



Inside this Issue:

Making Winnipeg a Smart City with New Technologies cover, 3	
Executive Director's Message	2
Food Waste is a Bigger Problem Than You May Think	4
Shoreline Restoration with Natural Landscaping	5
An Indigenous Perspective	6-7
Are You at Risk?	8
When Will Solar be Generally Viable in Manitoba?	9
Winter Camping	11

PHOTO: JAMES CULLETON

Making Winnipeg a Smart City with New Technologies

By Jennifer Temmer, Madeline Stanley, Geoffrey Gunn, and Sumeep Bath

AS GLOBAL POPULATIONS CONTINUE to migrate to cities in search of economic opportunities and higher living standards, the world's urban centres are continually growing.

However, in a time of limited resources, cities need to actively manage their own sustainable growth. In other words, cities need to get smart.

A smart city is an urban area that **uses new technologies and data collection mechanisms** to collect information about how the city is working—and then uses it to improve the efficiency of that city's systems and valuable assets, all in the name of sustainability.

For example, among its many “smart” initiatives, **New York City** has implemented an internet of things (IoT) system whereby various sources of data, from microwave sensors to traffic video cameras and EZPass readers, are analyzed to alter traffic signals in real time to ease congestion issues in NYC's busy midtown area and reduce cars' emissions. Many cities, including **Stockholm**, **London** and **Singapore** have adopted innovative solutions to make their cities more sustainable.

Winnipeg, in the heart of Canada, is no stranger to fast-growing populations. Thanks mostly to immigration, The Peg's population has grown to 765,800 from 657,800 in the last 10 years, and is well on course to hitting a million in the next decade.

Nevertheless, Winnipeg still faces a multitude of urban challenges ranging from **unreliable public transport** to inequitable access to health care. Despite **some worthy attempts**, Winnipeg also lags behind its Canadian cousins when it comes to implementing smart, city-wide solutions.

To move towards smart city status, however, Winnipeg does not need to reinvent the wheel, given the number of existing smart solutions already out there for cities.

We asked four members of our Winnipeg team how they would tackle some of Winnipeg's most pressing issues and this is what they came up with.

HEALTH CARE

JENNIFER TEMMER:

“Use big data to organize and better target health outreach and education campaigns in libraries.

“In many communities, including those across Winnipeg, libraries have become important public spaces for everything from socializing to accessing the internet. As books and DVDs make way for e-readers and movie streaming services, libraries need to remain relevant.

One unique way to do this would be to take advantage of smart technologies and the power of big data. By connecting library card data with provincial health card data (all of which would be anonymous), community health providers could learn from which health issues library users in certain communities are suffering and then develop targeted approaches for public health education and community interventions on a library-by-library basis.”

continued to page 3 >>

is published four times per year by the
Manitoba Eco-Network/
Réseau Ecologique du Manitoba Inc. at
3rd Floor, 303 Portage Avenue
Winnipeg, Manitoba, R3B 2B4
Phone: 204-947-6511 / Fax: 1-866-237-3130
info@mbeconetwork.org
www.mbeconetwork.org

Editor: Shawna Culleton
editor@mbeconetwork.org

CONTRIBUTORS:

**Arun Antony, Jared Bunkowsky,
Daniel Chevrier, Dave Courchene,
Adam Grycko, Glen Koroluk, Katrina Kroese,
Kristen Malec, Meghan Ostrum, Robert
Parsons, Larry Powell, Shwingping Thomas,
Sophie Touchette**

Design & Layout: Tracey O'Neil
www.simplerlifedesigns.ca

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Member-at-Large *Member-at-Large*

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the Canadian Environmental Network.

Individual subscriptions to *Eco-Journal*
are available as part of a supporting
membership to the Manitoba Eco-Network at
a cost of \$30. Group membership dues are
\$50. Associate membership dues are \$100.

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Manitoba Eco-Network is a registered charity
(# 128446846 RR0001).

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The advertising deadline for the
Spring 2019 edition is May 1, 2019.

Executive Director's Message

By Glen Koroluk

I WISH TO ACKNOWLEDGE that we are located on original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene Peoples, and on the homeland of the Métis Nation. We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

These are not my words, but those written by a friend and words that I strongly believe in and act upon.

All people and cultures in society must reconcile and collaborate in order to further the advancement of humanity. That collaboration must also happen within the structures we create to govern ourselves, whether at the political level or at the community level.

In my years of working and volunteering in the food sovereignty, environmental advocacy and community development sectors within civil society, I am amazed at the enthusiasm and commitment of the people who dedicate their energy and livelihoods towards sustainability and social justice.

Organizations working at the community level remind us that as global citizens, we must conserve resources and energy, use renewables and move towards a circular economy. We need to use climate-friendly modes of transportation, actively walk and bike more often and carpool. We need to grow more local sustainable foods, eat less meat and dairy products and build more natural spaces within our urban settings, where most North Americans live today. Consume less, is the motto. And if we have the time and the financial opportunity to experience the natural beauty of planet earth, then we can hike, bike, canoe, fish, camp and explore our wilderness. As we further disconnect ourselves from the natural world, experiential learning and getting out into the bush, purchasing food from a local CSA farm, growing a garden, planting a tree or building trails, are imperative actions to take, especially for our youth.

Organizations working at the political level are engaged with decision-makers at the municipal, provincial, federal, indigenous nation, and international levels to push for laws, policies, and programs that protect our environment from further degradation. From blockades, marches, and strikes to policy development, environmental hearings, and legislative committee meetings, these are the actions that citizens and organizations must engage in. Humanity is at a crucial stage, given that impacts associated with climate change are already in play and the biodiversity of the natural world is in rapid decline.

As a participant at the recent Climate Jam at the University of Winnipeg, I am hopeful that collaborations, whereby those working at the political level and those at the community level, will become the norm. In order to grow the environmental movement in this region, we all must work together as much as possible to counter the challenges that lie ahead.

In my tenure with the Manitoba Eco-Network, I will touch base with the many groups out there (new and old) and listen to what the needs and interests may be and whether the Manitoba Eco-Network can facilitate action and help start new initiatives that best serve the movement. 🌱



Beaver reclaiming their environment on Omands Creek beside Walmart, Fall 2018

<< continued from page 1

Making Winnipeg cont'd...

ENVIRONMENT

MADELINE STANLEY:

“Use sensors and the internet of things to detect water quality and sewage spills into Winnipeg’s waterways.

“Manitoba is the land of 100,000 lakes, but here in Winnipeg we continue to release raw sewage into our rivers and lakes. In fact, there is evidence of industrial sites leaking raw sewage into our waterways daily and we don’t hear about these issues until there is a *news flash* or extensive harmful algal blooms form on Lake Winnipeg.

We can learn from the *City of Stockholm*, which has implemented a source-to-sewer Internet of Things network of sensors to monitor water quality (such as pH, temperature, conductivity, dissolved oxygen) throughout the city’s water system. Data is collected in real time and analyzed with big data analytics to inform and warn city officials about bacterial contamination in drinking water, wastewater release, pollution or algal bloom production so that they can make quick, smart decisions.

There is a large opportunity for the City of Winnipeg to implement an IoT network throughout our source-to-sewer network. For example, if a sensor detects contamination downstream of a wastewater facility the analytical network could respond by adding chemical treatment or shutting gates to the downstream ecosystem. The integration of these technologies, which are relatively low cost, may resolve some of the largest contributors of point source pollution to downstream ecosystems, such as Lake Winnipeg.”

ENERGY

GEOFFREY GUNN:

“Make buildings smarter to make Winnipeg more energy efficient.

“Although Manitoba’s electric grid is almost entirely powered by renewable hydroelectricity, fully half of our winter non-transportation energy use still comes from natural gas and fossil fuels. Luckily there are more ways than ever to be smarter about our energy use.

Smart thermostats can now learn how to heat and cool buildings more efficiently and direct heat to the places it’s needed, and in new neighbourhoods we can choose efficient district heating powered by biomass or geothermal systems.

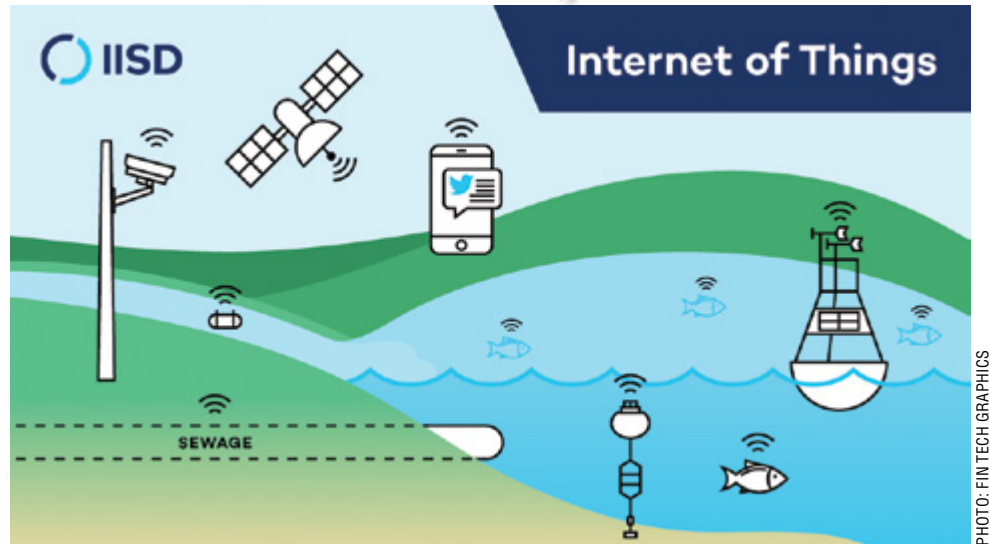


PHOTO: FINTECH GRAPHICS



PHOTO: ISTOCK-4581090

“Winnipeg still faces a multitude of urban challenges ranging from unreliable public transport to inequitable access to health care. Despite some worthy attempts, Winnipeg also lags behind its Canadian cousins when it comes to implementing smart, city-wide solutions.

Digital technology empowers networks by linking sensors to controllers with WiFi or cellular technologies. These micro-networks heat rooms, houses and even office buildings more efficiently because they develop more realistic models of airflow and what the needs of users are.

More practically, we can look to innovative projects like the *Prince George District Energy System* that uses low-carbon biomass to heat multiple buildings across downtown, saving 1,900 tonnes of greenhouse gas emissions each

year. This technology used to be more common in industrial facilities, but innovative cities are re-examining it as a way to reduce their carbon footprint and to save money.”

TRANSIT

SUMEET BATH:

“Make Winnipeg Transit more efficient by monitoring usage in real time.

“Despite enjoying a growing population—by an average of 1.7% per year since 2013—Winnipeg’s transit system has been *experiencing declines* in ridership for the last few years.

While reasons for this decline abound, what is clear is that healthy use of a reliable public transportation system could help Winnipeg to ease traffic congestion issues (and reduce greenhouse gas emissions); allow those with a low income to navigate the city better; and promote tourism.

Smart technologies could help Winnipeggers get a better real-time understanding of how long they have to wait for a bus to arrive, and where their bus is currently located, so they can plan their trips better, and reduce waiting times, especially in the winter.

This can be achieved by placing GPS tracking devices in buses to monitor their actual locations—real-time information that is then accessible via the existing Winnipeg Transit app and informs Google Maps. To improve sophistication, a complement could be using Internet of Things technology to track riders’ cell phone movement to better locate buses, as well as harvesting information from riders’ social media posts regarding transit movements and late arrivals.”



Food Waste is a Bigger Problem Than You May Think

By Kristen Malec, Compost Program Coordinator at Green Action Centre

THE VAST MAJORITY of food waste occurs in the food industry and not in the household.

According to a new report, *The Avoidable Crisis of Food Waste*, over half (58%) of all food produced in Canada is wasted, and 32% of this wasted food is avoidable. This means that 11.17 million tonnes of food fit for consumption are ending up in our landfills.

Previously, we had understood that households were responsible for the largest proportion of food waste, but this new report shows this to be incorrect. 79% of avoidable food waste actually occurs in the food industry, and not in households.



“ If food waste were a country, it would be the third largest emitter of greenhouse gas emissions following China and the United States.

Food waste is a crisis! It is both unjust and environmentally unsustainable. There are 3.4 million Canadians living below the poverty line who could benefit from receiving this food.

Resources used to produce, process, and distribute the food are wasted when we waste food. Not only that, the impact of food loss and waste on climate change would come as a surprise to most people. According to the U.N. Food and Agriculture Organization (FAO), food waste contributes 8 percent of global gas emissions. To put this statistic into perspective, if food waste were a country, it would be the third largest emitter of greenhouse gas emissions following China and the United States.

From the farm to our fridges, food waste occurs at each stage of the food value chain (primary production on the farm, processing of food into items such as canned soup or tomato sauce, distribution to grocery stores, consumption in restaurants and households).

How Can We Change the System to Reduce Food Waste?

The authors of the *Avoidable Crisis of Food Waste* came up with suggested actions for government and industry in order to address the systemic problems in the food industry. These are just a few of the suggestions:

- i. **Create mechanisms for measuring food loss and waste.** Currently, there is no standardized system within the Canadian food industry to measure, value, and monitor food loss and waste (FLW). Without this, there is no way for the industry to see the benefits of reducing FLW and therefore the status quo is viewed as easier and cheaper.
- ii. **Better communication from the government to increase food industry awareness of Food Donation and**
- Good Samaritan legislation (which protects food donors from liability).**
- iii. **Create a standardized system which makes food donation and redistribution easy, and identify infrastructure gaps preventing redistribution.** This would include a central communication system to connect food donors and rescuers, along with clear processes and guidelines of how to donate food. A great example of this is www.foodrescue.ca, a food rescue organization created by Second Harvest operating in Ontario.
- iv. **Education to increase understanding of best before and expiry dates, and**

when it is safe to consume and donate products past their best before dates.

How Can You Reduce Food Waste at Home?

Even though the majority of avoidable food waste occurs within the food industry, individuals can make a difference. By developing more informed shopping techniques and becoming smarter grocery shoppers, we can pressure manufacturers and retailers to change. Actions can sometimes speak louder than words.

- Understand the difference between best before dates and expiration dates. Best before dates have nothing to do with food safety. A best before date tells you how long unopened food is at its freshest. After a best before date, food is usually still okay to eat. Expiry dates are different from best before dates and are only used on foods where it is very important that the nutrients be exactly correct, like baby formula and meal replacement drinks (e.g. Ensure or Boost). If a food has an expiry date on it that has passed, it should not be consumed.
- **Purchase imperfect fruits and vegetables instead of avoiding them.** Stores only stock aesthetically pleasing produce because consumers tend to avoid the blemished or bruised fruits and vegetables. This leaves farmers with excess produce that is unmarketable because it doesn't fit our aesthetic standards. By purchasing the “ugly” produce, you're telling the food industry that there is a market for imperfect fruits and vegetables.
- **Don't let yourself be discouraged from purchasing the last couple of fruits in a bin, or the last box of cereal on the shelf.** Grocery stores will overstock their inventory so that their shelves are always full. This is because consumers tend to avoid products on shelves that are half full or in half empty bins. Choosing dented or damaged packaging can also keep it out of the landfill.

continued to page 7 >>

Shoreline Restoration with Natural Landscaping

By Katrina Kroese, Education Programs Coordinator at FortWhyte Alive

FORTWHYTE ALIVE'S LAKE EDGES are quietly undergoing a magical transformation, thanks to a bit of human effort and some amazing native plants.

FortWhyte Alive is a 660-acre space for humans to connect with nature. We are located in southwest Winnipeg and home to 5 lakes, many wetlands, aspen forests, grassland areas, and trails and facilities which are open year-round.

A close look into FortWhyte's history shows an industrial past which damaged the land. The 5 lakes were excavated during Canada Cement's clay mining operations in the area, starting in 1911. Bulldozers and other machinery left steep shorelines and a barren landscape.

As floodwater topped up the pits to form lakes, one by one, the 5 clay pits were rendered obsolete. Fish were stocked, waterfowl were released, and in 1966, a small group of nature-lovers established a new private, non-profit organization which would grow up to be FortWhyte Alive.

Today, though FortWhyte's shorelines host a variety of grasses and perennials, the steep banks continue to be prone to slumping and erosion, having a negative impact on lake water quality and wildlife habitat value. To combat this problem, FortWhyte has been gathering groups of volunteers to help improve our shorelines.

Expert advice from Manitoba Conservation Districts Association has us using native willows (*Salix* spp.), which quickly grow massive root systems to hold soil together. Willows are amazing shrubs, which already grow abundantly on FortWhyte's property.

Starting willows for planting is almost a magical process. A rooting hormone called indolebutyric acid produced at the growing tips of branches means that clipped willow stems, when placed in a bucket of water, will produce adventitious roots. Willow water can even induce rooting in other shrubs, such as dogwood.

Our willow clipping crew meets up and heads out in advance to clip hundreds of stems for shoreline restoration sessions. We take early spring cuttings, trimmed before air temperatures rise above an average of 5 Celsius, or we cut in fall after leaf drop. Differently sized clippings have been used, from small stems 30



PHOTO: GARY BROWN, FORTWHYTE VOLUNTEER.

Volunteers planted over 1500 pencil-thin willow cuttings, 600 dogwood cuttings and 100 live willow stakes by pushing, pounding or trenching them into shorelines at FortWhyte Alive in October 2018.

“Why not try to harness this botanical magic and plant your own willows on a shoreline in your own backyard or at the cottage? You'll protect your property from erosion, and help support a healthy environment.

centimetres long and about the diameter of a pencil, or up to 1 metre lengths about 5 centimetres in diameter. Stems are soaked in water for 14 days or more. On planting day, we push or hammer the stems into the ground near water as deep as possible, so only about a thumb-length appears above the soil surface.

Water is important for willows, so rainfall and proximity to the water's edge are considered. Planting in spring can result in better success in a drier area. It's really one big experiment!

With these instructions, why not try to harness this botanical magic and plant your own

willows on a shoreline in your own backyard or at the cottage? You'll protect your property from erosion, and help support a healthy environment.

Interested in being involved in shoreline restoration at FortWhyte Alive? Join FortWhyte Alive and Seine-Rat River Conservation District's Chris Randall on Saturday, May 4 from 10:00am-3:00pm to help install innovative natural erosion control materials and plant living willow stems.

You can read about last fall's shoreline restoration activities online at www.fortwhyte.org/willow-planting-2018.



An Indigenous Perspective

Seeking Direction from the Knowledge Keepers of our Nations

By Dave Courchene (Nii Gaani Aki Inini – Leading Earth Man)



This article is an excerpt from a presentation given by the author at the National Climate Change Science and Knowledge Priorities Workshop hosted by Environment Canada at the Shaw Centre in Ottawa on February 21, 2019.

AS WE REFLECT ON THE CURRENT ISSUE of climate change, we must be prepared to understand the root of this reality.

The reason we have climate change is because we have broken natural law. What is natural law and how can we find our balance again?

There's no doubt about how much man has evolved, to create so much comfort, that we are all enjoying today, yet at what expense to the earth.

As much as there have been advancements in this regard, we have not evolved morally and ethically. This is the crisis of our time.

We have left our spirit behind, our spirit that defines our true identity and destiny as human beings, which is to be stewards of the earth.

We need to understand this part of our nature, that deep part of us that we refer to as the spirit.

Indigenous people have always lived believing in the power of the Spirit. The challenge

for many to understand is that the earth herself is a living entity with a spirit, which gives her purpose, duties and responsibilities. Knowing the earth is alive is a core truth fundamental to having a sacred relationship with the earth.

The spirit in each of our beings carries moral and ethical principles of what should be the basis of our human conduct. We understand these moral principles as natural laws. Natural laws are innate to all living beings. They are the invisible laws that govern all life. All living beings, including Mother Earth herself, are governed by natural laws – whether they know it or not.

At the end of the day, we determine who we are by what we do, through our actions.

To the Indigenous, the symbol of the circle reflects the power of natural law. We see the circle in the sun, the moon, the earth; in the cycles of the seasons, and in the cycle of our life-givers, the women.

There is a natural law of the earth, the Law of the Circle – *Onjinaywin* in our Anishinabe language. Whatever we put into our circle sets the consequences of our actions, and returns multiplied.

Natural laws and forces of nature are self-enforcing, more powerful than any human laws we could possibly create. Every act of kindness sets off a chain reaction with the powers of nature that are in support of life.

Our elders warn the people, “Be careful what you put into your circle.” If you harm any living beings, nature dictates there will be a consequence, which could be realized not only for oneself but also one's children and descendants.

Indigenous peoples have known natural laws of living and surviving on the land. What humanity needs most now is to learn the natural laws – the rules of conduct we must follow in defining a sustainable relationship with the earth and each other. Some examples of natural law –

- Don't take more than you need from the land to survive. If you take too much, your greed will increase.
- Treat all life with respect, and abundance will return to you.
- Show gratitude for whatever you receive from life, and life will return its blessings.
- Give back to the earth by returning her love, and making offerings, a common practice of Indigenous people and the earth will continue to sustain you.

When we act according to our sacred teachings, we draw the same force that we have given

from nature. Love draws more love. Acting with courage draws more courage into your life. Like attracts like, spiritually.

Our biggest challenge as humanity is to shift from negative to positive values that sup-

port the natural laws of the earth. Our approach to seeking direction is to be-

“Indigenous peoples have known natural laws of living and surviving on the land. What humanity needs most now is to learn the natural laws – the rules of conduct we must follow in defining a sustainable relationship with the earth and each other.

port the natural laws of the earth.

I humbly propose working with Indigenous Knowledge Keepers to help understand natural laws and lay down values that are in support of life.

The Turtle Lodge is a central place that respected traditional Knowledge Keepers from across the continent have declared their central house of knowledge. These are Knowledge Keepers who still speak their ancient languages, who know and have kept the practice of our ceremonial ways of seeking and sharing knowledge; the ones who our communities have traditionally sought out for guidance; the ones who know the natural laws and teachings of our people. There are a few of these Knowledge Keepers still left amongst our Nations. If you want to learn, we invite you to come into our sacred environments, present tobacco, and listen and engage in our processes of seeking knowledge.

Indigenous Knowledge Keepers can help support humanity in coming to terms with our true destiny to become true stewards of the land. By taking care of the land, we begin to learn the values and practice the behaviours required to maintain real success – founded on strong relationships with all life on the earth, including all peoples of the earth. Loving and taking care of the land ensures our survival as a species that chooses to be kind and giving. Nature reciprocates generous behaviours.

The land has meant everything to our existence as Indigenous peoples. It is in the spirit

gin in a ceremonial context. Our ceremonies are not for show. The ceremonies of the Pipe, the rattle and the drum represent our sovereignty as a People. They are the gifts we carry, the tools we know how to use, to connect in gratitude with the higher spiritual intelligence that enforces natural law.

One element of our work as Knowledge Keepers at the Turtle Lodge is conducting the rite of passage for young women and men entering adulthood each spring. In their rite of passage, youth become connected to the land, the original mother and teacher for us all. They find their own identity and purpose by going into ancient ceremonies, guided and led by the Grandmothers and Elders.

A boy becomes a man, giving of himself by fasting for four days, seeking a vision or dream on the land, that will give him his purpose and meaning in life. It is true that all men must be initiated by Woman to understand life's sacredness. And so a young man must seek a vision for himself on a Vision Quest and be initiated by Mother Earth.

The young girls who have just begun to bleed for the first time are brought to the Grandmothers, who provide sacred ceremony and instruction for them on their responsibilities as sacred life givers and water carriers, and how to honour and take care of themselves as women.

As the Knowledge Keepers of our Nations, we welcome the opportunity to be a part of the process in seeking direction for the very serious issue of climate change. We want your help, and we want to offer ours, drawing on each other's strengths and knowledge, to help define a new vision for humankind.

Together, we can change the whole narrative in this country. It is important to leave a legacy for our children that can ensure they can have a future. This will require a change of heart, a heart that acts with kindness and respect. 🌱

Known as Nii Gaani Aki Inini (Leading Earth Man), Elder Dave Courchene is recognized internationally for his spiritual leadership and stewardship of indigenous knowledge. Dave is the founder of the Turtle Lodge Central House of Knowledge in Sagankeeng First Nation in Manitoba, an internationally renowned center for sharing traditional Indigenous knowledge and for action on climate change.

<< continued from page 4

Food Waste cont'd...

- **Avoid buying large quantities of products you don't use frequently, and avoid two for one sales if you know that you will not use that second brick of cheese.**
 - **Start planning your meals and make grocery lists.** If you plan your meals for the week, you can go to the grocery store and buy only what you need. This will help you to avoid overstocking your home with food you don't need and in the end, will spoil before you can get to it.
 - **Purchase a Community Supported Agriculture (CSA) share.** CSAs are great because you get to bypass the grocery store and receive fresh, sustainably grown vegetables directly from a local farmer. This type of farming helps to avoid waste created from aesthetic grading standards and overproduction resulting from produce that distributors no longer want. It's usually a surprise what you receive in your weekly box. You get what was harvested that week, which is in tune with the seasonality and unpredictability of farming. Check out CSA Manitoba for more information and for participating farms. <https://csamanitoba.org/>
- For more ideas, follow Green Action Centre on social media for our weekly food waste reduction tips starting this April! 🌱

Are You at Risk?

Farmers, pesticides and health

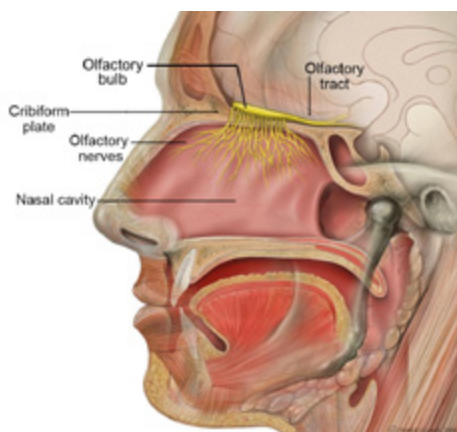
By Larry Powell

“Poor sense of smell predicts higher mortality and risk for neurodegenerative diseases after accounting for other risk factors such as age, sex, smoking and health status. - Dr. Chen

PHOTO: LARRY POWELL

IF YOU'RE A FARMER who generously applies certain pesticides to your crops - losing your sense of smell has just taken on a whole new meaning. It could foreshadow health problems down the road.

Decades of **research** - recently published - has found a significant link between a chronic loss of smell (olfactory impairment or “OI”) among American farmers, and their high exposure to certain chemicals they applied to their fields. Far from being a minor ailment, “OI” has long been identified as one of the earliest and most important symptoms of several neurological diseases, including Parkinson’s and Alzheimer’s.



The human “olfactory” system governs our sense of smell. Image - public domain.

Beginning in the ‘90s, a team of US scientists surveyed more than 11 thousand farmers from Iowa and North Carolina. They were asked about their experiences with farm chemicals during their lifetimes.

In 2015, there was a follow-up survey. Almost 12 hundred (10.6%) reported they had either lost or significantly lost their sense of smell. And those who reported accidents in which they were exposed to unusually high

levels of pesticides, were almost 50% more likely to report the symptom than those who did not. These mishaps are identified in the research as “High Pesticide Exposure Events” or “HPEEs.” In them, the farmers either swallowed, inhaled or spilled the pesticides on their skin.

And those who did not wash thoroughly with soap and water within four hours of exposure stood a greater chance of developing “OI”. In other words, those who washed quickly likely helped reduce their harmful effects.

The pesticides named in the analysis include DDT, an insecticide no longer used in North America. The researchers believe the older farmers reporting symptoms were exposed to it, even before it was banned back in the ‘60s. Another banned insecticide, lindane, is suspected of playing a similar role.

Both are persistent and can still be found in food, the environment, and even human tissue. They belong to a family known as organochlorines. Even before this latest research, organochlorines had been associated with both Parkinson’s and dementia.

Four other pesticides are also implicated. They include 2,4-D, a popular weedkiller still in use.



Honglei Chen, MD, PhD, professor of epidemiology, Michigan State U.

In an e-mail to the author, the lead author of the study, Honglei Chen (left) further explains, “Poor sense of smell predicts higher mortality and risk for neurodegenerative diseases after accounting for other risk factors such as age, sex, smoking and health status.”

The report concludes: “To the best of our knowledge, our study provides the first empirical evidence that acute high exposure to pesticides may lead to poor sense of smell among older farmers.”

The research was conducted by nine US experts. They represented groups including the National Institutes of Health and the National Cancer Institute. Their report was published in January in the journal, “**Environmental Health Perspectives**.” It calls for more studies to further explore the issue.

Larry lives in Shoal Lake, where he publishes *PlanetInPeril.ca* – “where science gets respect.”



A ground sprayer in Canada, where farming methods, including heavy inputs of pesticides, closely resemble those in the US. Photo. By Larry Powell.

PHOTO: LARRY POWELL

When Will Solar be Generally Viable in Manitoba?



Solar PV Installation at Fort Whyte Alive in Winnipeg.

PHOTO: ROBERT PARSONS

By Robert Parsons, Jared Bunkowsky, Adam Grycko, Shwingping Thomas, Daniel Chevrier, Arun Antony and Sophie Touchette

IN NOVEMBER 2018, the National Energy Board of Canada (NEB) released a new report examining the financial viability of solar photovoltaic (PV) power across the country. Results presented in the report entitled “Economics of Solar Power in Canada,” were not positive regarding near-term prospects within Manitoba. Such findings, though, are not surprising. Manitoba’s existing grid is dominated overwhelmingly by hydroelectric generation, affording us already electricity with both low costs and low greenhouse gas (GHG) emissions.

Solar advocates in Manitoba were encouraged in 2016 when Manitoba Hydro began a two-year pilot program for small-scale solar PV installations, offering the most generous incentive in Canada, upwards of \$1,000 per kW. Interest in the program was much stronger than expected. Despite protestations, though, the program ended at the appointed time in 2018, although with approved projects permitted

further time to complete an installation.

It is important to note that under certain selected circumstances, it is known that solar PV indeed can be economically viable in Manitoba. Such conditions, however, are not generally applicable, even considering the generous incentive. In the analysis by the NEB, Manitoba ranked consistently among the least promising jurisdictions, requiring grid-based electricity prices in all cases to be dramatically higher than current levels in order for solar PV to become generally economical.

Two key factors affecting the lack of viability are the still high upfront costs for solar panel installations and financing costs. Solar advocates have tended to de-emphasize the latter. For any long-lived asset similar to a house or a vehicle, however, these do need to be included and can be significant. At the same time, it is well known that installation costs for solar PV have been dropping, and will likely continue so into the foreseeable future, while grid-based

prices continue to rise, in particular in Manitoba to pay for expensive new dams and transmission projects.

As such, we set out to examine at what point in the future so-called “grid-parity” might be reached in Manitoba. This is when the cost per kWh of electricity from solar PV is at or below the unit utility price from the grid. We examined in more detail small-scale, residential installations of no more than 10 kW, often termed “roof-top solar.”

Several broad assumptions were based on Manitoba Hydro information, including an expected 25-year life, and a 15% capacity factor. The latter represents the proportion of a year, i.e., portion of 8,760 hours, at which a generation system effectively operates at full capacity. We also assumed an annual discount rate (cost of money) of 4.9%, which happens to be the interest rate Manitoba Hydro made available for the financing of approved solar projects.

continued to page 10 >>



<< continued from page 9

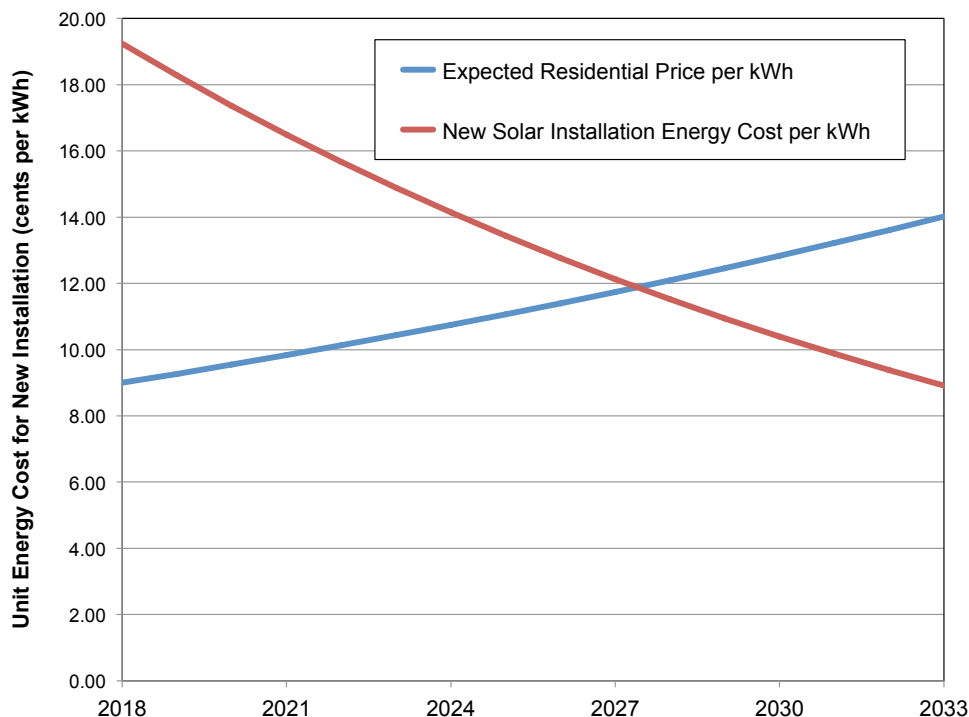
When will solar cont'd...

In terms of expected residential prices as the baseline, we turned to Hydro Quebec. They have published an annual report entitled, "Comparison of Electricity Prices in Major North American Cities," and include consistent data for Winnipeg. Hydro Quebec's numbers are slightly higher than Manitoba Hydro's posted energy prices per kWh, reflecting a more all-in figure, including all rate components. Based on their data over the past decade, it is also clear that residential electricity prices here have been increasing consistently at a compound annual growth rate (CAGR) of approximately 3%. As such, we started with Hydro Quebec's Winnipeg data point for 2018, and extrapolated forward using a 3% annual increase.

In terms of solar PV installation costs, we started with values based on the data outlined for residential applications in the 2018 NEB report. We then assumed, consistent with the Canadian Solar Industries Association (CSIA), that solar PV installation costs would continue to decline over the next 20 years, by roughly 5% each year. We lastly made a key assumption that a solar PV system was not deemed as viable until the expected cost per kWh over its entire lifetime was lower than the corresponding grid price in the year the new system was constructed.

Our results are presented as two curves in the enclosed diagram. As illustrated, these indeed cross around 2028, reflecting the expectation that solar PV will become lower than Manitoba grid-based residential prices by that time. In 2028, the expected lifetime cost of a new solar PV system is about 11.5¢ per kWh, compared to an assumed grid-based residential price of just over 12¢ per kWh. This is somewhat surprising in that solar PV appears to become competitive even in a "last hold-out" jurisdiction in North America less than a decade from now.

The obvious question is what might be key implications of such a major change? The likely answer is "not much different." The demise of our public utility, descending into the abyss of a "death spiral" as consumers abandon Manitoba Hydro in favour of solar PV, is highly unlikely. A recent article in the December 22, 2018 issue of Economist Magazine shows in the U.S. that despite the economics of solar PV continuing to improve there, actual installations of residential solar panels began leveling off over the past few years.



Comparison of Projected Future Solar PV Cost versus Expected Manitoba Hydro Residential Price.

“It is somewhat surprising that solar PV appears to become competitive even in a “last hold-out” jurisdiction in North America less than a decade from now.

Solar PV will certainly become a viable option to consider in the future, however, not all consumers are necessarily keen about solar PV. Further, like any generic product a market saturation level can be reached. One factor in this regard is the onus for maintaining the system. For grid-based electricity, Manitoba Hydro has responsibility for service, including restoration if anything adverse occurs. Yet, if anything goes wrong with solar PV, it is the owner's responsibility entirely.

Grid-based electricity has been traditionally sold in an overly simplistic manner, i.e., primarily a per kWh price for residential consumers. Yet, electricity is complex, involving not just energy provision, but delivery capacity, voltage level, current level, frequency, harmonic distortion control, etc. Users of solar PV systems inevitably require some sort of backup service, and provision of backup has a monetary value. As Manitoba Hydro gains actual experience with a large number of solar PV

systems on its grid, the most likely outcome we may see involves proactive changes in service rate structures to reflect the new reality. 🌱

Parsons teaches Sustainability Economics at the I. H. Asper School of Business, University of Manitoba, while Bunkowsky, Grycko, Thomas, Chevrier, Antony and Touchette are MBA-students in the Asper program.

Contact information:

Robert Parsons' U of M email address is:

Robert.Parsons@umanitoba.ca

Robert Parsons' cellular phone number is:

(204) 880-4287.

PHOTO: ROBERT PARSONS

Winter Camping

A love story

By Meghan Ostrum

AS A FAMILY, we love camping and have camped in seven provinces. We have never camped in the winter. We enjoy fall camping with the crisp fall air and no mosquitoes. The coldest we have camped in is 3°C and that was summer camping. We have woken up to find light snow falling for a few moments very early in the morning and frost on the car. We have never camped in the winter and were very excited to try something new.

We did have a few challenges. The campsite had a fire pit and we planned to use it if the BBQ/stove did not work. Our matches did not work. They were nice and dry, but they would not light when we used the strike sides on the box. So, our supper that first evening was food that did not need to be cooked. The next day we drove and bought a BBQ lighter and that worked well. The other challenge we had was we left the campfire toaster at home. So, we placed the bread directly on the grill and watched them carefully - similar to how you would make French Toast. The challenges just made it more fun and we learned how to cook toast differently and we may leave the campfire toaster home again!

The biggest difference between summer/fall camping and winter camping is that the sun sets early. You need to decide if you want to cook supper before it gets dark or after it gets dark. We were eating outside and decided that we would cook in the twilight and eat once it was dark.

You will be tired and sleep like you have not slept in days. We had a nap every day. You sleep wonderfully when its cool out in the summer. This is even better. You do have to dress properly - day and night. If you are properly dressed and dry, then winter camping is wonderful. Pack many pairs of socks and ensure you have enough for double layers of socks. Slippers for

inside are a clever idea so your feet are warm and dry. Keep your boots in a small area so the snow stays there, and you will not step in it and get your feet wet. People kept telling us we would freeze - we were actually quite warm and even hot one night.

Packing food was an experience. Usually, in the summer we are concerned with food staying cold and we pack ice packs in a cooler. With one large icepack in the cooler, we packed 4L of milk, cheese, hummus, margarine, yogurt, and some chicken. Everything was nicely cold and some of the meat was frozen for days. The milk did freeze in a cup when left on the picnic

“There are so many things you can do in the winter. Snowshoes, cross-country skiing, skating, ice fishing, and snowmobiling.

table after 30 minutes or so. Packing fruit and vegetables was an adventure. Grapes freeze. Apples did well. Carrots freeze and get frosty. The one food item we packed that we never pack with summer camping was chocolate - it did not melt and make a mess. Once we got a fire going, we toasted marshmallows and popcorn. The popcorn was frozen, and it took a bit longer and did not fully pop. It was still tasty. The marshmallows and popcorn smelt even better than in the summer. Pack whatever you will enjoy, and pack more than you would eat in the summer. You will be hungry.

Four deer came and wondered by us and were totally unconcerned about the few people around. We heard an Owl call as it flew over our heads. A few Magpies flew past our site the next day. There was a lot of Chickadees around

and they loved the wood piles. One Chickadee came quite close to us (within 4 feet) and was eating stuff off the snow on the ground. One night, we were quietly watching a video and in the background was a cricket. It took a minute to realize it was on the video. So, we were quite comfortable and warm.

There are no mosquitoes, no ticks, and very few people. The sky is dark early, and you can bring a telescope or powerful binoculars and watch the skies. Early in the evening, we saw two shooting stars. It is super quiet and everyone you meet is super friendly and happy to be there. Everyone we met loves the outdoors, camping, and winter. There are so many things you can do in the winter. Snowshoes, cross-country skiing, skating, ice fishing, and snowmobiling. If you are going to do any of these activities, check the trails as to what they are groomed for. Some trails are groomed specifically for certain activities and you do not want to snowshoe over a cross-country groomed trail.

Night time is chilly. Dress warm and in layers. Same as the day. Find out what temperature your sleeping bags are rated to. You may want to wear more clothes at night with a warmer rated sleeping bag. Notice how you sleep and what you are comfortable with. You can spend some cash and purchase winter sleeping bags. If you do, be advised they are bigger than summer bags and you'll need to pack accordingly.

If you are comfortable you will have a wonderful time. You can go winter camping with some knowledge and clothes. Do not forget the extra socks. Make sure your matches work and/or bring a BBQ lighter. Have fun with a new experience. That is fine if you did not enjoy it. Not everyone enjoys the same things, but we can support each other and not dismiss or dismiss each other.

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