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Climate Change Disinformation and Polarization in Canadian Society

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Introduction/Background

Climate change is one of the most pressing issues of our time and its long-term effects will have negative consequences for human civilization, but we can reduce the magnitude of these future effects by mitigating our GHG emissions (Government of Canada, 2019). Unfortunately, this issue has proven difficult to address through effective mitigation measures since GHG emissions are currently correlated with economic growth and balancing mitigation measures with economic growth has proven to be a point of contention and polarization in Western society (Strudwicke & Grant, 2020). Despite broad scientific consensus that climate change is occurring and is a result of anthropogenic GHG emissions, polarization within society on the issue of climate change continues to be a barrier to implementing effective mitigation and adaptation measures (Strudwicke & Grant, 2020). In this report, I will explore how disinformation relating to the issue of climate change might be used be a would-be adversary (e.g. Russia, China, non-state actor) to polarize Canadian society. Climate change is a prime issue for an adversary to exploit (vaccines are another one) because of the controversy and polarization that already exists on this topic and disinformation campaigns over social media (i.e. Twitter) have targeted both sides of this issue in the past (Strudwicke & Grant, 2020). The issue of climate change also falls predominately along partisan lines (Lewandowsky et al., 2013) and therefore would be a good issue to exploit for a threat actor trying to manipulate democratic elections, which was the intent of Russia in the 2016 U.S. presidential election (U.S. Department of Homeland Security, 2019; Taylor, 2019; Strudwicke & Grant, 2020).

Polarization on the issue of climate change exists in Western society because of the difficulty in communicating scientific concepts to the public (e.g. uncertainty), disinformation relating to climate change is already abundant in Western society and entrenched in the public's beliefs (which is difficult to correct) (Lewandowsky et al., 2013), and there are implications for economic growth to mitigate climate change. Concepts like uncertainty have two very different meanings in a scientific versus a colloquial context. A lack of understanding by the public and decision-makers about the nature of scientific uncertainty means that this uncertainty is often misconstrued as meaning scientists are uncertain whether climate change is occurring or

not and this has justified inaction in the past (Hillerbrand, 2009; Avi-Yonah & Uhlmann, 2009; Bocking, 2004). Past disinformation campaigns (by non-state actors such as fossil fuel companies) relating to climate change have capitalized on this misunderstanding to undermine the legitimacy of the body of scientific knowledge relating to climate change by creating confusion for the public to the benefit of fossil fuel producers (Oreskes & Conway, 2010). Disinformation relating to climate change denial or skepticism is already entrenched in public opinion as a result and is the most common theme associated with climate change disinformation (Oreskes & Conway, 2010; Lewandowsky et al., 2013). Climate denial or skepticism certainly contributes to polarization in Canadian society between those that believe that climate change needs to be substantially addressed and those that do not. However, it should be acknowledged that viewpoints that advocate for action on climate change can also wrongfully contribute to this polarization in Canadian society. Activism that encourages the government to adopt meaningful climate change policies certainly should not be discouraged, but narratives that overly stress government inaction and advocate for extreme mitigation measures which often take the form of activism are also misleading and unrealistic (even dangerous) because they fail to take into account the true reality of addressing climate change including carbon leakage (i.e. industries moving to countries with less stringent regulations) and the importance of economic growth for ensuring human well-being at home and abroad (Hillerbrand, 2009; Lind, 1995; Keohane & Victor, 2016; Government of Canada, 2016). Consequently, climate change is already a polarizing issue in Canadian society which can be exploited to create further polarization. For the purposes of this paper, I will explore how a threat actor could target one or both of these viewpoints in order to polarize Canadian society.

Disinformation can be outright false information or information that is true but is intended to be misleading and the terms disinformation, misinformation, false information and fake news are not synonymous (U.S. Department of Homeland Security, 2019). Disinformation campaigns are also different than legitimate influence operations used by national governments, NGOs and informal groups to shape public opinion domestically and internationally (U.S. Department of Homeland Security, 2019). Disinformation campaigns are often rooted in cognitive psychology which facilitates the uptake of disinformation by the target audience and sophisticated campaigns utilize a predictable progression with distinct steps to achieve an outcome (Lewandowsky et al., 2013; U.S. Department of Homeland Security, 2019). Individuals tend to incorporate information that aligns with their worldview and refute information that doesn't, meaning disinformation that seems to align with an individual's worldview can easily incorporated into their beliefs (Lewandowsky et al., 2013). Further, it is difficult to remove this disinformation even after it has been corrected (Lewandowsky et al., 2013). Disinformation campaigns intent on polarizing Canadian society can therefore have a significant effect by targeting opposing viewpoints on the issue of climate change.

Climate change disinformation content in Canada would differ depending on the target audience that an actor is hoping to influence. Disinformation campaigns rooted in climate skepticism or denial are not based in science but are well established in Western society so false information may be readily utilized but scientific information may also be presented in a way that seems support these viewpoints (Lewandowsky et al., 2013). Disinformation campaigns targeting climate activists or similar groups might utilize actual scientific information but in a way that is intentionally misleading since science supports action on climate change. Activist groups are certainly not immune to the uptake of false information which aligns with their worldview such as negative effects of climate change that are contrived rather than based in science. Environmental

groups have been criticized in the past by using sensationalized content such as the rhetoric of dangerous or apocalyptic climate change that is only loosely based on climate science to elicit an emotional response and raise awareness of the issue of climate change (MacKay & Munro, 2012; Rothe, 2012; Zelko, 2004). Disinformation campaigns targeting either of these opposing viewpoints may serve to polarize Canadian society by further entrenching opposing beliefs and by providing an avenue for the uptake of disinformation aimed at pushing these viewpoints further to the extremes. Worldview backfire effect described by Lewandowsky et al., (2013) occurs when individuals are presented with information that conflicts with their worldview (true or not) that serves to further entrench peoples' beliefs and can arise out of legitimate efforts to correct disinformation or be used intentionally to create or exacerbate polarization on issues such as climate change (i.e. also a use of cognitive psychology by disinformation campaigns).

Targeted disinformation campaigns were a well-established phenomenon prior to the advent of the internet but the internet and social media have provided a widely accessible and low-cost platform that threat actors can exploit for disinformation purposes (U.S. Department of Homeland Security, 2019). Disinformation campaigns over social media are inexpensive, effective, and well within the means of an increasingly wide range of threat actors in contrast to other advanced and expensive military technologies traditionally used by state actors (McGeehan, 2018). However, disinformation campaigns utilizing social media are not limited to use by smaller and non-state actors as demonstrated by the extensive use of social media by Russian disinformation campaigns during the 2016 U.S. presidential election. Extended disinformation campaigns are an effective means to influence a population in Western democracies because informed citizens are crucial to the proper functioning of democratic societies and it is ultimately the population that has control over the internal and external affairs of a nation (McGeehan, 2018).

Climate Change Viewpoints

Climate change is already a polarizing issue in Canadian society with many different viewpoints ranging from climate denialism and skepticism to extreme climate activism which advocates for extreme mitigation measures (i.e. mitigation at all costs approach). Climate change denialism or skepticism was considered a valid viewpoint in the early 1990s in the broader climate discourse but is now considered to be invalid (Rothe, 2012). However, climate change denialism and skepticism continues to persist in Western Society because disinformation campaigns by large oil companies which promoted ideas of climate skepticism and denial are inherently difficult to correct once they have been incorporated into individuals' worldviews due to cognitive psychological processes. Climate activism is becoming increasingly common worldwide and is often emotionally charged stemming from narratives of negative effects and fear for the future (Feldman & Hart, 2016; Renouf et al., 2015; Marris, 2019). The UN's Intergovernmental Panel on Climate Change is currently considered the standard with which to judge the validity of the range of viewpoints on climate change (Rothe, 2012).

Climate change is complex so different storylines are used as a framework to communicate climate change to the broader public and facilitate conceptualization and reasoning (Rothe, 2012). The storylines that underly different viewpoints can be used as an argumentative weapon in order for a particular group such as an

environmental NGO or Indigenous organization to position themselves politically or place blame with particular actions or a particular group (Rothe, 2012). These viewpoints are subjective and compete with other viewpoints for validity in the context of climate politics, each has implications for the measures that we take to address climate change (Rothe, 2012). For example, the intent of climate alarmism which frames climate change as apocalyptic, catastrophic or dangerous is used as a means of raising awareness and emphasizing the need for urgent action (Rothe, 2012; Methmann & Rothe, 2012). Unfortunately, the rhetoric of this storyline imposes a strict timeline for political action on climate change that is difficult or impossible for governments to meet but this viewpoint also competes with other viewpoints including the more moderate storylines that posit sustainable development as the solution to climate change, emphasizing the compatibility of economic growth and protecting the environment (Rothe, 2012). There is the possibility that different viewpoints might coalesce (Rothe, 2012) but also the possibility that different viewpoints could lead to polarization in Canadian society, especially if targeted disinformation campaigns succeed in polarizing opposing viewpoints. For example, whether the government is doing enough to address climate change or not could be a polarizing topic.

The Canadian government must walk a fine line between aggressive GHG mitigation, which would be damaging economically, and prioritizing economic growth over climate change mitigation in the context of climate politics. The Canadian economy is still heavily reliant on the export of fossil fuels, but Canada is also considered a responsible international actor which will act to mitigate the impacts of climate change. However, even in our current situation with a government that is actively trying to balance climate change mitigation and economic growth, there are still groups that believe that either we are doing too much to mitigate climate change at the expense of economic growth and also those that believe that we are not doing enough to mitigate climate change. Western Canada is a major fossil fuel producer and it is easy to see why many in the fossil fuel producing west would be opposed to climate mitigation measures that curb the production and consumption of fossil fuels because of the consequences (real and perceived) for the regional economy. In contrast, NGOs are increasingly drawing on the rhetoric of dangerous climate change to bring awareness to the issue (Rothe, 2012; Methmann & Rothe, 2012). This comprises two competing visions of what the government's action on climate change should be and which measures are applied in the future to combat climate change will depend on which storyline becomes strengthened (by actors) as the correct interpretation of the climate change issue (Rothe, 2012). Targeted disinformation campaigns could ultimately affect which storyline becomes strengthened and which measures are taken to address climate change or simply polarize Canadian society by amplifying these opposing viewpoints.

Disinformation targeting climate denialism and skepticism is relatively straightforward and well established in the literature and large fossil fuel companies and Russia have been successful in administering these campaigns. The literature on disinformation targeting other groups is less abundant so I will problematize how disinformation campaigns might target climate activism or alarmism, including how NGOs and Indigenous organizations might be manipulated by targeted disinformation campaigns (and the possible consequences). NGOs or Indigenous organizations might adopt and further storylines of apocalyptic, catastrophic, and dangerous climate change to raise awareness of the issue of climate change, for political reasons or to place blame with a particular group (Rothe, 2012; Methmann & Rothe, 2012). These notions of climate change imply urgent and significant actions are needed to mitigate climate change up to and including drastic changes to

the way we live our lives. The more extreme of these viewpoints tends to be critical of government policies on climate change, viewing them as inadequate and provide a counternarrative that sometimes lends support to alternative political viewpoints (Zelko, 2004). The implications of these viewpoints on domestic politics is significant since disinformation campaigns can be used to manipulate democratic elections as seen in the 2016 U.S. presidential election.

Russian troll tweets from the 2016 U.S. presidential election that targeted climate change tended to engage both sides of the broader public discourse and trended towards more extreme content for both opposing viewpoints (Strudwicke & Grant, 2020). Environmental NGOs or Indigenous organizations could come under the direct influence of disinformation campaigns causing them to deviate from their established positions or roles in Canadian society or be used to gain a following and establish a network based on positive and supportive messaging that can be used for the subsequent spread of disinformation to sow confusion and division (Linvill et al., 2019). Disinformation campaigns often utilize a spin of a particular topic that is more subtle than fake news or outright lies which can be more difficult to detect but still serves to manipulate or influence the target audience (Linvill et al., 2019). Repeated messaging utilizing disinformation is a tactic sometimes used by disinformation campaigns to manipulate organizations (Shu et al., 2020; Jennings, 2020). Targeted disinformation campaigns might also amplify the voices of NGOs or Indigenous organizations that are proponents of more extreme views relating to climate change within the overall competition between viewpoints. Polarization could result in Canadian society as more extreme viewpoints are amplified and more moderate viewpoints are suppressed.

Fossil fuel projects such as pipeline expansions face significant opposition by some groups in Canada. For example, the expansion of the Trans Mountain pipeline was protested because it represented the viewpoint of some Canadians that believed the impacts of the pipeline and the continued expansion of the oilsands is incompatible with Canada's commitment to mitigate climate change and traditional Indigenous responsibilities to the environment, despite approval by a fairly rigorous EIA process. Disinformation campaigns could manipulate NGOs or Indigenous groups into opposing projects such as this. Opposition narratives surrounding projects such as this are already a source of contention and polarization in Canadian society with oil sands and pipelines currently some of the most divisive issues in Canadian politics (Hoberg, 2016) and inherently tied to the discourse on climate change. Certain Indigenous groups and environmentalists tend to oppose these projects based on their viewpoint that climate change needs to be aggressively mitigated among other things (Hoberg, 2016) whereas, more moderate viewpoints take into account the current reliance of the Canadian economy on oil and the potential significance of these projects for sustainable development and the capital needed to begin to transition away from fossil fuels (i.e. that current reliance on fossil fuels can facilitate a transition to a sustainable model of economic growth). Unfortunately, many fossil fuel companies continue to have a record of downplaying and distorting climate science, even engaging in disinformation campaigns (Union of Concerned Scientists, n.d.) but this does not mean that fossil fuels won't to play a role in sustainable development or a transition to a green economy. An example of this is the push to shift away from more polluting fossil fuels such as coal and towards cleaner fuels such as natural gas for the generation of electricity and industry.

Climate change activists are correct in their understanding that the burning of fossil fuels is the cause of climate change but their viewpoints and actions sometimes reflect a lack of understanding of the implications of adopting extreme mitigation measures and also sometimes have questionable notions of distributive justice (i.e. who is to blame for climate change and who should pay) which is based in their simplified understanding of climate change, a complex issue and the particular views of the group they represent. Such rhetoric is intended to raise awareness about climate change but does not include pragmatic solutions (MacKay & Munro, 2012; Rothe, 2012; Zelko, 2004). Images and text intended to communicate climate change to a broad audience and utilized by activists also has pitfalls such as a loss of context and complexity represented by images and messaging like polar bears swimming or floating on ice floes (Born, 2019). As some of the complexity of climate change is lost in communicating climate change to the broader public and as the issue is framed differently to reflect the interests of certain organizations (e.g. NGOs or Indigenous organizations) there is room among these subjective interpretations for targeted disinformation and the spread of misinformation to take hold, particularly if it aligns with the worldviews of individuals that support these organizations or messaging is initially supportive but later divisive (Linvill et al., 2019).

The use of social media and the internet by targeted disinformation campaigns and also its role in the spread of misinformation is significant. Both disinformation and misinformation over social media and the internet are well suited to play to peoples' worldview and political leaning without being interpreted critically (i.e. testing some of this disinformation or misinformation against rigorous climate science and expert opinion which might occur with other sources of information like in conventional media like T.V. and newspapers) (Marsden, Meyer & Brown, 2020) and most people lack the background to be able to interpret this information critically through a scientific lens. Therefore, certain narratives can come to be influenced by threat actors through targeted disinformation campaigns and the subsequent spread of misinformation. The interpretation of science is particularly significant. The dissemination and uptake of scientific information is an avenue through which disinformation could spread and this has certainly proven to be true in the context of climate denial and skepticism disinformation campaigns undertaken by oil companies which spun science in a misleading way. Rhetoric of apocalyptic and dangerous climate change employed by some activists is also a spin on scientific data.

Many different modelling scenarios are used to project the future impacts of climate change under different warming scenarios and there are significant differences in the projected impacts under some of these models (Flato et al., 2013). Scientific uncertainty which consists of a range of possible values, is an important component of projections and this range increases the further models are forecasted into the future ("Scientific uncertainty", 2019; Flato et al., 2013). The global climate system is also extremely complex which makes constructing accurate models difficult (Hillerbrand, 2009). These realities represent inherent difficulties in predicting exactly the future effects of climate change and the magnitude of these effects (Hillerbrand, 2009). Still, all modelling projections exhibit a general warming trend and agree that the magnitude of future effects of climate change will be dependent on the future GHG emissions trajectory (Flato et al., 2013).

Various interpretations of this body of scientific knowledge might rely selectively on certain data (i.e. cherry-picking data) such as extremely high magnitude negative effects found in the high range of projections of certain climate models for the purposes of disinformation (i.e. the science is real but the way in which it is

presented is misleading). For example, models that project higher than average sea-ice loss estimates (compared to other models) might be used to support narratives of apocalyptic, catastrophic, or dangerous climate change when really most models have lower estimates of sea ice loss (or sea level rise etc.). Misinterpretations of the scientific data could be used to support narratives of apocalyptic climate change and if done intentionally with the intent to mislead or create polarization in Canadian society, constitutes disinformation. This underlies the need for scientists to evaluate the validity of various models and projections and emphasizes the importance of the work of bodies like the IPCC which critically evaluate and synthesize the body of climate change into reports which best represent the current body of knowledge on climate change. Mean projections are often utilized to provide a balanced interpretation across a range of projections (Flato et al., 2013).

Mackay and Munro (2012) have identified the use of different tactics used by ExxonMobil and Greenpeace in an information war between these two parties over the issue of climate change. ExxonMobil made extensive use of arms-length organizations and NGOs in order to generate counter-science intended to undermine real climate science and create the impression that that was discord among scientists on the issue of climate change, which generated confusion and skepticism among the public (MacKay & Munro, 2012). Greenpeace supported real climate science but made use of radical direct action activism, imagery, and slogans intended to generate an emotional response that were not necessarily based in fact or science (i.e. rather than to aid in the communication of science to the public) in order mobilize public support against large oil companies like ExxonMobil and pursue aggressive climate and environmental action (MacKay & Munro, 2012). Both parties used information as weapon in order to achieve strategic aims such as shaping public opinion and in the framing of this particular debate parties sought to reinforce their particular viewpoints at the expense of the other (MacKay & Munro, 2012). Framing Greenpeace's viewpoint as the only one that is reflective of the body of real science can be damaging and polarizing because it situates the implications of mitigating climate change as radical and extreme (MacKay & Munro, 2012). Obviously, ExxonMobil's use of pseudoscience is damaging to the real body of scientific knowledge and our ability to address climate change since this disinformation has become deeply entrenched in public opinion (MacKay & Munro, 2012). It is likely that such hostile and polarizing debates will worsen with the advent of a new informational landscape, particularly on the internet (MacKay & Munro, 2012).

The emergence of radical environmental and social movements in the 1960s and 70s led to the more widespread implementation of direct-action protest tactics which raised the media profile of these movements and gave rise to organizations such as Greenpeace (Zelko, 2004). Since that time, these organizations have established and maintained international profiles and brought environmental and social justice issues into the mainstream. The distain for the established power structures and institutions within society by these groups was a hallmark of earlier of movements and this was expressed in the adoption of radical direct-action tactics (Zelko, 2004) which are still used by some (more radical) organizations today. Organizations such as Greenpeace were successfully able to harness the chaos of dissent, embodying a range of different ideologies, and turn this into a political weapon (Zelko, 2004). However, critics have noted that even organizations such as Greenpeace, which have seemingly firm foundations in science such as ecology, have at times misinterpreted scientific information and engaged in overly emotional campaigns (Zelko, 2004).

In the 1960s and 1970s environmental and social groups were radicalized by new ideas, emerging viewpoints and overwhelming dissatisfaction with the established order and made increasing use of direct action protests in contrast to peaceful protest tactics that these groups had utilized previously (Zelko, 2004). Direct action is still a commonly used form of protest in Canada and has been utilized in pipeline blockades in B.C. and the 2020 rail protests led by Indigenous groups in Ontario and Quebec. Disinformation campaigns that target these groups with emotional content and poorly interpreted scientific information or false information that appears to be scientific could change the landscape of social and environmental movements in Canada by causing these groups to act in more radical ways (similar to what occurred in the 1960s and 70s with direct action protests). If this is the case, direct action protests might be more hostile in the future. Certain groups might be predisposed to adopt more radical forms of direct action due to the perceived ineffectiveness of current tactics in creating the change that these groups desire (as has happened in the past) (Zelko, 2004), providing a potentially fertile ground for disinformation that reinforces this worldview to take hold. The rail blockades in Ontario in February 2020 proved to exacerbate the already polarizing debate over energy development in Canadian society and divisions regarding the issue of Indigenous reconciliation (Delacourt, 2020). The middle ground regarding these issues seems to be fading in Canadian society and this increased polarization has been catalysed by the disruptive direct-action tactics of a radical minority (Hoberg, 2016; Delacourt, 2020). Therefore, an increased propensity for NGOs and Indigenous organizations to behave in this way as a result of manipulative disinformation campaigns is a real possibility and would likely further serve to polarize Canadian society.

Sophisticated disinformation campaigns pander to existing dissenting viewpoints and create movement towards the uptake and possibly implementation of more radical ideas. Therefore, it is possible that the rail blockades that occurred in Ontario (and Quebec in February 2020) and the pipeline corridor protests in B.C., which are considered the actions of a radical minority whose dissent led them to take direct action, could become more common if individuals and groups are influenced by disinformation campaigns. These events were intended to bring attention to the issue of Indigenous reconciliation and pipelines and illicit an emotional and sympathetic response from certain groups in Canada and possibly internationally but these actions also serve to entrench beliefs of individuals with opposing viewpoints, creating polarization. Potentially more significant is how these actions are perceived by broader Canadian society as representing the views of all Indigenous Canadians or environmentalists when this not the case. If disinformation lends greater support for more radical viewpoints, these viewpoints can become more well-established within the greater competition between climate change viewpoints and undermine the legitimacy of more moderate groups. The emerging information landscape is critically important for the dissemination of alternative viewpoints such as those of environmentalists, climate change activists, and Indigenous organizations, especially those that feel that their positions are misrepresented or lack coverage in the traditional media. However, unlike the 1960s and 1970s when these views were considered more radical than today, these subjects receive a fair amount of media coverage in Canada. Still, social media and the internet are important grounds for dissenting opinions (e.g. the government's handling of these issues) and although certainly not exclusive to dissenting opinions considered to be on the left of the political spectrum (with respect to these issues), there is a history of the use of alternative media and tactics to manipulate mass media by activist groups. Climate skepticism and denialism is much less prevalent in the mainstream media than it has been in the past and proponents of this ideology

have also found that the internet and social media are good places to perpetuate these beliefs (Strudwicke & Grant, 2020).

Protests and counter-protests over a variety of social and environmental issues including climate change have become a fixture of current events. Recent high profile climate change rallies such as those led by Greta Thunberg in Edmonton (2019) drew counter-protesters in support of the Canadian oil and gas sector and while this likely represents to a large degree the polarization that already exists in Canadian society over the issue of climate change, it is also indicative of the role that the modern information landscape, especially the internet and social media, has in shaping individuals' and groups' viewpoints. More significant is the impact that targeted disinformation campaigns in the modern information landscape have on the discourse of issues like climate change in democratic societies which depend on public debate and well-informed citizens (Saurwein & Spencer-Smith, 2020). Moreover, there is a lack of awareness of the existence of disinformation and misinformation online, especially in social media, and these sources of information are easy to access and widely used (Shu et al., 2020). It is entirely possible that individuals and groups on both sides of the issue in this case were influenced by targeted disinformation campaigns such as the one used by the Russian government over Twitter that effectively weaponized the climate change issue and that this is contributing to some extent to the polarization we are currently seeing in Canadian society over climate change.

Combatting Disinformation

The spread of disinformation over the internet and social media is of primary interest to researchers and Western governments, especially since the 2016 U.S. presidential election. The uptake of information is rapid and convenient for users of this technology and influences their opinions and actions through direct and indirect means (Shu et al., 2020). Shu et al. (2020) group the challenges of combatting disinformation into two groups, content-related and user-related. Various technologies used to detect and mitigate disinformation and user education are being developed and implemented as ways to combat the spread of disinformation online and in social media, but the rapid spread of disinformation on these platforms remains an unsolved problem (Shu et al., 2020). Disinformation threat modelling is an emerging field, but improvements need to be made to identify multiple forms of disinformation (e.g. images and video) beyond just text (see Zellers et al., 2019) and technologies for dealing with disinformation need to keep pace with emerging technologies such as AI and deepfakes which could automate the generation of disinformation and make it harder to detect (Shu et al., 2020). User education, which helps social media users differentiate between real information and disinformation, has been successful in combatting disinformation but is limited by the fact that some individuals are predisposed to the uptake of disinformation based on their worldview and cognitive ability and also because some sophisticated forms of disinformation are difficult to detect using only the human brain (Shu et al., 2020). Flagging and fact checking suspected disinformation on some social media platforms is an existing mechanism for combating the spread of disinformation that is driven by users but still insufficient in the overall fight to combat disinformation (mostly related to rapid spread) (Shu et al., 2020).

Education is an important tool that gives the public skills to detect and think critically about possible disinformation and provides them with real facts related to certain subject matter such as climate change with

which to truth the information that they encounter on the internet and social media. These are practical and reliable ways of inoculating the public against disinformation (Shu et al., 2020). Correcting disinformation once it has been incorporated into individuals' beliefs is more difficult (as has been outlined previously) but also effective, especially when the true source of the disinformation is exposed (Lewandowsky et al., 2013; Shu et al., 2020; Pfau et al., 2007). There are also educational challenges associated specifically with the issue of climate change and many people hold erroneous views about climate change due to past disinformation campaigns by some large corporations that saw climate science as a threat to the fossil fuel industry (Kolmes, 2011). These campaigns have been successful in creating confusion and uncertainty on the issue of climate change for the American public that has stifled concerted action (Kolmes, 2011). This deep-seated disinformation related to climate change also exists in Canadian society, which is heavily influenced by American society, but to a lesser extent (revealed by climate change polls) (CBC News, 2020). Education campaigns that utilize both content and skill development to combat the spread and uptake of disinformation can create a society that is resilient to the threat of disinformation and protect Western democracies from would-be threat actors.

Education of the Canadian public specifically related to climate change is a good opportunity to depoliticize the issue of climate change and further a broader, more productive national discourse. The association of climate change with a particular political stripe is currently a barrier to the processing of information and belief updating that is necessary to displace disinformation and reduce polarization in Canadian society (Lewandowsky et al., 2013). By depoliticizing and depolarizing the issue of climate change its usefulness as an issue to further polarize Canadian society by a would-be threat actor would be greatly reduced. To what degree the issue of climate change can be depoliticized and depolarized is a practical matter in the current political climate but it is likely that climate change will continue to occupy a high profile in Canadian politics and be increasingly accepted rather than refuted among Canadians. Incorporating climate change into the grade school curriculum and fostering scientific and digital literacy early on and not just at the post-secondary level should help to create a deeper understanding of the issue of climate change among a younger generations and facilitate the critical thinking necessary to refute disinformation among a generation that will rely increasingly on the internet and social media for information.

Alarmingly high numbers of Americans viewed targeted disinformation and misinformation on the internet and social media during the 2016 presidential election and more recently disinformation related to the COVID-19 pandemic has been pervasive on these platforms (Tagliabue, Galassi & Mariani, 2020; Strudwicke & Grant, 2020). The prevalence of conspiracy theories and extremist groups online and on social media (especially those observed recently in the U.S.), which undermine government authority and legitimate groups, has also brought to light systemic problems related the dissemination of information over the internet and social media, especially the ability of these movements to transform into real world actions, even violent actions. Violence related to disinformation (mob justice and lynching) is an emerging concern with respect to disinformation over social media and the internet compounded by the fact that false information can spread very rapidly over these platforms (Shu et al., 2020). This phenomenon is being observed in other countries, sometimes with tragic consequences (Shu et al., 2020). Violence related to false information about climate change, especially against individuals that represent controversial viewpoints (such as Greta Thunberg) would be a disturbing development in the climate change discourse in Canadian society.

Technology can certainly aid in detecting and combating information, but this also raises questions of governance and the steps taken by social media to deal with disinformation on their platforms is widely viewed as insufficient, despite being considered an improvement (Marsden, Meyer & Brown, 2020). Public education is therefore an essential tool to combat disinformation and mitigate its impact on democratic societies. The use of well-established names and iconography by certain groups is a concern in terms of manipulation of groups and the perception of the public. For example, the use of the hashtag "#SaveTheChildren" as a rallying cry by the QAnon conspiracy group in the U.S. infringes upon the legitimate Save The Children charity organization of the same name and is part of the reason why the movement has gained traction (Jennings, 2020). Therefore, the effect of piggybacking on well-established and legitimate brands and groups can serve to further the spread of disinformation and create polarization. AI and deep fakes also serve this purpose by doctoring images, videos, and documents to make it appear that they are supported by certain groups or to attack other groups (Marsden, Meyer & Brown, 2020). And while fakes can be identified, the speed at which this disinformation can be disseminated remains a significant problem in curbing the spread and minimizing the impact of this information on the public. Tactics used to spread disinformation often include creating sensationalized content that is intended to go viral (Canadian Security Intelligence Service, 2018). The QAnon hastag "#SaveTheChildren" also gained support among women and mothers because it elicited an emotional response (Jennings, 2020). Technology and human intervention and inoculation against disinformation can prevent this.

Combatting disinformation has become a question of governance and while individuals have an important role to play in combatting disinformation, government has a responsibility to its citizens to protect them and the integrity of their democratic society from the malicious effects of disinformation (Marsden, Meyer & Brown, 2020). The appropriate role that governments have to play in regulating the freedom of speech differs between countries (e.g. total freedom of speech infringing on other rights versus an unimpeded free marketplace of ideas) and governments are facing difficulties in regulating the online space and social media platforms (Marsden, Meyer & Brown, 2020). However, disinformation has been a problem since the advent of written language and governments have successfully regulated other forms of media (now considered conventional) in response and it is inevitable that the online space will need to be regulated appropriately as well (Marsden, Meyer & Brown, 2020). Marsden, Meyer & Brown (2020), suggest that a combination of AI and human intervention is the best way to do this and that although the threat that disinformation poses to democratic societies is not one that can be completely eliminated, it can and should be minimized. Therefore, allowing the unregulated uptake of disinformation online and in social media cannot be considered an appropriate policy option as it infringes upon the rights of citizens to free and fair democratic elections and their freedom of expression (Marsden, Meyer & Brown, 2020).

The proper functioning of democracies relies on reliable sources of information and there is no silver bullet to combatting disinformation (i.e. AI is not a silver bullet for addressing disinformation), so a range of policy options need to be explored (Marsden, Meyer & Brown, 2020). Much of the information that is shared over social media still comes from conventional sources and human moderation is important for the application of values to content (i.e. discern what is right and wrong or legal and illegal pursuant to each country's or governing body's content regulations), which lends support to a human-regulated AI approach to detecting disinformation (Marsden, Meyer & Brown, 2020). Politicians, public figures, organizations, and NGOs have a

responsibility to be reliable sources of information and addressing disinformation and misinformation in a timely manner is critical in preventing its uptake (Lewandowsky et al., 2013). Action on the part of leaders and organizations to confront disinformation has important implications for broadly addressing the threat of disinformation in society. Disinformation campaigns are indeed a whole of society problem that must be dealt with by all sectors of society (i.e. government, business and civil society) (U.S. Department of Homeland Security, 2019).

Education and digital literacy are valuable tools to combat disinformation for the individual and especially in the context of climate change. Furthering climate change education among the public will help to combat disinformation related to climate change and reduce the ability of a threat actor to be able to polarize Canadian society or manipulate existing organizations (e.g. Indigenous) and NGOs. The use of alternative sources of information such as the internet and social media by NGOs or Indigenous organizations can be particularly problematic for combatting disinformation due to the ease with which disinformation is proliferated in this information landscape and the lack of assurances that the information is valid compared to conventional sources. The internet is a source of alternative viewpoints not found in conventional media and this is significant for both sides of the climate change debate. AI is very good at detecting disinformation for well-established topics such as climate change but not very effective at detecting disinformation related to novel topics (Marsden, Meyer & Brown, 2020). Therefore, the methods of combating disinformation suggested above which combine AI and human moderation of content will likely be very effective at stemming the tide of climate change disinformation. However, the implementation of an effective regulatory framework is an important caveat.

Self-regulation by social media platforms is considered inadequate and complete state regulation would be expensive and difficult to implement (Marsden, Meyer & Brown, 2020). Co-regulation is considered the best balance between government control, including transparency and accountability, and practicality of implementation (Marsden, Meyer & Brown, 2020). Finally, the success of AI in identifying information can further combat disinformation by revealing the source of disinformation and reduce the incorporation of disinformation content into individuals' viewpoints (Marsden, Meyer & Brown, 2020). For example, had the public been aware of the fact that troll tweets about climate change originated from an initiative of the Russian government, were intended to polarize Western society, and targeted both sides of the debate, it is likely that individuals (in Canadian society and Western Democracies) would interpret climate change content on social media more critically and would reject the content identified as disinformation on the basis of its origin. Inducing suspicion about the source of information that is actually disinformation has been found to be sufficient to cause its rejection (Lewandowsky et al., 2013). So ultimately identifying and revealing the source of disinformation is significant because it will likely result in less polarization in Canadian society over the issue of climate change. Canada and Ireland have both recently implemented regulations to combat foreign interference in elections which require transparency and ban overseas donations to political campaigns which have led social media to ban all political advertising on their platforms (Boutilier, 2019; Marsden, Meyer & Brown, 2020) thereby reducing the ability of foreign actors to influence democratic elections in Canada through targeted disinformation using topics such as climate change and related issues such as fossil fuel production. Leadership from government, NGOs, and other organizations also has important implications for broadly addressing the threat of disinformation in Western democratic societies.

Who are Possible Threat Actors?

Russia is often framed as a threat in North American security discourse and has been a primary threat to Western democracies through foreign interference and disinformation campaigns since Vladimir Putin assumed power in Russia in the early 2000s (also during soviet times (Linvill et al., 2019)) (Taylor, 2019), but many other state and non-state actors (e.g. terrorist organizations) also view western democracies as a main adversary (Lewandowsky et al., 2013). Other countries may use disinformation to achieve desired outcomes in the context of great power competition such as China, an emerging great power with economic interests in the Arctic (Kopra, 2020). Non-state actors have access to a cheap and broad-reaching platform to spread disinformation via the internet and social media such as extremist and terrorist groups which use the internet for propaganda, including the dissemination of disinformation (United Nations Office on Drugs and Crime, 2012). The rise of far-right extremism is concerning trend and disinformation is certainly contributing to this on the internet and social media. Far-left extremism and terrorism is less of a concern but became a reality in this country during the 1970 October crisis and also during past armed confrontations between Indigenous activists and the Canadian government (e.g. Oka). It is possible that disinformation, especially over social media and the internet, could be utilized by independence or armed Indigenous resistance movements to undermine the authority of the Canadian state. Climate change may even serve as an area of common interest for the coalescence of far-left interests in opposition of the Canadian government such as in the case of the expansion of national energy infrastructure (i.e. pipelines).

European democracies have been dealing with the threat of foreign interference and disinformation (mostly from Russia) for longer than North American democracies (most notably the United States) (Taylor, 2019). Early in his presidency Vladimir Putin attempted to influence the former Communist countries of Central and Eastern Europe and former states of the Soviet Union with the intent of swaying these countries away from Western-style democracy and returning them to Russia's coercive sphere of influence (Taylor, 2019). Later Russian disinformation campaigns sought to influence Western European and North American democracies by weakening NATO and the EU and targeting democratic institutions (e.g. elections and the independent media) and the liberal international order (e.g. multiculturalism, the rule of law and human rights) (Taylor, 2019). Disinformation is just one tool that Putin uses in asymmetric warfare to undermine Western democracy and the rule of law (McGeehan, 2018). Other tactics include military invasions, cyberattacks, support for fringe political groups, and the weaponization of energy resources, organized crime, and corruption (Taylor, 2019; Royal, 2019). Russia tries to destabilize the west by exploiting divisions in society (Emmott, 2020) and as many democracies work to combat the problem of foreign interference and disinformation, lessons can be learned for their experiences (Taylor, 2019). Different countries have different vulnerabilities and have responded differently (Taylor, 2019).

Canada might be targeted by Russian disinformation in response to Canada's or NATO's actions in other parts of the world or for various reasons such as because we are a fossil fuel producer and possible competitor, have a large Arctic territory, are a member of NATO, or simply a Western democratic nation. Russian media

recently launched a significant disinformation campaign against the West during the coronavirus pandemic with the intent of generating panic and sowing distrust according to an EU report (Emmott, 2020).

Conclusion

Climate change disinformation is broadly significant because it can contribute to increasingly fractured and polarized societies in general and is a significant as a barrier to taking meaningful collective action on climate change. Russia is a known threat actor that engages in disinformation campaigns against the West using the internet and social media but these methods are also available to an increasing variety of state and non-state actors as cheap and broad reaching means for the purposes of spreading disinformation. Russia has effectively targeted both sides of the climate change debate with disinformation campaigns over social media and targets the issue of climate change more than other topics because it is one of the most polarizing issues in Western society. The internet as a source of information and the use of social media can serve to reinforce pre-existing viewpoints and facilitate the uptake of disinformation compared to conventional sources of information which have more rigorous standards for determining the validity of their sources.

Ideological conflict is becoming more deeply entrenched as information war rages between opposing sides of the climate change debate (MacKay & Munro, 2012) and it is likely that the internet and social media will be the grounds for an increasingly polarized debate unless meaningful action is taken to reverse this trend. Co-regulation of the online space between governments and social media platforms with human-moderated AI is probably the most effective policy option to combat the spread of disinformation. Public education is another avenue that needs to be pursued to inoculate the public against the spread of disinformation. Education specifically related to climate change and digital literacy can give the public the knowledge and skills necessary to reject disinformation that they encounter online, although this depends greatly on individuals' cognitive ability and their worldview. Increased knowledge of climate change through education will hopefully serve the added purpose of furthering a more productive national discourse on climate change, resulting in less polarization and reducing the usefulness of climate change as an issue that a would be adversary could exploit to polarize Canadian society.

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