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Politics, housing and climate adaptation in Ottawa, Canada

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Abstract

This article reflects on a turning point in how Canadians respond to climate change. The article summarizes research on urban flood risk and resilience in the city of Ottawa. The research involved semi-structured interviews with municipal representatives and developers in Ottawa, and began with extensive background exploration on the politics of urban development and climate change. Our findings indicate escalating debates between key public and private stakeholders—the regulators and producers of housing—regarding approaches to protecting neighbourhoods from flooding. Debates stem from inconsistent pressures imposed (or not imposed) by the market, insurers, three levels of government, geography, differing time horizons and ambiguities in climate projections. Overall, stakeholders appear siloed in their responses to climate change, which limits opportunities to collaborate on geographically-specific and community-based flood resilience. The project increased our understanding of how private and public sector actors negotiate policies, guidelines, and regulations intended to improve the resilience of Ottawa neighbourhoods. Our approach is unique, as there is scant research to date on how the building industry in Canada is responding to climate change and flood risk.

The research adds to the growing body of Canadian scholarship on urban development and climate change adaptation. Research results are of interest to municipal policymakers, urban planners, urban studies researchers, the development industry, financial institutions, insurers, and urban sustainability advocates.

Keywords: climate adaptation, municipalities climate policies, flood risk, housing, Ottawa

Résumé

Cet article reflète un tournant concernant la façon dont les Canadiens réagissent au changement climatique. L'article résume la recherche sur le risque d'inondation urbaine et la résilience dans la ville d'Ottawa. La recherche comprenait des entretiens semi-structurés avec des représentants municipaux et des promoteurs immobiliers à Ottawa ainsi qu'une exploration approfondie des politiques de développement urbain et du changement climatique. Nos résultats indiquent une escalade des débats entre les principales parties prenantes publiques et privées – les régulateurs et les

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producteurs de logements – concernant les approches visant à protéger les quartiers contre les inondations. Les débats proviennent de pressions incohérentes imposées (ou non imposées) par le marché, les assureurs, les trois niveaux de gouvernement, la géographie, les horizons temporels différents et les ambiguïtés des projections climatiques. Dans l'ensemble, les parties prenantes semblent cloisonnées dans leurs réponses au changement climatique, ce qui limite les opportunités de collaboration sur la résilience aux inondations à l'échelle géographique et communautaire. Le projet a amélioré notre compréhension de la manière dont les acteurs des secteurs privé et public négocient les politiques, les lignes directrices et les réglementations destinées à améliorer la résilience des quartiers d'Ottawa. Notre approche est unique, car il existe à ce jour peu de recherches sur la manière dont l'industrie du bâtiment au Canada réagit aux changements climatiques et aux risques d'inondation. Le projet a amélioré notre compréhension de la manière dont les acteurs des secteurs privé et public négocient les politiques, les lignes directrices et les réglementations destinées à améliorer la résilience des quartiers d'Ottawa. Notre approche est unique, car il existe à ce jour peu de recherches sur la manière dont l'industrie du bâtiment au Canada réagit aux changements climatiques et aux risques d'inondation. Ces recherches s'ajoutent au nombre croissant de travaux de recherche canadiens sur le développement urbain et l'adaptation aux changements climatiques. Les résultats de la recherche intéressent les élus municipaux, les urbanistes, les chercheurs (euses) en études urbaines, l'industrie du développement, les institutions financières, les assureurs et les promoteurs de la durabilité urbaine.

Mots-clés : politique municipale et adaptation climatique, risque d'inondation, Ottawa, marché immobilier et climat

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Introduction: Climate change and urban flood risk

Flooding disasters are increasing globally. According to researchers at the World Bank (Rentschler et al. 2022), “Flooding is among the leading climatic threats to people’s livelihoods”. The United Nations Office of Disaster Risk Reduction states that from 2000 to 2019 global climate-related disasters and major floods more than doubled (UNDRR 2020). Unprecedented spring flooding in Ottawa in 2017 and 2019 were data points in a global trend. The increasing number and severity of weather events will require greater attention to where and how houses are built (Macdonald 2019; Martin and McKay 2022; Martin et al. 2017; McGillivray 2019b).

As we describe below, many factors influence flood risk. Significantly, climate change does not impact everyone equally. Developed nations, including Canada, have more resources to devote to flood defences and regulations. Governments and Canadian taxpayers have been willing and able to pay for recovery from big flood events. Climate change also has different impacts from place to place. Some areas are impacted more than others by weather-related climate change. Because myriad variables influence climate globally and weather locally, responsible earth scientists refrain from making unequivocal projections about impacts of severe weather on any given region. This ambiguity is a major source of friction between urban development stakeholders, especially when leaders in rapidly growing cities struggle to decide where and how to expand. The situation is ironic: many new Canadians are escaping climate-related disasters, including flooding, in their home regions. Where and how shall we safely house the influx of people seeking better lives in Canada? Where are the flood lines now within areas where we want to build housing, and where will they fall in the future?

The following article covers research on the planning and political complexities of climate change adaptation in the City of Ottawa, Canada. The researchers enquired if government and housing industry actors are working together or at odds to plan and build flood-secure new housing. The article begins with a review of literature on urban politics and flooding nationally and regionally. The article then describes the research project and commentary from selected interviews with key Ottawa stakeholders, followed by a discussion of the findings.

The context for a study of flood risk in Ottawa

We chose to study Ottawa because of its proximity to our university and because it shares growth pressures and risk factors common to other Canadian cities. To understand risk in Ottawa it is necessary to understand national trends

and provincial policy. Are housing producers and regulators planning new Canadian neighbourhoods that are less at risk of flooding as a result of climate disruptions?

Growth pressures and lack of housing supply are key background variables behind this study, and our subsequent research in other Canadian cities. Ottawa's population grew by almost 9% between 2016 and 2021 according to the 2021 census (StatsCan 2021)¹. If not carefully managed, new urban development may alter natural drainage, add impervious surfaces, and add runoff to streams, thereby increasing volume of surface water flow and frequency of flooding (Rosenberger et al. 2021). In addition, the federal government advocates adding housing in existing neighbourhoods to increase housing supply (CMHC 2023). As new and existing neighbourhoods have different flood risk profiles, adding dwellings where stormwater infrastructure was built to lesser standards may increase flood risk. Relentless demand for more and denser housing creates geographically-specific, complicated and potentially expensive challenges.

Some researchers assert that housing development professionals are not adapting fast enough to the increased risks of flooding in Canadian cities (Evans and Feltmate 2019; Feltmate et al. 2020; Moudrak and Feltmate 2018). These researchers claim that perhaps 10% of Canadian homes are in flood plains and are thus uninsurable (Bakos et al. 2022; Storah in Gambrill 2023). By many accounts the costs of flooding in Canada is growing at an alarming rate (Aon 2023; Government of Canada 2023; IBC 2019; PBO 2016; Public Safety Canada 2022; Thistlethwaite et al. 2020). By one estimate, storms could result in a loss of \$139 billion to Canadian gross domestic product (GDP) by 2050, or an average annual GDP loss of 0.2%. (GHD 2022). Increasing flood events clearly pose an extraordinary risk to the broader Canadian economy, housing equity and community safety.

A key question is whether new and older neighbourhoods are equally at risk. Many older neighbourhoods were built in risky areas now known to be flood plains, whereas modern zoning and building regulations are designed to prevent new housing in known flood plains. Further, climate change may in fact reduce the risk of flooding in some areas as, for example, in cases where warmer temperatures may reduce winter snow accumulation and thus spring melt flooding in parts of the northern hemisphere (see for example NCC 2022; Gottlieb and Mankin 2023).

Climate variability makes flood mapping difficult. The Canadian government claims that flood mapping is inconsistent and deficient across Canada, leading to insufficient risk mapping and elevated risk for numerous neighbourhoods (NRCan 2023). One variable in mapping is the event threshold, defined as the likelihood of a storm that will cause flooding. Many provinces, municipalities and civil engineers use a "one in a hundred year" event probability to define flood plains, referring to a flood that has on average a 1 in 100 chance of occurring each year, or a one per cent probability in any given year. This event threshold may be insufficient given the occurrence of increasingly severe storms that exceed that threshold, and newer climate models with increasingly dire projections for flooding in many parts of Canada. Accordingly, the Canadian government is upgrading flood maps to "...inform decision-making in support of land use planning, flood mitigation, adaptation to a changing climate, resilience building, and protection of lives and properties" (NRCan 2023). Financing this recent initiative is to be matched by the provinces dollar for dollar (Province of Ontario 2022a). It remains to be seen how climate modelling will be incorporated into the maps.

According to the Auditor General of Canada, "...proactive planning is more effective and less costly than reacting to climate change impacts as they happen" (OAG 2017: Section 2.49; see also McGillivray 2019b; and Public Safety Canada 2022). However, the federal government also states quite starkly that:

...due to the absence of collaboration, coordination, alignment, and knowledge-sharing between various partners and stakeholders, and inadequate intentional investment to address climate related risks, there are missed opportunities, siloed and piecemeal approaches, objectives that are sometimes in conflict, policies and processes that block progress on resilience, and an overall inability to monitor progress and amplify successes (ECCC, 2022, p.4).

It seems that in general, Canadians are not working together to reduce urban flood risk.

Is flood risk changing real estate market tendencies? One might expect consumers to be wary of flood risk given the potential impact of flooding on the value of homes. A study by the *Intact Centre on Climate Adaptation* (Bakos et al. 2022) focusing on Canadian neighbourhoods that flooded between 2009 and 2020 found that flooding reduced house sale prices and number of houses for sale, and increased days on the market for houses in flooded neighbourhoods. However, the *Intact Centre* study only tracked property values for six months before and after flood events. Other studies have called this relationship into question, as it appears that while property values drop immediately

after a flood, they frequently bounce back over time². A key variable appears to be the willingness of insurers and governments to pay for disaster recovery after major events, which is an incentive for homeowners to rebuild high risk properties and may also serve to uncouple housing finances from flood risk in new housing (McGillivray 2017; McGillivray 2019a; Public Safety Canada 2022). Remarkably, homeowners seem unaware of their homes' vulnerability to flooding (Bakos et al. 2022; see also City of Ottawa 2019a; Thistlethwaite et al. 2020). However, as recovery costs have ballooned in recent years, insurance and government stakeholders are now debating alternatives to existing flood insurance and repeated payouts. Actuaries have begun factoring climate change into their risk calculations (Thistlethwaite and Wood, 2018), and insurers and three levels of government in Canada are re-evaluating who will assume responsibility for flood recovery in the future (Henstra et al. 2018; IBC 2019; IBC 2024; Public Safety Canada 2022). It appears risk will be transferred from the commons to individual property owners found to be at risk in new flood maps. The politics and economics of housing appear to be at a turning point, compelled partly by climate change and partly by insurers (IBC 2019; Stewart 2023)³.

Provincial politics may directly or indirectly influence flood resilience. After significant flooding in eastern Canada in 2017 and 2019, and after extensive public consultations, Ontario's Ministry of Natural Resources and Forestry released a strategy document to recommend protections for people and property from the impacts of flooding. The document notes that mitigation, preparedness, response, and recovery activities must be managed through a "strong partnership with municipalities, conservation authorities, the federal government, private landowners, industry, and Indigenous communities" (MNR&F 2020). Shortly after, the Province's Auditor General noted the lack of coordination between various ministries entrusted with building urban flood resilience (OAGO 2022) which echoes concerns from the national government mentioned earlier.

The Canadian Constitution gives provinces, including the province of Ontario, power to dictate development policies for most cities. Ontario is unique in Canada in that the Province created Conservation Authorities (CAs) which are mandated to work with municipalities to protect natural areas and mitigate flood risk. In Ontario, primary responsibility for flood mapping, a critical process in urban planning, falls upon the CAs. (Conservation Ontario 2023; Province of Ontario 2023).

Varying interpretations of climate projections seem to be reflected in provincial policy directions. The Ontario government has introduced new restrictions on environmental assessments on lands slated for development. The measure is intended to expedite approvals for new housing (Hale 2021). More recently, with *Bill 23: More Homes Built Faster* legislation (Province of Ontario 2022b), and without input from the CAs or municipalities, the provincial government scaled back the oversight powers of Ontario's conservation authorities and gave the province arbitration powers to force developments that would have been restricted by CAs. Critics claim these actions ignore local expertise and geographic contexts, potentially enabling housing development in hazard lands, or on ecologically sensitive wetlands (AMO 2022; Javed 2020; Jones 2022; Mitchell et al. 2021; Pasch and McGillivray 2019). Provincial Ministers may now potentially override municipal and/or CA opposition, and approve housing in flood zones (Mitchell et al. 2021). In response, the Association of Municipalities Ontario has claimed starkly that:

...the legislation will create serious risks to the environment and human health at a time when the impacts of climate change are evident and urgent. The proposed changes to how municipalities approve development and manage where and how growth occurs signal a move away from environmental protection when it is needed most (AMO 2022, p.4).

Industry stakeholders in Ontario generally applauded the new legislation, claiming it will reduce red tape and speed development approvals (e.g., Flannery 2022), though Toronto-area housing industry stakeholders have reportedly noted concern about potential unintended consequences and urged Ontario's government to be cautious regarding potential negative impacts on the *Conservation Authorities Act* and the oversight abilities of conservation authorities (e.g., Sayed 2022). For some, the bill has disrupted a decades-old relationship between Ontario municipalities, conservation authorities, and development stakeholders. The same government that acknowledges the risk of flooding to properties appears to be simultaneously circumventing protections for homebuyers with potentially dire long-term consequences (Conservation Ontario 2019).

The situation in the municipality of Ottawa reflects all of the issues described above. Aging stormwater management infrastructure contributes to flooding events (City of Ottawa 2019b; Mas and Garber 2019). Pressure to build (and rebuild) homes in flood-prone areas puts (and keeps) houses in harm's way. Compounded climate vulnerability

was evident in the spring floods of 2017 and 2019, and a significant one-day rainfall event that overburdened Ottawa stormwater infrastructure in August 2023 (see Duffy 2023). Ambiguity and variability in climate science aside, certain parts of Ottawa have experienced fluvial flooding repeatedly for centuries. Newer neighbourhoods have also flooded in pluvial storm events (Tousignant 2013; Willing 2017).

The City of Ottawa (2019a p.7) acknowledges that “a core challenge relates to the volume of stormwater runoff created through development pressures”. Growing concern about past and future flooding may be competing with consumer demand for houses, developer demands for more land and less regulation, and pressure on municipalities to generate property tax revenues through development (Leffers and Wekerle 2020; Raco et al. 2018).

Housing industry stakeholders and three levels of governments in Canada have a long history of collaboration. National and provincial governments work directly with the house building industry on construction innovation and updating building codes (Clayton et al. 1994; Martin and McKay 2022; NRC 1997; NRC 2023). Similarly, the development industry works closely with municipal planning and permitting departments (Kardish 2017; Leffers 2015; Leffers 2018; Leffers and Wekerle 2020). These collaborations within three levels of governance have resulted in millions of comparatively safe houses built and billions of dollars of economic activity across Canada over the past century.

Relationships between the housing industry and City officials are critical: Ontario municipalities are on the front line of climate change, and private and public sector stakeholders work closely, and sometimes too closely according to academic research on tension between private housing development interests and the interests of the public in Canadian cities (e.g., Boulton et al. 2020; Grant et al. 2019; Heinmiller and Pirak 2017; Leffers 2015; Leffers 2018; Leffers and Wekerle 2020; Ley 2021; Parsons and Harris 2020; Sandberg et al. 2013; Sorensen and Hess 2015). Planning for flood risk requires a multistakeholder approach that includes the producers, regulators, consumers, and insurers of housing, which leads to critical emerging questions: as might be assumed from urban studies literature and news media, are urban development interests including city officials impeding or helping climate change adaptation? Is the private sector collaborating with or resisting efforts to reduce flood risk? What are the impacts on development and flood risk of ‘short-termism’ in planning (i.e. the four year electoral cycle), siloed city management, shifting political priorities, and lack of municipal capacity to enforce regulations (Shrubsole et al. 1997; Shrubsole 2000; Measham, et al. 2011)? As Pasch and McGillivray (2019) suggest, do city governments ignore risk because insurers and higher levels of government have historically paid for disaster recovery in Canada? How does this complex mix of variables impact on urban resilience?

The following sections describe research to address how housing development stakeholders are responding to these contradictory pressures. The research includes viewpoints from private sector actors who are absent from the above literature review and from literature on urban development in general. The next section describes study methods.

Methodology

The study city was Ottawa, population one million, in southeastern Ontario, Canada. Ottawa sits at the junction of the Gatineau, Rideau and Ottawa rivers and has a history of regular pluvial and fluvial flooding that appears to be worsening in recent decades (City of Ottawa 2024). The study was designed as a pilot project to test an innovative way to approach a municipality for research participants, and to test and refine research questions. The innovation was the recruitment of an ex-municipal councillor to access a senior City official who then vetted the questions and referred us to interviewees with relevant expertise. The study employed extensive document analysis, interviews, comments from an email survey and informal conversations with stakeholders. Questions were simple and open ended: Interviewers asked if interviewees thought the private sector and the City were cooperating to reduce flood risk in new developments in the city and if they could suggest ways to improve the process. Interviewees were encouraged to go into detail.

Researchers acquired ethics approval and then recruited interviewees who then received consent forms including assurances of confidentiality. Between January and June of 2022 researchers recorded 11 semi-structured in-depth interviews using the Zoom™ meeting platform. These key informants included three senior ranking real estate development industry officials known for leadership in the industry, four senior City Engineering and Planning staff, two ex-municipal councillors, and two senior staff engineers from an Ottawa region conservation authority. Interviews were 40 minutes to two hours in length and formed the core of the analysis. Interviewees were told the

interviews would run for roughly an hour “depending on how much information they chose to share” in keeping with the aim of semi-structured interviews to provide “space to follow topical trajectories as the conversation unfolds” (Magaldi and Berler 2020, p. 4825). In addition, researchers circulated a confidential survey among management staff at the City of Ottawa and the conservation authority. Seven surveys were returned, and comments were extracted. Interviews and surveys yielded more than 1,000 pages of dense textual data. Quotes used for this manuscript were sent to each interviewee for clarification or revisions which were then incorporated into the manuscript. Data were applied to analysis of the intersection of public and private sectors as they respond to climate change. We consider this study unique because to our knowledge we were the only Canadian researchers directly asking developers about the challenges they face regarding climate change.

There was no attempt to generate representative sampling. Study participants were chosen for their positions of authority and broad and deep understanding of the topic. The reader is cautioned about extending the analysis to the wider population of municipal and real estate development officials.

Researchers determined themes in the transcripts in a three-stage process. First, researchers reviewed and loaded transcripts into Nvivo qualitative analysis software to compare between groups and identify key themes. Using NVivo harnesses the software’s capacity for sorting, matching and linking to use the data to help answer research questions without losing access to the source data or contexts (Leech and Onwuegbuzie 2011). Nvivo enables researchers to challenge assumptions and first impressions, identify gaps in the data and revisit data from a new perspective (Bazeley and Jackson 2015). Second, using a multiple coder method (O’Connor and Joffe 2020) four researchers independently categorized themes, then together agreed upon a concise list of common themes in the data. Third, researchers compared the list with the Nvivo results. Amalgamated and simplified themes were then used to pull representative quotes, compare stakeholder groups and evaluate assumptions behind the research question (e.g. are developers and regulators working together to reduce flood risk in new Ottawa neighbourhoods?). The findings were then compared against the initial literature review and the authors’ previous research. At the time of publication, the research methods and selected questions developed from the pilot were being employed in subsequent research in the cities of Abbotsford BC, Gatineau QC, Saint John NB and Nijmegen in the Netherlands.

The following section is a thematic analysis of the interviews.

Findings

Analysis and comparisons among the researchers led to the emergence of four general themes within the study data. They were:

- development policy and regulation in the context of climate change;
- the Province of Ontario’s Bill 23 and the role of conservation authorities in managing development;
- attitudes about public-private relationships across stakeholder groups; and
- issues of transparency within these relationships.

The following sections illustrate the themes with anonymous quotes from the interviewees. In the following, the letter P before an interviewee denotes an individual from the public sector while D represents an individual from the housing development sector.

Development policy and regulations in the context of climate change

Within discussions of development regulation, public sector representatives appeared more concerned about risks to development from future flood events, while industry representatives (perhaps predictably) appeared more concerned about existing regulation and the impacts of regulatory compliance on production schedules and the costs of compliance for housing consumers.

Public sector representatives repeatedly talked about the necessity of robust flood zone mapping and adjusting flood zone lines in response to growing climate change impacts, and of the need for strong and consistent enforcement of flood mitigation policy for development as set out in the Provincial Policy Statement (P3; P4; P5; P8). One municipal staff member noted in relation to that policy: “The first thing is stay out of the floodplain, right, just stay out of it... it’s the failsafe way, it’s the most economical way, it’s the safest way to prevent flood risk from affecting public health and safety” (P3). Other public representatives questioned the appropriateness of using the province’s 1

in 100 year flood event threshold (a flood that has on average a 1 in 100 chance of occurring each year, or a one per cent probability in any given year) for infrastructure design guidelines for residential development. They were not confident that a one in 100 year event design threshold would protect new neighbourhoods, given unprecedented recent weather events in Ottawa (P4; P5). They also noted some confusion about how to implement recently updated Provincial directives to “consider” climate change when addressing flood plains (P4; P5). Municipal representatives referenced updated municipal policy (see City of Ottawa 2024) as examples of appropriate responses to flood risk with climate change. They noted their support for new policy dictating that new essential or critical services (e.g., schools, hospitals, day cares, emergency services, etc.) respect watercourse setbacks designed to a 1 in 350-year event threshold (meaning the probability that a severe flood would occur once in every 350 years) (P5).

Industry representatives expressed varied views about flood risk to developments from climate change. One interviewee suggested that new development is clearly better protected by regulations than older development, and that the majority of major flood events in Ottawa have impacted on housing that had been built—or re-built—where it should not have been allowed. Another emphasized their interpretation of recent climate science demonstrating that spring stream flooding will diminish over time in eastern Canada and across the northern hemisphere, as warming will result in less snow, less snow melt and consequently less spring freshet flood risk (D3) (see also City of Ottawa 2024; Gottlieb and Mankin 2024; NCC 2022). This interviewee also asserted that the intensity of severe rainstorm events is expected to increase in climate projections for Ottawa, which concurs with regional studies such as that published jointly by the City of Ottawa and the National Capital Commission (City of Ottawa and NCC 2020. See also City of Ottawa 2024). Such statements illustrate complexities and rapid evolution of climate science.

Industry representatives expressed concern that responding to flood risk would likely add greater complexity to residential development (D2). One developer tied municipal regulation in general to lengthy delays in land development approvals, stating, “the process doesn’t work when it takes 15 years to go from ‘we want to develop on this land’ to ‘we can now put a home on the land’, right? Like, nobody wins” (D2). Industry representatives appeared focused on an urgent need for housing in Ottawa and expressed concern about a mandate to reign in sprawl in Ottawa’s *Official Plan*. They suggested clear benefits to developing residential areas on lands developers currently own within existing urban boundaries, including making efficient use of existing piped and energy infrastructure (D2; D3). They repeatedly referred to the need to improve housing affordability and reduce housing shortages (D2; D3), with one developer noting that “the counterpoint to [restrictions on development] is...pushing the middle class out of housing, pushing the lower income families and individuals out of an option. You know, that’s catastrophic” (D3).

Study participants noted the varied challenges of building resilience into existing versus new neighbourhoods (D3; see Sandink and Binns 2021). Public sector representatives voiced support for strengthening stormwater management in existing neighbourhoods (through, for example, proper drainage pipe sizing or limiting of impervious areas) (P2; P4), while industry representatives suggested that infill flood mitigation policy complicated development processes, as stormwater management requirements were sometimes in conflict with other municipal directives. For example, one representative noted that requirements to retain trees or maintain streetscape character may influence the degree and location of hard landscaping and by extension, stormwater/flood risk management on infill lots (D1). Another suggested that a lack of foresight related to municipal infill policy sets up an unfair situation where developers must manage infill properties for stormwater and demonstrate adequate flood mitigation at “exorbitant cost” while surrounding properties are not subject to the same expensive risk reduction measures (D2).

In summary, the public sector and developers are aware and concerned about climate change and flood risk, but their perspectives and interpretations of implications are different especially with regards to infill versus new development. Development stakeholders appear concerned with more immediate time horizons and short-term business costs of flood resilience regulations in new development.

Bill 23 and the role of conservation authorities

In November 2022 the Ontario government passed *Bill 23, the More Homes Built Faster Act* into legislation. Industry representatives expressed mixed views of *Bill 23*. They noted what they perceived as the positive influence of the Bill in promoting greater development within existing urban boundaries, particularly within the Ottawa context and municipal efforts to reduce sprawling suburban development. They also suggested that the Bill could inspire innovation in development by making it easier to employ thoughtful engineering approaches to water management (D1; D2; D3).

Echoing the perspectives of some Toronto-area development stakeholders (noted earlier), one industry representative expressed concern that *Bill 23* would shift power to vet development applications from conservation authorities (who they perceived as holding greater expertise) to municipal engineers (who they perceived as lacking sufficient knowledge of local geography to adequately make these decisions) (D2). In contrast, another industry representative asserted that *Bill 23* was not intended to take authority away from conservation authorities but to “[prevent] the duplication of approval” (D3). They expressed support for the Bill as it would help to streamline a development process that over previous decades had been hindered by too much regulation within an excessively “bureaucratic”, “complex”, and “broken” system. According to this representative:

There is no change at all to a CA's need to examine and control and own the regulatory area that's hazard lands in Ontario. That has not changed, and quite honestly, that should never change, because CAs have this objectivity. It doesn't have the same pressures a municipality would with respect to development pressure. A CA's mandate is to protect and manage hazard lands, and that objectivity and that sole path of focus, it's very important for Ontario... a CA though shouldn't be involved in planning conversations that a municipality is really geared up to deal with, where you have... the need for housing and studying population trends... That's a municipal requirement, and municipalities are really good at dealing with it. (D3)

Public sector representatives expressed uneasiness that with *Bill 23* the Province of Ontario had effectively stripped conservation authorities of their power to guide or restrict development. One representative voiced concern that a lack of clarity around *Bill 23* may blur the lines of what new development could be approved in higher flood risk areas:

My understanding is it's basically undermined the conservation authorities' ability to veto certain applications... I mean, will that actually result in a bunch of properties being developed that are going to be flooded?... I think it opens the door for a lot more grey area, and a lot more close calls to be, you know, taken, approved when they might not have otherwise been approved... (P7)

That representative also suggested the Bill was part of, “an overall thrust from this government provincially to shift power towards the development industry under the guise that it's going to augment [housing] supply” (P7). Another municipal representative expressed concern that the Bill would negatively impact the influence of conservation authorities as well as collaborative approaches to development policy, with the potential for “politicizing flood plain mapping” (P8); as they suggested, “I think that there is a strong role for conservation authorities... we do need that expertise, you know. Elected officials should not be responsible for mapping floodplains” (P8).

In summary, both the public sector and developers see *Bill 23* as having an impact on the process of housing development, but their views of the impact are notably different. Public sector representatives are concerned about loss of expertise in development regulation and associated risk to homeowners, while development stakeholders in the study were focused on streamlining the development approvals process amid varied business opportunities and business risk. Overall, a shift in power from CAs to the municipality was considered significant by both public and private stakeholders, and all of our research participants were watching to see how *Bill 23* would be implemented.

The next two sections reveal challenges within interactions between public and private sector stakeholders.

Attitudes about public-private relationships: Industry perceptions

Case study discussions revealed concerning levels of distrust among some public sector and industry stakeholders in Ottawa. Industry representatives have more positive impressions of and are more willing to work with conservation authorities versus municipal representatives. Among municipal representatives, some bring significant negative bias to their engagements with developers, as well as concerns about internal municipal activities in engaging with developers.

Industry representatives frequently noted their respect for conservation authorities, whose efforts, related to hazard land protection within the development process, were perceived as appropriate and necessary (D2; D3). One noted: “...they're not horrible regulators. They're doing their job, and they do it professionally” (D3). Another stated:

The three CAs that we work with in Eastern Ontario...how do I put this correctly? They're not easy to work (with) but they don't put up roadblocks to development. They do everything they need to do in the process to ensure that they're protecting the natural environment and natural hazards. But they're not--I have never experienced a case where I feel like a conservation authority is actively trying to undermine an application. (D2)

Industry representatives contrasted these relationships with developer/CA relationships in the Greater Toronto area, which they had heard from colleagues were not cordial (D1; D2; D3). One developer expressed a view that the combative relationships in the GTA were influenced by conservation authorities operating as "activist workshops" with too broad a scope in considering development applications (D3).

Industry representatives shared negative perceptions about working with municipal staff versus conservation authorities (D1; D2; D3). One developer spoke about delays in development that they perceived as part of overly-bureaucratic processes in working with municipal staff. They said municipal staff lack knowledge and experience, are overworked, more stringent, and "don't keep up with...best practices" (D3). Another industry representative suggested:

I think if you were to canvas a half dozen sophisticated players in the land development game in Ottawa and ask them pointedly, like "are our conservation authorities the problem in land development", I don't think you'd hear any of them say that they're the issue. I really think...the issue for the timelines... rests with the City. (D2)

Another industry representative stated: "[the City] has a lot of environmental expertise in terms of species and forestry and things like that, but not to my understanding, at least not the kind of that really wide watershed flood plain expertise that the conservation authority has" (D1).

One developer suggested that municipal staff did not work well with developers' civil engineers, which was limiting opportunities for innovation, unfairly placing developers in conflict with neighbourhood residents, and "not allow[ing] a good outcome to naturally unfold":

I think a lot of zoning bylaw amendments, for example, would have been avoided if the City more thoroughly consulted the industry on feasible ways to have housing built in urban areas, for example, where neighborhoods are forced to adjudicate it really...with a lot of animosity later, because the City has basically washed its hands in many cases, saying, you know, we're just going to maintain a static bylaw. And, every time an application comes in, we'll let the developer and the community fight it out, when the City very well knows that development is needed there to meet its population projections. (D3)

That industry representative emphasized that a developer's engineer should ultimately take control of figuring out solutions to development in complex situations, stating, "I think we should leave the engineer to take the liability and do the work needed, and not get so much of this kind of monkey-in-the-middle approach to sort of constraining the engineer's work" (D3).

That developer also asserted that anti-development and anti-developer bias among the general public, in media, and among residents in affected neighbourhoods have significantly reduced opportunities for productive municipal/industry stakeholder engagement, due in part to unjustified concerns about too friendly or inappropriate public/private stakeholder relationships and a common perception that developers manipulate local politics for economic advantage (D3). As they stated:

I've seen the industry really become far more isolated...it's definitely become a political hot potato to be seen with a developer...I think the municipalities and CAs that we work with, they know the industry is trying to do a good job, you know. They know that. There's this, you know, manufactured front that tries to create distance in the industry because of the optic. (D3)

For that developer, these combined influences reduced communication, increased polarization, and diminished trust between stakeholders, ultimately disrupting paths to housing development in higher risk areas:

The irony of where we're at is that...I can't directly sit down with...the GM of the CA and just hammer out a deal. The optic...has made it very difficult actually to... brainstorm together... Our brainstorming always happens through a third party, where...we're providing comments or filing these written submissions to these publicly open and transparent vehicles. And that sometimes lacks the nice brainstorming in conversation that, you know, would come from a relationship that's founded on a bit more trust... the problem, I think, is that everyone's polarized and everyone's taking their corners before they're even listening to each other. If we just kind of opened our hearts and minds a bit to hearing from each other more, I think everything would be better. (D3)

These comments stand mostly in contrast with perceptions of the private sector among City staff in the next section.

Attitudes about public-private relationships: Public sector perceptions

Public sector representatives relayed differing impressions of relations between developers and municipal officials, ranging from productive and respectful to frustrating. One ex-municipal councillor suggested that there exists a wide "spectrum" of developers, "from the ethically scrupulous about whom we hear very little and there probably aren't that many, to the will-do-anything-to-make-it-go-ahead, which will be similarly few in number...and most will be somewhere in between" (P1). Another municipal representative linked challenging engagements around development to broader political narratives about over-regulation and freedom of choice:

There is and continues to be serious objections on the part of property owners to having development limited [by the city] on their lands, even if they're fully in the flood plain. And politicians support these views. They refer to unfair...controls that conservation authorities have and that they should be abolished, that prohibitions on...development in floodplains should not be allowed... (P4)

While one municipal representative noted that development restrictions in risky areas were generally supported internally among municipal staff (P5), some public sector representatives linked development approvals with whether a council was developer-friendly or not. At one end of this view, one councillor spoke about their desire to seek good outcomes for the community within otherwise flawed systems of public sector-industry engagements around development:

The community I represented knew that the council would pretty much put anything through... I would tell residents that the best way to get any change is not to wait and vote it down at committee or council, because that was never going to happen, but to work with the developer, and to come to some understanding on the...most egregious aspects of the development for them. (P8)

Issues around development politics and flood risk were always close to the surface within study interviews. Ottawa development politics emerged clearly in interview comments about transparency.

Similar to industry representatives, municipal representatives noted their respect for conservation authorities, and welcomed collaboration between CAs and municipal staff to establish flood zone lines (P4; P5). One municipal staff member noted, "it's on us to define those areas and the conservation authorities are actually the ones who would regulate the development in those areas" (P5), while another member stated, "We pay the conservation authorities to produce that mapping [in consultation with the City] and it's because they have expertise there" (P4). There appeared to be some variation in how municipal representatives understood the role of conservation authorities. Regarding options for floodplain alterations for development one city official stated:

...that's a whole process that the applicant has to work through with the conservation authority, not the City. We have our policies that say you can't develop in the flood plain. If they managed to work through something and come to agreement on a plan...[developers] get their permit from the conservation authority to alter that flood plain (P5).

Another representative in an email suggested that the municipality has the final authority to determine the flood line:

Under the *Emergency Management and Civil Protection Act* in Ontario it's the municipalities that have been delegated the responsibility of identifying hazard lands. Since municipalities typically shoulder the largest share of operational and clean-up / restoration costs resulting from natural hazard events, it is to be expected that local councils be responsible for establishing ...development limits. Cities may request conservation authorities to assist with mapping hazard lands—but since liability ultimately rests largely with municipal ratepayers—the buck has to stop with municipal council in establishing its risk tolerance as reflected in its policies (which can be no less stringent than natural hazard policies in the *Provincial Policy Statement*). Accordingly, it isn't acceptable for municipalities like the City of Ottawa to defer to decisions of often unelected board members of a conservation authority, to redefine hazard limits based on less stringent policy compared to what had been approved by elected members of City Council. (P2)

Transparency

As is likely with municipal politics in many contexts, environmental concerns add to the complex mix of interests, issues and pressures that make up urban development. One municipal representative noted what they perceived as sometimes inadequate levels of transparency in negotiations between developers and conservation authorities (P5). Other public sector representatives emphasized the potential for “political interference at the local municipal level” within development processes (P2), and described perceptions of inappropriate behaviour among municipal colleagues that has resulted in too close of an alignment with industry actors. In their view, this has led to unethical conduct among some city councillors that results from (unregistered) lobbying by developers, and among some senior municipal staff who may in turn be pressured by councillors to approve risky development (P1; P2; P8). As one senior City staffer suggested:

What the developers and the developer-friendly councillors do is that they'll find the easiest path to allow the irresponsible development to go forward... if certain councillors want to have certain rules bent...senior management will see to it that the rules are bent [at planning committee] in order to result in the outcome that the local councillor and the developer are looking for... (P2)

Another City representative asked, “To what degree does pressure from the elected official find its way down to the junior clerk receiving the development application and giving it its first read through? It does” (P1). One ex-councillor suggested that some senior municipal staff lack real interest in climate change mitigation and, in collaboration with some councillors and developers, willingly enable conditions that expose neighbourhoods to flood risk (P8).

The ex-municipal councillors interviewed for this study repeatedly voiced suspicion that developers try to influence individual councillors to push through inappropriate development. One ex-councillor also stated: “There's heavy, heavy campaign financing by the development industry. I know that development companies themselves can't, but developer families and employees do” (P8), while another spoke of a personal experience in this regard:

My very first Christmas...elected for a whole three weeks...came (with) the \$140, you know, chocolate gift basket delivered to my home...by a senior member of the development companies... And then I've had cases where I've had developers pretty much overtly...imply that, you know, we can make life difficult for you if you don't get this, you know, if you don't see it our way. (P1)

It must be emphasized that such comments from a modest selection of research interviews do not constitute indication of widespread malfeasance by the development industry or city councillors in Ottawa, but rather one aspect of rather complicated social arrangements and negotiations that result in urban housing. These dynamics are highlighted in the following discussion.

Discussion

The literature review for this research began with an examination of Canadian climate change policy, including contradictions and silos that may hinder a coherent national response to climate change. This background set the tone for our study of Ottawa, where the same dynamics are apparent.

Case study background and interviews revealed siloing and debates among stakeholders on multiple levels in how standards are applied, as well as inconsistencies across narratives and perspectives. There were also differences in perceived pressures and timelines driving perspectives and decision making by the stakeholders. Recent provincial government policy and regulatory changes—in particular *Bill 23*, the *More Homes Built Faster Act, 2022*—have amplified tensions between developers and municipal representatives.

Standards, consistency, perspectives and time horizons

The examination of background context and research interviews reveal siloed understandings among public sector and industry representatives of flood risk and the role of development regulations. First, stakeholders revealed differing understanding of regulations, and inconsistency between stakeholders on the value of those regulations. City of Ottawa interviewees repeatedly reinforced the legitimacy of regulation and the need for robust policy in maintaining the integrity of flood plains and preventing new development in flood-prone areas. They were critical of the Ford government changes to regulations for managing flood risk in new housing developments. They also endorsed Conservation Authorities as arbiters of flood plain lines. Municipal representatives implied that the newer policies and communications from the Province of Ontario sidestep effective planning policy, local geography and regulation on the ground. At the time of this study, interviewees were all uncertain about the diminished role of Ontario's conservation authorities. They also noted a lack of consistency between municipal and provincial flood mitigation policy, as Ontario's Provincial Policy Statement continues to dictate a 1 in 100-year event threshold while the City of Ottawa is now moving in some contexts to a 1 in 350-year event threshold. Inconsistent and reportedly regressive environmental policy changes have apparently set Ontario municipalities in opposition to the Province of Ontario on managing climate change risk. This reflects a profound lack of collaboration at a time when all players must be on board to protect neighbourhoods from severe weather.

There were clear disparities between public and private stakeholder perceptions of risk from climate disruptions. In contrast to the alarm voiced by municipal representatives about the ballooning costs of flooding, climate change seems to be viewed by some developers as a manageable risk. As development sector actors viewed municipal and provincial development policies as overly restrictive, they were more concerned with shorter-term outcomes and less attuned to longer-term climate change concerns. Industry representatives expressed annoyance with the amount of detail, but ultimately confidence in Ontario's existing (i.e., prior to the current Conservative government) policies which guide the management of water on their developments. Some developers are also willing to let private engineers assume responsibility for the modelling and standards applied on each development plan. This does not necessarily constitute 'climate denial' but rather paying attention to what are perceived as more pressing business needs rather than uncertain weather projections that may or may not impact their operations. Time horizons are worth noting. During the ten years it can take to get a housing development approved, our understanding of changes to our regional climate has likely grown significantly. Are housing stakeholders staying abreast of developments in climate change science, and how might this knowledge (or lack of) affect their attitudes about flood risk and new housing?

Differing pressures on stakeholders

Comments by public and private stakeholder groups reveal differing pressures influencing their views of development. Industry officials who participated in our study asserted that housing development is a net positive activity that adds (monetary and other) value to the lands they hold. With regard to standards, building code and land development regulations have been anathema to many in the development sector (e.g., see CHBA 2024). While acknowledging that housing should be restricted from areas at risk of flooding, industry stakeholders are legitimately concerned that changes to flood risk management regulations, like most regulations, will add to the cost of producing housing. In the case of new infill development, development officials also argued that new housing built to higher standards could not compete with existing housing in neighbourhoods built to less stringent standards. These perspectives align with typical refrains from industry and the current provincial government that over-regulation, restrictions on land, and municipal bureaucracies interfere with housing production and make housing unaffordable. These assertions

stand in contrast to City of Ottawa claims of the necessity for stricter development rules to address growing flood risk in a changing climate. Interestingly, in our interviews private sector antipathy to regulation was not reflected in discussions about the credibility of Ottawa region conservation authorities. It is noteworthy that both municipal and industry sector interviewees expressed respect for and a desire to work collaboratively with conservation authorities as they expressed reservations about the potential impacts of *Bill 23* on relationships with conservation authorities.

Bill 23 seems to have exacerbated siloed and competing stakeholder interests, as well as tension in stakeholder relations. The Province amplified confusion among public/private stakeholders around which body holds veto power for development in hazard lands. Debates around the Ford government's policy shift connect to broader clashes between public and private interests related to strengthening standards to address flood risk versus deregulating a present-focused and highly competitive housing industry. This situation is complicated by indications that consumers (and voters) do not seem aware of or care about local flood risk when purchasing a home (Bakos et al. 2022; Henstra et al. 2018).

City of Ottawa officials asserted that *Bill 23* shifts power to the development industry in considerations of how and where housing can be built, including on properties that may be at risk of flooding. That shift may reflect a more extensive and potentially inappropriate relationship between developers and the premier's office that has caused considerable controversy over development near Toronto in the summer and fall of 2023 (OAGO 2023; Wake 2023). Among some public sector views, the degree to which flood risk is considered in development could then ultimately be determined through politics versus science, with *Bill 23* expediting housing but simultaneously usurping the ability of Ontario municipalities to govern their own development. Growing climate change impacts and provincial changes to policy have introduced further volatility into somewhat strained relationships among some of these stakeholders.

As was also observed by Leffers and Wekerle (2019) and Leffers (2020), comments by several study participants reveal how the development sector considers itself to be a legitimate actor in policy development, adding significant value to discussions about housing production and flood risk mitigation within the growth regime. The developers we spoke to positioned themselves as honest, rational professionals within development processes, but also as victims of public opinion which hindered the potential for collaborative exchanges with municipal actors. Among municipal stakeholders, some demonstrated a sense of inevitability about development and tried to make as best a fit as possible for existing communities, while others experienced animosity in internal municipal as well as external developer relations, and expressed significant frustration with a perceived development-friendly council and aligned staff. These observations point to the capacity of each stakeholder to influence development decisions: Who influences regulatory change? Who has the resources, environmental expertise, and political power to influence decisions about how we build our cities? Our research suggests that dysfunctional relationships among stakeholders add to the unpredictability and volatility of development processes in a flood-prone urban area. Silos may be complicating efforts to keep Canadians safe.

Conclusion

Siloing is reducing the ability for public sector and industry stakeholders to significantly advance the management of housing production within a rapidly evolving climate change context. Stakeholders talk about climate change and flood risk but have different perspectives on environmental threats. For example, risk horizons differ across municipal versus provincial policy in Ottawa: moving to a 1-in-350 year event threshold from the 1-in-100 year event threshold results in differing approaches to flood risk. Are we keeping up with evolving science and understanding of climate disruptions? And are public and private stakeholders aware of pending changes to flood insurance based on more extreme projections for flooding that may drastically alter housing economics in Canada? In our research municipal representatives are worried about climate change impacts, while the housing industry seems more worried about the costs of adaptation. Insurers, another stakeholder with the bottom line in mind, are collaborating with the federal government on flood resilience, but without making room around the table for the people who must follow already complicated rules to build our homes. And no one seems to be concerned with private sector actors directly influencing public policy and regulation at all three levels of government. Different pressures and timelines may cause friction and interfere with collaboration between the housing industry and municipalities. *Bill 23* has added pressure by negating environmental protections enshrined in the *Conservation Authorities Act* for decades, and by heading in a direction opposite to that of federal environmental policy.

This paper began with a description of federal government climate change policies as background for debates about housing development “on the ground” in one Canadian municipality. The City of Ottawa acknowledges growing alarm about changing weather and the need for better relationships across sectors and jurisdictions to address flood risk. Developers, insurers and governments can ill afford to be misaligned in responses to climate disruptions. Canadian stakeholders must build enough trust to collaborate across sectors and jurisdictions in Canada to keep Canadian neighbourhoods safe. Climate change is forcing the issue.

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End notes

¹The Census Metropolitan Area combines Ottawa and Gatineau. The second stage of this research project will study the City of Gatineau.

² Research in Canada and elsewhere suggests a nonlinear relationship between flood risk, actual flood events and real estate market values, and that while real estate prices typically drop and houses take longer to sell after a flood, these impediments diminish within a year or two. Furthermore, flood risk seems to be disconnected from values of high end waterfront properties. See for examples Beltrán et al. (2018); Cohen et al. (2021); Ebbwater Consulting (2022); Fletcher et al. (2022); Kaufman (2022); Nguyen et al. (2022); Rajapaska et al. (2017).

³ According to Stewart (2023), the insurance industry in Canada is working with Public Safety Canada and provincial regulators to identify and disclose overland flood risk for insured houses, to build neighbourhood flood resilience in Canada, and to encourage homeowners to address their own flood risk. The plan will tie several elements together. First, the federal government will produce a portal whereby the public can check flood risk for specific properties on updated flood maps. Second, the federal government will work with provinces to prioritize infrastructure spending on flood resilience dependent on areas deemed at risk in the new maps. Third, changes to the national Disaster Financial Assistance Arrangements will be designed to incentivize managed retreat and/or flood protection in high-risk areas by (a) ending recovery payments for housing that was constructed in known flood zones; and (b) possibly capping the value of post flood event payouts to recover infrastructure in these areas. Fourth, the Insurance Bureau of Canada (IBC) and the federal government are developing an overland flooding insurance program for high-risk properties which will protect real estate values. In addition, as of early 2024, these public and private stakeholders are working on an appropriate rating scheme for houses and identifying gaps in insurance. The high risk flood pool should come into effect in April 2025.

References

- AGO. 2022. Little provincial attention on urban flooding. News Release. Office of the Auditor General of Ontario. November 30, 2022. https://www.auditor.on.ca/en/content/news/22_newsreleases/2022_news_ENV_CCURb-Flooding.pdf.
- AMO. 2022. AMO's submission to consultations related to Bill 23 & The More Homes Built Faster Plan. December 9, 2022. Toronto, ON: Association of Municipalities Ontario. <https://www.amo.on.ca/sites/default/files/assets/DOCUMENTS/Bill%2023/2022-12-09-Submissions/AMO%E2%80%99s%20Submission%20to%20Consultations%20Related%20to%20Bill%2023%20%26%20The%20More%20Homes%20Built%20Faster%20Plan%202022-12-09%20RPT.pdf>.
- Aon. 2023. *Weather, climate and catastrophe insight*. Natural disaster costs for 2022. <https://www.aon.com/getmedia/f34ec133-3175-406c-9e0b-25cea768c5cf/20230125-weather-climate-catastrophe-insight.pdf>.

- Bakos, K., B. Feltmate, C. Chopik, and C. Evans. 2022. Treading water: Impact of flooding on Canada's residential housing market. Intact Centre on Climate Adaptation, University of Waterloo. https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2022/04/UoW_ICCA_2022_02-Treading-Water_Flooding-and-Housing-Market.pdf.
- Bazeley, P., and K. Jackson. 2015. Qualitative data analysis with NVivo (2nd ed.). *Qualitative Research in Psychology* 12(4): 492–494. https://www.researchgate.net/publication/282802998_P_Bazeley_and_K_Jackson_Qualitative_Data_Analysis_with_NVivo_2nd_ed.
- Beltrán, A., D. Maddison, and R. J. R. Elliot. 2018. Is flood risk capitalised into property values? *Ecological Economics*, 146: 668–685. <https://doi.org/10.1016/j.ecolecon.2017.12.015>.
- Boulton, C., A. Dedekorkut-Howes, M. Holden, and J. Byrne. 2020. Under pressure: Factors shaping urban greenspace provision in a mid-sized city. *Cities* 106: 102816. <https://doi.org/10.1016/j.cities.2020.102816>.
- CHBA .2024. *Why housing affordability is hurting*. Web page on CHBA website. <https://affordability.ca/information/what-affects-housing-affordability/>.
- City of Ottawa .2019a. *New Official Plan: Climate adaptation and resiliency*. Highlight Sheet. Ottawa, ON: City of Ottawa. https://ehq-production-canada.s3.ca-central-1.amazonaws.com/927a18a63a7e1b149e2c447000f06a75f56d6bb7/original/1625579185/c43f49b5277e8cea6d3b7adef16d4458_op_highlights_climate_en.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA4KKNQA-KIOR7VAOP4%2F20240123%2Fca-central-1%2Fs3%2Faws4_request&X-Amz-Date=20240123T021034Z&X-Amz-Expires=300&X-Amz-SignedHeaders=host&X-Amz-Signature=c821a3257a17ec9f608ad5c-d1b5b80d3beb5662a4f37beea2ab6d4ec75b635ed.
- . 2019b. *Sewer backups and basement flooding*. Ottawa wastewater and sewers public information site. Ottawa: City of Ottawa. <https://ottawa.ca/en/living-ottawa/water/wastewater-and-sewers/sewer-backups-and-basement-flooding>.
- . 2024. *Climate resiliency: How is Ottawa's climate changing?* <https://ottawa.ca/en/living-ottawa/environment-conservation-and-climate/climate-change-and-energy/climate-resiliency#section-530d10f6-e86e-46d8-9281-d93e8b202ff6>.
- City of Ottawa and NCC. 2020. *Climate projections for the National Capital Region: Executive summary*. Analysis and report prepared by CBCL. Ottawa, ON: City of Ottawa and National Capital Commission. https://documents.ottawa.ca/sites/documents/files/climateprojects_execsummary_en.pdf.
- Clayton Research Associates Ltd. and D.G. Wetherell and Associates Ltd. 1994. *Two decades of innovation in housing technology, 1946–1965*. Ottawa, ON: Canada Mortgage and Housing Corporation. http://publications.gc.ca/collections/collection_2015/schl-cmhc/NH15-340-1994-eng.pdf.
- CMHC .2023. *Housing Market Information Housing Supply Report: Canadian Metropolitan Areas*. Ottawa, ON: Canada Mortgage and Housing Corporation. https://assets.cmhc-schl.gc.ca/sites/cmhc/professional/housing-markets-data-and-research/market-reports/housing-supply-report/housing-supply-report-2023-04-en.pdf?rev=f0988ca5-6454-44da-8934-587d4a5650fe&_gl=1*qq7fh1*_ga*MTU4NTk1MTcxMy4xNzA1OTM4MDkx*_ga_CY7T7RT5C4*MTcwNTkzODA5MS4xLjEuMTcwNTkzOTE4MS41OS4wLjA.*_gcl_au*MTA0NDIzMDcyOS4xNzA1OTM4MDkx.
- Cohen, J. P., J. Barr, and E. Kim .2021. Storm surges, informational shocks, and the price of urban real estate: An application to the case of Hurricane Sandy. *Regional Science and Urban Economics*: 90, September 2021, 103694. <https://www.sciencedirect.com/science/article/abs/pii/S0166046221000545>.
- Conservation Ontario .2019. *Risk to resiliency: Why are conservation authorities critical to flood management in Ontario?* Flood Briefing Note. August. Toronto, ON: Conservation Ontario. https://conservationontario.ca/fileadmin/pdf/conservation_authorities_section/FloodMang_2019_Risk_to_Resiliency_CO_flood_briefing_note_Final.pdf.
- . 2023. *About conservation authorities*. <https://conservationontario.ca/conservation-authorities/about-conservation-authorities#:~:text=Conservation%20Authorities%20protect%2C%20restore%20and,%2C%20rivers%2C%20streams%20and%20groundwater.&text=Conservation%20Authorities%20develop%20programs%20that,that%20lead%20to%20healthy%20watersheds>.

- Duffy, A. 2023. More than 300 million litres of sewage water poured into Ottawa River during storm. *Ottawa Citizen*. August 14. https://ottawacitizen.com/news/local-news/more-than-300-million-litres-of-sewage-water-poured-into-ottawa-river-during-storm?utm_source=Sailthru&utm_medium=email&utm_campaign=OC%20Health%20Newsletter%202023-08-14&utm_term=OC_Covid19_Newsletter.
- Ebbwater Consulting .2022. Update: *The impact of flood hazard on real estate values*. <https://www.ebbwater.ca/update-the-impact-of-flood-hazard-on-real-estate-values/>.
- ECCC .2022. *Advisory Table on Resilient Natural and Built Infrastructure in support of the development of a National Adaptation Strategy Phase 1 (Fall 2021)*. Report to Parliament. Ottawa, ON: Environment and Climate Change Canada. <https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/national-adaptation-strategy/Preliminary%20Advice%20Advisory%20Table%20-%20Resilient%20Natural%20Built%20Infrastructure.pdf>.
- Evans, C., and B. Feltmate. 2019. *Water on the rise: Protecting Canadian homes from the growing threat of flooding*. University of Waterloo, Intact Centre on Climate Adaptation. <https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2019/04/Home-Flood-Protection-Program-Report-1.pdf>.
- Feltmate, B., M. Moudrak, and K. Bakos. 2020. *Climate change and the preparedness of Canadian provinces and territories to limit flood risk*. University of Waterloo, Intact Centre on Climate Adaptation. <https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2020/11/Provincial-Territory-Flood-Report.pdf>.
- Flannery, P. 2022. Industry reaction to Ontario More Homes Built Faster Act. *Canadian Contractor*. October 31. <https://www.canadiancontractor.ca/canadian-contractor/industry-reaction-to-ontario-more-homes-built-faster-act/1003291648/>.
- Fletcher, C. S., K. R. Ganegodage, M. D. Hildenbrand, and A. N. Rambaldi. 2022. The behaviour of property prices when affected by infrequent floods. *Land Use Policy* 122, November., 106378. <https://www.sciencedirect.com/science/article/abs/pii/S0264837722004057>.
- Gambrill, D. 2023. Six to 10% of Canadian homes aren't insurable for flooding, industry stats show. Statement by Aviva Canada CEO Jason Storah. *Canadian Underwriter*. <https://www.canadianunderwriter.ca/insurance/6-to-10-of-canadians-arent-insurable-for-natcats-industry-1004231463/>.
- GHD .2021. *Aquanomics: The economics of water risk and future resiliency*. GHD Engineering, Architecture & Construction Services. Waterloo, ON: GHD. <https://aquanomics.ghd.com/en/index.html>.
- Grant, J., P. Fillion, and S. Low. 2019. Path dependencies affecting suburban density, mix, and diversity in Halifax. *The Canadian Geographer* 63(2): 240–253. <https://doi.org/10.1111/cag.12496>.
- Gottlieb, A. R., and J. S. Mankin. 2024. Evidence of human influence on Northern Hemisphere snow loss. *Nature* 625: 293–300. <https://www.nature.com/articles/s41586-023-06794-y#:~:text=So%20far%2C%20however%2C%20observational%20uncertainties,over%20the%201981%E2%80%932020%20period>.
- Government of Canada. 2023. *Canada's National Adaptation Strategy: Building resilient communities and a strong economy*. Environment Canada climate change adaptation policy webpage. Ottawa, ON: Government of Canada. <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy.html>.
- Hale, A. S. 2021. PCs broke the law when beefing up MZO powers last summer, court rules. *Politics Today*. September 9. <https://www.politicstoday.news/queens-park-today/pcs-broke-the-law-when-beefing-up-mzo-powers-last-summer-court-rules/>.
- Heinmiller, B. T., and K. Pirak. 2017. Advocacy coalitions in Ontario land use policy development. *Review of Policy Research* 34(2): 168–185. <https://doi.org/10.1111/ropr.12210>.
- Henstra, D., J. Thistlethwaite, C. Brown, and D. Scott. 2018. Flood risk management and shared responsibility: Exploring Canadian public attitudes and expectations. *Journal of Flood Risk Management* 12(1). March. Retrieved January 22, 2024 from <https://onlinelibrary.wiley.com/doi/abs/10.1111/jfr3.12346>.
- ICLR. (2019). *Focus on flood mapping in Canada*. Toronto: Institute for Catastrophic Loss Reduction. Retrieved January 22, 2024 from https://www.iclr.org/wp-content/uploads/2019/09/ICLR_Flood-mapping_2019.pdf.
- IBC. 2019. *Options for managing flood costs of Canada's highest risk residential properties: A report of the National Working Group on Financial Risk of Flooding*. Toronto, ON: Insurance Bureau of Canada. <http://assets.ibc.ca/Documents/Studies/IBC-Flood-Options-Paper-EN.pdf>.
- . 2024. *Climate: Adapting to our changing climate and its impacts*. Issues and Advocacy. Toronto, ON: The Insurance Bureau of Canada. <https://www.ibc.ca/issues-and-advocacy/climate>.

- Jalili Pirani, F., M. R. Najafi. 2022. Multivariate analysis of compound flood hazard across Canada's Atlantic, Pacific and Great Lakes coastal areas. *Earth's Future* 10(8). <https://doi.org/10.1029/2022EF002655>.
- Javed, N. 2020. 'The developers are all in control': Doug Ford's government moves to limit the power of conservation authorities, sparking fears for the environment. *Toronto Star*, November 11. <https://www.thestar.com/news/gta/2020/11/11/the-developers-are-all-in-control-new-rules-by-doug-fords-provincial-government-will-limit-the-power-of-conservation-authorities-sparking-fears-for-the-environment.html?rf>.
- Jones, A. 2022. Ontario passes housing bill amid criticism from cities, conservation authorities. *CBC News*, November 28. <https://www.cbc.ca/news/canada/toronto/ontario-passes-housing-bill-23-1.6666657>.
- Kardish, J. 2017. Kardish: Yes, developers have relationships with city staff. And there's nothing wrong with that. *Ottawa Citizen*, June 23. <https://ottawacitizen.com/opinion/columnists/kardish-yes-developers-have-relationships-with-city-staff-and-theres-nothing-wrong-with-that>.
- Kaufman, L. 2022. Real estate listings with flood scores shift home-shopper habits. *Bloomberg News*. <https://www.bnnbloomberg.ca/real-estate-listings-with-flood-scores-shift-home-shopper-habits-1.1817584>.
- Leech, N. L., and A. J. Onwuegbuzie. 2011. Beyond constant comparison qualitative data analysis: *Using NVivo*. *School Psychology Quarterly* 26(1): 70–84. <https://doi.org/10.1037/a0022711>.
- Leffers, D. 2015. *Politics of land developers and development in the Toronto region*. [Doctoral dissertation, York University]. <https://yorkspace.library.yorku.ca/items/a422f4a6-cef7-40f8-98d8-4e0037daf952>.
- . 2018. Real estate developers' influence of land use legislation in the Toronto region: An institutionalist investigation of developers, land conflict and property law. *Urban Studies* 55(14): 3059–3075. <https://doi.org/10.1177/0042098017736426>.
- Leffers, D., and G. R. Wekerle. 2020. Land developers as institutional and postpolitical actors: Sites of power in land use policy and planning. *Environment and Planning A: Economy and Space* 52(2): 318–336. <https://doi.org/10.1177/0308518X1985>.
- Ley, D. 2020. A regional growth ecology, a great wall of capital and a metropolitan housing market. *Urban Studies* 58(2): 297–315. <https://doi.org/10.1177/0042098019895226>.
- Macdonald, N. 2019. Updated flood plain maps will send the housing market underwater: Neil Macdonald. *CBC News*, May 14. <https://www.cbc.ca/news/opinion/flood-plains-1.5135336>.
- Magaldi, D., and M. Berler. 2020. Semi-structured interviews. In *Encyclopedia of personality and individual differences*. ed. V. Zeigler-Hill and T. K. Shackelford. Springer, 4825–4830. https://doi.org/10.1007/978-3-319-24612-3_857.
- Martin, G. and R. McKay. 2022. Transparency and efficiency in building code review. The case of Ontario, Canada. *Canadian Journal of Civil Engineering* 49(9): 1471–1482. <https://doi.org/10.1139/cjce-2021-0396>.
- Martin, G., R. McKay, and P. Ballamingie. 2017. Climate change and housing production in Ottawa, Canada: The business case for change. *Transnational Corporations Review* 9(4): 269–280. <https://doi.org/10.1080/19186444.2017.1401205>.
- Mas, S., and L. Garber. 2019. Ottawa-Gatineau pressed to notify public of sewer spills in real time. *National Observer*. <https://www.nationalobserver.com/2019/04/10/investigations/ottawa-gatineau-pressed-notify-public-sewer-spills-real-time>.
- McGillivray, G. 2019a. Death, taxes – and flooding: Repeated disasters are the norm, so let's have a better plan. *The Globe and Mail*. <https://www.theglobeandmail.com/opinion/article-death-taxes-and-flooding-repeated-disasters-are-the-norm-so-lets/>.
- . 2019b. The whats, wheres and whys of flood mapping in Canada. *InsBlogs*. <https://www.insblogs.com/uncategorized/the-whats-wheres-and-whys-of-flood-mapping-in-canada/8925>.
- . 2017. Flood, rinse, repeat: The costly cycle that must end. *The Globe and Mail*, May 7. <https://www.theglobeandmail.com/opinion/flood-rinse-repeat-the-costly-cycle-that-must-end/article34914333/>.
- Measham, T., B. L. Preston, T. F. Smith, C. Brooke, R. Gorddard, G. Withycombe, and C. Morrison. 2011. Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and Adaptation Strategies for Global Change* 16(8): 889–909. <https://doi.org/10.1007/s11027-011-9301-2>.
- Mitchell, B., D. Shrubsole, and N. Watson. 2021. Ontario conservation authorities – end, evolve, interlude or epiphany? *Canadian Water Resources Journal* 46(3): 139–152. <https://doi.org/10.1080/07011784.2021.1930585>.

- MNR&F .2020. Protecting people and property: Ontario's flooding strategy. Toronto, ON: Ontario Ministry of Natural Resources and Forestry. Retrieved September 6, 2023 from <https://files.ontario.ca/mnrf-2020-flood-strategy-en-2020-03-10.pdf>.
- Moudrak, N., and B. Feltmate. 2018. Combatting Canada's rising flood costs: Natural infrastructure is an underutilized option. University of Waterloo, Intact Centre on Climate Adaptation. https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2018/09/IBC_Wetlands-Report-2018_FINAL.pdf.
- NCC .2022. Climate Change Vulnerability & Risk Assessment. Ottawa, ON: National Capital Commission. <https://ncc-website-2.s3.amazonaws.com/documents/Climate-Vulnerability-Risk-Assessment.pdf>.
- NRC .1997. Every innovation has its starting point: 1947–1997. Special 50th anniversary supplement. Ottawa, ON: National Research Council of Canada. *Institute for Research in Construction*. <https://nparc.nrc-cnrc.gc.ca/eng/view/fulltext/?id=71276def-a08b-49bc-aa5a-e72b89a05791>.
- . 2023. *New governance model for harmonized construction code development*. Ottawa, ON: National Research Council of Canada. <https://www.canada.ca/en/national-research-council/news/2022/11/new-governance-model-for-harmonized-construction-code-development.html>.
- NRCan .2023. *Flood hazard identification and mapping program*. Ottawa, ON: Natural Resources Canada. <https://natural-resources.canada.ca/science-and-data/science-and-research/natural-hazards/flood-hazard-identification-and-mapping-program/24044>.
- Nguyen, Q., P. Thorsnes, I. Diaz-Rainey, A. Moore, S. Cox, and L. Stirk-Wang. 2022. Price recovery after the flood: risk to residential property values from climate change-related flooding. *The Australian Journal of Agricultural and Resource Economics* 66(3): 532–560. <https://doi.org/10.1111/1467-8489.12471>.
- OAG. 2017. *Report 2—Adapting to the impacts of climate change*. Report to Parliament. Ottawa, ON: Office of the Auditor General of Canada. https://www.oag-bvg.gc.ca/internet/English/att_e_42591.html.
- OAGO. 2022. *Value-for-money audit: Climate change adaptation: Reducing urban flood risk*. Toronto, ON: Office of the Auditor General of Ontario. https://www.auditor.on.ca/en/content/annualreports/arreports/en22/ENV_CCUrbFlooding_en22.pdf.
- O'Connor, C., H. Joffe. 2020. Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods* 19. <https://doi.org/10.1177/1609406919899220>.
- Parsons, J., R. Harris. 2020. Hometown advantage: The making of a modern suburb. *Urban Geography* 41(2): 247–267. <https://doi.org/10.1080/02723638.2019.1647756>.
- Pasch, C., and G. McGillivray. 2019. Why Canada's political system makes it difficult to fight floods. *The Conversation*, July 30. <https://theconversation.com/why-canadas-political-system-makes-it-difficult-to-fight-floods-118511>.
- PBO. 2016. *Estimate of the average annual cost for disaster financial assistance arrangements due to weather events*. Ottawa, ON: Office of the Parliamentary Budget Officer. https://qsarchive-archivesqs.pbo-dpb.ca/web/default/files/Documents/Reports/2016/DFAA/DFAA_EN.pdf.
- Province of Ontario. 2022a. *Flood hazard identification and mapping*. Programme Brief. Toronto, ON: Ministry of Natural Resources and Forestry. <https://www.ontario.ca/page/flood-hazard-identification-and-mapping-program>.
- . 2022b. *Bill 23, More Homes Built Faster Act, 2022*. Toronto, ON: Legislative Assembly of Ontario. <https://www.ola.org/en/legislative-business/bills/parliament-43/session-1/bill-23>.
- . 2023. *Conservation Authorities Act, R.S.O. 1990, c. C.27*. Toronto, ON: Legislative Assembly of Ontario. <https://www.ontario.ca/laws/statute/90c27>.
- Public Safety Canada. 2022. *Adapting to rising flood risk: An analysis of insurance solutions for Canada*. Canada's Task Force on Flood Insurance and Relocation. Ottawa, ON: Public Safety Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/dptng-rsng-fl-d-rsk-2022/dptng-rsng-fl-d-rsk-2022-en.pdf>.
- Raco, M., D. Durant, and N. Livingstone. 2018. Slow cities, urban politics and the temporalities of planning: Lessons from London. *Environment and Planning C: Politics and Space* 36(7): 1176–1194. <https://doi.org/10.1177/2399654418775105>.
- Rajapaska, D., M. Zhu, B. Lee, V-N. Hoang, C. Wilson, and S. Managi. 2017. The impact of flood dynamics on property values. *Land Use Policy* 69: 317–325. <https://www.sciencedirect.com/science/article/abs/pii/S0264837717309997?via%3Dihub>.

- Rentschler, J., S. Melda, and B. Arga Jafino. 2022. Flood risk already affects 1.81 billion people. Climate change and unplanned urbanization could worsen exposure. *World Bank Blogs*, June 28. https://blogs.worldbank.org/climatechange/flood-risk-already-affects-181-billion-people-climate-change-and-unplanned?cid=ECR_TT_worldbank_EN_EXT.
- Rosenberger, L., J. Leandro, S. Pauleit, and S. Erlwein. 2021. Sustainable stormwater management under the impact of climate change and urban densification. *Journal of Hydrology* 596: 126137. <https://doi.org/10.1016/j.jhydrol.2021.126137>.
- Sandberg, L. A., G. R. Wekerle, and L. Gilbert. 2013. *The Oak Ridges Moraine battles: Development, sprawl, and nature conservation in the Toronto Region*. Toronto, ON: University of Toronto Press.
- Sandink, D., and A. Binns. 2021. Reducing urban flood risk through building- and lot-scale flood mitigation approaches: Challenges and opportunities. *Frontiers in Water*. Vol 3. https://www.researchgate.net/publication/354082553_Reducing_Urban_Flood_Risk_Through_Building-_and_Lot-Scale_Flood_Mitigation_Approaches_Challenges_and_Opportunities.
- Sayed, F. 2022. Homebuilders urge Ontario government to be 'cautious' with conservation authority changes. *The Narwhal*, December 8. <https://thenarwhal.ca/ontario-developers-conservation-authorities/>.
- Shrubsole, D. 2000. Flood management in Canada at the crossroads. *Global Environmental Change Part B: Environmental Hazards* 2(2): 63–75. [https://doi.org/10.1016/S1464-2867\(01\)00002-X](https://doi.org/10.1016/S1464-2867(01)00002-X).
- Shrubsole, D., M. Green, and J. Scherer. 1997. The actual and perceived effects of floodplain land-use regulations on residential property values in London, Ontario. *The Canadian Geographer* 41(2): 166–178. <https://doi.org/10.1111/j.1541-0064.1997.tb01156.x>.
- Sorensen, A., and P. Hess. 2015. Building suburbs, Toronto-style: Land development regimes, institutions, critical junctures and path dependence. *The Town Planning Review* 86(4): 411–436. <https://doi.org/10.3828/tpr.2015.26>.
- StatsCan. 2021. Revised 2022–12–16. Focus on Geography Series, 2021. Census of Population. Ottawa - Gatineau, Census metropolitan area, Ottawa, ON: Statistics Canada. Retrieved April 15, 2024 from <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/fogs-spg/page.cfm?lang=E&topic=1&dguid=2021S0503505>.
- Stewart, C. 2023. Personal communication with the Vice President of Climate Change and Federal Issues, Insurance Bureau of Canada. December 7.
- Thistlethwaite, J., and M. O. Wood. 2018. Insurance and climate change risk management: Rescaling to look beyond the horizon. *British Journal of Management* 29(2): 279–298. <https://doi.org/10.1111/1467-8551.12302>.
- Thistlethwaite, J., D. Henstra, C. Brown, and D. Scott. 2020. Barriers to insurance as a flood risk management tool: Evidence from a survey of property owners. *International Journal of Disaster Risk Science* 11(3): 263–273. <https://doi.org/10.1007/s13753-020-00272-z>.
- Tousignant, E. 2013. *Flood reduction strategies in the City of Ottawa*. Presentation by City of Ottawa Senior Water Resources Engineer to the Institute for Catastrophic Loss Reduction, September 19. Retrieved January 15, 2024 from https://www.iclr.org/wp-content/uploads/PDFS/Ottawa-Sept_19.pdf.
- UNDRR .2020. *The human cost of disasters: An overview of the last 20 years (2000–2019)*. Report published by the Centre for Research on the Epidemiology of Disasters United Nations Office for Disaster Risk Reduction. New York, NY: The United Nations. Retrieved January 19, 2024 from <https://www.undrr.org/publication/human-cost-disasters-overview-last-20-years-2000-2019>.
- Wake, J. D. 2023. Report regarding The Honourable Steve Clark, Minister of Municipal Affairs and Housing and Member of Provincial Parliament for Leeds–Grenville–Thousand Islands and Rideau Lakes. Toronto, ON: Office of the Integrity Commissioner, Legislative Assembly of Ontario. Retrieved January 22, 2024 from <https://s3.documentcloud.org/documents/23932176/ic-clark-report.pdf>.
- Willing, J. 2017. How the city is handling the 2017 flood differently from the 2009 flood. *Ottawa Citizen*, May 14. <https://ottawacitizen.com/news/local-news/how-the-city-is-handling-the-2017-flood-differently-from-the-2009-flood>.