

Chapter 3

Climate Change Frames in Public Health and Water Resource Management: Towards Intersectoral Climate Change Adaptation

Lindsay P. Galway, Margot W. Parkes, Kitty K. Corbett, Diana M. Allen, and Timothy K. Takaro

Abstract Effective and appropriate climate change adaptation requires a greater understanding and appreciation of the diverse ways in which the issue of climate change is constructed and understood. The ways in which an issue is framed should not be overlooked in interdisciplinary and intersectoral efforts given that implicit and divergent frames often impede the processes of knowledge integration and collaboration and therefore, can hinder adaptation processes. This study used frame analysis to identify and summarize the climate change frames in public health and water resource management texts. Five frames emerged from the analysis of the public health texts: *Preventing direct and indirect health impacts, promoting health and sustainability, climate change as a complex problem, strengthening the evidence base, and health equity in a changing climate*. Three frames emerged from the analysis of water resource management texts: *planning and decision-making under uncertainty, managing multiple drivers of water insecurity, and understanding impacts on complex systems*. Drawing on insights from this work, we assert that the notion of frames and the process of frame-reflection are useful tools to foster integration and intersectoral collaboration and an opportunity to foster enabling conditions for climate change adaptation.

L.P. Galway (✉)

Department of Health Sciences, Lakehead University, 955 Oliver Rd., Thunder Bay, ON, Canada

e-mail: lgalway@lakeheadu.ca

M.W. Parkes

School of Health Sciences, University of Northern British Columbia, Prince George, BC, Canada

K.K. Corbett

School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada

D.M. Allen

Department of Earth Sciences, Simon Fraser University, Burnaby, BC, Canada

T.K. Takaro

Faculty of Health Sciences, Simon Fraser University, 8888 University Dr., Burnaby, BC, Canada

Keywords Climate change • Adaptation • Framing • Public health • Water resource management • Interdisciplinary • Intersectoral collaboration

Introduction

There is now widespread consensus that adaptation to the current and future impacts of climate change is necessary (Field et al. 2014). Despite many compelling reasons for climate change adaptation, we currently face a disconcerting “adaptation deficit” (Burton 2004); a vast gap between needed action and the extent to which we are actually taking action to adapt to climate change. Over the last decade, a body of literature on the constraints for climate change policy and action has emerged. To date, most research has focused on informational and technological constraints, and our understanding of enabling conditions for climate change adaptation is generally lacking (Kiem and Austin 2013). Recognizing that adaptation is a social process over and above being a technical challenge underscores the need to address constraints with social and governance dimensions and focus on enabling conditions (Adger 2003; Field et al. 2014; Moser et al. 2012).

We argue that the challenge of “learning and working together” (Parkes et al. 2012), i.e., interdisciplinary research and intersectoral action, is an often overlooked yet important adaptation constraint. To develop and implement adaptive responses, we must consider how to engage a diversity of actors, integrate knowledge, and foster intersectoral collaboration (Warren and Lemmen 2014). More explicit attention to these interconnected processes is an opportunity to foster enabling conditions for adaptation. This in turn calls for a greater understanding of the diverse ways in which the problem of climate change itself is conceptualised and communicated across various divides. Actors from different sectors, disciplines, and perspectives construct and understand issues in different ways; they frame issues differently (Dewulf et al. 2007; Schön and Rein 1994). For example, public health professionals understand issues through public health lenses, and resource management professionals understand the same issues using their own theories, methods, and vocabularies. By examining the various ways in which the issue of climate change is framed across disciplinary and sectoral divides, we can develop tools and processes that promote knowledge integration and intersectoral collaboration and contribute towards enabling conditions for adaptation.

Against this backdrop, this research is guided by the question: ‘*How is the issue of climate change framed in the public health and water resource management sectors?*’ Using the method of frame analysis, we analyze and summarize the various ways in which climate change is constructed and understood within two sectors that are central to climate change adaptation. Our intention is to contribute to the emerging literature and dialogue on enabling conditions for adaptation while also highlighting the potential utility of frames and frame-reflection for learning and working together to address the current adaptation deficit.

A Brief Background on Frames and Frame Analysis

There are various interpretations of the notion of frame and different approaches to frame analysis. In his influential paper *Framing: Towards Clarification of a Fractured Paradigm*, Entman (1993) aimed to “identify and make explicit common tendencies among the various uses of the terms [frames and framing] and to suggest a more precise and universal understanding of them” (Entman 1993). Entman offers the following definition; “to frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for an item described (original italics)” (Entman 1993). Adapting Entman’s work, Benford and Snow (2000) present core framing tasks: diagnostic framing, prognostic framing, and motivational framing. Diagnostic framing refers to problem identification, prognostic framing answers the question, ‘what can and should be done?’ and articulates solutions while motivational framing refers to the moral appeals and the rationale for addressing the issue. In addition to framing tasks, Van Gorp and Vercruyssen (2012) highlight the role of framing devices including metaphors and exemplars. Frames thus are distinct combinations of diagnostic, prognostic, and motivational framing and the use of particular framing devices that together depict the distinct ways in which an issue is constructed and understood within written or spoken text. Since frames are not made explicit in communication, they must be interpreted through the analysis of language using frame analysis (O’Brien et al. 2007; Schön and Rein 1994). We draw primarily on the theoretical work of Entman (1993, 2000) and Benford and Snow (2000) to inform an analytical procedure utilizing prognostic framing, diagnostic framing, motivational framing, and framing devices as frame-signifying dimensions (herein referred to as frame dimensions).

Methods

The public health and water resource management texts were selected using a purposive sampling strategy (public health $N = 30$; water resource management $N = 25$). The first phase of the sampling strategy consisted of a search of the Web of Science database. The search consisted of the following terms within the “title” search field: “climat* change” or “climat* variability”. The search results were then limited to the “public environmental occupational health” research area to select from public health literature and “water resources” research area to select from the water management literature. Next, the search was refined to include only texts published in the English language between 2007 and 2013 and editorial texts. The period of 2007 and 2013 was selected because we aimed to identify and described current frames of climate change rather than to document changes in frames over time. We focused on editorial texts in the scholarly literature because these texts are

more likely to contain elaborated discussions of the issue of climate change, and thus depict the frames of the issue more fully, compared to research articles that tend to be heavily focused on methods (Huttenen and Hilden 2013). The initial selection of texts was screened and those that (a) were not explicitly focused on climate change and health or on climate change and water resources; (b) were short responses to other published work; or (c) were introductions to special journal issues primarily outlining the content of the journal issue were excluded. Although the Web of Science database includes a wide range of journals, the authors decided that the journal *EcoHealth* was missing from the “public environmental occupational health” research area. Consequently, literature from the journal *EcoHealth* was manually searched using the same process described above.

In the second phase of the sampling strategy, we identified relevant policy-oriented documents by reviewing the reference list of all texts selected from the scholarly literature. Policy documents from 2003 through to 2007 were selected, again to identify recent frames of climate change. The initial selection of policy-oriented texts was screened and those that were not explicitly focused on climate change and health or on climate change and water resources were excluded.

The frame analysis involved two main steps: immersion and frame identification. Immersion involved “obtaining a sense of the whole” (Tesch 1990) by carefully reading all of the text to become familiar with the climate change-related discourse and the data. To identify frames, NVivo software was used to generate a database containing statements from each text in the sample that illustrated frame dimensions. Sensitizing questions (Verloo and Maloutas 2005) were used to guide the identification of frame dimensions (see Table 3.1). This process was carried out separately for the water resource management and public health sample.

Frames evolved as patterns in the frame dimensions emerged within and across individual texts. Candidate frames were therefore “refined, combined and differentiated” iteratively (Porter and Hulme 2013). Frame summaries were generated to describe the identified frames. Original quotes from the data were used to illustrate frame dimensions. Text between ‘quotation marks’ is illustrative excerpts taken directly from the data.

Table 3.1 Frame dimensions and sensitizing questions

Frame dimensions			
Diagnostic framing	Prognostic framing	Motivational framing	Framing devices
<ul style="list-style-type: none"> – What is the nature of the climate change? – What is the climate change problem about? – What aspects of climate change are the primary foci? 	<ul style="list-style-type: none"> – How can/should we respond to climate change? – What should be the outcome of policy and action? – Who should be responsible for responding to climate change? 	<ul style="list-style-type: none"> – Why should we respond to climate change? – What is the rationale/motivation for action? 	<ul style="list-style-type: none"> – What are common metaphors, terms, exemplars etc. used in relation to climate change? – What language characterises the frame?

Findings

Frames outline the nature of a given problem, what should be done, and rationale for action. Our frame analysis identified five climate change frames from the public health sample and three from the water resource management sample (see Figs. 3.1 and 3.2). Frame summaries are presented below.

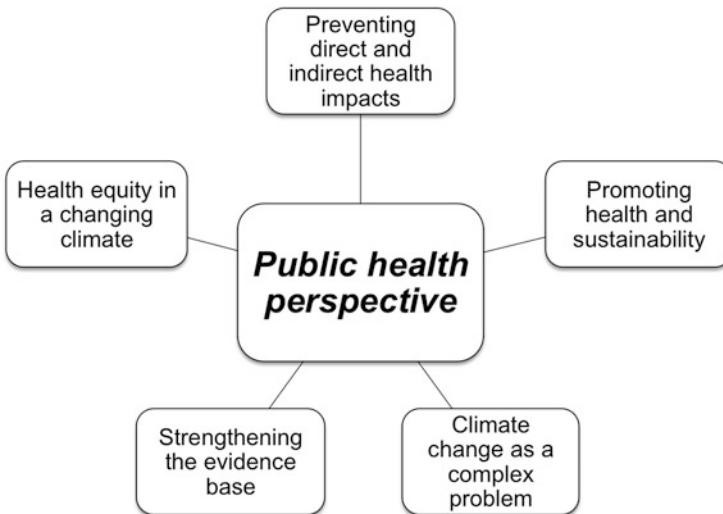


Fig. 3.1 Climate change frames from a public health perspective

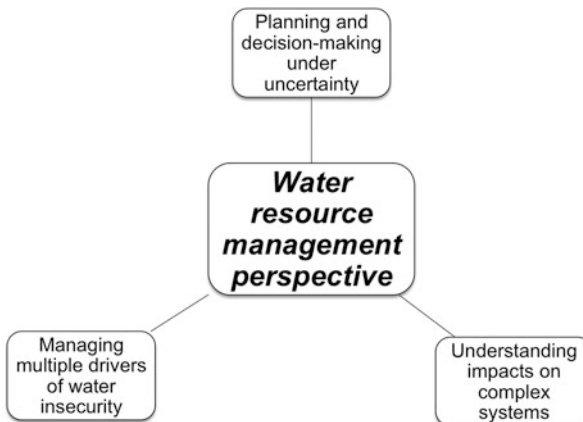


Fig. 3.2 Climate change frames from a water resource management perspective

Climate Change Frames from a Public Health Perspective

Preventing Direct and Indirect Health Impacts Texts depicting this frame emphasize that climate change is making us sick and will have increasingly serious direct and indirect impacts on health. Climate change is viewed as a major public health problem because it exacerbates the burden of disease, particularly among vulnerable populations like children, the elderly, and the chronically ill. The ways in which climate change will impact specific health outcomes and disease is the primary concern. The language of direct and indirect impacts features heavily.

Prognostic framing is focused on coping with the direct and indirect health impacts of climate change using conventional public health prevention strategies. Climate change adaptation is equated with secondary and tertiary prevention (i.e., early diagnosis and controlling the progression of disease), while mitigation is equated with primary prevention (i.e., preventing the onset of disease). Adaptation to climate change is conceptualized as ‘conventional medical and public health practice’ (Frumkin et al. 2008). Consequently, surveillance, disease control, and monitoring, the traditional suite of secondary prevention activities, are emphasized as adaptation strategies.

Predicting the direct and indirect impacts of climate change on health outcomes is emphasised as the primary means for informing adaptation strategies. The assumption that appropriate adaptation strategies can be identified based on predicted future health impacts underlies discussions and reflects a predict-and-provide approach to adaptation (Wise et al. 2013). Although mitigation does not feature as prominently as adaptation when it comes to prognostic framing, the links between mitigation and health are identified because of the view that mitigation strategies may improve health in the long run via health co-benefits. Finally, the need for ‘integrated action. . . and multisectoral collaboration’ (Campbell-Lendrum et al. 2007), in terms of both adaptation and mitigation, is emphasized in this frame.

The primary motivation for action is to protect vulnerable populations from the direct and indirect health impacts of climate change.

Promoting Health and Sustainability Texts representing this frame emphasize that climate change is a problem because it affects the fundamental drivers of health. Healthy and productive ecosystems are seen as critical to overall health and wellness and climate change puts ‘pressure on the natural, economic, and social systems that sustain health’ (Neira et al. 2008). The consequences of climate change are viewed more broadly than focusing on specific health outcomes. Prognostic framing therefore stresses the need for policy that can ‘improve the conditions in which people are born, grow, live and work’ (Stott 2012), while protecting ecosystems that support health. Protecting and promoting health *and* sustainability is highlighted as the aim of adaptation. The importance of working across sectors to achieve this dual vision of health and sustainability is recognized. Also, given the view that ‘[h]ealth professionals and organisations are well placed to help generate a more informed debate and policy response’ (Sweet 2011), advocacy and

education about the importance of climate change and need to for action are commonly discussed in texts expressing this frame.

Motivational framing is based on the dual vision of human health and sustainability and, in part, a desire to shift climate change–health conversations away from a focus on specific health outcomes and disease prevention towards a broader understanding of climate–health relationships.

Climate Change as a Complex Problem The view that climate change is a complex problem with interrelated implications for ecosystems, health, and social systems characterizes this frame. Climate change is presented as a problem of ‘unprecedented scale and complexity’ (McMichael and Wilcox 2009) characterized by non-linearity, feedback, and a high degree of interconnectedness in terms of causal pathways. Given this complexity, prognostic framing highlights the need for new modes of thinking and novel approaches to research and action. This is clearly illustrated by Forastiere (2010), who contends we must ‘apply new modes of approaching and studying the issue, while continuously searching for collaboration from other disciplines’. Interdisciplinary research and collaborative action are seen as essential tools for working with this complexity, and therefore, are highlighted as a major feature of the climate change response. McMichael and Wilcox (2009) argue that ‘we must stop thinking in outmoded differentiated sectoral terms’. Aside from recommendations for systems approaches and collaboration, texts illustrating this frame provide few specific recommendations when it comes to the details and practical aspects of novel ways of thinking and approaches for research and action, raising the need to explore and further develop options for dealing specifically with the complex nature of climate change.

Motivational framing is driven by the limitations of traditional modes of thinking and tools, which are seen as unsuitable for complex issues. Climate change is therefore also presented as an opportunity to develop novel and more effective approaches.

Strengthening the Evidence Base This frame constructs climate change as a problem of insufficient knowledge and evidence regarding the climate change impacts on health. There is a focus on specific health outcomes and climate-sensitive diseases in general. The lack of evidence regarding climate change impacts on health is largely explained by insufficient data and our limited methods to predict future health consequences. Articles demonstrating this frame tend to conceptualize uncertainty as a lack of knowledge: the view that uncertainty can be reduced and eventually eliminated with more data and knowledge features prominently. Prognostic framing revolves around generating more data and evidence that can be delivered to decision makers to develop policy and action. Generating knowledge about extreme weather–disease relationship is presented as a particularly useful means of strengthening the evidence base. Similar to the *Preventing direct and indirect health impacts* frame, a predict-and-provide approach to policy development underlies discussions (Wise et al. 2013).

Motivational framing here is rooted in the belief that health researchers and professionals have a responsibility to ‘develop a more comprehensive body of evidence to inform decision makers and policy makers’ (Hrynkow 2008).

Health Equity in a Changing Climate In this frame, climate change is seen as a health equity problem because it generates, and will amplify, ‘inequalities in health within and across populations’ (Künzli et al. 2000). Further, both mitigation and adaptation policy and action ‘pose particular challenges for health equity’ (Walpole et al. 2009).

Prognostic framing emphasizes that climate change responses should be aimed at reducing inequalities in health and ensuring access to basic human rights such as the right to water and food. Health equity is prioritized as the central goals of climate change policy and action. The texts illustrating this frame do reflect the assumption that evidence about climate change impacts directly leads to appropriate policy and action. Rather, the idea that ‘ethical principles’ (Singh 2012) are needed to guide adaptation and mitigation emerges. Jensen (2009) calls for the application of a ‘climate change health equity filter’ to assess any proposed adaptation and mitigation strategies. The assumption that those populations most responsible for climate change (i.e., western industrialized nation-states) should be primarily responsible for the costs of responding to climate change underlies discussions—‘justice demands it’ (Kiang et al. 2013).

The rationale for action in texts presenting this frame is the inherent injustice of climate change coupled with the mandate of human rights. Motivation stems in part from claims that ‘health ethics has been absent in climate change discourse’ (Singh 2012) and that ethical considerations should be the central considerations, ‘not at the periphery’ (Singh 2012).

Climate Change Frames from a Water Resource Management Perspective

Planning and Decision-Making Under Uncertainty In this frame, climate change is understood as a problem of planning and decision-making given the uncertainties surrounding climate change. The main challenge of climate change is ‘how to plan for the future under highly uncertain conditions’ (Rogers 2008). As Dessai et al. (2013) explains, ‘water managers have often planned under the assumption of a stationary climate. This assumption is no longer valid’. We can no longer make management decisions based on the premise that ‘future hydrology will not significantly deviate from past hydrology’ (Barsugli et al. 2012). Reference to the ‘assumption of stationarity’ and the fact that stationarity is violated in a changing climate is common and in part underlies the motivation and rationale for action. Additional motivation for action stems from the belief that we need to adapt and make changes ‘despite the fact that we have little faith in climate model projections

and impact studies' (Dessai et al. 2013). The notion that uncertainty should not be used as an excuse for inaction emerges.

The uncertain nature of climate change impacts on the hydrologic cycle and water resources, particularly at the regional and local level, is highlighted. However, uncertainty here is not only about impacts. Uncertainty is conceptualized as a characteristic of complex problems and is seen as 'irreducible' (Barsugli et al. 2012). Adaptation processes must therefore 'embrace principles of decision making under uncertainty' (Gober 2013). The view that '[t]oo much attention has been focused on reducing, clarifying, and representing climatic uncertainty and too little attention has been directed to building capacity to accommodate uncertainty and change' underlies discussions (Gober 2013). Within this frame, adaptation calls for a shift away from predicting impacts and towards novel approaches to decision-making and governance. Specific recommendations include interdisciplinarity and adaptive co-management.

Managing Multiple Drivers of Water Insecurity The view that water resources are increasingly under pressure from many factors, including but not limited to climate change, characterizes this frame. Drivers of water insecurity include climate change as well as 'land use, aging infrastructure, urbanization, and changing social values.' (Connor et al. 2009). Current technologies, infrastructure, and management practices are insufficient to ensure water security in a rapidly changing world. Discussions of supply and demand are common among the texts demonstrating this frame because 'the supply of and demand for water resources will be substantially affected by climate change' (GWP 2009). Concerns regarding water quantity are at the forefront; discussions about water quality are secondary. Since climate change is seen as one of the many drivers of water insecurity, and because fragmented development across sectors is viewed as part of the problem, integration and intersectoral collaboration are underscored as key features for achieving water security. Integrated water resource management (IWRM) emerges as a key adaptation strategy to manage climate change impacts on water resources. The long-term sustainability of water resources, a goal that can be shared across sectors, is underscored as the overarching goal of climate change policy and action. Additionally, prognostic framing underscores that the drivers of water security vary across settings such that adaptation will need to be 'diverse and locally specific' (IWA 2012).

Motivation for action stems largely from the view that 'the main impacts of climate change on humans and the environment occur through water' (Connor et al. 2009). The management of water resources must therefore feature prominently in the climate change adaptation agenda.

Understanding Impacts on Complex Systems The *Understanding impacts on complex systems* frame is focused on the challenge of understanding and predicting change in the context of complex systems. Texts using this frame argue that we currently have little reliable knowledge of climate change impacts and, perhaps more importantly, also lack adequate understanding of key hydrological processes and relationships under current conditions. There is a high degree of uncertainty

with regards to our current understanding of climate change impacts and ‘uncertainty tends to increase as one goes down in scale and as one moves to more extreme events’ (Blöschl et al. 2007). ‘Dependence on local conditions is a distinguishing feature of hydrology that can make the effect of climate change less predictable’ (Blöschl and Montanari 2010). The belief that regional climate projections do not adequately capture variability characterises this frame. With regards to regional projections, Beven asks if ‘any of this work is fit for the purpose of adapting to, or managing for, the future?’ while Blöschl and Montanari (2010) compares impact predictions to ‘throwing the dice’.

Prognostic framing therefore is focused, primarily, on improving our ‘knowledge of connections among climate, weather, and hydrology under current conditions’ (Blöschl and Montanari 2010) and key processes that characterize complex systems. Second, better uncertainty estimation and improvements in modeling to reduce uncertainty are called for. There are parallels with the *Planning and decision-making under uncertainty* frame, uncertainty and complexity feature prominently in both for example. However, the major focus of prognostic framing here is the challenge of generating knowledge rather than the challenge of making decisions due to uncertainty and complexity.

Motivational framing centers on the belief that decision-makers and water managers want more evidence regarding the impacts of climate change; specifically evidence that is not plagued by uncertainty. Finally, climate change is generally presented not only as a significant challenge, but also as an opportunity for change.

Discussion: Frames and Frame-Reflection as Innovative Tools for Climate Change Adaptation

This set of frames is illustrative of the diverse ways in which climate change is constructed and understood across two purposefully selected sectors at a particular point in time (2007–2013). We present it less as an authoritative description than as a heuristic tool, a conversation piece to stimulate intersectoral discussion and action. We recognize that this set of frames is in flux. Environmental problems are continuously re-defined and constructed and frames are not static (Hajer 1995). Finally, although efforts were made to capture a suitable sample of texts for frame identification, it is possible that certain frames have not been adequately captured in the sample analyzed.

De Boer et al. (2010) contends that climate change is an issue that “can be framed and reframed in several ways”. Our results show that this is certainly the case with regards to the public health and water resource management sectors. The fact that we identified eight distinct frames, within and across these perspectives, underscores the importance of considering the role of frames in our efforts towards knowledge integration and intersectoral collaboration. The literature increasingly acknowledges that learning and working together in the context of global change

necessitates the reconciliation of multiple perspectives (Brown et al. 2010). Tools, mechanisms, and processes that create synergies across disciplines, sectors, and perspectives are lacking and sorely needed. We argue that the construct of frames and the process of frame-reflection (Schön and Rein 1994) could be useful tools to promote learning and working together in the context of climate change adaptation processes.

A plurality of implicit frames can impede mutual understanding and decision-making with regards to complex problems like climate change (Dewulf 2013; Gray 2003; Schön and Rein 1994). However, doing away with framing differences, or establishing that one particular way of understanding climate change is better than another, should not be the goal if we wish to learn and work together toward effective climate change adaptation (Dupuis and Knoepfel 2013; Pahl-Wostl 2006). Instead, we should aim to explore and make explicit the myriad frames and framing differences to better understand and appreciate various perspectives while utilizing points of convergence to achieve integrated understanding and motivate collective action. Schön and Rein (1994) have convincingly argued for situated frame-reflection as a means of navigating the challenge of learning and working together and addressing complex policy problems. We echo Schön and Rein's (1994) call for frame-reflective research, decision-making, and action, and suggest that this may be particularly fruitful for fostering enabling conditions for climate change adaptation. This involves acknowledging, respecting, and valuing diversity in interdisciplinary and collaborative efforts within in a particular context or setting. Engaging in the process of frame-reflection requires a high degree of critical self-reflection. Self-reflection may not come easily to many actors involved in climate change adaptation processes. Cornell (2010) writes, "most physical scientists are not habituated to reflection so... enter interdisciplinary areas unequipped for critical reflection". Building capacity for reflection may need to be purposefully addressed by drawing on specific design tools and frameworks [e.g., (Kolb 1984; Rolfe et al. 2001)].

Conclusion

This paper contributes to the growing body of research addressing the challenge of knowledge integration and collaboration by examining the ways in which climate change is framed across two sectors that are central to addressing the climate change adaptation deficit. Using frame analysis, we summarized the ways in which climate change is constructed within water resource management and public health texts. We argue that frames and framing should not be ignored in interdisciplinary and intersectoral activities given that implicit and divergent frames often underlie the challenge of learning and working together. Acknowledging, appreciating, and reflecting on a diversity of climate change frames could be a simple yet effective means of promoting enabling conditions for climate change adaptation.

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