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By Ingrid Sapona | 16-minute read

In this Quarterly Review we cover two topics that, though not directly related, at least tangentially relate to climate change. The first topic is eco-friendly retrofits. The connection to climate change here is the fact that buildings in Canada account for a not insignificant amount of direct greenhouse gas emissions that are of concern when it comes to climate change. The second topic is the use of satellite data by the insurance industry. Though we look at a variety of uses for satellite data, such data is particularly relevant when predicting – or dealing with – natural disasters that are on the rise thanks to climate change.

Eco-friendly reftrofits

The 16 million+ dwellings and 482,000 commercial and public buildings in Canada account for "13% of Canada's direct greenhouse gas (GHG) emissions. And, if you include the GHG emissions related to the generation of electricity used by buildings, the total emissions attributable to this sector is 18%. Given these facts, as part of Canada's commitment to get to net zero emissions by 2050, the government has proposed a specific Green Building Strategy that aims to have a net-zero emissions and climate-resilient buildings sector by 2050. Net-zero refers to a state where GHG emissions from operations are as close to zero as possible and then balancing out any remaining emissions with an equivalent amount of carbon being removed (for example, through carbon capture). For purposes of the Green Strategy, the government

considers a net-zero-emissions building one that is "highly energy-efficient by design and uses only non-emitting energy for heat and power".

Whether driven by high energy prices or the desire to try to be a good social steward by trying to help reduce global warming, more and more building and home owners are considering eco-friendly options when they renovate or retrofit. In this section of the Review, we look at some of the insurance aspects of eco-friendly retrofits.

It's useful to distinguish between a "smart building" and a "green building". A smart building is one powered by systems and sensors (often referred to as smart technologies) that monitor building systems and optimize the building's environment and operations. Smart technologies are sensors, equipment, applications, and so on, that typically rely on the internet for connectivity. A green building is one that, in its design, construction, or operation, reduces or eliminates negative impacts – and can create positive impacts – on our climate and natural environment. Obviously, there is an overlap between these concepts, as smart technologies often play an integral role in the eco-efficient operation of a green building. However, the insurance risks and concerns related to the installation of smart technologies are beyond the scope of this paper.

Commercial Building Eco-upgrades

Eco-friendly retrofitting of commercial buildings is fairly common these days, as landlords seek to reduce their energy costs and make their buildings more attractive to tenants. Bernard McNulty, Chief Agent and Head of Claims - Canada at Allianz Global Corporate & Specialty (AGCS) say most of the commercial retrofits he sees include eco-friendly components. "A lot of building owners are seeing the value of making their buildings eco-friendly. I think it has a lot to do with the Environmental, Social, and Governance (ESG) patterns of their tenants. When a tenant is looking to lease office space and their corporate governance platform includes a commitment to ESG, one of the ways they'll look to uphold that commitment is to ensure they're in buildings that are eco-friendly," he says. "But, eco-friendly retrofits can also be done to reduce heating costs, to be able to charge higher rent, and to retain tenants," McNulty adds.

When a landlord of a commercial building decides to undertake a major renovation, from initial planning to final recommissioning of the building can take a number of years. While the retrofit is being planned – scoped, materials purchased, etc. – the commercial policy on the building continues in force. But, when the work on the retrofit work starts, in addition to the commercial policy, the landlord would obtain a Course of Construction (CoC) policy or Builder's Risk coverage, which would run for the duration of the project. Once the work is complete and the building recommissioned, the remaining term of the commercial policy would apply but, if the building is LEED certified as a result of the retrofit, the commercial policy would have an endorsement added to reflect the fact it's so certified.

LEED, which stands for Leadership in Energy and Environmental Design, is the global standard in green buildings and is the most widely used green building standard in Canada. In fact, in 2021 Canada ranked second globally on the annual list of Top 10 Countries and Regions for world for LEED certified buildings. But, LEED is not the only green building certification available in Canada. Natural Resources Canada's ENERGY STAR certification recognized high performing buildings in Canada as does the Building Owners and Managers Association's Building Environmental Standards (BOMA BEST).

All CoC coverage is custom, tailored to the specific project and often written in monthly increments based on the planned schedule of the project, says McNulty. The nature of the retrofit determines the questions and concerns the underwriters have. Insurers like Allianz have quite a lot of experience with retrofits designed to achieve LEED certification, for example, so in such cases the underwriter's have fewer questions about the materials and being used. But, if the eco-friendly retrofit isn't done to meet LEED certification, McNulty says the underwriting process is likely to seem more ad hoc. "Naturally, we'd look at the construction schedule to ensure it's reasonable. Scheduling is extremely important on big retrofits. And we'd look at the material specs on the products they are using, especially if it's something we're not familiar with. But, because LEED standards have been around a long time, we have a lot of trust in the products that have been developed and used in LEED projects, for example," he says.

The technology behind the green revolution is changing rapidly, which can pose a challenge to underwriters. If products or technologies are not widely used, or if novel designs or construction methods are used, the concern is unforeseen risks. Indeed, in its 2020 Sonar publication Swiss Re raised the question of whether green buildings will pass the test of time. Among the areas of concern noted in the publication are underperformance of products, structural deficiencies, leakage, mould, etc., all of which can lead to expensive repairs. Swiss Re noted that, " The wave of green innovation in the building sector has also brought a flood of labels, ratings and certification programmes. These make determining the relevant standards for a particular project challenging."

If the building's value has increased as a result of an eco-retrofit, the policy coverages might need to be revisited and additional coverages should be considered. McNulty says that once the project is complete, the improvements would increase the insured values of the commercial building policy and, in turn, the premium. But, he notes, the premium calculation is based on insured values, type of construction, and so on; it would not increase directly because of the energy efficient components.

An example of a special endorsement the owner of a LEED certified building might seek is coverage for the cost of recertification in the event the building suffers substantial damage. Standard policies may not cover recertification costs, but an endorsement might be available or the policy's definition of extra expense might be customized to

include such costs. The terms of business interruption coverage should also be reviewed, as returning a green property to full operation following a loss might take longer. Also, any particular special features, for example, a vegetative roof, would have unique properties and parts (a waterproof membrane, for example) that might justify higher replacement cost coverage.

Given the pace of change in green building products, if a green component is damaged, though the insurer would replace like-for-like, it's not unusual for the specific green component to not be available any longer. McNulty says that in such cases the insurer would end up replacing the damaged component with whatever the current generation of that product is. "This circumstance isn't unusual or particularly concerning to us in buildings with LEED certification, for example, because the LEED products are constantly evolving – getting better and often getting cheaper," he says.

In the event a building owner suffers an insured loss and decides to re-build to gain LEED or other certification, if their policy had a "green endorsement" it would allow the owner upgrade to eco-friendly products. Absent such an endorsement, insureds can agree to pay the difference for upgrading to an eco-friendlier product after a claim, but there are a few factors – besides cost – that could impact the decision.

Considerations such as whether the eco-friendly product is available or whether installing it may take longer are factors that can have ramifications regarding coverage. "Since most commercial policies have a business interruption component, if the upgrade takes longer, for example, because the green components have to be specially ordered and the claim remediation cannot be done within the established period of restoration, the additional delay would not be covered by the policy." says McNulty.

Residential retrofits

Individuals are also looking at ways to make their homes eco-friendlier. Consumers have come to realize that simple things like replacing burnt out bulbs with energy-saving LEDs and choosing more energy-efficient models when it's time to replace existing appliances can help reduce their utility bills. So, when it comes to time to renovate or replace major systems like their furnace or roof, they are open to considering eco-friendly options.

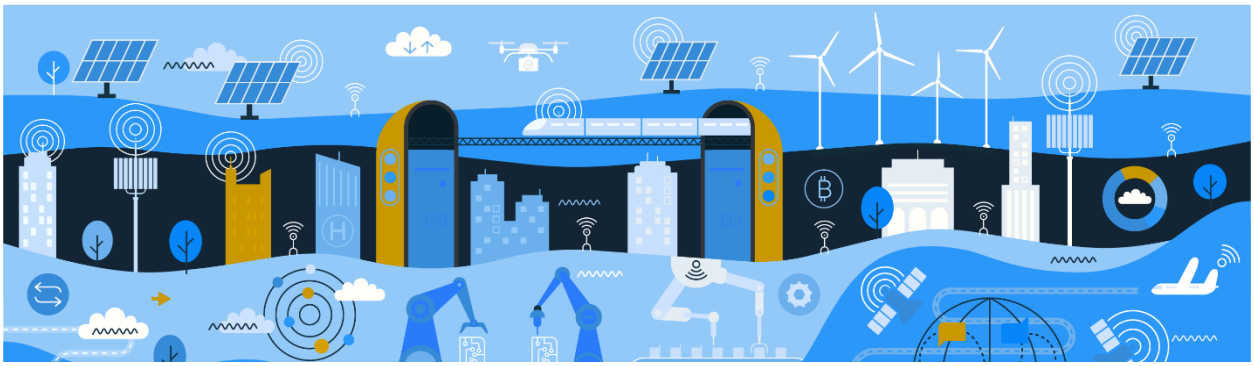
Canadian insurers have started seeing their role in encouraging clients to reduce their carbon footprint so they have begun offering coverage that encourages eco-friendly retrofits in the event of a claim. Huma Pabani, Director, Environment & National Issues, Environment, Government and Industry Relations at TD Insurance explains, "Our Eco-Efficient Rebuild endorsement fits into our ESG strategy, and is part of our efforts to help homeowners address and increase resilience to climate-related risks."

TD Insurance's Eco-Efficient Rebuild endorsement is included, at no additional cost, in TD's Enhanced Home Coverage, which is available on home, secondary home, condo, secondary condo, and tenant insurance packages. With this coverage, in the event an

insured has a claim, they can install environmentally friendly or energy efficient materials up to an extra 10% over the amount of the claim, up to $50,000. This coverage was launched in 2020 but, because the endorsement is embedded in TD Insurance's Enhanced Home Coverage policies, Pabani couldn't say whether the endorsement makes the Enhanced home Coverage a more attractive option. Other insurers in Canada are offering similar coverage, though Pabani believes in some cases they are optional endorsements or, if they are bundled as TD's is, the limits are lower.

Conclusion

Renovations are costly and unsettling at the best of times. But, more-and-more Canadians are realizing that if they incorporate eco-friendly products and materials in their renovation or retrofit, they'll be getting more than their money's worth: they'll be doing their part to help reduce their GHG emissions.



The Use of Satellite Data by the Insurance Industry

Less than a decade ago when drones came on the scene there was quite a buzz about how they could be used for underwriting and claims to inspect things that are hard to get to in person. Though drones still have their uses, commercial satellite images and data has moved into the spotlight. In this section of the Review, we look at some of the ways the insurance industry is using satellite data.

Sputnik 1, the first man-made satellite to orbit the earth, was launched in 1957. By 1965 Intelsat 1, the first commercial satellite, was launched. It provided telecommunications and broadcasting service between North America and Europe. Finding out the exact number of satellites orbiting the earth today is tricky – it seems to depend on the source you consult and even the day you do the research. It's safe to say that there are over 5,000 operational satellites orbiting the earth right now, including government, military, civil, and commercial satellites.

What is satellite data

Satellite data is basically information about earth that's gathered by sensors on man-made satellites and transmitted to earth. High-resolution photos that we've all seen in news stories are just one example of satellite data that comes from "earth observation

satellites". Such photos come from passive remote sensing. Spatial resolution determines the smallest object the satellite's sensor will detect on the ground. The smaller the area covered by a pixel, the higher the resolution of the image. If the resolution of a satellite sensor is 100 metres, then the smallest image a pixel can pick up is 100 meters. Spatial resolution, of satellite images is usually expressed in meters. Temporal resolution of an image describes the period of time the data was acquired.

Satellites can also collect data through active remote sensing, which involves the satellite sending energy down to the earth and then measuring the energy received back through sensors. So-called SAR satellites, which stands for synthetic aperture radar, use active remote sensing technologies like radar and lasers. SARs can provide all sorts of data, such as elevation information and the amount of moisture in soil, rock, and vegetation. Active remote sensing works any time – day or night – and regardless of atmospheric conditions.

Satellite imagery data is often processed, interpreted, and augmented with other date. It is the combining of satellite images with data from other sources, all of which is analyzed with the help of artificial intelligence, that produces data that's useful for insurers. For example, Swiss Re's NatCat combines satellite imagery with hazard, loss, exposure, and other data to provide natural hazard exposure analysis for any location in the world.

Risk Modelling / Risk Assessment

Satellite data is routinely used to predict the severity of storms, fires and other naturally-occurring catastrophes. Such information is important for modelling future losses. Modelling catastrophes is necessary so that insurers and reinsurers can estimate the likely on their portfolio. But such models are probabilistic – mere approximations of future reality. While it's true that the computational power available today allows for sophisticated and better modelling, they are sensitive to the quality of the inputs on which they are based.

Once a catastrophic event happens, insurers and reinsurers must size the expected losses so that they can manage resources – both human and capital. This is when having accurate, timely empirical data is most crucial. As satellite owner and data provider ICEYE explains when describing how satellite data can be used to size flood losses, for example, " The ability to observe the extent of a flood and its depth at each location anywhere in the world … [and] [M]arrying this with information on the properties impacted empowers (re)insurers with accurate loss numbers in near real-time." Now that sophisticated observation data – what ICEYE calls "truth data" – from satellites is widely available and more affordable, companies like ICEYE expect that the insurance industry will realize the benefits of going beyond cat models when sizing losses post-event.

Underwriters

Satellite data that provides natural hazard data can provides underwriters with risk exposure insights for a single location anywhere in the world. It can be used, for example, to determine whether any modifications were made to a property that might increase risk, all without the need to do a costly physical inspection.

Claims Services

Satellite data can be used for claims services in a number of ways. It can be used for individual claims, for example, to determine if an insured's roof was damaged in a storm. A claims adjuster can use satellite data to determine when a storm went through, as well as to assess the extent of the damage to that particular property. Satellite data can also be used to prevent malfeasance, such as, claim inflation. In terms of business interruption claims, for example, satellite data can also be used to confirm repairs have been completed and the date customers returned.

In the aftermath of a big event – whether it's a hail storm, hurricane, flood or wildfire – areas may be inaccessible, but the needs of insured clients are especially important in those situations. "With satellite data you can be proactive – you identify clients in a particular area and you can figure out what resources you'll need. If it's an 'all-hands-on-deck' situation you'll be able to ensure you have enough staff to answer the calls to help your customers in that area," said Linda Paccanaro VP Claims and Quality Control at Baird MacGregor. "In the event of a wide-scale disaster, you can use satellite data to help you prioritize and establish action plans for handling the incoming volume of calls," she added.

Speeding up the claims process is critical to customer relations and loyalty and is especially important in wide-scale disasters. Having satellite data after a catastrophic event can even help you start processing claims before customers contact their broker for help. "If a person's house is totally flattened or burnt to the ground, they need money now. So if we can access data that can help us act quickly to help our customers, that's great. After all, helping people is what we're there for," says Paccanaro.

In Japan Tokio Marine & Nichido and Fire Insurance (TMNF) has been using satellite data for claims servicing after major floods. "In Japan, where TMNF has approximately 25% market share for property insurance, it's working for shorten the claims response time to use satellite data for claims. It helps us handle claims efficiently because the satellite data can help you tell what areas are most affected and so you know where to send adjusters right away. With satellite data we can tell how deep flood waters are in various areas and know where there may be more damage associated with the deeper water," explained Satoshi Ohkuma, Head of Digital Innovation, Tokio Marine Innovation Lab (New York).

TMNF has been collaborating with Finnish-based ICEYE to improve insurance claims payments since 2020. Having found that ICEYE's advanced technology in SAR image acquisition from its 21 satellites and its near time data analysis has brought its long-term

business goals related to claims servicing to reality, in February 2022 they concluded a capital and business alliance agreement.

Parametric Insurance

Sophisticated data available from satellites can also be used to create parametric – or index – insurance products. Parametric insurance provides pre-specified payouts based on trigger events, such as wind speed, amount of rain, temperature extremes, and seismic activity (earthquake). Satellite data can be used to quickly, and accurately, determine whether a trigger threshold has been passed. For example, an index-based supply chain disruption policy could be designed to pay out if there's a flood of a certain level at a supplier's location. With satellite data it's easy to get accurate, timely information to determine whether the insurance's trigger was met, making it easy to determine whether to pay out on the policy.

Considerations when buying satellite data

Cost of the data, timeliness of the information – in other words, data that is updated regularly enough to provide useful comparison – and ensuring the data attributes match your needs (images of southern Ontario won't help you assess a crop in the prairies). In terms of whether such data is worthwhile, as Scott Hastings, Vice President, Information Technology, Tokio Marine Canada, Ltd., put it, when deciding whether to buy such data – and whom to buy it from, they assess it like any other expenditure. If it provides useful information, it's in your best interest to subscribe.

Side Bar: Various government sources and organization provide free satellite data, including: NASA, NOAA (National Oceanic and Atmospheric Administration), DigitalGlobe, and many others.

Conclusion

For a long time, satellite data was primarily seen as useful mainly to large insurers and reinsurers for things like risk modelling and risk assessment. Now, thanks to the coupling of satellite imagines with vast quantities of other data, this once-exotic technology has become invaluable to the insurance industry in a variety of contexts.