Similarities and differences in managing the Covid-19 crisis and climate change risk

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Abstract

Purpose – *This paper investigates both similarities and differences between two global threats represented by climate change (CC) and Covid-19 (CV). This will help understand the reasons behind the recognition of the CV as a pandemic that requires global efforts, whereas efforts to tackle climate change still lack such urgency. This paper aims to answer to the following questions: What are the elements that make CV restrictions acceptable by both the public and policymakers? and What are the elements that make CC restrictions not acceptable?*

Design/methodology/approach – *This paper analyses the situation reports released by the World Health Organisation between the 11th of March (declaration of pandemic) and the 22nd of April, and their associated documents such as the Strategic Preparedness and Response Plan (WHO), the Risk Communication and Community Engagement Action Plan (WHO) and its updated version (WHO) and the Handbook for public health capacity-building (WHO). The analysis ends one week after President Trump's announcement to suspend US funding to WHO (Fedor and Manson, 2020) and his support to public demonstrations against restrictions.*

Findings – *The application of the second stage of the "Crisis and Emergency Risk Communication" model identifies five lessons that can be learned from this comparison. These relate to the necessity to simultaneously warn (about the severity of a threat) and reassure (by suggesting specific courses of action) the public; the need for multilevel collaboration that integrates collective and individual actions; the capacity to present cohesive messages to the public; the risk of politicisation and commodification of the issue that might undermine global efforts to tackle the threat; and the capacity to trigger individual responses through the promotion of self-efficacy.*

Originality/value – *This paper identifies both similarities and differences between CC and CV managements to understand why the two threats are perceived and tackled in different ways. The analysis of official documents released by both the World Health Organisation and the Intergovernmental Panel on Climate CV outbreak as a crisis, whereas climate change is still anchored to the status of a future-oriented risk.*

Keywords *Climate change, Risk-management, Coronavirus, Pandemic, Crisis-management*

Paper type *Research paper*

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1. Introduction

This paper investigates both similarities and differences between two global threats represented by climate change (CC) and Covid-19 (CV). This will help understand the reasons behind the recognition of the CV as a pandemic that requires global efforts, whereas efforts to tackle climate change still lack such urgency. The management of risk and disasters also rely on communication strategies to persuade the public to change specific behaviours (Bengel *et al.*, 1996; Freimuth *et al.*, 2000; Murray-Johnson *et al.*, 2001; Witte, 1991). This suggests that although both CC and CV are life-threatening and invisible threats, the way in which they are communicated can influence the public perception and

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the actions implemented to fight the problem. In fact, the general recognition of CV as an impending threat to life makes restrictions to individual freedom "acceptable" for the public. By contrast, despite the visible consequences of CC, the implementation of such severe restrictions would be preposterous. As with other epidemiologic studies (e.g. AIDS till recently), cures and vaccines against CV have not been developed yet. Therefore, one fundamental aspect to reduce the spread of the virus is prevention, which is invoked by global authorities and implemented at local levels through strict restrictions. In the context of CC, the literature emphasises a need to combine disaster risk reduction and adaptation strategies (Islam and Smart, 2020). Some efforts in this direction have been made, by, for example, the Sendai Framework for Disaster Risk Reduction (UN, 2015) and the Paris agreement (UNFCCC, 2015), which adopt a risk-informed approach to increase disaster preparedness and resilience. Even though these plans recognise the concrete existence of CC consequences, they are still far from ensuring protection to vulnerable communities and ecosystems (Mal *et al.*, 2017) at both global (Booth *et al.*, 2020) and local levels (Ngwenya *et al.*, 2018). In fact, CC is often described as a crisis in act that affects both humans and ecosystems, but both policymakers and public opinion struggle to accept the substantial changes needed to tackle the problem. One plausible explanation might be that CC perception results from a multiplicity of opinions from different fields (e.g. policymakers, politicians, government, experts, social media and the media). These interpretations might either converge (e.g. in the case of CV) or diverge (e.g. in the case of CC) by producing different patterns of action. The analysis of these mechanisms is important to identify the factors that contribute towards transforming a risk in a tangible crisis. Moreover, the degree of urgency invoked to tackle a threat also affects the types of intervention needed both locally and globally.

Therefore, this paper aims to answer to the following questions:

Q1. What are the elements that make CV restrictions acceptable by both the public and policymakers?

Q2. What are the elements that make CC restrictions not acceptable?

The first section revises the literature on risk and crisis management. The second section describes the methods used to compare CC and CV. The results are split into two sub-sections regarding CV and CC. The discussion will identify similarities and differences between the management of the two threats. Finally, the conclusion will highlight the implications of this research, the future developments and the limitations of the latter.

2. Background

When planning how to anticipate, respond to and recover from a crisis (Houston *et al.*, 2014), communication processes might significantly contribute to the success of a response operation (Falagas and Kiriaze, 2006). In fact, the provision of timely, reassuring and accurate information (Glik, 2007) is considered essential to promote specific interpretations of a phenomenon (Reynolds and Seeger, 2007), enhance trust-building processes and trigger behavioural changes (Covello *et al.*, 2001). The ways in which social knowledge is conveyed influences the perception of the events (Linde, 1993). For this reason, management knowledge studies (Linde, 2001; du Toit, 2003) pay particularly attention to the narrative of the events. At the same time, also human and social factors play a key role in knowledge management (KM) (Thomas *et al.*, 2001), triggering interpretation and influencing the ways events are interpreted and understood. Evidently, information is a key element in a knowledge society (Castells, 2001; Webster, 2014) and therefore at the centre of KM studies (Caputo, 2017). As noted by Mc Evoy *et al.* (2018), KM in the public sector is particularly complex both for the disparate nature of public services and for the greater difficulty of promoting KM initiatives in public organizations. Even though the literature about KM in the public sector (especially for particular public entities as

universities) is growing in past decade (albeit the works devoted to the private sector are still the vast majority), there is a lack of research efforts in the ambit of developing a knowledge framework for disaster management and this is especially true when international institutions are considered (Massaro *et al.*, 2015). In their review of more than 8,000 research papers focussed on KM systems, Dorasamy *et al.* (2013) reported that only the 1% was focussed on disaster management.

More specifically, and by focussing on risk/crisis communication (Seeger *et al.*, 1998, 2001) we can notice how this specific forms of knowledge and communication involve several contexts, amongst which public health harm (Freimuth *et al.*, 2000) and environmental hazards play a primary role (Baker, 1990; Mabon, 2020; MacIntyre *et al.*, 2019). Heath (1995) noted in addition to other factors (e.g. excessive bureaucracy and the related lack of cooperation amongst government agencies, the unavailability of resources devoted to rare and hardly predictable events, the attitude to focus on local consequences of a disaster without seeing the "big picture" at the national or even at international level, etc.) communication failures play a central role in hindering the timeliness of the response to a disaster. Also Faulkner (2001) focussing on the role of disaster management in the tourism industry, highlighted the importance of avoiding the dissemination of misleading and contradictory information in tourism disaster situations. In a similar vein, Mistilis and Sheldon (2006) building on Ritchie (2004), invokes the necessity of creating a knowledge-based system for the management of crises and disasters. In particular, they suggest the need of developing knowledge at three different stages:

1. the pre-crisis (the preventative planning);
2. the crisis (the management plan); and
3. the post-crisis (the recovering handling).

In particular, before going in the greater details on these stages, it must be said that despite the existence of several definitions, the literature distinguishes between risk communication and crisis communication (Coombs, 2010; Reynolds, 2002; Williams and Olaniran, 1998). Generally, risk communication involves a flow of information amongst stakeholders about how to address a threat and potential behavioural change needed to prevent/reduce it (McComas, 2007 for a review). Accordingly, risk communication research focusses on uncertainty and potential severity of a threat (An and Cheng, 2010). By contrast, a crisis can be defined as "a risk manifested" (Heath, 2010) and crisis communication aims to reduce the harm deriving from an occurring event. Hence, risk communication applies the lessons learned from a post-crisis stage (Coombs, 2010) to reduce the probability of a new crisis/damage to occur (pre-crisis phase). However, as highlighted by Reynolds and Seeger (2007), both risk communication and crisis communication aim to trigger specific public responses and channel their messages mainly through mass media. Following their CERC integrated model, the success of a crisis management also depends on the combination of these two types of communication, the credibility of claim-makers, public trust, reassurance, uncertainty reduction and perception of self-efficacy. Holmes *et al.* (2009) refer to an integrated approach that includes "health promotion communication", "crisis communication" and "risk communication".

What is common to the variety of approaches present in the literature is the need for integrated plans that are based on communications strategies and result from the coordination of governments, experts and communicators/media. Therefore, during pre-crisis phases, these actors are committed to implement risk communication plans to prevent/reduce the likelihood of a harm to occur. During the crisis, they coordinate to provide the necessary information to reassure and guide the public on the behavioural changes needed. Finally, during post-crisis phases, lessons are learned to inform and update both risk and crisis management plans.

In the case of CC, even though the scientific community classified the phenomenon as a global crisis (Cook *et al.*, 2013, 2016; Oreskes, 2005), both governments' intervention and public perception seem to conceive it as a future-oriented risk (Ungar, 1992, 1995, 1998, 2003) rather than an occurring crisis. The comparison between CC and CV is important for several reasons. Firstly, they both represent crises that are globally recognised to be in action and need to be tackled by the implementation of both preventive and adaptive measures. Secondly, in both cases, the primary crisis triggers new risks (e.g. the risk of CV contagion and the risk of extreme weather events) that should be prevented/tackled. Therefore, the originality of this paper relies on identifying what makes CV accepted as a "crisis" that is worth to tackle through aggressive measures, whereas relegates CC to the status of "permanent risk" that does not require extraordinary intervention.

3. Methods

This paper analyses the situation reports released by the World Health Organisation between the 11th of March (declaration of pandemic) (WHO, 2020a) and the 22nd of April, and their associated documents such as the Strategic Preparedness and Response Plan (WHO, 2020c), the Risk Communication and Community Engagement (RCCE) Action Plan (WHO, 2020d) and its updated version (WHO, 2020o) and the Handbook for public health capacity-building (WHO, 2020h). The analysis ends one week after President Trump's announcement to suspend US funding to WHO (Fedor and Manson, 2020) and his support to public demonstrations against restrictions (The New York Times, 2020). These aspects might be important to consider when exploring potential changes in the trajectories of the CV crisis management.

In the case of CC, this paper analyses the Response Strategies included in the Overview and Policymaker Summaries (SPM) released by the Intergovernmental Panel on Climate Change (IPCC) since 1990 as a part of their Assessment Reports. The IPCC was established in 1988 to provide policymakers with scientific insights on impacts/risks of climate change, and adaptation and mitigation options (IPCC, 2013). This analysis compares the recommendations provided by the IPCC with the binding targets established by climate protocols over time.

The elements described by the "Crisis and Emergency Risk Communication" model (CERC) (Reynolds, 2002; Reynolds and Seeger, 2007), with regard to the "crisis phase" (characterised by "uncertainty reduction", "self-efficacy" and "reassurance") will guide the identification of similarities and differences between the two threats (Adaptation of the CERC crisis stage developed by Reynolds, 2000 and Reynolds and Seeger, 2007*).

Communication to the general public/affected groups to establish:

- Empathy, reassurance and reduction in emotional turmoil.
- Designated spokespersons and channels/methods of communication.
- Understanding about crisis, reduction of uncertainty and transparency in emergency management.
- Promotion of self-efficacy and personal response activities.

*The original model splits "understanding of the crisis", "uncertainty" and "transparency" in three separated points.

4. Results

This section will report the results of the analysis. It is split into the following two subsections: the first one reports the results related to the climate change risk narrative, while the second subsection reports the results related to the CV narrative. This section will be followed by the discussion in which we will highlight similarities and differences between CC and CV managements to understand why the two threats are perceived and tackled in different ways.

4.1 Climate change risk narrative

The first IPCC Scientific Assessment defines climate variations as a result of both natural processes and human activities (Houghton *et al.*, 1990) and characterises CC as a global issue (IPCC, 1992a). Specifically, its SPM (IPCC, 1992b) emphasises the necessity to simultaneously intervene in multiple sectors to reduce emissions and contain the temperature rise to 0.1°C per decade. However, despite its emphasis on the adoption of precautionary approaches, the first SPM also highlights that the degree of scientific uncertainty around the "magnitude, timing, rate and regional consequences", "effective specific response options" and "economic and social implications of specific response options", hampers the formulation of adequate responses. Nevertheless, the SPM provides countries with short- and long-term strategies to achieve the reduction of emissions. This report also emphasises the importance of involving industry, the general public and non-governmental organizations (NGOs) to limit greenhouse gases (GHG) emissions. In response to the necessity highlighted by the scientific community, in 1992, the United Nations Framework Convention on Climate Change (UNFCCC) establishes the importance of reducing GHG emissions and limiting human interferences with the climate system. However, this framework only sets the rules for future agreements/protocols without establishing binding obligations.

The second IPCC Scientific Assessment (IPCC, 1995) adopts the definition provided by the UNFCCC, where CC was directly or indirectly attributed to human activities. Its SPM (Bruce *et al.*, 1996) provides a combination of mitigative options and cost-effective opportunities to reduce GHGs. It also reiterates the value of internal (at national level) and external (at global level) cooperation. Despite the uncertainty around CC consequences, precautionary approaches are promoted and some of these scientific insights are used to establish the first binding-targets for the reductions of six GHG emissions under the Kyoto Protocol in 1997 (UNFCCC, 1998). The protocol, entered into force in 2005, establishes two phases (2008-2012; and 2013–2020 with Doha amendments). During the first phase, the treaty assigns a maximum amount of emissions that each signing party can emit, with an overall aim to reduce emissions by an average of 5% against 1990 levels. By the end of the first phase, 36 out of 38 countries achieved their goals. However, 10 countries met their targets through the so-called "carbon trading", which is the right to purchase emissions from other countries or financially support sustainable projects in developing countries in exchange of an increase in their emissions. Moreover, with the collapse of the Soviet Union, the Eastern bloc economies were hit by a severe economic crisis that caused a spontaneous decrease in GHG emissions (Shishlov *et al.*, 2016). By contrast, between 1992 and 2012, the global anthropogenic CO_2 emissions increase of 50% (Olivier *et al.*, 2012).

The third SPM (IPCC, 2001) focusses on both robust findings and key uncertainties. The uncertainties include the quantification of natural influences on climatic variations (but certainty of the damage caused by GHG emissions); future emissions/concentrations (but necessity to drop emissions below year 1990 levels to stabilise atmospheric CO_2 concentrations); the quantification of changes (but certainty of increased drought risk) in terms of benefits and damages (but certainty that the larger the rate of change in climate, the more the negative impacts predominate); and interactions between CC and socio-economic systems (but opportunity to lower the costs through policymaking planning and technological/trading opportunities).

These uncertainties are further reduced by the fourth SPM (IPCC, 2007) that highlights that climate warming is "unequivocal" and "evident". It refers to concrete and visible CC consequences such as melting glaciers and sea-level rise. Moreover, human influences are associated with a high probability of sea-level rise, changes in wind patterns, heat waves and heavy precipitation events. A need for both adaptation and mitigation is emphasised. In response to this urgency, a number of conferences of the parties (COP) take place, such as COP13 in Bali (UNFCCC, 2007), COP15 in Copenhagen (UNFCCC, 2009), COP16 in

Cancun (UNFCCC, 2010), COP17 in Durban (UNFCCC, 2011), to plan a second phase of the Kyoto Protocol (commitment to reduce GHG emissions by at least 18% below 1990 levels). However, despite the scientific evidence of CC, none of these international meetings establish binding targets. Some authors suggest that the reduction of GHG emissions are impossible under the existing circumstances (e.g. carbon trades) and incompatible with economic growth. By contrast, the current mechanisms require an approach exclusively based on adaptation (Campbell, 2013). Finally, the COP18 in Doha (agreement on the extension of the Kyoto Protocol) has never entered into force.

The SPM included in the Fifth Assessment Report (IPCC, 2014) emphasises the negative influence of GHGs on the climate system. Even though this report refers to a "very likely" attribution of visible changes to CC, it highlights that "the precise levels of climate change sufficient to trigger abrupt and irreversible change remain uncertain, but the risk associated with crossing such thresholds increases with rising temperature". Therefore, the amplification of existing risks (and the creation of new risks) can be reduced by integrating responses that combine adaptation and mitigation strategies. However, the report highlights that the social acceptability of climate policies, which include lifestyle changes, also depends on incentives (in terms of advantages) and education/information. Hence, the invoked transformation includes a practical level (e.g. technical innovations, behavioural changes and managerial changes), a political level (political, social, cultural and ecological integration to support adaptation, mitigation and sustainable development) and a personal level (change of values and beliefs that influence CC responses). These scientific advances culminate in the implementation of the Paris Agreement in 2015, which aims to keep the increase in global average temperature below 2°C above pre-industrial levels. However, despite its legally binding nature, the agreement does not contain legally binding emission targets (Clémencon, 2016). Therefore, even though the Paris Agreement addresses the urgency emphasised by the IPCC by establishing a long-term objective, it does not provide specific instructions on how to achieve this goal. The advances introduced by the IPCC reports show that several certainties can be supported, such as the human contribution to CC, but also connections between climatic variations and increasing temperatures, sea-level rise, melting glaciers and weather extremes. Moreover, despite some areas of uncertainty (due to a variety of variables that can influence future scenarios), the IPCC has always recommended the adoption of preventive strategies.

4.2 Covid-19 narrative

Since the 21st of January, the WHO has released a daily SR. These reports update the data about the number of countries and people affected and deaths. In addition to providing general guidelines related to both health and technical management of the crisis, each report can focus on specific aspects. On March 11, 2020, the CV emergency has been characterised as pandemic by the SR51 (WHO, 2020b). At that point, 118319 individuals were affected, the virus caused 4,292 fatalities and spread in 113 countries. The focus of this report is on people at higher risk, such as older people and those with underlying medical conditions. The guidelines for these groups of people include advices related to self-isolation, distance from other people, hand washing and disinfection of surfaces at home. SR53 focusses on the importance of Infection Prevention and Control in preventing and mitigating the spread of the virus. This strategy is further supported by the activation of online courses in several languages to foster preparedness, readiness and response to the emergency. The day after, SR54 classifies Europe as the new epicentre of the pandemic and refers to the adoption of the eight pillars, included in the Strategic Preparedness and Response Plan (WHO, 2020c), by many countries. The second pillar specifically refers to community engagement and risk communication about what is unknown and current and

future actions. On March 16, the number of cases outside China overtakes the number of cases in China, and a new RCCE action plan is released (focus of the RS58 issued on March 18) (WHO, 2020d). The plan explicitly refers to the need to provide people with precise instructions to follow and behaviours to adopt and to encourage them to share information with friends and family. These are also considered fundamental points to avoid social stigma (WHO, 2020e). Moreover, it emphasises the importance of involving influencers (policymakers, bloggers and social media leaders, local leaders, religious leaders, NGOs experts and practitioners, volunteers and people who have contracted the virus) for an effective dissemination. The focus on risk-communication has been also emphasised by the RS60 that announces the launching of a Health Alert messaging service, in partnership with WhatsApp and Facebook, further underlining the role of big data in the knowledge economy (Caputo *et al.*, 2017). In 5 days, the app reached 10 million users (RS64). The same report also announces the start of both a vaccine trial and the Solidarity Trial, which involves several countries in comparing different CV treatments. Several reports (e.g. RS60, RS80, RS88 and RS93) further show that the communication between WHO and civil society aims to be comprehensive by, for example, including recommendations on how to stay physically active during self-quarantine (WHO, 2020f), on how to recognise cyber scams (WHO, 2020g) and on the role of religious leader/organisations in containing the spread (WHO, 2020l). Moreover, CV-related communications are often linked to other initiatives (RS63 and RS78), such as the World Water Day (UN, 2020) and the World Health Day (WHO, 2020i). RS66 announces the release of the *Handbook for public health capacity-building at ground crossings and cross-border collaboration* (WHO, 2020h). This handbook further reinforces the importance of risk communication planning and training to prepare the public to respond to the crisis. This includes developing message content in line with national trends and identifying appropriate forms and channels for message delivery. On April 1, RS72 highlights the importance of a global collaboration by inviting those countries (such as Americas) still late in adopting restrictive measure, to follow WHO recommendations. On April 4, in less than a month, the total number of positive cases surpassed 1 million (with over 50,000 fatalities). Moreover, RS83 reports that total number of deaths from CV climbed above 100,000. Starting from RS86, which focusses on the risk of infodemic due to the over-abundance of information about CV, a fracture between WHO recommendations and some countries (e.g. USA) can be detected. The WHO identifies four main themes subject to misinformation and rumours that relate to the origins of the virus; its symptoms and transmission patterns; treatments; and impact of interventions by health authorities/other institutions. The organisation also announces the development of a CV infodemic framework to guide governments and public health institutions in managing the flow of information. Accordingly, the infodemic management promotes the establishment of a dialogue with a constellation of stakeholders (e.g. business sector, faith-based organisations, health care and medical associations, media/journalists and decision-makers). Moreover, social media are considered strategic actors to track, monitor and quantify the infodemic (WHO, 2020m). This underlines the importance of KM in helping understand and manage social and economic complexity (Caputo *et al.*, 2019). RS87 quotes the speech of the WHO Director-General during the media briefing of the 15th of April. The WHO Director-General refers to the decision of Donald Trump to halt support to WHO and reiterate the aim of the organisation that is a common struggle against a common enemy without discrimination between nationalities, ethnicities or ideologies (WHO, 2020n). In addition to the US withdrawal, Trump accuses the WHO of being under the control of China (Borger, 2020). The WHO chief responds to these accusations by urging the end of the politicisation of the virus (BBC, 2020). Finally, SR91 focusses on the update of the Strategic Response and Preparedness Plan, which sets criteria to be met by those countries considering lifting restrictions on movement.

5. Discussion

The second stage of the CERC model related to the eruption of the crisis will help guide the discussion. This stage includes sending reassuring messages, using designated spokespersons and channels/methods of communication, sharing understanding of the crisis, reducing uncertainty and increasing transparency on emergency management; and promoting personal response activities through self-efficacy.

The first point relates to reassuring the public, which might be achieved by avoiding fear-leaden communications and sending unequivocal messages on both risks and associated preventive and reparative measures (Glik, 2007; Reynold, 2005; Reynolds and Seeger, 2007). As already noticed, communication failures severely hinder the timeliness of the response to a disaster (Heath, 1995). Since the release of its first report, the IPCC has highlighted the need to adequately inform the population to promote awareness and provide guidance on behavioural changes through tailored approaches. Both messages and language associated with CC seem to play a role in influencing public opinion (Sakellari, 2014; Whitmarsh, 2011). For example, in an unpublished memo Frank Luntz (Bush's advisor) recommended the use of "climate change" due to its less frightening effect on public concern compared to "global warming" (Luntz, 2003, p. 142). This example suggests that climate change framing is not casual (Saunders, 2017). This is further supported by an update of The Guardian/Observer style guide, which recommends the use of a specific vocabulary that reflects the severity of CC (e.g. "climate emergency") (Carrington, 2019).

As with CC, studies on CV-risk communication recommend avoiding the use of fear that can activate mechanisms of "fight or flight responses" (Ng *et al.*, 2017), which can either trigger panic reactions (Murray-Johnson *et al.*, 2001) or cause underestimation of the problem (Ng *et al.*, 2017). Risk-communication studies found that the spread of panic (Frewer *et al.*, 2003), in addition to the incapacity of leaders to channel people fears into behavioural changes and the coexistence of contrasting messages (Covello *et al.*, 2001; Robinson and Newstetter, 2003), often causes the failure of crisis communication. Even though the implementation of CV restrictive measures triggered some panic reactions at the beginning of the crisis (e.g. assaults to supermarkets and pharmacies, Ruiu, 2020), the sharing of collective understanding of CV and the provision of specific behaviours (necessary to limit the risk of spread), encouraged people to accept changes.

This is directly connected to the influences exercised by multiple and sometimes competing information/voices/channels on the public perception (Ng *et al.*, 2017), which is the second point included in the CERC model. The CC debate is characterised by a multiplicity of voices that makes it difficult the identification of primary definers of the problem (Boykoff, 2011). These voices either support scepticism or highlight the urgency of intervention to halt CC. This "interpretative pluralism" (Sellnow *et al.*, 2019) is also amplified by the media (Antilla, 2005; Boykoff and Boykoff, 2004; Moser and Dilling, 2004; Painter and Ashe, 2012; Takahashi *et al.*, 2017). Moreover, some studies and investigative journalism linked several attempts to deny CC to conservative think tanks and corporations by showing their connections with scholars, politicians and the media (Jacques *et al.*, 2008; McCright, and Dunlap, 2001, 2003; Mooney, 2005). Moreover, since the release of the second IPCC scientific assessment (IPCC, 2001), several studies have increasingly focussed on the severity of CC consequences (Painter and Ashe, 2012; Painter and Gavin, 2015; Rahmstorf, 2005). This suggests that the focus on adaptive approaches creates different levels of urgency (e.g. focus on vulnerable communities affected by specific consequences) that might shadow global efforts to tackle CC causes.

By contrast, in the CV case, the general tendency is to align global, national and local efforts towards the implementation of restrictions (announced by governors and supported

by experts). Holmes *et al.* (2009) interpret the difference between health-related risks and other types of risk in relation to the level and actors involved. This suggests that, in the case of health risks (e.g. CV), the emphasis is on a personal level (likelihood of suffering an illness) and communication strategies specifically focus on individuals (preventive measures to be adopted, e.g. washing hands). By contrast, in the case of other risks (e.g. CC), different levels (collective, governmental and individual actions) and bodies (e.g. industry, government and society) compete to protect their own interests. The multilevel management of CV involves a mass communication process that informs the public about the individual measures necessary to contain the virus; and a specific communication focussed on the most vulnerable people who are more likely to suffer worse symptoms. Therefore, the CV management involves the coordination between WHO and governments, which in turn establish science-based guidelines for the population. Finally, the results of this multilevel interaction are shared through institutional and media channels to provide the public with specific recommendations/rules.

This is also connected to the CERC emphasis on sharing crisis understanding, reducing uncertainty and increasing transparency. Transparency, trust and credible claim-makers (Fessenden-Raden *et al.*, 1987; Peters *et al.*, 1997; Reynolds, 2005) are recognised to play a fundamental role for the success of a crisis management. The CC-risk management shows a lack of collective efforts to reconcile the plurality of interests at play, reduce crisis-related uncertainty (e.g. policymaking focus on uncertainties rather than on certainties) and manage the emergency transparently (e.g. transparency about concrete Kyoto protocol results in terms of GHG reductions). Ungar (1998, 2000) highlights that the media are not capable to set the public agenda on CC and accuses CC claim makers (the media, policymakers and scientists) to present CC as a "future-orientated" and "abstract" problem (1992, 1995, 1998, 2003). In turn, the representation of the problem as "abstract" (Kleinschmit and Sjöstedt, 2014) and "invisible" (Markowitz and Shariff, 2012), produces a feeling of uncertainty amongst the general public. However, the communication of uncertainty around scientific issues is generally recognised to be a signal of transparency (Patt and Weber, 2014), but it might produce an underestimation of the risk if it is not supported by concrete intervention (Retchless, 2014). Therefore, the CC "state of uncertainty" is mostly attributed to the "invisibility of causes, distant impacts, lack of [...] direct experience of the impacts, [...] disbelief in human's global influence" (Moser, 2010). In the CV case, the rapid spread of the virus imposed rapid action to halt the outbreak and required transparency in revealing the management choices. However, public demonstrations against the restrictions have been increasing, first in the USA and then in Europe (DW, 2020). This has been attributed to a politicisation of the issue by the WHO. In fact, the transformation of a scientific issue into a political debate might cause interferences between global, national and local efforts (Carvalho, 2010). These interferences might also be amplified by new players (e.g. private businesses) that support the development of a vaccine and treatments. In fact, as with CC, the CV scientific community can be supported by both public and private funding (e.g. Gates Foundation, see www.gatesfoundation.org).

Finally, the fourth point relates to the promotion of self-efficacy and individual actions. Several studies suggest that solution-oriented messages (Hart and Feldman, 2016) tend to motivate people to act (Cody *et al.*, 2015; Kreslake *et al.*, 2016; Morton *et al.*, 2011; Wibeck, 2014). This interpretation is supported by the environmental psychology that shows how, for example, fear-laden messages should combine with self-efficacy perception and clear actions needed to tackle the problem (Amelung *et al.*, 2016; Hornsey *et al.*, 2015; Moser, 2016; Somerville and Hassol, 2011; van Zomeren *et al.*, 2010). Although climate science is settled, the "interpretative pluralism" that characterises the climate change infodemic hampers the development of unitarian and clear guidelines about the changes required at different levels. By

contrast, in the CV case, the WHO disseminates clear guidelines through multiple channels, which are legally enforced at the national level (e.g. by imposing fines). At the individual level, healthy people are urged to reduce the risk to get the virus (e.g. by avoiding social contacts). At a societal level, people are recommended to avoid contacts with vulnerable people to protect them from the risk to get the virus. Each of these recommendations is accompanied by specific behaviours (restrictions) to reduce the risk and gain personal advantages (e.g. being healthy). Therefore, the rejection of severe restrictions to tackle CC might derive from its permanent "state of uncertainty". However, the awareness that CV measures are adopted almost globally might play a role in stimulating individuals to act given that everyone is playing a part.

6. Conclusions

This paper focussed on managing the dissemination of knowledge in the context of risk and disaster management. This research filled a gap in the literature regarding the development of a knowledge framework for disaster management. In particular, through the lenses of the CERC model, we analysed the management of information conveyed to deal with the coronavirus emergency and that for climate change risk. We paid particular attention to the narrative of the events, intended as a vital mechanism through which social knowledge is expressed, as a core topic for management knowledge studies (Linde, 2001; du Toit, 2003).

6.1 Lessons learned

Some lessons can be learned from the comparison between CV and CC that help understand why the two threats are perceived and tackled in different ways.

A first lesson relates to the necessity to warn but simultaneously reassure the public about the possibility to reduce potential arms through specific courses of action. By contrast, the prevalence of fear-leaden language and contrasting messages (such as in the CC case) contribute to undermining the acceptance of substantial changes in society by triggering "fight or flight responses".

A second lesson relates to the need for multilevel and synergic responses that simultaneously involve collective/individual actions and scientific/policy efforts towards the same goal. By contrast, both a lack of alignment between global, national and local efforts and a gap between policy-responses and scientific evidence (such as in the CC case) create the favourable conditions for chaotic intervention.

Directly connected to this point, a third lesson is that a crisis can be understood only through an "interpretative pluralism". However, an effective collective management should be capable to reduce these differences to present a unitarian voice to the public through the media. By contrast, a lack of coordination can cause an overload of contrasting messages (infodemic) that in turn can affect people's perception.

A fourth lesson learned relates to the risk connected to a politicisation and commodification of the threat that might undermine global efforts to contain the problem. It is difficult to evaluate the effects of these turbulences at this point. However, future research might look at the evolution of CV narratives to see, for example, if US attempts to ease restrictions and undermine WHO's credibility will reproduce mechanisms similar to those that characterise CC.

Hence, the fifth lesson relates to the capacity of leaders and scientists to communicate the urgency of a threat by recognising the importance of both individual and collective actions and by highlighting the possibility of gaining advantages from personal sacrifices.

6.2 Implications

While in the case of CV political and scientific interpretations have progressively converged into a dominant communication that provides specific motivations to accept behavioural changes at all levels, this has not happened in CC-risk communication. Both CC and CV represent invisible threats. However, despite its invisibility, the CV threat has become concrete because its characterisation as global pandemic (and global efforts to control it). By contrast, CC effects are mostly experienced by vulnerable realities (e.g. developing countries) that are almost "invisible" (e.g. on the western media) and do not have the necessary resources do deal with disasters (e.g. damages caused by extreme weather events). The CV shows that the interplay between a constellation of actors (including the media) at all levels is fundamental to enhance personal responses. The lack of such coordination makes it difficult to recognise the problem as a crisis that needs aggressive intervention. By contrast, the CC communication relegates the CC status to that of a future-oriented risk.

6.3 Future developments and limitations

The complexity of the topic was evident by a variety of conditions, creating barriers for the research. For instance, to show the scientific basis of the two narratives (CC and CV), we focussed our analysis on official documents released by both the World Health Organisation and the IPCC shows. Different documents may be analysed by using different methods.

The limitations of this research point towards topics to be addressed in the future. The results of this study highlight the need for future research to further explore the role played by information and communication technologies in the dissemination of knowledge in the context of risk and disaster management. Moreover, in addition to the role played by governments, potential financial stakes behind KM in the context of both phenomena need to be further investigated. This might help understand why in some cases (CV) a sense of urgency is transmitted to the public and a need to take personal actions, whereas in some others (CC) such urgency struggles to emerge. The study of similarities and differences between CC and CV management is fundamental to identify the characteristics that make a communication successful in engaging people to act.

References

Amelung, D., Fischer, H., Kruse, L. and Sauerborn, R. (2016), "Defogging climate change communication: how cognitive research can promote effective climate communication", *Frontiers in Psychology*, Vol. 7 No. 1340, pp. 1-4, doi: 10.3389/fpsyg.2016.01340.

An, S. and Cheng, I. (2010), "Crisis communication research in public relations journals: tracking research trends over thirty years", in Coombs, W.T. and Holladay, S.J. (Eds), *The Handbook of Crisis Communication*, Blackwell Publishing Ltd., West Sussex.

Antilla, L. (2005), "Climate of scepticism: US newspaper coverage of the science of climate change", *Global Environmental Change*, Vol. 15 No. 4, pp. 338-352, doi: 10.1016/j.gloenvcha.2005.08.003.

Baker, F. (1990), "Risk communication about environmental hazards", *Journal of Public Health Policy*, Vol. 11 No. 3, pp. 341-359, doi: 10.2307/3342713.

BBC (2020), "Coronavirus: WHO chief urges end to 'politicisation' of virus", available at: www.bbc.co.uk/news/world-52224183 (accessed 9 April 2020).

Bengel, J., Belz-Merk, M. and Farin, E. (1996), "The role of risk perception and efficacy cognitions in the prediction of HIV-related preventive behavior and condom use", *Psychology & Health*, Vol. 11 No. 4, pp. 505-525, doi: 10.1080/08870449608401986.

Booth, L., Schueller, L.A., Scolobig, A. and Marx, S. (2020), "Stakeholder solutions for building interdisciplinary and international synergies between climate change adaptation and disaster risk reduction", *International Journal of Disaster Risk Reduction*, Vol. 46, doi: 10.1016/j.ijdrr.2020.101616.

Borger, J. (2020), "Caught in a superpower struggle: the inside story of the WHO's response to coronavirus", The Guardian, available at: www.theguardian.com/world/2020/apr/18/caught-in-a-superpower-struggle-the-inside-story-of-the-whos-response-to-coronavirus (accessed 18 April 2020).

Boykoff, M.T. (2011), *Who Speaks for the Climate? Making Sense of Media Reporting on Climate Change*, Cambridge University Press, Cambridge.

Boykoff, M.T. and Boykoff, J.M. (2004), "Balance as bias: global warming and the US prestige press", *Global Environmental Change*, Vol. 14 No. 2, pp. 125-136, doi: 10.1016/j.gloenvcha.2003.10.001.

Bruce, J.P., Lee, H. and Haites, E. (1996), *Climate Change 1995. Economic and Social Dimension of Climate Change*, Intergovernmental Panel on Climate Change, Cambridge.

Campbell, D. (2013), "After Doha: what has climate change PolicyAccomplished?", *Journal of Environmental Law*, Vol. 25 No. 1, pp. 25-136, doi: 10.1093/jel/eqt001.

Caputo, F., Evangelista, F., Perko, I. and Russo, G. (2017), "The role of big data in value co-creation for the knowledge economy", in Vrontis S., Weber T. and Tsoukatos E. (Eds), *Global and National Business Theories and Practice: bridging the past with the Future*, EuroMed Press, Cyprus, pp. 269-280.

Caputo, F. (2017), "Reflecting upon knowledge management studies: insights from systems thinking", *International Journal of Knowledge Management Studies*, Vol. 8 Nos 3/4, pp. 177-190.

Caputo, F., Garcia-Perez, A., Cillo, V. and Giacosa, E. (2019), "A knowledge-based view of people and technology: directions for a value co-creation-based learning organisation", *Journal of Knowledge Management*, Vol. 23 No. 7, pp. 1314-1334.

Carrington, D. (2019), "Why the guardian is changing the language it uses about the environment", The Guardian, available at: www.theguardian.com/environment/2019/may/17/why-theguardian-is-changing-the-language-it-uses-about-the-environment (accessed 20 May 2019).

Carvalho, A. (2010), "Media(ted) discourses and climate change: a focus on political subjectivity and (dis)engagement", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 1 No. 2, pp. 172-179.

Castells, M., (2001), *The Rise of The Network Society: The Information Age: Economy, Society and Culture*, Blackwell Publishing Ltd, Sussex, Vol. 1.

Clémencon, R. (2016), "The two sides of the Paris climate agreement: dismal failure or historic breakthrough?", *Journal of Environment & Development*, Vol. 25 No. 1, pp. 3-24, doi: 10.1177/1070496516631362.

Cody, E.M., Reagan, A.J., Mitchell, L., Dodds, P.S. and Danforth, C.M. (2015), "Climate change sentiment on twitter: an unsolicited public opinion poll", *Public Library of Science*, Vol. 10 No. 8, pp. 1-18, doi: 10.1371/journal.pone.0136092.

Cook, J., Nuccitelli, D., Green, S.A., Richardson, M., Winkler, B. and Skuce, A. (2013), "Quantifying the consensus on anthropogenic global warming in the scientific literature", *Environmental Research Letters*, Vol. 8 No. 2, pp. 1-7, doi: 10.1088/1748-9326/8/2/024024.

Cook, J., Oreskes, N., Doran, P.T., Anderegg, W.R.L., Verheggen, B., Maibach, E.W.and Rice, K. (2016), "Consensus on consensus: a synthesis of consensus estimates on human-caused global warming", *Environmental Research Letters*, Vol. 11 No. 4, pp. 1-7, doi: 10.1088/1748- 9326/11/4/048002.

Coombs, W.T. (2010), "Parameters for crisis communication", in Coombs, W.T. and Holladay, S.J. (Eds), *The Handbook of Crisis Communication*, Blackwell Publishing Ltd., West Sussex.

Covello, V.T., Peters, R.G., Wojtecki, J.G. and Hyde, R.C. (2001), "Risk communication, the West Nile virus epidemic: responding to the communication challenges posed by the intentional and unintentional release of a pathogen in an urban setting", *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, Vol. 78 No. 2, pp. 382-391, doi: 10.1093/jurban/78.2.382.

Dorasamy, M., Raman, M. and Kaliannan, M. (2013), "Knowledge management systems in support of disasters management: a two decades review", *Technological Forecasting and Social Change*, Vol. 80 No. 9, pp. 1834-1853.

Du Toit, A. (2003), "Knowledge: a sense making process shared through narrative", *Journal of Knowledge Management*, Vol. 7 No. 3, pp. 27-37.

DW (2020), "German conspiracists protest against coronavirus lockdown", DW, available at: www.dw.com/en/german-conspiracists-protest-against-coronavirus-lockdown/a-53243126 (accessed 25 April 2020).

Falagas, M. and Kiriaze, I. (2006), "Reaction to the threat of influenza pandemic: the mass media and the public", *Critical Care*, Vol. 10 No. 2, p. 408, doi: 10.1186/cc4910.

Faulkner, B. (2001), "Towards a framework for tourism disaster management", *Tourism Management*, Vol. 22 No. 2, pp. 135-147.

Fedor, L. and Manson, K. (2020), "Trump suspends funding to world health organization", Financial Times, available at: www.ft.com/content/693f49e8-b8a9-4ed3-9d4a-cdfb591fefce (accessesd 15 April 2020).

Fessenden-Raden, J., Fitchen, J.M. and Heath, J.S. (1987), "Providing risk information in communities: factors influencing what is heard and accepted", *Technical and Ethical Aspects of Risk Communication*, Vol. 12, pp. 94-101, available at: www.jstor.org/stable/689388

Freimuth, V., Linnan, H.W. and Potter, P. (2000), "Communicating the threat of emerging infections to the public", *Emerging Infectious Diseases*, Vol. 6 No. 4, pp. 337-347, doi: 10.3201/eid0604.000403.

Frewer, L.J., Hunt, S., Kuznesof, S., Brennon, M., Ness, M. and Ritson, C. (2003), "The views of scientific experts on how the public conceptualise uncertainty", *Journal of Risk Research*, Vol. 6, pp. 75-85.

Glik, D.C. (2007), "Risk communication for public health emergencies", *Annual Review of Public Health*, Vol. 28 No. 1, pp. 33-54, doi: 10.1146/annurev.publhealth.28.021406.144123.

Hart, P.S. and Feldman, L. (2016), "The influence of climate change efficacy messages and efficacy beliefs on intended political participation", *PLoS One*, Vol. 11 No. 8, pp. 1-16, doi: 10.1371/journal.pone.015765.

Heath, R. (1995), "The Kobe earthquake: some realities of strategic management of crises and disasters", *Disaster Prevention and Management: An International Journal*, Vol. 4 No. 5, pp. 11-24.

Heath, R.L. (2010), "Crisis communication: defining the beast and de-marginalizing key publics", in Coombs, W. T. and Holladay, S.J. (Eds), *The Handbook of Crisis Communication*, Blackwell Publishing Ltd., West Sussex.

Holmes, B.J., Henrich, N., Hancock, S. and Lestou, V. (2009), "Communicating with the public during health crises: experts' experiences and opinions", *Journal of Risk Research*, Vol. 12 No. 6, pp. 793-807, doi: 10.1080/13669870802648486.

Hornsey, M.J., Fielding, K.S., McStay, R., Reser, J.P. and Bradley, G.L. (2015), "Are people high in skepticism about anthropogenic climate change necessarily resistant to influence? Some cause for optimism", *Environment and Behavior*, Vol. 48 No. 7, pp. 905-928, doi: 10.1177/0013916515574085.

Houghton, J.T., Jenkins, G.J. and Ephraums, J.J. (1990), *Climate Change IPCC Scientific Assessment. IPCC*, doi: 10.1097/MOP.0b013e3283444c89.

Houston, J.B., Hawthorne, J., Perreault, M.F., Park, E.H., Goldstein, M., Halliwell, M.R. and Griffith, S.A. (2014), "Social media and disasters: a functional framework for social media use in disaster planning, response, and research", *Disasters*, Vol. 39 No. 1, pp. 1-22, doi: 10.1111/disa.12092.

IPCC (2007), "Climate change 2007: synthesis report", available at: https://archive.ipcc.ch/publications_and_data/ar4/syr/en/spms1.html

IPCC (2014), IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change, Geneva, Switzerland.

IPCC (1992a), *Climate Change: The 1990 and 1992 IPCC Assessments*, Intergovernmental Panel on Climate Change, Canada.

IPCC (1992b), "Policymaker summary of working group III (formulation of response strategies)", available at: https://archive.ipcc.ch/publications_and_data/publications_ipcc_90_92_assessments_far.shtml (accessed 2 March 2020).

IPCC (1995), *Climate Change 1995: A Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, available at: https://archive.ipcc.ch/ipccreports/tar/wg3/index.php?idp=0 (accessed 10 March 2020).

IPCC (2001), Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge.

IPCC (2013), "IPCC factsheet: What is the IPCC?", available at: www.ipcc.ch/news_and_events/docs/factsheets/FS_what_ipcc.pdf (accessed 21 July 2016).

Islam, C. and Smart, C.R. (2020), "Challenges in integrating disaster risk reduction and climate change adaptation: exploring the Bangladesh case", *International Journal of Disaster Risk Reduction*, Vol. 47, doi: 10.1016/j.ijdrr.2020.101540.

Jacques, P., Dunlap, R.E. and Freeman, M. (2008), "The organisation of denial: conservative think tanks and environmental scepticism", *Environmental Politics*, Vol. 17 No. 3, pp. 349-385, doi: 10.1080/09644010802055576.

Kleinschmit, D. and Sjöstedt, V. (2014), "Between science and politics: Swedish newspaper reporting on forests in a changing climate", *Environmental Science & Policy*, Vol. 35, pp. 117-127, doi: 10.1016/j.envsci.2013.02.011.

Kreslake, J.M., Price, K.M. and Sarfaty, M. (2016), "Developing effective communication materials on the health effects of climate change for vulnerable groups: a mixed methods study", *BMC Public Health*, Vol. 16 No. 1, pp. 1-15, doi: 10.1186/s12889-016-3546-3.

Linde, C. (1993), *Life Stories: The Creation of Coherence*, Oxford University Press.

Linde, C. (2001), "Narrative and social tacit knowledge", *Journal of Knowledge Management*, Vol. 5 No. 2, pp. 160-171.

Luntz, F. (2003), "The environment: a cleaner, safer, healthier America. The Luntz research companies-straight talk", Unpublished Memo, pp. 131-146, available at: https://nigguraths.files.wordpress.com/2013/03/luntzresearch_environment.pdf

Mabon, L. (2020), "Making climate information services accessible to communities: what can we learn from environmental risk communication research?", *Urban Climate*, Vol. 31, p. 31, doi: 10.1016/j.uclim.2019.100537.

MacIntyre, E., Khanna, S., Darychuk, A., Copes, R. and Schwartz, B. (2019), "Evidence synthesis evaluating risk communication during extreme weather and climate change: a scoping review", *Health Promotion and Chronic Disease Prevention in Canada*, Vol. 39 No. 4, pp. 142-156, available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC6553581/

Mal, S., Singh, R.B., Huggel, C. and Grover, A. (2017), "Introducing linkages between climate change, extreme events, and disaster risk reduction", in Mal S., Singh R. and Huggel C. (Eds), *Climate Change, Extreme Events and Disaster Risk Reduction. Sustainable Development Goals Series*, Springer, pp. 1-14.

Markowitz, E. and Shariff, A. (2012), "Climate change and moral judgement", *Nature Climate Change*, Vol. 2 No. 4, pp. 243-247, doi: 10.1038/nclimate1378.

Massaro, M., Dumay, J. and Garlatti, A. (2015), "Public sector knowledge management: a structured literature review", *Journal of Knowledge Management*, Vol. 19 No. 3, pp. 530-558.

Mc Evoy, P.J., Ragab, M.A.F. and Arisha, A. (2018), "The effectiveness of knowledge management in the public sector", *Knowledge Management Research & Practice*, pp. 1-13.

McComas, K.A. (2007), "Defining moments in risk communication research: 1996-2005", *Journal of Health Communication*, Vol. 11 No. 1, pp. 75-91, doi: 10.1080/10810730500461091.

McCright, A.M. and Dunlap, R.E. (2001), "Challenging global warming as a social problem: an analysis of the conservative movement's counterclaims", *Social Problems*, Vol. 47 No. 4, pp. 499-522, available at: www.jstor.org/stable/3097132

McCright, A.M. and Dunlap, R.E. (2003), "Defeating Kyoto: the conservative movement's impact on US climate change policy", *Social Problems*, Vol. 50 No. 3, pp. 348-373, doi: 10.1525/sp.2003.50.3.34.

Mistilis, N. and Sheldon, P. (2006), "Knowledge management for tourism crises and disasters", *Tourism Review International*, Vol. 10 No. 1, pp. 39-46.

Mooney, C. (2005), *The Republican War on Science*, Basic Books, New York, NY.

Morton, T.A., Rabinovich, A., Marshall, D. and Bretschneider, P. (2011), "The future that may (or may not) come: how framing changes responses to uncertainty in climate change communications", *Global Environmental Change*, Vol. 21 No. 1, pp. 103-109, doi: 10.1016/j.gloenvcha.2010.09.013.

Moser, S.C. (2010), "Communicating climate change: history, challenges, processes and future directions", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 1 No. 1, pp. 31-53, doi: 10.1002/wcc.011.

Moser, S.C. (2016), "Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say?", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 7 No. 3, pp. 345-369, doi: 10.1002/wcc.403.

Moser, S.C. and Dilling, L. (2004), "Making climate HOT", *Environment: Science and Policy for Sustainable Development*, Vol. 46 No. 10, pp. 32-46, doi: 10.1080/00139150409605820.

Murray-Johnson, L., Witte, K., Liu, W. and Hubbel, A.P. (2001), "Addressing cultural orientations in fear appeals: promoting AIDS-protective behaviors among Mexican immigrant and African American adolescents and American and Taiwanese college students", *Journal of Health Communication*, Vol. 6 No. 4, pp. 335-358, doi: 10.1080/108107301317140823.

Ng, Y.J., Yang, Z.J. and Vishwanath, A. (2017), "To fear or not to fear? Applying the social amplification of risk framework on two environmental health risks in Singapore", *Journal of Risk Research*, Vol. 21 No. 12, pp. 1487-1501, doi: 10.1080/13669877.2017.1313762.

Ngwenya, B., Oosthuizen, J., Cross, M. and Frimpong, K. (2018), "Emerging heat-related climate change influences; a public health challenge to health care practitioners and policy makers: insight from Bulawayo", *International Journal of Disaster Risk Reduction*, Vol. 27, pp. 596-601, doi: 10.1016/j.ijdrr.2017.10.012.

Olivier, G.J., Janssens-Maenhout, G. and Peters, A.H.W. (2012), "Trends in global co2 emissions", 2012 Report, PBL Netherland Environmental Assessment Agency, The Hague.

Oreskes, N. (2005), "The scientific consensus on climate change", *Science*, Vol. 306 No. 5702, p. 1686, doi: 10.1126/science.1103618.

Painter, J. and Ashe, T. (2012), "Cross-national comparison of the presence of climate scepticism in the print media in six countries, 2007-10", *Environmental Research Letters*, Vol. 7 No. 4, pp. 1-8, doi: 10.1088/1748-9326/7/4/044005.

Painter, J. and Gavin, N.T. (2015), "Climate skepticism in British newspapers, 2007-2011", *Environmental Communication*, Vol. 10 No. 4, pp. 432-452, doi: 10.1080/17524032.2014.995193.

Patt, A.G. and Weber, E.U. (2014), "Perceptions and communication strategies for the many uncertainties relevant for climate policy", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 5 No. 2, pp. 219-232, doi: 10.1002/wcc.259.

Peters, R.G., Covello, V.T. and McCallum, D.B. (1997), "The determinants of trust and credibility in environmental risk communication: an empirical study", *Risk Analysis*, Vol. 17 No. 1, pp. 43-54, doi: 10.1111/j.1539-6924.1997.tb00842.x.

Rahmstorf, S. (2005), "The climate sceptics", in Berz, G. (Ed.), *Weather Catastrophes and Climate Change*, Munchener Ruckversicherungs-Gesellchaft, Munich, pp. 76-82.

Retchless, D.P. (2014), "Sea level rise maps: how individual differences complicate the cartographic communication of an uncertain climate change hazard", *Cartographic Perspectives*, Vol. 77 No. 77, pp. 5-20, doi: 10.14714/CP77.1235.

Reynolds, B. (2002), *Crisis and Emergency Risk Communication*, Centers for Disease Control and Prevention, Atlanta, GA.

Reynolds, B. (2005), "Crisis and emergency risk communication", *Applied Biosafety*, Vol. 10 No. 1, pp. 47-56, doi: 10.1177/153567600501000106.

Reynolds, B. and Seeger, M.W. (2007), "Crisis and emergency risk communication as an integrative model", *Journal of Health Communication*, Vol. 10 No. 1, pp. 43-55, doi: 10.1080/10810730590904571.

Ritchie, B.W. (2004), "Chaos, crises and disasters: a strategic approach to crisis management in the tourism industry", *Tourism Management*, Vol. 25 No. 6, pp. 669-683, doi: 10.1016/j.tourman.2003.09.004.

Robinson, S.J. and Newstetter, C.W. (2003), "Uncertain science and certain deadlines: CDC responses to the media during the anthrax attacks of 2001", *Journal of Health Communication*, Vol. 8 No. sup1, pp. 17-34, doi: 10.1080/713851980.

Ruiu, M.L. (2020), "Mismanagement of Covid-19. Lessons learned from Italy", *Journal of Risk Research*, doi: 10.1080/13669877.2020.1758755.

Sakellari, M. (2014), "Cinematic climate change, a promising perspective on climate change communication", *Public Understanding of Science*, Vol. 24 No. 7, pp. 1-15, doi: 10.1177/0963662514537028.

Saunders, K.L. (2017), "The impact of elite frames and motivated reasoning on beliefs in a global warming conspiracy: the promise and limits of trust", *Research & Politics*, Vol. 4 No. 3, pp. 1-9, doi: 10.1177/2053168017717602.

Seeger, M.W., Sellnow, T.L. and Ulmer, R.R. (1998), "Communication, organization and crisis", in Roloff, M.E. (Ed.), *Communication Yearbook*, Sage, Thousand Oaks, CA, pp. 231-275.

Seeger, M.W., Sellnow, T.L. and Ulmer, R.R. (2001), "Public relations and crisis communication: organizing and chaos", in Heath, R.L. (Ed.), *Public Relations Handbook*, Sage, Thousand Oaks, CA, pp. 155-166.

Sellnow, T.L., Sellnow, D.D., Helsel, E.M., Martin, J.M. and Parker, J.S. (2019), "Risk and crisis communication narratives in response to rapidly emerging diseases", *Journal of Risk Research*, Vol. 22 No. 7, pp. 897-908, doi: 10.1080/13669877.2017.1422787.

Shishlov, I., Morel, R. and Bellassen, V. (2016), "Compliance of the parties to the Kyoto protocol in the first commitment period", *Climate Policy*, Vol. 16 No. 6, pp. 768-782, doi: 10.1080/14693062.2016.1164658.

Somerville, R.C.J. and Hassol, S.J. (2011), "Communicating the science of climate change", *Physics Today*, Vol. 64 No. 10, pp. 48-53, doi: 10.1063/PT.3.1296.

Takahashi, B., Huang, K., Fico, F. and Poulson, D. (2017), "Climate change reporting in great Lakes region newspapers: a comparative study of the use of expert sources", *Environmental Communication*, Vol. 11 No. 1, pp. 106-121.

The New York Times (2020), "Trump foments protests against governors; experts warn of testing shortages", The New York Times, available at: www.nytimes.com/2020/04/17/us/coronavirus-cases-news-update.html (accessed 17 April 2020).

Thomas, J.C., Kellogg, W.A. and Erickson, T. (2001), "The knowledge management puzzle: human and social factors in knowledge management", *IBM Systems Journal*, Vol. 40 No. 4, pp. 863-884.

UN (2015), "Sendai framework for disaster risk reduction 2015 – 2030", available at: www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf (accessed 24 April 2020).

UN (2020), "World water day 22 march", available at: www.un.org/en/observances/water-day (accessed 25 April 2020).

UNFCCC (1998), "Kyoto protocol to the united nations framework convention on climate change", available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf (accessed 25 October 2016).

UNFCCC (2007), "Bali climate change Conference – December 2007", available at: https://unfccc.int/process-and-meetings/conferences/past-conferences/bali-climate-change-conference-december-2007/bali-climate-change-conference-december-2007-0 (accessed 25 October 2016).

UNFCCC (2009), "Copenhagen climate change Conference – December 2009", available at: http://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php (accessed 25 October 2016).

UNFCCC (2010), "Cancun climate change Conference – November 2010", available at: https://unfccc.int/cancun-climate-change-conference-november-2010-0 (accessed 25 October 2016).

UNFCCC (2010), "Durban climate change Conference – November 2011", available at: https://unfccc.int/process-and-meetings/conferences/past-conferences/durban-climate-change-conference-november-2011/durban-climate-change-conference-november-2011 (accessed 25 October 2016).

UNFCCC (2015), "Paris agreement", available at: http://unfccc.int/paris_agreement/items/9485.php (accessed 24 October 2016).

Ungar, S. (1992), "The rise and (relative) decline of global warming as a social problem", *The Sociological Quarterly*, Vol. 33 No. 4, pp. 483-501, doi: 10.1111/j.1533-8525.1992.tb00139.x.

Ungar, S. (1995), "Social scares and global warming: beyond the Rio convention", *Society & Natural Resources*, Vol. 8 No. 5, pp. 443-456, doi: 10.1080/08941929509380935.

Ungar, S. (1998), "Bringing the issue back in: comparing the marketability of the ozone hole and global warming", *Social Problems*, Vol. 45 No. 4, pp. 510-527, doi: 10.1525/sp.1998.45.4.03x0178v.

Ungar, S. (2000), "Knowledge, ignorance and the popular culture: climate change versus the ozone hole", *Public Understanding of Science*, Vol. 9 No. 3, pp. 297-312, doi: 10.1088/0963-6625/9/3/306.

Ungar, S. (2003), "Global warming versus ozone depletion: failure and success in North America", *Climate Research*, Vol. 23 No. 3, pp. 263-274, doi: 10.3354/cr023263.

van Zomeren, M., Spears, R. and Leach, C.W. (2010), "Experimental evidence for a dual pathway model analysis of coping with the climate crisis", *Journal of Environmental Psychology*, Vol. 30 No. 4, pp. 339-346, doi: 10.1016/j.jenvp.2010.02.006.

Whitmarsh, L. (2011), "Scepticism and uncertainty about climate change: dimensions, determinants and change over time", *Global Environmental Change*, Vol. 21 No. 2, pp. 690-700, doi: 10.1016/j.gloenvcha.2011.01.016.

WHO (2020a), "WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 march 2020", available at: www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020 (accessed 11 March 2020).

WHO (2020b), "Situation reports", available at: www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports (accessed 23 April 2020).

WHO (2020c), "COVID-19 strategic preparedness and response plan", available at: www.who.int/docs/default-source/coronaviruse/covid-19-sprp-unct-guidelines.pdf (accessed 23 April 2020).

WHO (2020d), "Risk communication and community engagement (RCCE) action plan guidance COVID-19 preparedness and response", available at: www.who.int/publications-detail/risk-communication-and-community-engagement-(rcce)-action-plan-guidance (accessed 23 April 2020).

WHO (2020e), "A guide to preventing and addressing social stigma", available at: www.who.int/docs/default-source/coronaviruse/covid19-stigma-guide.pdf (accessed 24 April 2020).

WHO (2020f), "Stay physically active during self-quarantine", available at: www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/stay-physically-active-during-self-quarantine/_recache#article (accessed 24 April 2020).

WHO (2020g), "Beware of criminals pretending to be WHO", available at: www.who.int/about/communications/cyber-security (accessed 25 April 2020).

WHO (2020h), "Handbook for public health capacity-building at ground crossings and cross-border collaboration", available at: www.who.int/publications-detail/handbook-for-public-health-capacity-building-at-ground-crossings-and-cross-border-collaboration (accessed 24 April 2020).

WHO (2020i), "World health day 2020", available at: www.who.int/news-room/campaigns/world-health-day/world-health-day-2020 (accessed 23 April 2020).

WHO (2020l), "Practical considerations and recommendations for religious leaders and faith-based communities in the context of COVID-19", available at: www.who.int/publications-detail/practical-considerations-and-recommendations-for-religious-leaders-and-faith-based-communities-in-the-context-of-covid-19 (accessedaccessed 23 April 2020).

WHO (2020m), "Infodemic management – infodemiology", available at: www.who.int/teams/risk-communication/infodemic-management (accessed 23 April 2020).

WHO (2020n), "WHO Director-General's opening remarks at the media briefing on COVID-19 – 15 april 2020", available at: www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—15-april-2020 (accessed 23 April 2020).

WHO (2020o), "COVID-19 STRATEGY UPDATE april 14, 2020", (accessed 24 April 2020).

Wibeck, V. (2014), "Enhancing learning, communication and public engagement about climate change -some lessons from recent literature", *Environmental Education Research*, Vol. 20 No. 3, pp. 387-411, doi: 10.1080/13504622.2013.812720.

Williams, D.E. and Olaniran, B.A. (1998), "Expanding the crisis planning function: introducing elements of risk communication to crisis communication practice", *Public Relations Review*, Vol. 24 No. 3, pp. 387-400, doi: 10.1016/S0363-8111(99)80147-7.

Witte, K. (1991), "The role of threat and efficacy in AIDS prevention", *International Quarterly of Community Health Education*, Vol. 12 No. 3, pp. 225-249, doi: 10.2190/U43P-9QLX-HJ5P-U2J5.

Further reading

Schafer, M.S. and Schlichting, I. (2014), "Media representations of climate change: a meta-Analysis of the research field", *Environmental Communication*, Vol. 8 No. 2, pp. 142-160, doi: 10.1080/17524032.2014.914050.

UNFCCC (1992), "United nations conference on environment and development", (accessed 25 October 2016), doi: 10.1007/s11671-008-9208-3.

UNFCCC (2016), "About UNFCCC", available at: http://newsroom.unfccc.int/about/file:///C:/Users/maria/Downloads/covid-strategy-update-14april2020.pdf (accessed19 October 2016).

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