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Risky times: Hazard management and the tyranny of the present

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ABSTRACT

This paper examines how the processes and practices of hazard management skew decision-making towards current concerns, shaping the treatment of the future in the present. We reveal how norms of science and policy combine to manage the complexity, uncertainty and intangibility inherent in working to long-term time horizons by defining, bounding and codifying how we understand the future. These processes, we argue, frequently but not inevitably, constrain the influence of long-term considerations, resulting in 'hazardscapes' where risks become embedded spatially, transferred temporally and difficult for future generations to reverse. We introduce the notion of a 'tyranny of the present' as a means to critique the ways in which the future is heard in risk management, that is, how the future is known, bounded, and incorporated, and the legacies that this may create. Overall, we highlight how more effective management of risks is not just a matter of better data or improved policy, rather that discourses of risk are subject to a 'presentist' bias, the underpinnings of which need to be better understood in order to make more effective decisions for future generations.

1. Introduction

The impact and the incidence of disasters associated with environmental hazards has been on the rise. In a 2015 study, UNISDR [52] estimated that since 2005 around 1.5 bn people have been affected globally, involving economic costs of around US$1.3 trillion. In response there has been an emphasis on improving risk management by increasing understanding of environmental hazards and their potential impacts, notably when and where they may happen, how damaging they might be, or who and what is most vulnerable. Due to the emphasis on both incidence and impact, risk management is inherently interdisciplinary, situated at the nexus of science and society. The approach has been characterized as 'evidence-led', where science assesses risks and enables decisions to take into account multiple scales and time periods [50,52]. Typical measures focus on understanding the probability of future events, with policy aiming to address future risks, for instance, by delineating areas as inappropriate for development due to high flood risk [49], 'red-zoning' properties in areas of high seismic risk [46], or reducing the potential for damage by improving current building standards ([7]).

It is at this juncture of the voices of the present and the future that this paper is positioned. Specifically, we examine how effective current decision-making processes are at considering future hazards. This is a critical and challenging issue if society wants to adapt to future threats, such as those presented by climate change. While we can make the future more knowable and predictable through improved evidence or scientific modelling, risks can be unruly and resist temporal demarcation: hazards do not necessarily advance towards us in a rational, linear, and readily predictable fashion. In the face of global climate change, the risk environment is becoming more dynamic, with patterns of change increasing in speed, uncertainty and complexity. For instance, more frequent extreme weather events may change patterns of coastal erosion and flooding. This move to a more complex risk milieu poses challenges for disciplines that regulate future development, not least planning and legal systems, which rely on clarity and certainty in decision-making, with limited flexibility to address changing risks ([27,30,48,56]). Once development is consented, unless conditions specify otherwise, this tends to be granted in perpetuity in order to provide certainty for developers. This system however, whilst reducing private or developer risks, can create new societal risks by locking-in land uses that may be difficult to transform, resulting in higher remedial costs and exposure to risks that could have been potentially avoided ([4,44]).

We use New Zealand as a case study to explore the way that the future, and future risks in particular, are understood and considered in land use planning. Risk from this perspective is usually defined as consisting of three other variables: hazard, exposure and vulnerability, but it should be noted that these are also dependent variables. As Oliver-Smith et al. ([38]: 5) explain: 'Most hazard is a reflection of both socially constructed as well as physical processes; exposure is a

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reflection of how social relations of production unfold in territory and geography; while vulnerability characterizes a range of social, economic, political and cultural conditions.' New Zealand is one of the most exposed countries in the world to environmental hazards [20], being subject to a wide range of perils, such as tsunamis, flooding, coastal erosion, wildfires, earthquakes and volcanic eruptions. It is also one of the most hazard aware countries globally, particularly after experiencing the devastating 2010–2011 Canterbury earthquakes, which had a significant impact upon the thinking of citizens, government, and scientists alike [29,43]. Selecting one country also enables a multi-hazard approach to be taken, which allows more general messages to be taken for other countries similarly grappling with the effective management of hazards. The data collection was qualitative and interpretive to effectively unpack the expert views and privileged knowledge that exists at the science-policy interface. It consisted of in-depth interviews with 24 key people connected with hazard planning. These were selected to provide a wide-ranging overview of perspectives from critical actors and agencies across multiple scales, sectors, locations and risks. Interviewees included central government officials, regional and district council officials who have been active in this field, researchers and scientific advisors to government on climate change and hazard management, politicians, and representatives from planning, local government, and the insurance industry.

This article has a number of key messages. Firstly, that the future brings three main challenges for decision-making: complexity, uncertainty and intangibility, and that science and policy norms in risk management struggle to deal with these. Compared to immediate policy concerns, hazards in the distant future appear more phantasmagoric—far off and insubstantial—in comparison to the 'facts' provided by historic data sets, or the expediency and materiality of short-term political concerns. This brings us to our second point: the broad structures of risk management foster a 'tyranny of the present' that needs to be recognised and mitigated in policy in order to allow future risks to have a stronger voice in current decision making.

2. The scientific and political disciplining of the future

Hazards are natural phenomena that, when become intertwined with human systems, potentially create risks to be managed [37,58]. As such, this section focuses on the science-policy interface to better understand how the future is disciplined so it can be incorporated into current decisions. In doing so, we argue that the operation of science and policy serve to create and maintain specific 'hazardscapes'—a term that highlights the complex discursive environment within which "hazardous spaces are produced, contested and struggled over" ([36]: 570).

2.1. The role of science

Our analysis of how structures of decision-making create and constitute hazardscapes is rooted in the view that science is not a separate artefact to be brought to society, it is a product of society—the way we know and represent the world is inseparable from the ways in which we choose to live in it [22]. For our study, this lays the foundation of how scientific choices regarding understanding or codifying complex and uncertain futures can produce particular hazardscapes. Bell [2], for instance, argued that the selection of research methods can confer respectability on certain intervention choices and privilege particular outcomes, a situation described as the 'tyranny of methodology'.

The pressure on science to discipline the future by quantifying risk in monetary terms, such as the use of cost-benefit analysis (CBA), provides a good example of the limitations of this methodological inclination. The CBA approach is valued because it requires detailed evidence of costs and benefits, and conforms to the apparent preference of many policy makers for economic approaches that provide 'law-like regularities' to simplify complexity ([39]: 487). It provides a clear and quantifiable basis against which policy decisions, such as flood management schemes, can be justified and defended; thus helping produce decisions which can defend potential legal challenges or future liability claims [24]. However, various social and psychological costs struggle to be quantified within this framework. For example, in the aftermath of disasters Post-Traumatic Stress Disorder can affect people, and there are frequently increased incidences of anxiety, depression or even marital stress ([10,14,35]). Moreover, the methodology not only commonly assumes the future to be comparable to the present, but importantly outlines when it ceases to have a voice—all cost-benefit decisions are bounded temporally, say for 5, 10 or 20 years [28]. Few cost benefit analyses stretch beyond these artificial boundaries as the complexities amplify and the uncertainties resist quantification. As a consequence, CBA has been criticized as unfair to future generations [16].

These artificial time limits and boundaries are important for our argument as they exercise important shaping influences on how scientific information is commissioned or marshalled to reflect the needs of the decision-making tool. As such, it is apparent that decision-makers do not just receive data; management demands also influence the operation of science. Rothstein et. al. ([47]: 12) describe this interlinked relationship as 'risk colonisation', where to conform to the limitations of decision-making systems, regulatory processes and the use of science also become a means to protect institutions and confer legitimacy.

In a related fashion, there are fears that the way in which scientific evidence is requested by policy-makers can lead to a 'false precision' in predictive techniques. For instance, while drawing a single probability line on a map to delineate high risk areas is convenient for decision-makers, it can mask significant data uncertainties [28,54]. In the case of flooding one recent review concluded that the more we understand its complexity, the less we can be sure of 'concrete' facts [49], leading Hayes et al. ([17]: 16) to argue: "there seems to be mismatch between our understanding of flooding as complex and fuzzy and our assessment of flooding as quantifiable and precise."

Similarly, recent critiques of the concept of stationarity provide further insights into the dilemmas at the science-policy interface. Stationarity suggests we can understand, categorise and predict the future behavior of natural systems, based on an assumption that fluctuations occur within broadly known parameters (Milly et al., [33]). For example, hazards can be predicted based on their historical frequency, leading to framings such as a 1-in-a-100 year event probability. This probability (based on the past) is then considered in the context of consequences (based on the present), to determine the degree of risk. These confidence or probability levels represent efforts to discipline time and codify uncertainty for decision-making. The obvious problem with such simplified calculations is that in the context of climate change and rapid urbanization, natural and social systems are so dynamic that we should question the extent to which the past is an accurate predictor of future risk. Several studies argue how 'stationarity is dead' [33,34,6] as a result of changing extreme event frequencies due to climate change (e.g. high storminess), the rising awareness of risk aggregation effects (e.g. landslides and coastal erosion), and how human activity (e.g. urbanization) changes and compounds the risk profile. Discussing hazards in this way has also been criticized as contributing towards the creation of a false sense of security concerning when the next event may occur, with, for example, a move from a 1-in-a-100 year terminology to presenting the same risk as being a 1% chance per annum [53]. Using the past to predict the future has, in effect, become less useful than previously as our knowledge of complexity and uncertainty has increased.

Moreover, there is a view that despite an increasingly sophisticated understanding of the complexity of natural and human systems and continuous improvements in modelling, scientists have not necessarily produced models that are better at predicting the future [1,49]. For

instance, despite huge advances in climate change models, the uncertainty range has remained stubbornly unchanged for around 30 years [45]. Knowledge is not a process of incremental reassurance; science progresses by deepening understanding of existing phenomena, or by uncovering new uncertainties, both of which can present fresh challenges that can make the future even more unruly. Assumptions will always be built into scientific models, such as how linear and stationary do we assume the future to be, or how to account for shocks, so there will always be a degree of epistemological uncertainty that is in tension with decision-making desires. This relates to another intrinsic temporal problem, well established by Popper [42], that efforts to accurately predict the future are detrimentally affected by our very presence: the future may look little like the past; both society and hazards are incredibly dynamic and complex.

Research in the field of climate change adaptation offers further insights into how improved understanding of future uncertainty is being acknowledged. Here, a number of authors describe multi-decadal considerations as being of 'deep uncertainty' and question the effectiveness of traditional analytical tools in enabling adaptation to avoid future costs (e.g. [5,26,9]). As such, alternative approaches and decision-making frameworks have been proposed to address the inherent uncertainty of future risks, such as integrated resilience [55], adopting co-management approaches with communities at risk [3], pursuing 'no-regret' or 'low-regret' options [18], or dynamic adaptive pathways and tipping points [15]. Some of these policy innovations and techniques are now starting to be used in a number of countries, for example Ranger *et. al.*, [44] discuss how the Thames Estuary 2100 project adopted a strategy that can adapt as information changes.

Together these examples highlight the tensions and choices involved in incorporating complexity and uncertainty into decision-making. The future represents inductive knowledge and, in comparison to the past, a comparatively weak mastery of circumstances. As such, it can erode trust in expert systems [12], including hazard management. In part response, science and policy norms, such as the scientific mapping of hazards serve to bound spatially and constrain temporally. Therefore, hazard science and policy are not merely technical enterprises using objective data, but assemblages of real power: they shape new hazardscapes, support the functioning of institutions, and influence how the future is known, considered and prioritized. Consequently, the ways that science operates will inevitably produce certain configurations of hazardscapes, particularly when it is charged with defining and identifying risks as evidence for politicians and other decision-makers, who, as we will now explore, exert their own influence.

2.2. Politics and Policy

The existence of a political propensity to privilege current generations over those of future ones has often been claimed, though can be difficult to prove. Thompson [51] refers to this tendency as 'political presentism', arguing that a form of 'democratic myopia' can cause neglect of the future due to a combination of the psychological tendency to prefer the immediate, the desire for government that responds to the current demands of the electorate and the influence of short electoral cycles. In a similar vein, Jacobs [21] notes the strong influence of electoral safety and the poor valuation of long-term returns within politics. Of particular interest for this argument is his assertion that while politics is designed to manage trade-offs, the reliance on quantified evidence and cost-benefit figures within decision-making means that it favours past data and current lost opportunities over more intangible possible future benefits.

There is an alternative view, however, which argues that the future is well-served within politics. Future generations should have more knowledge, expertise and technologies at their disposal, which means they are able to look after their own concerns. Moreover, enabling development creates economic growth and opportunities to enhance the capacity of future citizens to respond to threats. From this perspective there is a strong justice argument: if a current development opportunity is prevented due to a fear of a long-term future risk it means you are transferring the use of a resource away from the present to the future. This leads us into moral territory where we trade-off the economic welfare of current generations against that of future generations. Perhaps more fundamentally, by considering future citizens we are involving them in a democratic process without knowing their opinion. They may have favoured a development going ahead in the present had they been in a position to be asked.

Thinking of such debates in relation to hazards, we can see how tensions emerge, particularly around land use. Planning systems are geared to producing decisions which combine clarity, consistency and permanence, resulting in outcomes that are typically less reversible than many other public policy fields. There are exceptions: mineral mining rights, for instance, tend to be time-limited. However, development rights for housing tend to granted in perpetuity, or at least without specifying an end date, in part because introducing flexibility may mean authorities avoid tough decisions or provide an avenue for legal challenge [40,6]. The result is a rigid system of rights that once granted are difficult to reverse, whilst at a larger scale as new neighbourhoods and their infrastructure become established they similarly become politically difficult and economically costly to change. Layered over such considerations are issues of liability, such as if a court were to decide that development consents were wrongly given and a future damaging event might reasonably have been predicted.

One way of understanding these temporal trade-offs is to consider risk management techniques as time-space ordering devices [11] that help predict the likely occurrence and location of major hazard events. They are mechanisms for rendering the future more knowable, which to improve accuracy and credibility must impose temporal and geographical limits. In this sense they are framing devices, and the choices over which space and which time means they are more than neutral technical decisions. Putting boundaries around territorial geographies and preferred timescales not only creates hazardscapes, but imposes limits on how we identify potential future problems and prepare for future hazards.

This highlights that effective risk management requires an acknowledgment of how complexity and uncertainty is coded into knowable, quantifiable risks in order to balance alternatives against each other and determine priorities. This is related to the powerful rationality that risk management practices imbue. As Ewald ([8]: 207) succinctly put it: "to calculate a risk is to master time, to discipline the future". It is a means of enabling distanciation—the process by which transactions occur between current and future agents. The approach is essentially a means of disciplining unruly hazards, where complexity and uncertainty are defined and coded so future risks can be inserted within a linear, containered conception of time that outwardly links past, present and future. In a similar vein, even as scientists and politicians recognize that environmental hazards do not respect geographical boundaries, in practice risk management practices have calculative rationalities for assigning levels of risk within bounded geographies, such as producing hazard maps or CBA calculations for territorial units.

Thinking of hazard maps as time-space ordering devices draws attention to the ways in which time and space are instrumentally containered in order to help make the future more comprehensible, more knowable. In other words, it draws attention to the choices implicit in drawing boundaries around both space and time and the political work this entails. By contrast, adopting a less bounded, more relational view of time and space opens up new possibilities for thinking about how risks are understood and managed. Recent work on relational thinking, for instance, critiques instrumental conceptions of space and time as insensitive to alternative understandings of lived time that might coexist, such as seasonal or social forms of connected-

ness across space and time, or the coming together of disaster understandings that mix the past, present and future [19,31,32]. Put another way, there is a tendency in science and politics to 'fix' risks in time and space, from a past earthquake in area X, or a previous flood in year Y, to the future sea-level rise in an area in 2100. This does, however, help erode the connection to the here and now (see [57]).

3. The Production of Hazardscapes and the Tyranny of the Present

3.1. Coding complexity: reconciling contested logics, approaches and timescales

The previous section highlighted how a key scientific approach to reduce complexity and provide clarity is to tightly define and code the scope of inquiry. Our interviews revealed how time is routinely bounded in this manner, but the way that this is operationalised differs depending upon the actor or agency involved and their dominant logic; typically scientific, engineering, or financial.

For scientists, hazards tended to be categorised into a time frame that reflects IPCC projections, or the steady incremental change over a given time period, such as projected sea level rise until a named year. The second logic by which time was understood and codified related to the norms of engineering. For example, estimates of:

> the number of exceedances within a certain life, a planning lifetime, or asset lifetime (Scientific Advisor 3).

Here, design or performance standards bound time, such as the height of a flood defence constructed to protect up to a specific return period, or the predicted built lifetime of an asset. This links to the third defining logic: financial. The interviewed insurers in particular revealed a concern with how key institutions for risk management bound the future in accordance with financial value or market norms, which are usually short-term from a hazard perspective. The time periods also differed by sector, as one interviewee explained:

> insurers only price risk for twelve months, a mortgage lender sees risk for 25 years (Private Sector 2).

This interviewee from the insurance sector suggested that banks should take more interest in risk issues than they currently do, but also pointed to fundamental tensions in the differing logics for understanding risk across a wide range of governmental agencies and private institutions.

For central government, one of the drivers in identifying hazards more accurately was said to be a growing awareness of the costs to government of recovering from major earthquakes, such as those in Christchurch, expressed in terms of contingent liability:

> It's commonly used in balance sheets… where they might be exposed to a legal action in a court case. They don't know whether they're going to win or lose the court case, but if they lose they may have a debt to pay… that's called a contingent liability, and that's what government is quite interested in.
> Prior to the Canterbury earthquakes, I don't think it was envisaged that there would be… several billion dollars' worth of cost ultimately to the taxpayer. So, that's like a future earthquake event on a similar scale as a contingent liability sitting on the government's books (Civil Servant 1).

This related to a parallel set of concerns about the 'moral hazard' logics of disaster recovery policy. For policy makers the worry was that helping out those affected might set an undesirable precedent for future governments and lead to householders refraining from insuring their homes. This was a particular issue in Christchurch where after the earthquake the government agreed to cover the costs of moving for those living in the red zone, which covered the most 'at risk areas' where development needed to be strictly controlled:

> So the tendency of national governments… when big hazard events occur like the Canterbury earthquakes is to step in and help bail people out…. And so essentially all they're doing are doing are passing on those costs to the next government until the events occur again. You can see that's an impossible system dynamic.
> If you look at the Canterbury earthquakes and look at the red zone buyout offers… they were very clear that those that didn't have insurance would not be part of those offers, so they were clear about trying not to create any additional moral hazard precedents. But, of course, everyone around the country is aware of the red zone buy out, so [people say], "well, why don't you red zone us and bail us out?" (Civil Servant 5).

For government, the logic was that an accurate assessment of risk was a way of ensuring risks were managed and appropriate insurance sought, helping reduce the financial liabilities of future governments.

The Canterbury earthquakes were also said to have been important in focusing attention on the particular challenges involved when planning for low frequency, high impact events such as these, acknowledging that previously perhaps the focus had been more on addressing frequent but less damaging events, such as flooding. In the words of one interviewee this had led to a policy re-think:

> it was a real wake-up call that, "hey, we need to think about the low probability events as well, and they are pretty damaging" (Scientific Adviser 5).

We can see from such comments that how the government, engineering or finance sectors know and bound risk is in considerable part shaped by concerns about future liability within the lifetime of the loan, the building, or the policy. However, longer-term and aggregated risks are rising quickly up the policy agenda. Many of our interviewees talked about how we are in a new era in terms similar to the 'stationarity is dead' debate [33], arguing that the future is more dynamic and less predictable as a result of climate change and urbanization. For example, with regard to flooding in one area, one local government official said:

> We had a period between 2004 and 2012 where we had around six [flood] events that were greater than 100 year return periods (Local Government 2).

The problem of using historic events as a logic to code time was further highlighted with regard to coastal erosion, sea-level rise and, in particular, the unpredictability of seismic activity. From this perspective experience of hazards and knowledge of their complex interactions were destabilizing belief in the value of those scientific models and representation practices which relied heavily on past frequencies of a single hazard as a guide to future risks. One interviewee powerfully noted the interaction between risks:

> large swathes of eastern Christchurch and Waimakariri have fallen by up to a metre as a result of the earthquakes. We've had nominally 50 years of sea level rise in one go (Local Government 9).

Perhaps more fundamentally with regard to the ways that science is used to code complexity and understand the future, after the 2010–11 Canterbury earthquakes there was a view that historic decisions about development had often not drawn on community or indigenous knowledge. Even where such knowledge was known to be out there, there had been a preference for quantitative scientific data and a reluctance to engage with more qualitative information. However:

> once we started talking with some of the members one on one, they shared their anecdotal evidence that had been passed down from one generation to another about previous events and there were several of them that described the same time and the same location and pretty similarly the extent of it, but that's qualitative information as opposed to actually mapping boulder sizes and locations (Local Government 2).

Another official told us about how shortly after the Canterbury earthquakes:

> a viewpoint emerging out of local Māori was, "oh, you silly bloody Pākehā [a term used by Māori to describe predominately white European migrants] you never should have built that damn city on that swamp". There's a sense in which there was strong local knowledge of strengths and weaknesses of the land long before you (Local Government 9).

This disjuncture in the logics, timescales and types of information used by officials and indigenous communities in part reflected attitudes to understanding and coding knowledge about hazards, which until recently meant that government scientists and officials 'saw' the past and future in certain ways, privileging particular ways of understanding time. Here hard data was seen as almost the antithesis of cultural understandings of risk recorded through story-telling and other techniques for storing and sharing knowledge.

3.2. Manufacturing certainty: reconciling variegated knowledge, aggregated risks, and quicker decisions

One of the prominent issues in our interviews concerned the difficulties in dealing with scientific uncertainty. Not all hazards were equally well understood, so some hazards are much more uncertain and complex than others. While the relatively recent rise of hazards such as surface water flooding and tsunamis, meant that there had been less work done to develop both modelling techniques and historical databases to inform policy responses:

> Certainly for New Zealand, surface water, whatever you call it, urban flash flooding... it's way behind compared with our river modelling (Scientific Adviser 5).
>
> The science does move really quickly in some areas, particularly around tsunami modelling. You know, it's just going, going, going (Scientific Adviser 1).
>
> The big problem I guess, with particularly debris flow, is a lot of uncertainties around it and [an] inability to validate your models to a high degree of accuracy.... we know there've been other events... but nobody has actually gone out and monitored that work because it happened decades and centuries before (Local Government 2).

Following the Christchurch earthquakes, awareness rose concerning how impacts became intensified through risk interaction. For instance, land movement made soil liquefaction, boulderfalls or flooding more likely. Both scientists and policy makers told us of their growing interest in trying to understand risk interactions or aggregation. These also emerged as important in a series of public disputes over how maps set out new boundaries for areas deemed at risk from coastal erosion from sea level rise and more extreme weather events. One interviewee told us that modelling sea level rise on its own was relatively unproblematic, but modelling patterns of coastal erosion in the context of future sea level rise had proved much harder to calculate as the historical datasets were not there.

> In terms of modelling it's [predicting sea level rise] pretty easy. If we have very good historical information such as tide gauges, rain gauges or river gauges, then we have something quite tangible that we can hang our hats onto, as long as it's a long enough time series. From that you can produce some statistical forecasts in terms of what the frequencies and return periods are... So that's easyish. But it's when you have some of these physical processes where it's very hard to put numbers on and where there hasn't been that long term monitoring record or beach profile data sets (Local Government 5).

So even as scientists sought to set out the objective basis for their predictive models, in practice the possibility of different scientists using different assumptions, timescales, data or models meant that there was a degree of subjectivity involved both in commissioning particular groups of experts and in selecting how to use the information provided. This was seen a problem in the context of moving away from the practices of drawing up hazard maps with single probabilistic lines (e.g. 1-in-a-100 years likelihood) and presenting these to the public as the basis for determining whether an area would be defended or public infrastructure provided. This approach had led to a series of high profile disputes regarding the science behind coastal hazard maps, including one which ended up at judicial review, leading to the Kapiti District Council deciding to withdraw its coastal hazard maps from its website.

> There's talk of us being in a post-science world, post-normal science world, and any source of information presented well, potentially has some credence with the community, and if there's sufficient motivation to find out amongst individuals or a community, their own information, then they may well challenge the official view, and that's what we saw in Kapiti, where the consultant used by the council was... challenged, from a number of different angles, because the community was well-resourced to seek its own information (Civil Servant 4).

Reflecting on these issues, New Zealand's Parliamentary Commissioner for the Environment [41] recently recommended to government that more time be allowed for complex issues such as these to be debated and policies developed, involving greater consultation with affected communities. However this advice conflicted with a theme which emerged from many of our interviews: a political drive to simplify rules to speed up decision-making in planning. Amongst the issues raised was that while the scientific community wanted to provide full details of the complexity of assessments, including sometimes multiple modellings of a hazard to help generate more options, from the political sphere there was a drive to streamline decision-making processes into a 'tick box methodology' where the question concerning a development proposal would be reduced to a quick: 'well, is it permitted or not? Make up your mind' (Local Government 9). The political imperative to make consenting and permitted development rules clearer and faster essentially requires reducing complex science into something definite and defendable.

> The rules have got to be certain... otherwise people just either ignore it or are getting stuff wrong (Local Government 6).

A push for certainty to avoid costly court appeals was also identified as key for decision-makers. This issue in part reflected the nature of New Zealand's legal system, which has struggled to deal with scientific uncertainty and the consequent need for greater policy flexibility ([13,6,27,40]). This produced an additional factor that drove a simplification of science in policy, as unclear or multiple findings tended to produce a situation where the policy could be challenged. As one interviewee told us:

> The planning process in New Zealand tends to enforce single numbers because otherwise you are arguing in the Environment Court (Scientific Advisor 2).

The problems with enacting a single long-term future was particularly apparent in relation to changing existing land use rights as knowledge of future risks evolves, leading one of our interviewees to reflect:

> we don't really have a very good mechanism for managing existing use rights. We have quite good mechanisms for protecting them, but not for managing them (Civil Servant 5).

While the judicial system responds to evidence put before it and interprets the law and planning instruments based on the law, it is clear that existing use rights are very hard to challenge politically and judicially. Consequently, unless a regional council wants to implement a specific rule designed to expunge existing land uses, there is a danger that problems get passed on to future actors and agencies to deal with.

3.3. The presentist problem: reconciling a strong present and a weak future

The need to provide certainty, whether regarding land rights or economic analyses, highlights a core tension where the intangibility of the future is in conflict with the tangibility of the present. Political priorities were a recurring theme in our interviews, not least in the context of recovery efforts following the Christchurch earthquakes, which for one interviewee (Local Government 9) highlighted how new mechanisms were needed for dealing with long-term risk, because more immediate priorities always seemed to be prioritized.This is not to say that addressing future hazards was not a strong concern politically, but more that current political systems tended to prioritise current needs and short-term risks over more intangible future threats:

> Most of the debate in Christchurch is about people are already living there, they are already at risk. What do we do to respond to that? (Local Government 1).

Whilst it is often argued that disasters open up critical space for radical policy changes, whether by 'policy windows' [23] or capacity building [25], our interviews pointed to the ways major hazard events led to a privileging of the present over the future, as short-term priorities dominated, such as rehousing, rebuilding, refitting or recovery. The limits of science as a political influence were also repeatedly highlighted by our interviewees, such as:

> you might have objective scientific evidence, engineering evidence, the best you can get on one side, which to scientists and engineers that's quite a strong argument in itself that there's a need to act, but on the other side you've got the political survival aspects, and if it's not in the political agenda at the time you're struggling to get any traction (Local Government 2).

The long-term time horizons associated with certain risks further highlighted a presentist bias within politics that affects multiple hazards. Sea-level rise was identified as an example of a distant future risk that struggles to gain influence in the present with one interviewee explaining how attempts to plan for the future might be met with comments along the lines of:

> this is 50–100 years out you're talking. Hell, I'm worried about why isn't some bugger fixing my damn roads right now (Local Government 9).

Even in risk aware New Zealand, attempts to plan for earthquakes struggled to gain traction in the case of pressing contemporary concerns alongside a misunderstanding of risk:

> Of course people will say, "well, our next event isn't going to be for another 16,000 years or whatever so I'm not going to worry about that" (Local Government 9).

In addition, there was a potential systemic issue around how individuals might ignore risks in the hope that governments would pick up the bill in the future:

> People being people, something is going to be a, I don't know, a 1-in-a-100 years, they will think, "oh the chances of that happening are virtually zero and therefore I am going to carry on purchasing properties in this area". And the capital keeps on going up and you get into the situation where the properties get so expensive that maybe those people have the influence on the council to get them to pay for the mitigation risks (Private Sector 1).

At one level, the pressures favouring short-termism in individual, business and public decision-making might be seen as a manifestation of recent moves to develop more market oriented policy solutions and a desire to put more responsibility for decisions into the hands of individuals rather than governments. Certainly some of our public sector interviewees identified such issues as part of the context in which they operated. But perhaps more notable was how interviewees in both central and local government were keen to point out that they saw it as part of their role to make good decisions for the longer term:

> It's harder too where you have… large scale infrequent events, but have big consequences. I mean, they might have a one or 200 year return period and people struggle to get their mind around that and councils, planners, and so on, we typically work to those horizons. We're not just here for this generation, we're here for future generations (Local Government 2).

The very intangibility of the distant future made it difficult for markets to assess and price future risks accurately. Markets might provide some of the solutions for preparing for the future, but government always seems to be in the lead when addressing the long-term. Overall, our interviews revealed considerable evidence of public sector willingness to engage with long-term hazard planning. The debate was rather about how the structures of science and policy may enable or resist that desire.

3.4. Changing direction: sticky risks and weak reversibility

One of the ways to better appreciate the impact of a tyranny of the present on hazardscapes is to reflect upon how today's embedded risks are a result of yesterday's decisions. During interviews, decisions concerning the location of both the capital and third largest city in New Zealand were criticized as being poor in retrospect, and ones which are now locked in and impossible to change:

> like everywhere we're dealing with the legacy of where everything has been built… if you looked at whether Wellington should be where it is now you'd probably say, "no, it's a stupid place to build a city" (Civil Servant 5).

Similarly, referring to Christchurch and the multiple risks that it is now known to be subject to:

> if we had the knowledge that we do today we would probably say, "no, we don't want people there" (Local Government 1).

The situation planners face involves dealing with changed awareness of risk and dealing with development with existing use rights. Again, issues of creating precedents that might increase the liability of future governments very much concerned civil servants.

> The horse has bolted when some of the existing development is done; we need to manage that as best we can. The problem with doing that though is, again, when you are looking at development, especially residential development, is that once you create that freehold title it is there indefinitely (Local Government 5).
> So there is a long-term dynamic question about what the government decides to do to support councils to manage some kind of transition out of some areas that are higher risk, because otherwise… the call to be bailed out all just becomes more and more intense (Civil Servant 5).

One of the issues raised by interviewees was the difficulty in proving the future benefits of refusing development. The problem lay in countering the claims of developers about creating jobs or homes against the uncertain possibility of avoiding a future hazardous event. So a planner might reject:

> a development in the wrong area that might save three lives 50 years down the track but you might not ever know that… And it is the same with the flood risk, you might avert some serious flood damage happening. But probably, because the development there has not gone ahead, you won't be thanked (Local Government 8).

An example of the positive impacts from more stringent hazard zoning came from the North Island where an interviewee explained to us how:

> the first coastal erosion hazard zone study we did in the very early '80s had sea level rise included, and incredibly it was a 0.7 m sea level rise that was built into that hazard zone, which has stood the test of time. But the developer was miffed that they lost the first row of potential houses… On the other hand people really appreciate and use that foreshore area for a lot of recreational walking and so on, so in hindsight it's been of benefit to the community (Scientific Advisor 5).

One way of improving policy for the long-term suggested by some of our interviewees was to invest heavily in the evidence base to allow future decision-makers to better understand how risks have changed. This led one to argue for:

> monitoring and measuring the bugger out of everything. Getting that information, taking the photos, measuring as much as we can… and getting that baseline information. That is going to help someone 50 years down the track (Local Government 5).

The legacy of the past in the present, and current approaches to hazard management, demonstrate a presentist power on hazardscapes and, as a consequence, a means of risk transfer from one generation to the next. In the main, those who benefit from the economic development of land will not be living there over the very long-term, while those who currently live there and resist new regulations may not be there in 50 years. Therefore, to make current investment decisions more certain we may make future society more risky by transferring costs. Adaptation measures provide a good example. They encompass a variety of techniques that appear to be inclusive of the future, but they are a mode of rescheduling; a way to acknowledge future implications but in a way that passes costs forward—the problem remains, it is just deferred. In this sense, adaptations are temporary and can contribute to lock-in. For instance, with regard to flooding policy:

> raising the floor levels for homes, that buys you time… [but] that house shouldn't be there to be honest, it's just saying if there is an effect in the next 50 or 100 years the effect will be less because it is higher. But you still need to issue people with dinghies at some point (Local Government 1).

As there will always be uncertainty, the challenge is not necessarily to give permanent development rights, rather to build in reversibility and adaptability—a situation where regrets are few, time is used efficiently, and transferable costs are low. This is not just a case of turning down development, but rather of finding new means for managing the future. This was leading some policy makers at the local level to argue for ways of providing permission in areas where the risk might be foreseeable, but some way off, for instance with sea level rise. One interviewee contended that in such a case it is inefficient,

> to lock away land that you are going to get two, three generations of use out of… Rather than having a freehold title, there needs to be some other ownership entity that doesn't have that permanence, such as some sort of leasehold title where there are review periods guaranteed for the next 50 years… when we will have hopefully a lot better information… That type of risk profile might be acceptable for many (Local Government 5).

Similarly, some aspects of risk transfer and residual risks could be dealt with by innovative policy tools, such as triggers that activate after certain events as mentioned earlier. However, while these hold potential in theory, it was cautioned by interviewees that these approaches are still subject to political pressures—any future measures will still have to navigate elements such as budgets and competing priorities, when the time comes.

4. Conclusion

There are some reflective experts, pioneering practitioners and responsible communities who are trying to plan effectively for the future, but this paper highlights how the structures of decision making hinder these intentions. Science and policy code uncertain futures and allow distanciation to occur. Within this process there is an assumption that future needs are internalised by present decision-makers, but with regard to decisions we can see how a number of elements impede this consideration. The first is the historicism of decision-making, demonstrated by the demand for certainty, the need to provide clarity for investment, the protection of property rights, or long-standing legal precedent. Second is the scientific norms of hazard decision making, as seen from the effect of practices such as mapping, quantification or cost-benefit analysis, where the future may represent weak inductive knowledge compared to the 'certainty' of current and historical quantitative datasets. The third is the politics of decision-making, which is evidenced by aspects such as the wish to avoid liability, the requirement for political and institutional defence, the desire for short-term returns, or easy risk transfer. All of these strengthen the argument that structures of decision making create certain hazardscapes, where risks may be embedded, transferred, and hard to reverse.

We introduced the notion of a 'tyranny of the present' as a means to critique the extent to which the future is heard in risk management; how it is known, bounded, and incorporated, and the legacies that this may create. The arguments in the paper lend weight to the view that the tyranny exists, is systemic, and is related to the long-standing ways in which we assign value to science, the influence of politics, and the processes by which we make decisions. We argue that the notion of a tyranny of the present allows us to better understand the broader contexts of long-term decision-making and the insider-outsider effects that occur. For instance, privileging certainty, as is the norm in decision making, also runs the risk of privileging regrets; an unfortunate corollary that has helped constitute a number of current problematic hazardscapes as well as increasing future risks. As such, a challenge for hazard management is not just with regard to understanding and managing impacts, but rather looking deeper at the system which defines and assigns value to the future.

We emphasise how effective risk management is not just a matter of better data, or improved policy, rather that powerful discourses exert a presentist bias that is largely hidden and needs to be recognised in order to allow future considerations to better influence current decisions. While science theoretically expands time-space distanciation to allow long-term risks to be considered, it is also evident that politics and practice compresses this time, dragging attention back to the present. A further message is that while society may not know what the future will offer, certainty and inflexibility create legacies that are difficult to manage. Therefore, rather than focus on designing a policy response for area X, or producing slightly better modelling for area Y, a key principle should be flexibility—to leave future citizens more choices as evidence changes. Those arguments relating to the need for more innovative and flexible systems for land use rights, more consistent logics across sectors, or flexible policy tools that can better enable a transition from risky areas, provide good examples of an important emerging research agenda. These approaches help give future generations a voice in current decision making, and are essentially a process of ensuring policy can be reflective, responsive and reversible in a way that can partially transcend the structural problems of short-term political demands or scientific constraints.

An appreciation of the constitution on hazardscapes therefore provides a lens by which to unpack how time is understood and shaped by the structures and agencies of decision making. Even when the future has a stronger voice due to events making hazards more real, urgent and less 'othered', these underlying forces remain unchanged; complexity and uncertainty persist and struggle to compete against the tyranny of the present. Where gains occur and adaptability is embedded, significant effort and engagement has taken place, highlighting how the structures of decision making require increased academic and policy focus. It is in this positive vein of reexamining

the science-policy interface that the paper is positioned. Appreciating the ways that hazardscapes are shaped and the legacies they may leave can stimulate the discussion of new decision making processes that allow the future to exert influence in the present and, in doing so, help resolve the tension between an unknowable future and a knowable now.

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