipated flooding threat.

According to Peter Whiteman, Energy Centres Manager at Regina Qu'Appelle Health Region (RQHR), during the summer months in Saskatchewan there are, historically, one or two periods of high temperatures coupled with high humidity every year. "However, these occurrences were typically short-lived; usually lasting no more than a day or two, and our building could ride through them without developing any significant adverse reactions. Unfortunately, these events have a tendency to last much longer now."

During the summer of 2007, however, RQHR experienced a period of ten consecutive days with the humidity index rating exceeding 45 degrees Celsius. These environmental extremes created uncontrolled humidity conditions throughout RQHR facilities and Whiteman and his team had to shut down all operating rooms except for the most life-critical cases. To safeguard against future unplanned disruptions, RQHR upgraded and added cooling towers, replaced the cooling coils in many HVAC systems and added additional building automation controls to monitor and control humidity in real time with the aim of maintaining the humidity within acceptable ranges.

For the most part, RQHR's operating room HVAC systems were designed for 100% outside air, which was the norm back in the mid-eighties. Medical, environmental and technical advancements since then have significantly altered how these critical care areas are ventilated and controlled. Mixed air or return air systems can significantly reduce operating costs and improve indoor environmental conditions. "We would have preferred to incorporate these modifications into our facilities years ago. However, space and resource limitations just didn't allow for it at the time," says Whiteman. "We would like to see humidity conditions monitored, recorded and reported in critical care areas by the building automation system (BAS) with the ability to modulate control within the desired range."

"Subsequently, we designed a BAS to automatically take control of the room temperature setting during periods of excess humidity, automatically increasing the spatial temperatures and reducing the relative humidity (RH). Generally speaking, for every degree of temperature rise we

see a corresponding decrease of 5% RH.” He added.

The team explained to all relevant stakeholders within the organisation that the environmental extremes were beyond the facilities’ original design limitations. Once they had done so, everyone came on-side to design and develop solutions that enabled building operators to maintain the indoor environment within acceptable standards. Regarding justifying the cost of the changes, Whiteman says “leadership in health care isn’t restricted to doing things right; it’s also about doing the right things. The management team were very supportive once they understood how climate change was impacting our ability to deliver quality health care.”

Nanaimo Regional General Hospital

Opened in 2012, the Nanaimo Regional General Hospital (NRGH) is a 247-bed facility serving central Vancouver Island’s 160,000 residents and also serves as a referral hospital for an additional 400,000 British Columbia (BC) residents. The original hospital building was constructed in the 1960s and, to meet the growing demands of the central island, has undergone numerous additions and renovations over the years. The addition of the NRGH Emergency Department

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provided an increase in floor area (6,200 m²) and improved functionality for one of the busiest emergency rooms on Vancouver Island (53,000 visits per year).

The local health authority, Island Health, and all public sector organisations in BC were required by legislation to be carbon neutral by 2010. New buildings must be certified to a minimum standard of ‘Leadership in Energy & Environmental Design’ (LEED) Gold and Island Health wanted to minimise greenhouse gas emissions with the NRGH Emergency Department. The designers provided many features that have the additional benefit of mitigating risk in the event of extreme weather:

- To reduce energy use and concomitant greenhouse gas emissions, the building design includes use of displacement ventilation, radiant heating/cooling panels, wood products with lower associated greenhouse gas emissions, solar shading, extra roof and wall

insulation, high performance glazing, a heat recovery chiller, efficient lighting and lighting controls, low-flow water fixtures and a dynamic subterranean labyrinth for heat and cooling storage. During daylight hours, for example, the majority of the building operates with very little artificial light compared to the old Emergency Department which had no natural light.

- Designers provided day lighting in most areas of the building (even in the trauma room) as well as operable windows to allow natural ventilation.
- The building’s dedicated heat recovery chiller provides most of the space heating as well as preheating for the domestic hot water. This system is 100% backed up by the main hospital’s existing plant.
- Design and technology complying with LEED Gold standards and BC Hydro’s Commercial New Construction Program.

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The model predicted energy use index (EUI) is 524 kWh/m²/yr and an annual saving of 939 gigajoules (GJ) of gas; 1,071,892 kWh of electricity and a 39 kW demand reduction for a total annual saving of \$59,815 compared to a comparable facility built to code.

- The Actual EUI for the one-year period ending June 30, 2016, has been determined to be 242.6 kWh/m², less than half of the figure predicted by the energy model (See Figure 1).
- Island Health took what they learnt in the development of the NRGH Emergency Department and applied it to the requirements for the new North Island Hospitals (NIHP) with the added requirement of an energy and greenhouse gas emissions target. Island Health set very ambitious but achievable targets which has resulted in the new much larger facilities being significantly more energy efficient and generating 75 per cent less greenhouse gas emissions than the facilities they are replacing.

A Canadian leader in bringing environmental stewardship practices to the forefront in health care facilities, Toronto's University Health Network (UHN) was honoured for their sustainability efforts with three Climate Champion Awards in the 2020 Health Care Climate Challenge, in Paris, France on December 4, 2015.

UHN received the Gold Award for Climate Resiliency and Silver Awards for Energy Efficiency and Climate Leadership. Presented by Global Green and Healthy Hospitals, the awards focus on three key areas of the Climate Challenge: Mitigation (reducing health care's carbon footprint); Resilience (preparing for the effects of extreme weather and the shifting burden of disease); and Leadership (educating staff and the public while promoting policies to protect public health from the consequences of climate change.)

Led by the Energy and Environment department, they breathe life into the motto "UHN: Committed to Patient and Planet Centered Care." They have won numerous other awards for their groundbreaking programs and put concern for the environment into how they care for and treat patients.

UHN's many achievements include:

- An energy awareness program that combines raising awareness changing behaviours, retro-commissioning and installing more efficient equipment to save energy, including LED lights, energy efficient chillers and the installation of variable speed drives
- Working with Operation Green and other organisations, they collect surplus medical equipment and supplies for developing communities
- They participate in several programs to

Figure 1: Based on actual results, the savings compared to a facility built to code would be: 3,303 GJ of gas and 2,207,200 kWh of electricity, giving a total annual cost reduction of \$215,000.

| | kWh/year/m ² | | |
|---------------------------------|-------------------------|-------------|------------------------|
| | Electricity | Natural Gas | Total Energy Use Index |
| Model of Facility Built To Code | 594 | 153 | 747 |
| Model of NRGH ED | 413 | 111 | 524 |
| Actual Results 2015/16 | 238 | 5 | 243 |

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- They developed the Krembil Discovery Tower, a world-class research centre, and a LEED Silver certification candidate
- They enabled the operation of a long-running and successful recycling and composting program that saves over a third of their waste from going to landfill, and,
- Enable the operation of an eco-certified green cleaning program which helps protect staff, patients and visitors from toxic chemicals.
- They were the 2016 recipient of the CCHL Energy and Environmental Stewardship Award

Climate Change Resiliency Planning for Health Care

Thanks to recent funding from the Ontario Trillium Foundation, the Coalition and its health care partner, University Health Network (UHN), are offering a new program: The Climate Change Resiliency Planning for Healthcare (CCRPH), which will be providing mentoring in climate change resiliency to Ontario's health services sector. The project team will develop best practice in climate change resiliency for health care facilities, integrate and expand the Coalition's Climate Change Resiliency Toolkit, establish collaborative learning groups to train health care site facilitators to use the Toolkit at their sites and help organisations become more aware of their level of preparedness for climate change incidents that might negatively impact their ability to deliver care during challenging times.

The three-year initiative will also lead to the development of a climate change resiliency position statement for the health sector and explore opportunities to embed resiliency practices into existing health care priorities such as accreditation and insurance.

Thanks to the Ontario Trillium Foundation grant, the Coalition will be able to facilitate much greater understanding and use of the Health Care Climate Change Resiliency Toolkit, as a mechanism to promote responsible resource stewardship within the health services sector. By increasing the number

of organisations using the toolkit, the Coalition will be empowering an even greater number of individuals to reduce the negative impacts their health care facilities have on the environment and enabling increased infrastructure resiliency to climate change events. Through facilitated discussions and expert advice, program participants will be much better prepared to undertake facility assessment and resiliency actions.

Participants will have exclusive access to peer mentoring, and take part in educational webinars, networking conference calls and will develop their skills as climate change resiliency champions in their organisation. **IFHE**

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- The Coalition thanks Health Canada's Climate Change and Innovation Bureau for their financial contribution in support of climate change and resiliency research and education.
- The Canadian Coalition for Green Health Care is driving leadership in environmentally-sustainable health care practices. As Canada's premier green health care resource network for over fifteen years, the Coalition empowers the health sector to adopt resource conservation, pollution prevention principles and effective environmental management systems. To learn more visit: <http://www.greenhealthcare.ca>

References

- 1 World Health Organization. (2015). *Operational framework for building climate resilient health systems*. [Retrieved July 27, 2016]. http://apps.who.int/iris/bitstream/10665/189951/1/9789241565073_eng.pdf?ua=1
- 2 Waddington K, Varangu L, Berry P, Paterson J. Health Care Providers Prepare for Extremes - Climate Change Factors into Facilities Planning. *Canadian Property Management*, September 2013, 25.