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Climate-change lore and its implications for climate science: Post-science deliberations?

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ABSTRACT

Using of the results of survey questionnaires distributed to climate scientists who focus on the German Baltic coast, regional political decision makers on the German Baltic coast and weather observations from the same region, this paper assesses the existence of developing climate-change lore and the implications for the role of climate science in the science–policy interface. The Oxford Dictionary (1993) provides one definition of lore as 'A doctrine, a precept; a creed, a religion.' This is the definition adopted for this paper. The paper concludes that the discrepancies among weather observations, scientific assessments and decision makers' perceptions suggest that climate-change lore exists, or is coming into existence. The paper then discusses the implications for the science–policy interface and suggests that given current trajectories, science could come to play a secondary role to climate-change lore in regional political decision making concerning climate change. To the truth-to-power model of the science–policy interface and the tenets of post-normal science, three additional possibly evolving science–policy configurations (as pertaining to the climate change issue) are offered.

1. Introduction

We should not forget Thomas' Theorum, that it is not important whether or not the interpretation of a situation is correct or not, 'If men define situations as real, they are real in their consequences.' (Thomas & Thomas, 1928:572). In other words, it is the interpretation of the situation that leads to the course of action. The interpretation of climate-change is driven by a number of factors, one of which is lore. This paper suggests that lore, namely climate-change lore, is having an impact on regional political decision makers (hereafter RPDMs) in the German Baltic coastal region. The presence and impact of climate change lore is empirically investigated by the analysis of the results of two survey questionnaires, one of RPDMs and the other of scientists concerned with climate change issues in the same region, and weather observations for the same geographic region.

1.1. Defining lore

The Oxford Dictionary (1993) defines lore as 'A doctrine, a precept; a creed, a religion.' Lore includes, among other things, legends, oral history, beliefs and stories. This paper explores the role of climate-change 'lore' in the formation of climate change policy in the German Baltic coastal region, and the potential consequences for the science–policy interface.

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Lore survives through repetitive recitations. Traditionally, this would be through the likes of song, poetry or prose. Today, the world of digital technology offers an alternative and much quicker means of dispersion. Lore comes to reflect the collective experience of its adherents, expressing fears, ideals and values. Historically, lore has 'blocked the way for alternate modes of explanation, directions of research and the problems of study, silencing the expressions and the people themselves.' (Ben-Amos, 1983:12).

Bascom (1954:333–349) argued that lore can serve four primary functions in a culture. 'Folklore lets people escape from repressions imposed upon them by society; Folklore validates culture, justifying its rituals and institutions to those who perform and observe them; Folklore is a pedagogic device which reinforces morals and values and builds wit; Folklore is a means of applying social pressure and exercising social control.' (Dundes, 1965:279–98).

1.2. Traditional knowledge versus lore

Much has been written about the role of traditional knowledge in determining regional adaptation strategies for the perceived impacts of climate change. Little, if any, attention has been given to the role of lore. Even less interest has addressed the personal integration of lore into the mindset of political decision makers (i.e. how do normative judgments influence the individual perceptions of political decision makers?). To that end, it is necessary to distinguish between traditional knowledge and lore. As used in the following discussion of climate-change lore, succinctly, lore simply *is*, in essence it is knowledge; traditional knowledge *does*, in essence, it is practical knowledge. Lore is epistemic. Traditional knowledge is empirical. In reference to climate change, lore states there is climate change, traditional knowledge informs on how to adapt.

One distinction between traditional knowledge and lore is provided by Dutfield (2003:19): 'Traditional knowledge commonly refers to knowledge associated with the environment rather than knowledge related to, for example, artworks, handicrafts and other cultural works and expressions (which tend to be considered as elements of folklore)'.

Traditional knowledge (or what Johnson 2002 calls, 'traditional environmental knowledge') is 'a body of knowledge built by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resource use.' Traditional knowledge, unlike lore, has a tendency to be practical and applied knowledge.

> Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview. [...]Traditional knowledge provides the basis for local-level decision-making about many fundamental aspects of day-to-day life: hunting, fishing, gathering, agriculture and husbandry; preparation, conservation and distribution of food; location, collection and storage of water; struggles against disease and injury; interpretation of meteorological and climatic phenomena; confection of clothing and tools; construction and maintenance of shelter; orientation and navigation on land and sea; management of ecological relations of society and nature; adaptation to environmental/social change; and so on and so forth.
>
> (Jones, 2002:10–11)

> [F]olklore (or traditional and popular culture) is the totality of tradition-based creations of a cultural community, expressed by a group of individuals and recognized as reflecting its cultural and social identity; its standards and values are transmitted orally, by imitation or by other means.
>
> (Johnson, 1992:3–4)

Traditional knowledge shares a close affinity with decisions concerning adaptation to an existing set of conditions. It does not, however, share such a close affinity with the interpretation of the future. The formation of these perceptions is a result of the assessment of climate-change lore and climate-change science. Lore does not typically, or necessarily, include the notion of practice. Consequently, whereas traditional knowledge refers to what is known and what can be done, climate-change lore can be used to address the future. Traditional knowledge is gleaned from past experience, it is learned. Lore, on the other hand, is not confined only to the past and present.

The concept of lore includes, among other things, legends, oral history, beliefs and stories. While weather lore (that has a close affiliation with traditional knowledge and draws from past experience) has been well noted and presented in many almanacs (a red sky at night ...) and employed throughout history to predict weather, only the advent of climate change, offered by science, has provided for the possibility of climate-change lore. Unlike weather lore/traditional knowledge, climate-change lore does not have a history and tradition for validation or a long period of development: there is traditional knowledge pertaining to weather, but no traditional knowledge of global climate change. Traditional knowledge shares a strong affinity to adaptation to real change. Climate-change lore, on the other hand, refers to perceptions of what the future might bring.

Technological change resulting in rapid mass communication has also played a role in the development of climate-change lore. Modern lore is often referred to as an 'urban legend' (Dorson, 1968:166). An urban legend is a narrative that does not address the veracity of the story being told, nor does it necessarily contain practical knowledge. According to

Zacher (2010) urban legends often take the form of a cautionary tale or take the form of a moral message, both of which are plainly evident in climate change discourse. Based on urban legends, it is not uncommon for public media to issue warnings concerning the threat presented in the narrative (Gross, 2010). According to Mosier (2005) these narratives both construct and reinforce worldviews in populations in which they circulate and 'provide us with coherent and convincing explanations of complex events'. One of the characteristic that distinguishes lore from urban legend (from traditional folklore) is the means of dissemination. Typically an urban legend is disseminated by news stories, television reports, e-mail and, as was traditional lore, by word of mouth. Since the conception of the global warming issue, newspaper headlines, television headlines, internet, big screen theater and environmental NGOs have all offered a plethora of apocalyptic scenarios related to climate change. Those who question the urban legend are often confronted with outrage by proponents of the urban legend (Best & Horiuchi, 1985; Davis, 2002). Skeptics are charged with promoting urban legends that denounce the popular consensus and alarmists are charged with promoting exaggerated scenarios of the future. Spencer (2009:no page number) 'contend[s] that the belief in human-caused global warming as a dangerous event, either now or in the future, has most of the characteristics of an urban legend. [...] But skillful storytelling has elevated the danger from a theoretical one to one of near-certainty.' One could contend that the major difference between lore and urban legend is the length of the history of the narrative, the history of lore tending to be much longer. Climate-change lore is a compilation of legends, oral history, popular beliefs and interpretations and stories that act to produce the popular account of climate change and its implications for regional weather. Lore differs from science in that it is often based on memories and accounts (real or imagined) of first hand experiences rather than the recorded measurements of scientific apparati. Lore becomes common knowledge as information is passed informally from person to person and might come to suggest a perceived future that differs from scientific projections. The implications of the development of such lore, or urban legend, for the science–policy interface have remained mostly unexplored and constitute the theme of this discussion.

2. An example of the interaction of lore, science and policy: the case of the German *Kur*

Although (perhaps) not one hundred percent lore as defined above (as there is a notion of embedded intention), the example of the German *Kur* demonstrates how lore (perhaps combined with traditional knowledge but lacking in demonstrated efficacy) has previously impacted on science and policy in Germany. The *Kur*, although having its origins long before the völkische Bewegung (which had its origins in the Romatic nationalism of the 19th century), has no doubt been sustained by similar sentiments. According to Pietikäinen (2000:524) the völkische Bewegung was a loosely organized social movement that was unified by 'a cauldron of beliefs, fears and hopes' often drawn from romantics' notions of folklore and the organic world. Life was to be lived in a mystical, lorific relationship with the land. The *Kur* can be located within this context.

Kurs are places that offers mineral waters, with claims of medicinal properties, for bathing, drinking and as a component of mud-baths. These centers are often located in a pleasant natural environment, known for the special qualities of the air, for which a visitor is often taxed (albeit minimal) to breathe.

As Maretzki (1989) points out:

> The *Kur*, spa treatments that are part of rehabilitative medicine, exemplifies a form of biomedical care that reflects a distinct cultural style. Though ideal standards of German biomedicine devalue traditional treatments like the *Kur*, a variety of cultural, economic, and political factors support its persistence.
>
> (Maretzki, 1989:22)

and,

> Unlike in most western nations, in Germany "alternative medicine" '... survives as part of professional practice though it is neither acknowledged nor condoned by academic medicine (Schulmedezin), which sets the ideal, though ever-changing standards of the profession.'
>
> (Maretzki, 1989:22)

The origin of the *Kur* dates back to the 17th and 18th centuries. By 1800 many were well established in area of modern Germany. At such centers, people "took the waters" (Steudel, 1962). In the 19th century rising reform movements stressed adherence to the "natural" lifestyle that also depended on the healing powers of water (Rothschuh, 1983). As this movement was evolving, science was gaining a strong influence in transforming "medicine" into biomedicine. 'Political reform movements, embodying the romantic philosophical and social principles current at the time, simultaneously led to liberal social legislation that laid the basis for [German] health and welfare policies and institutions. [In effect, lore was entering the policy realm.] The legislation covered naturopathic treatment, including the *Kur*, and ever since the *Kur* has existed as a supplementary therapy on the margins of German biomedical practice.' (Maretzki, 1989:25). Under Hitler, the *Kur* was temporarily given the same status as allopathic (academic) medicine.

In the 1950s the costs of a *Kur* became covered by the national health insurance, resulting in the expansion of *Kur* therapy centers, and qualifying communities became officially designated as *Kurort* or *Heilbad*. As such, a *Kur* became 'an accepted and state-supported form of therapy.' (Maretzki, 1989:22).

The study of the therapeutic value of hydrotherapy is known as balneology. The science of balneology began to develop in the early 19th century. This science gradually found its way into universities and increasingly adopted more rigorous scientific methods into seeking correlation between properties of waters and patient responses to treatments. Such institutes still persist in today's universities that have schools of medicine. 'Though balneology institutes have official relationships with university departments [...] they rank low in the overall medical research hierarchy, and the field is not taught as part of the required medical curriculum.' (Maretzki, 1989:27).

Advocates, both pro and con, of the *Kur* demonstrate that the lore that led to the establishment of the *Kur* as an institution extends beyond the concerns of only health. During a confrontation of beliefs in the mid-1980s, the Minister of Health 'stressed the importance of this therapy complex in promoting both patient participation in medical care and greater responsibility for one's own health (Die Welt, Oktober 24, 1986). Clearly, the *Kur* therapy complex provides a focus not only for medical but also for economic and political controversy.' ((Maretzki, 1989:28; cf. Englehardt, 1981; Light & Schuller, 1986).

Interviewing patients, Maretzki (1989:28) noted that 'patients speak about their "right" to the *Kur*.' In his conclusion, Maretzki states 'The *Kur* is also consonant with broader cultural ideas about the efficacy of the outdoors and a "change of air" for health maintenance and restoration.' (1989:33). However, the efficacy of *Kur* therapy remains contested.

This brief example demonstrates how lore stemming from the 16th and 17th centuries has evolved to be embedded in a national health care system and how it has shaped national policy, and of how lore shapes normative judgments that influence the perceptions of individual political decision makers (cf. Maretzki & Seidler, 1985). Certainly the *Kur* fulfills the function of lore as outlined by Bascom (1954:333–339):

- *Kur*-lore is a means of escape from repression.
- *Kur*-lore justifies rituals and institutions.
- *Kur*-lore reinforces values.
- *Kur*-lore provides the opportunity to exercise social control.

In the case of the German *Kur*, individuals are offered a choice; they can attend lorific cures or approach modern medicine, the two being institutionally integrated. In short, the example of the *Kur* demonstrates how lore permeates health policy decisions; in this case as a partner of science, albeit not necessarily an equal partner and how 'value' is shaped by the prevailing lore. This brief digression illustrates how lore has found its way into politics and come to operate as a parallel system with science in influencing national policy.

3. Climate-change lore

In the case of climate change in the German Baltic coastal region, climate-change lore, like *Kur*-lore, also validates culture and institutions, also reinforces morals and values and is also a means of applying social pressure and social control. Climate-change lore (like most modern folklore) is strongly influenced by the forces of mass media and its sensationalist tendencies (Dégh, 1994; Dundes & Pagter, 1975; Sullenberger, 1974). While in recent years, folklore has been employed to assist in the resolution of social problems (Goldstein, 2004), folklore can also be manipulated as a means to achieve political goals, as might be in the unwitting case of regional political decisions concerning climate change. The implications of the inclusion of lore in regional decision making concerning climate change also has implications for the role of climate-change science.

The output of computer simulations of regional climate change impact assessments provide insight into a limited number of factors of first order impacts, expressed in terms of change in means and/or extreme events (an increase in x or an increase in y will result in a change in z), an approach typically employing the deliberate and systematic manipulation of particular variables while everything else is perceived as being held constant or, in some cases, irrelevant. Such an approach is beneficial for making educated guesses as to the future behavior of the climate and the subsequent expression of weather related phenomena such as change in extreme events: floods, droughts, storms, etc. Typically such scientific information has been presented directly to decision makers, representing the 'truth-to-power model of the science–policy interface. (Often, the social reality is not acknowledged at all (Bray, 2000) and local culture is deemed as irrelevant.) Decision makers are often faced with the questions of where to adapt, how to adapt, when to adapt, and who should adapt (Fankhauser & Soare, 2012). To this, can be added an additional question: 'Why adapt?': because something has happened; because science suggests it will happen; or because the regional population thinks it will happen or claims it has happened. In the absence of scientific *predictions*, decision makers are charged with the political task of planning responses to climate change. Resolution might draw not only on climate-change science but also on an evolving 'climate-change lore', and lore, as has been demonstrated, has the potential to play a significant role in shaping the German science–policy interface. Whereas, in the case of the *Kur*, historically, science and lore have settled into parallel paths in the policy realm, the data presented in this paper suggests there is a possibility that climate-change lore might come to play a larger role than science in making these decisions.

Figure 1.a. Science as intervening variable: truth (science) to power

climate change science → responses to climate change

Figure 1.b. Science as interaction variable: truth (science and culture) to power

climate change science + culture → responses to climate change

Fig. 1. The changing interface of science–policy relations.

4. Knowledge and policy

If we look at the historical progression of adaptation to changes in the natural world, there are transitions from responses based on traditional knowledge drawn from local observations to responses based on technocratic, science-based intervention; the latter depicting the contemporary truth-to-power model of decision making, in which science provides the 'truth' to political decision makers, who, in turn, make political decisions based on this 'truth', as depicted in Fig. 1a (cf. Price, 1965). In the traditional-knowledge model, however, one should not forget that decisions were often based simply on a *different* 'truth', that is, on the 'truth' provided by elders, shaman and lay observations, etc., in which case, all that has changed is the source of 'truth'.

More recently, oft under the rubric of post-normal science, there are cries for a new model of science, in which the formulation of knowledge is shared between science and, for want of better words, tradition, lay observations and lay interpretations, etc., as depicted in Fig. 1b (c.f. Funtowicz & Ravetz, 1991).

In creating a shared vision of the knowledge, there has been an increased focus on local values, local perceptions and the role of culture in the design of adaptation strategies to climate change (cf. Adger, 2003; Anderson, Scheufele, Dominique, & Corley, 2012; Brossard & Nisbet, 2007). This paper suggests that some of this *local knowledge* is now climate-change lore.

In models of the climate-change science–policy interface, lay knowledge of the future – now the equivalent to lore in many cases – when included, is often presented only as an intervening variable, something that occurs between scientific projections of climate change and the political response to climate change: (independent variable = scientific projections) *acts on* (intervening variable = climate-change lore) *acts on* (dependent variable = response to climate change). The intervening variable (climate-change lore) helps explain why the independent variable (scientific projections) affects behavior, and change in the intervening variable (climate-change lore) must be viewed as a consequence of change in the independent variable (scientific projections); the progression being that climate changes → decision makers' perceptions change → response to climate change changes. This, while incorporating both local and scientific knowledge, is still a very linear model. The analysis performed in this article differs from this linear view and takes the view that the decision makers' perception is not an *intervening variable*, but, in the current policy process concerning response to climate change, is becoming, or has become, an *interaction effect*. This refers to the situation where two or more independent variables (climate-change lore and the scientific projections of climate change) act in combination to produce the resulting effect on the dependent variable (response to climate change).

In this slightly modified variation, climate-change lore works in conjunction with projections of climate change to produce an effect, but could also have an effect even in the absence of scientific projections of climate change. The data does indeed indicate that this is happening. For example, decisions might be made based on lore at the exclusion of science.

The data suggests that within the interaction effect model, currently climate-change lore is beginning to play a greater role than climate-change science in the decision making process and that environmental decision making and its relationship to science is in a process of transition, with the input of science becoming secondary to the role of climate-change lore. In summary, the *perceptions* of *expected implications* of *projected* climate change vary according to climate-change lore, and in turn, climate-change lore could vary according to scientific projections of climate change. However, the science is not necessarily accurately represented in the lore. The combination of the two *independent* variables determines the response to climate change. This potential of the interaction effect is typically not a major consideration in the investigation of responses to climate change, suggesting it is necessary to apply increased scrutiny on lay perceptions when assessing adaptive strategies.

5. Analysis

The analysis employs an empirical case study of RPDMs regarding the German Baltic coastal zone with respect to the response to climate change in view of uncertain climate change projections. Vested interests might vary widely, resulting in discourse based not only on facts but also on values. Policy makers are entrusted with the task of mediating these conflicting values and developing a consensual means of synthesis which involves normative judgments; and as proposed, these

Table 1
Demographics of the sample of Baltic climate change scientist survey.

Country	Number	Percent
Belarus	3	2.2
Denmark	7	5.2
Estonia	13	9.7
Finland	9	6.7
Germany	31	23.1
Latvia	5	3.7
Lithuania	5	3.7
Poland	16	11.9
Russia	6	4.5
Sweden	25	18.7
Other non-Baltic	14	10.4
Total	134	100

judgments have the potential to be shaped (partly or completely) by climate-change lore. Typically, these perceptions have been treated as operating in a linear manner.

However, policy makers' perceptions and policy makers' decisions alone have the potential to produce results at least equal to any climate change, with different perceptions of risk and different decisions concerning the same risk, having the potential to lead to good or bad outcomes. They are indeed an independent variable. This has most often been discussed in terms of non-action as a result of skeptical tendencies towards climate change. However, ill posed action can also have significant ill effects.

The analysis draws from the records of regional weather observations for the German Baltic coastal region, from a survey of scientists with a specific focus on the same region and from a survey of the RPDMs for that region, ensuring all elements of the analysis are drawn from the same socio-political, geo-physical context in the same temporal frame.

Data used to represent the scientific projections and perceptions of climate change are taken from "SurBACC 2010. A survey of the perspectives of climate scientists concerning climate change and climate science in the Baltic Sea basin" (Bray, 2010). This included scientists from 10 countries bordering the Baltic Sea. The demographics are presented in Table 1. However, as the decision maker survey consisted of only a German sample, the results of the German scientists are also shown separately. Comparing the German sample of scientists to the entire sample of Baltic scientists gives an indication of consensus agreement between the two groups. The sub-sample of German scientists was drawn without replacement.

The survey sample consisted of scientists listed on the BALTEX[1] mailing list, not a probability sample of all scientists focusing on the Baltic Sea Basin. The survey was conducted using e-mail invitations containing a brief explanation and a web link to the survey. It was conducted in spring, 2010. The total number of responses was 134, a response rate of approximately 19%.[2] The results are presented as box-plots.[3] The scientific perceptions of how change might translate into impacts and associated risk factors is of importance to decision makers, so to this end, the BALTEX climate scientists were asked explicitly about the threat of climate change for the Baltic region. These results are presented in Fig. 2.

The scientific consensus evident in the data suggests that while climate change is perceived as somewhat of a threat to the region, the potential for any catastrophe is a long time in the future, and even then, the potential is not ranked very high, and the public, although they should be informed, should not be told to be overly concerned.

The survey sample of the German Baltic RPDMs (Bray and Martinez, 2011) consisted of the members of local governments in the German states of Schleswig-Holstein and Mecklenburg-Vorpommern located within the Baltic Sea coastal region. Potential respondents were limited to political stakeholders operating at a local level, while still possessing sufficiently significant decision-making power. The effective sample size was 1110. Respondents were contacted by email containing a link to the survey. The on-line survey was designed so that multiple submissions by the same respondent were not possible. The response rate was 103, approximately 9%. The survey was conducted in 2011. In this study, respondents were asked to recount any changes they had noticed (seen) in weather patterns, as suggestive of a changing climate. This raises the question of 'Is climate change visible?'

[1] BALTEX (the Baltic Sea Experiment) http://www.baltex-research.eu/.

[2] C.f. Hamilton (web site accessed 12.02.2010), Holbrook, Krosnick, and Pfent (2007), Viser, Krosnick, Marquette, and Curtin (1996). Accordingly, the sampling method and the response for the survey of climate scientists employed in this analysis do not appear distinct from other such undertakings (Bray and von Storch, 2010).

[3] The data is presented as box plots illustrating the median, spread and data values, providing a visual assessment of the degree of consensus. Lowest and highest values are indicated by "whiskers" extending from the boxes. The boxes contain the 50% of total values falling between the 25th and 75th percentile, meaning that 50% of the cases have values within the box, 25% have values larger than the upper boundary and 25% have values less than the lower boundary. The length of the box indicates the spread in the data values within the middle 50 percentile. The length of the box is considered to suggest consensus and the location of the box to represent assessment. The median is in the middle of the box only if the distribution is symmetric. If the median line is closer to the left of the box than to the right of the box the data are skewed in that direction, meaning that there are more cases towards that end of the distribution. If the median is closer to the right of the box then tail of the distribution is towards those values. By focusing on the middle 50th percentile, extreme perceptions are separated from the conservative perception represented in the shaded box (Bray and von Storch, 2010).

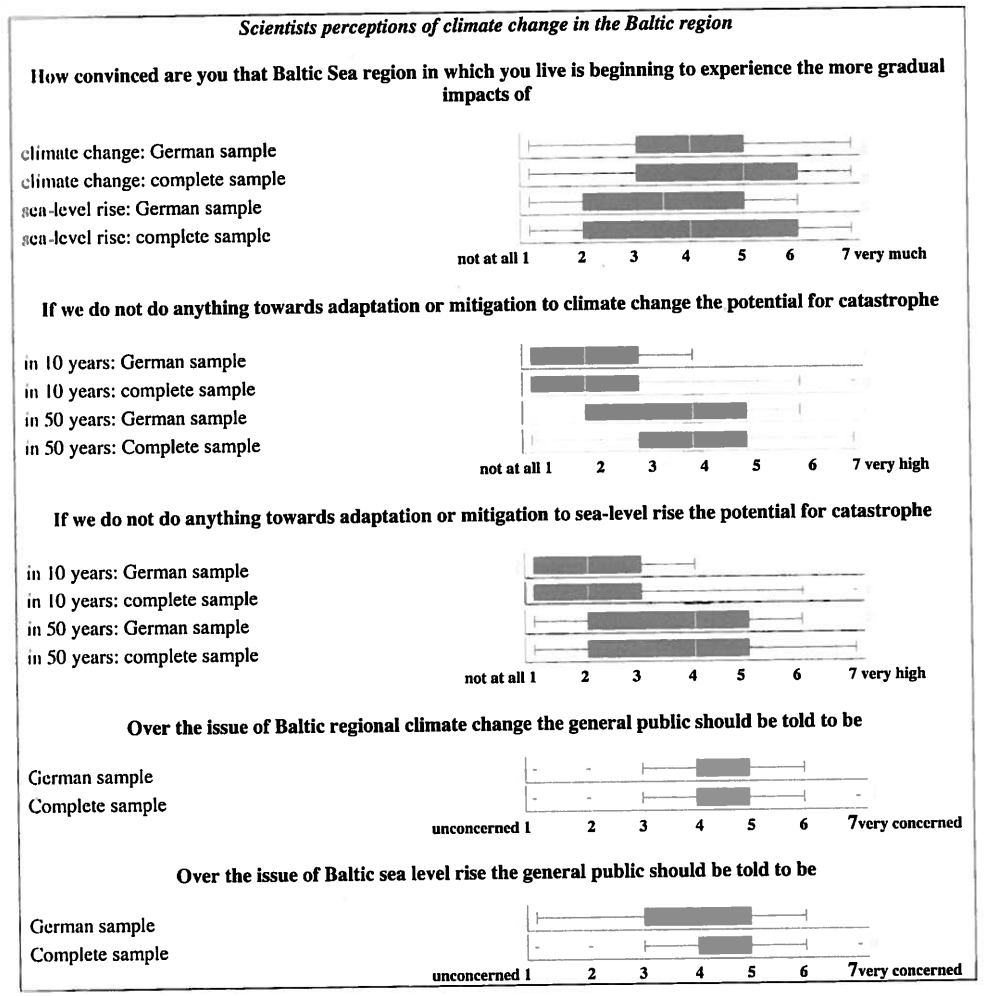


Fig. 2. Scientific assessment of the threats posed by climate change and sea level rise in the Baltic region.

> 'Physical scientists and experimental psychologists tend to regard climate change as inherently undetectable to the lay observer, while others, such as anthropologists, indigenous advocates, and environmentally inclined Western citizens, often claim that the phenomenon is not only visible in principle but is indeed already being seen. [Another] understanding of the visibility of climate change is held by some scholars who portray climate change as invisible at the outset but capable of being made visible via communication tactics such as the miner's canary.'
>
> Rudiak-Gould (2014:120)

While one could not disagree that some aspects of weather change might be visible, one *could* disagree that climate change is visible. Much of the literature concerning the visibility of expressions of climate change does not distinguish between the first and second order impacts of climate change, for example, between rainfall and/or temperature and crop yields, suggesting the crop yield as a proxy for climate change. This analysis deals mainly with first order impacts, the expression of climate as elements of weather. It compares empirical measurements with lay persons' assessments of fist order impacts, and they are indeed considerably different.

Overall, the assessment of changes in the weather by RPDMs is perceived of as being evident in all variables. In all variables, respondents reported that change had already occurred. The results are presented in Fig. 3. Only a value of 1 signifies no change. Values 2–7 indicate the perceived magnitude of change.

The data presented in Fig. 3 suggests that the RPDMs have noticed changes in all of the weather variables presented. However, the observations they have made are, for the most part, somewhat contradictory; there are observations of both more and less rain in the winters and summers, with no claims of *no* change; there are claims of changes evident by both more and less snow; claims of both more and less sea ice with some claims of no change; agreement to some degree that floods have increased; more sunshine and less sunshine; and an apparent consensus that winds have gotten stronger.

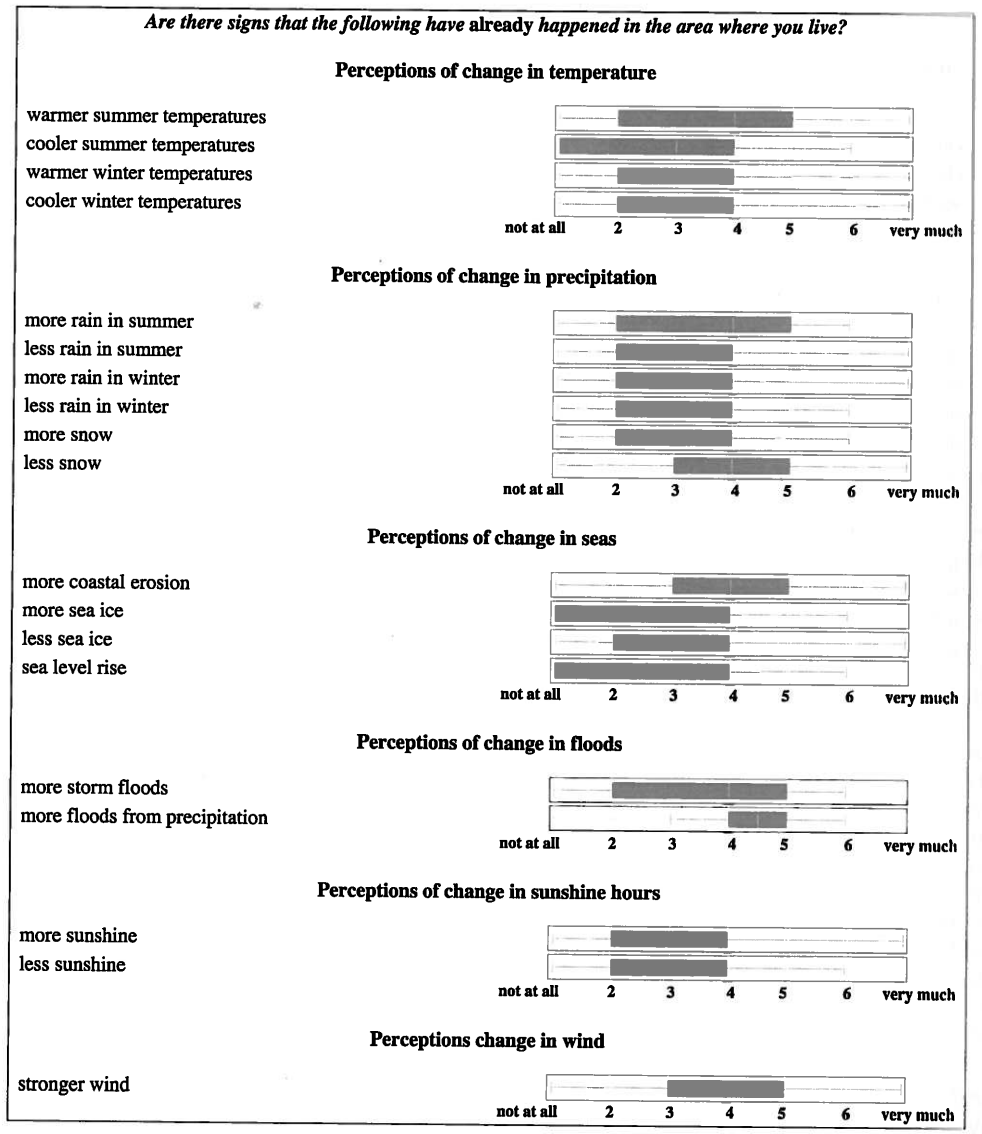


Fig. 3. Decision makers' perceptions of change in weather.

The above refers to evidence of what change has occurred. Adaptation, in its modern contextual use refers to being proactive against future conditions. To this end, RPDMs were asked their perceptions of things to come. A summary of the responses is presented in Fig. 4. In summary, the RPDMs claim to expect increases and decreases in summer and winter temperatures, increases and decreases in precipitation, more coastal erosion, rising sea levels, increased flooding, winds of greater strength and increases and decreases in hours of sunshine. In short, there is little agreement as to what the future might bring.

All of these phenomena are to some degree claimed to have been already observed (Fig. 3) and are expected to increase or decrease in the future (Fig. 4). As to what this might mean in terms of regional impacts (positive or negative), the responses given by the RPDMs, are presented in Fig. 5.

Warmer winter temperatures and warmer summer temperatures are assessed as having both positive and negative impacts. Cooler summer and winter temperatures are assessed as having no impact or only negative impacts; more rain in summer and winter as having no, or only negative impacts. Less rain however is perceived of as potentially having both positive and negative impacts. More and less snow is also assessed as having both positive and negative impacts. Increased sea level and increased sea ice are perceived of as having no or only negative impacts. Stronger wind is the only variable that was perceived of as having only a negative impact.

With these mixed perceptions of the future impacts, how would RPDMs advise the local citizenry? The answer is presented in Fig. 6.

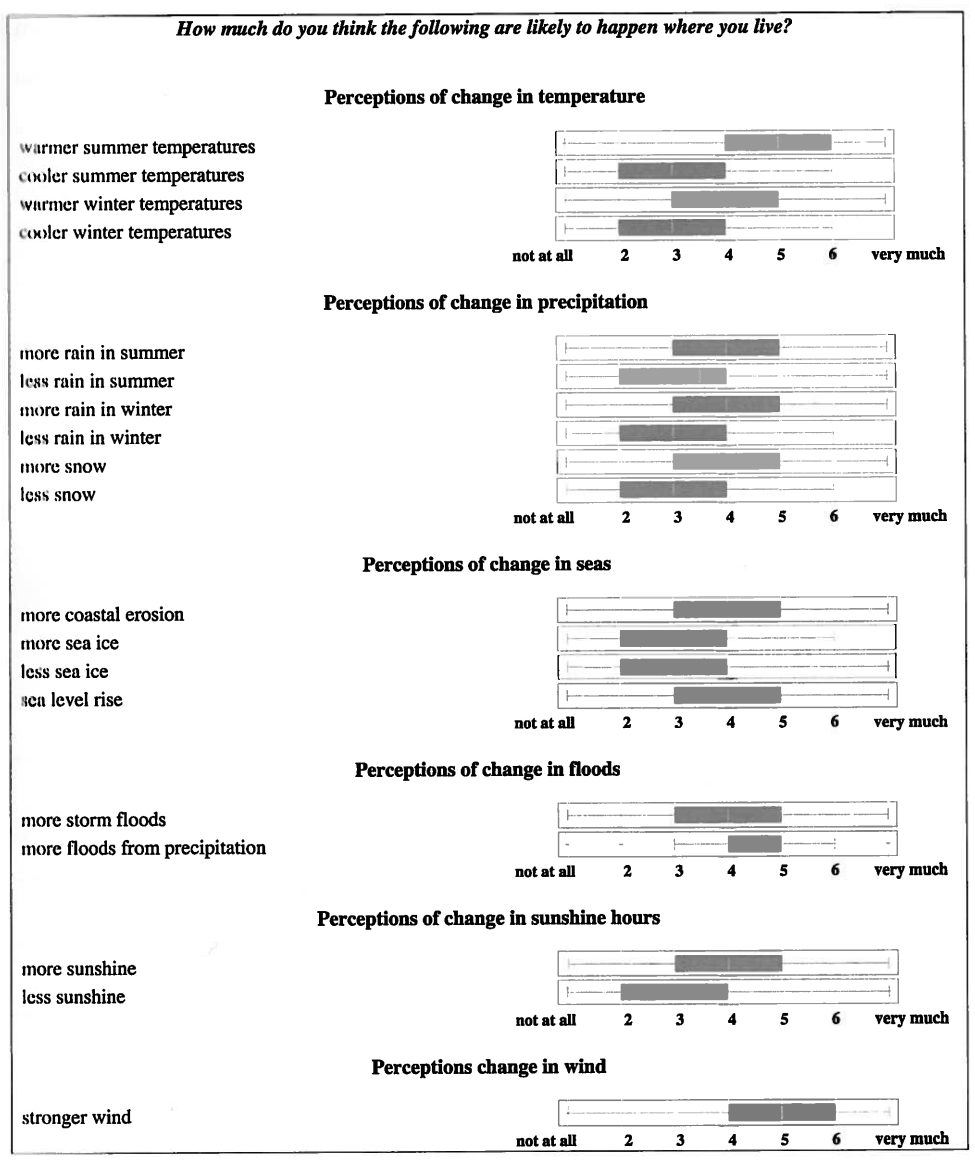


Fig. 4. Perceptions of the prognosis of climate change.

Fig. 6 suggests that advice to local citizens would be to worry on both the accounts of sea level rise and climatic change, and consensus suggests that there should be more concern over climatic change than sea level rise.

Given that there are perceptions of immanent change and a call for concern, respondents were asked about the necessity and urgency of measures to combat climate change and sea level rise. Results are presented in Fig. 7.

The RPDMs express a necessity for responses to climate change and a sense of urgency as to when they should be enacted. The extent to which science is used in forming these perceptions is presented in Fig. 8.

Science, it appears, does not play the only role in decision making. Having previously discussed the dissemination of urban legends, it is necessary to determine where the RPDMs obtain their perceptions of climate change. To this end, the sample of RPDMs was asked 'How much do you use the following sources of information in shaping adaptation decisions and policy? The results are presented in Fig. 9.

Fig. 9 suggests that the most common sources of information that inform RPDMs come in the form of public media, much in line with the means of the development of urban legends.

After presenting data that suggests the RPDMs do not necessarily adhere to scientific accounts of climate change and after noting that the RPDMs claim that indeed evidence of climate change is visible, it is necessary to determine what has occurred in the last decade in terms of changing weather patterns.

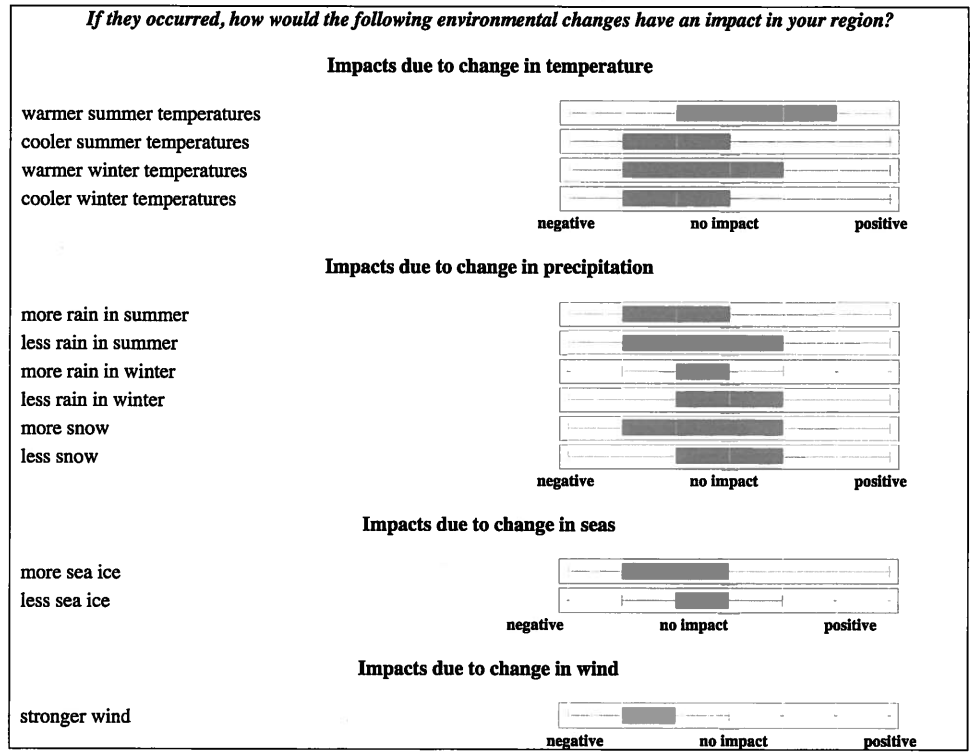


Fig. 5. RPDM's perceptions of potential dangers due to changing weather.

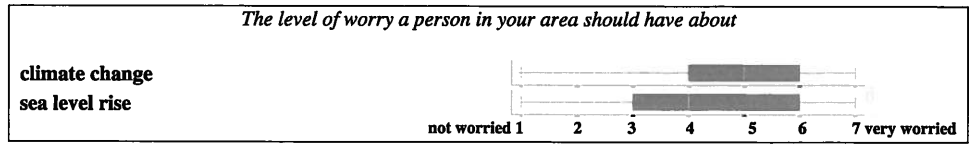


Fig. 6. The level of concern RPDM's suggest the public should have in their region.

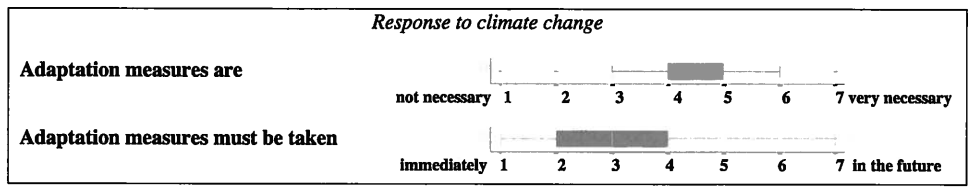


Fig. 7. RPDM's perceptions of adaptation needs.

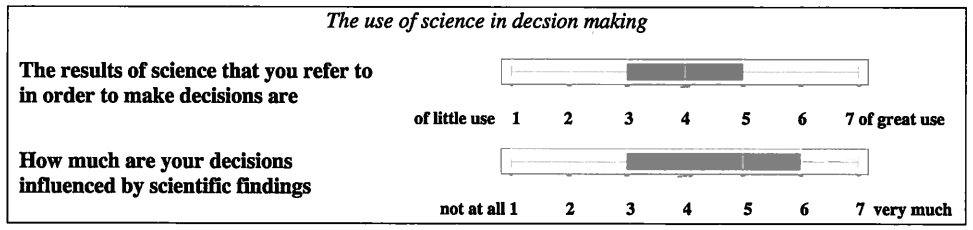


Fig. 8. Utility of science in the RPDM's process of shaping adaptation decisions and policy.

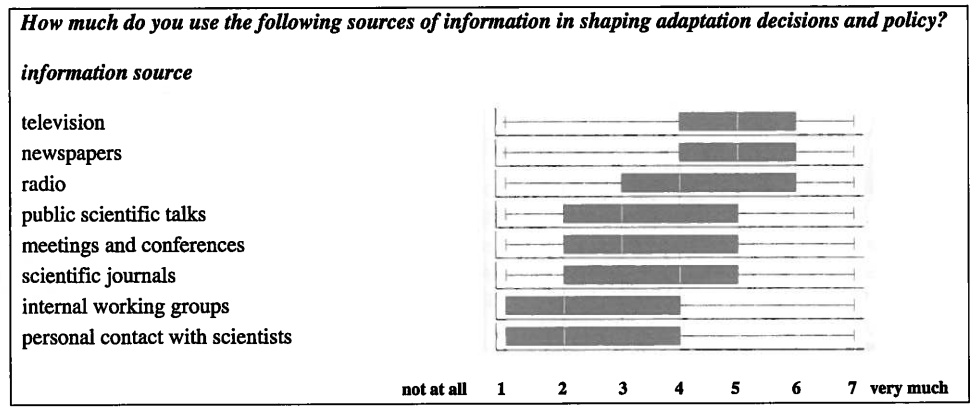


Fig. 9. Sources of information used in the decision-making processes of regional political decision makers.

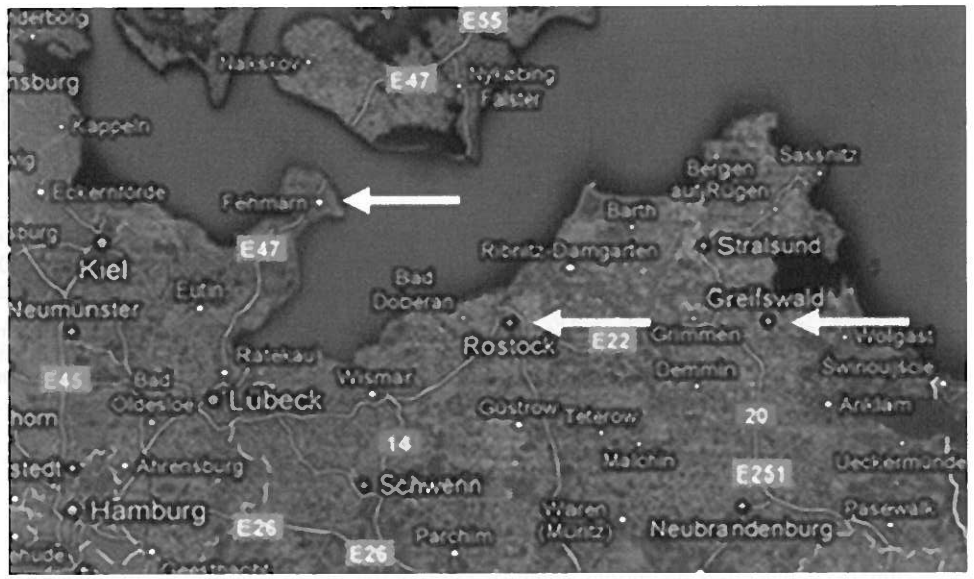


Fig. 10. Locations of weather stations.

Data for single weather stations on the German Baltic coast are freely available on-line at the website of the German Weather Service (www.dwd.de: accessed March 2013). Three stations were chosen to represent the geographical section of the coast line relevant for this analysis: Fehmarn, Rostock, and Greifsward. The locations are shown in Fig. 10. While observations for more stations are readily available, the assumption was made that these three selected stations were sufficient to capture a small, homogeneous region, taking into account the climatological west-east gradient.

Meteorological variables were selected on the basis that they would represent the characteristics of experienced weather. Monthly values of temperature, sunshine, precipitation, and wind force were used for the analysis. The time period covered by the data is January 2000 to June 2011. 'Sociologists estimate [...] that people only remember the worst effects of a hurricane for about seven years.' (Blake, Rappaport, & Landsea, 2007:6). Harely (2003) discusses the impact on memory by severe events, stating that they tend to color memory. As Harley (2003:114) states, '[...] memories might be very clear, but might also have never happened'. The weather observations are plotted in Fig. 11.

With the exception of one or two spikes in precipitation, which are not uncommon for local regions and not necessarily an indication of an extreme event, there is not much observed evidence of significant change over the period 2000–2011, at least not change that would be notably experienced by an individual in that region. Although there may be some detectable statistical trend, it is highly unlikely that an individual could notice such change based on personal experience, given that it is not obvious even when looking at the chart of weather measurements.

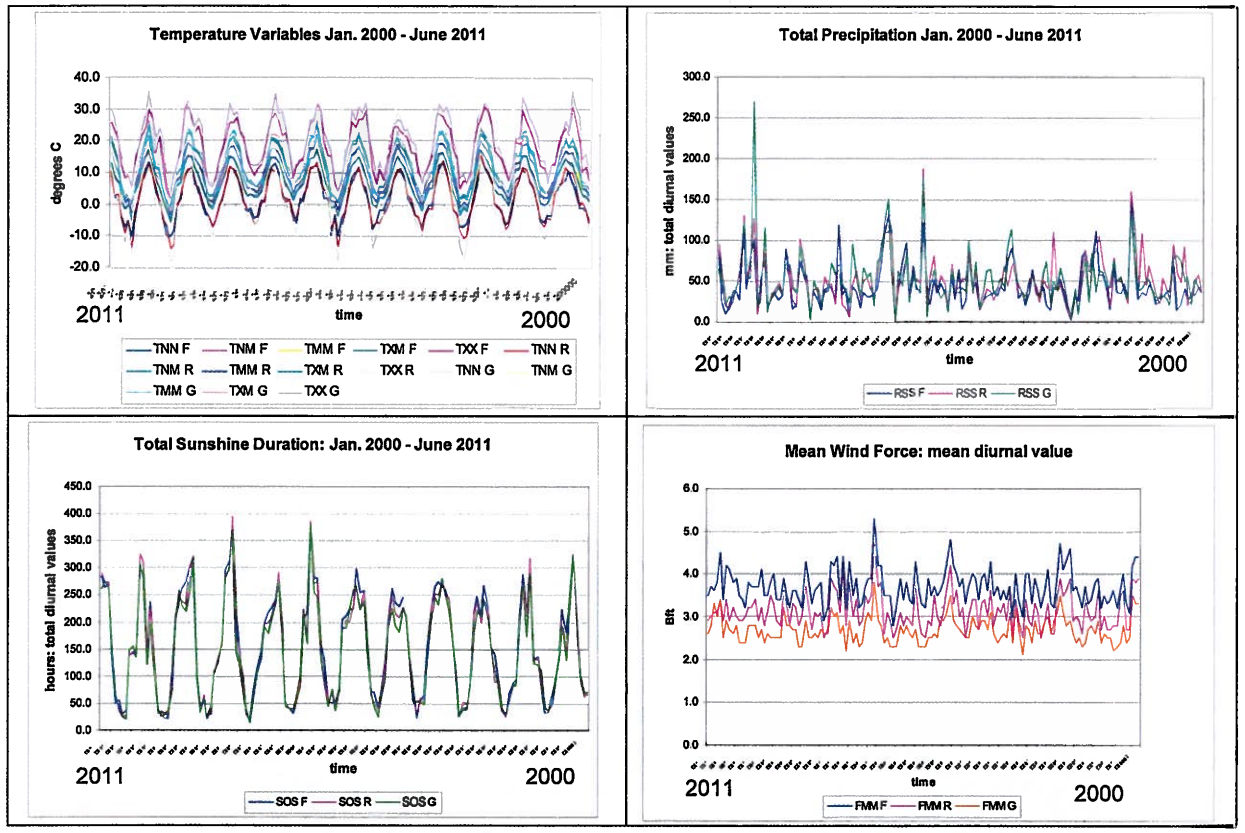


Fig. 11. Seasonal weather history of selected variables for the German Baltic coast: 2000–2011. TNN = minimum temperature 2 m above ground; TNM = mean diurnal minimum temperature 2 m above ground; TMM = mean temperature 2 m above ground; TXM = mean diurnal maximum temperature 2 m above ground; TXX = maximum temperature 2 m above ground; SOS = total sunshine duration in hours; RSS = total precipitation in mm; FMM = mean wind force in Bft. Suffixes F, R and G = geographical locations Fehmarn, Rostock and Greifswald respectively.

6. Conclusion

The ubiquity of climate change offers no options (whereas *Kur* therapy and academic medicine operate in parallel) and addresses a collective regional future rather than an existing individual malaise. Furthermore, the nature of climate change offers no opportunity for a parallel system of advice to operate simultaneously. Given the status of balneology assigned by the academic medical community, it seems that, in this case, lore has had little impact on science. However, this is not to say that lore might not also come to shape science, whereby an official public doctrine might at least direct the scope of accepted research and research funding.

In this discussion of climate-change lore, lay knowledge is assigned the status of an evolving lore. The discussion emphasizes the impact of (contested) visible climate change on the role of scientific expertise in the political decision making process. This is significant for the following discussion as climate-change lore, as discussed here, has its 'proof' in the visualization of climatic-change.

Change is noted by the RPDMs in all aspects of the weather, when in fact nothing notable has occurred, at least in the observed weather records, and according to scientific assessments, is not likely to occur for some time in the future. Yet it is perceived that adaptations measures must be taken as soon as possible to avoid the negative impacts of climate change that are making themselves visible.

The discussion begins with the relationship between observed weather phenomena and the perceptions of the RPDMs. The actual weather records indicate little, if not no, change. Simmons, Franconeri, and Reimer (2000) note that observers have great difficulty in detecting gradual change even in conditions where transition is fast enough that it can be easily noticed. 'Memories', however, have a social aspect and 'can change when an individual is exposed to the recollection [*or projections*] of others' (Roediger & McDermott, 2011:47) and this perhaps leads to social contagion or group-think tendencies developing as a result of focus groups, public events, personal conversation, etc. Greater conformity also occurs as a result of social pressure (Edelson, Sharot, Dolan, & Dudai, 2011:110).

Byg and Salick claim

> '[…] local observations and perception should be taken into account in an effort to understand climate change, its impacts, adaptation to it and mitigation of it.' [and concluded] 'To understand [climate change phenomena] local actors and their accounts are directly relevant.'
>
> (2009:165).

This assumes the accounts are accurate. Rudiak-Gould (2013a, 2013b) claims

> '[…] that in at least one frontline indigenous community, the idea of climate change is currently more powerful, in a sense, than the physical impacts; others have speculated on this (Hulme, 2009:328; Moser, 2010:36; Swim et al., 2009:91). This study also shows that, even among indigenous communities known for keen awareness of local environmental conditions, reports of climatic change may be strongly mediated by prior expectations; this has been demonstrated in Western populations (Kupperman, 1982; Weber, 1997)'.
>
> Rudiak-Gould (2013a, 2013b:84)

Extreme weather events are memorable, changes in weather might be noticeable, but climate, due to its ubiquity, exists only at a statistical level, and is not noted in daily experience: we have weather reports, not climate reports. Climate is brought to the forefront of consciousness only by word; it is a statistical construct. Akerlof, Maibach, Fitzgerald, Cedeno, and Neuman (2012:81) concluded '… that the perceived personal experience of global warming appears to heighten people's perception of the risks, likely through some combination of direct experience, vicarious experience (e.g. news media stories), and social construction'. But are people able to see climate change? Rudiak-Gould explores the 'visibilism versus invisiblism' of climate change in some detail, claiming '… the dispute between climate change "visibilism" and "invisibilism" is not scientific so much as political, being a proxy war for a larger debate on scientific versus lay knowledge and the role of expertise in democratic society.' (2013:20). Rudiak-Gould (1013:29) concludes 'the visibility of climate change is partly an empirical question of just how dramatically humans have tampered with the atmosphere; partly an instrumental question of how best to communicate anthropogenic global warming to the public; and partly a moral, political, and epistemological interrogation of the value and role of scientific expertise in democratic society.' As Hulme (2014) declared, '… maybe in the end what you see is what you believe' begging the question do we believe it because we see it or do we see it because we believe it?

In summary, the regional political decision makers, although by no means unanimously, tend to expect, and claim to have already seen, greater increases or decreases in summer and winter temperatures and precipitation, more coastal erosion, rising sea level, increased flooding, more or less sunshine and winds of increasing strength. Cooler summers, cooler winters, more rainfall, any change in sea ice and stronger winds were perceived of as having only negative impacts. Warmer summers were perceived of as having mostly a positive impact, more so than warmer winter temperatures (perhaps due to the regional economic reliance on tourism). All of these phenomena are to some degree claimed to have been observed and further changes were expected to occur in the future. This is climate-change lore, the result of oral history, popular beliefs (often shaped by public media sources) and interpretations. Lore, as previously mentioned, becomes common knowledge as information is passed informally from person to person. RPDMs said they would advise citizens to be worried about climate change and sea level rise, but to be more worried about climate change. Scientists would claim the same, but to somewhat of a lesser degree. In light of the absence of regional catastrophic events and empirical evidence of little, if any, measureable change in weather events, the claims of change in weather and the sense of urgency assigned to possible impending events can only be derived from the imagination.

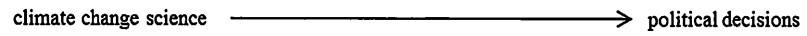
The debate concerning the accuracy of observation of climatic-change made by local populations remains open. The data employed in this analysis seems to support the conclusions of those who contest the accuracy of lay observations.

In this case, the constant call for alarm concerning climate change, from the media, NGOs, lobby groups, activist groups, etc., almost demands conformity, especially as political sentiments follow public sentiments (c.f. Connell, 2003). Given the general social milieu surrounding climate change, it is not surprising that memory differs from empirical record. Science has simply provided a framework in which to anchor perceived change. Lore begins by seeding the brain with association. While climate has long been a topic of lay discussion, remembrances of childhood experiences of various seasons as compared to those now, possibly noting some changes, accurate or not, it was not until the advent of possibility of climate change that such discussions took on the characteristics of lore. There was no sense of doom or no associated moral imperatives permeating the previous discourse on changing weather.

There are two patterns of science–policy interaction that currently dominate political discourse, particularly concerning controversial science-based issues. These two patterns are the truth-to-power interface and post-normal extended peer review negotiation of science. In the truth-to-power interface, scientists produce impartial knowledge and this is given as truth to those in positions of political power, often by-passing the input of civil society (Price, 1965). However, this is an ideal: truth is seldom without values. (An editorial in Nature warns '… about the danger of scientists' interests, deliberately or otherwise, becoming too dominant in determining outcomes. (Nature Editorial (Anonymous), 2011).) Practicing post normal science is said to somewhat prevent scientists' values from dominating policy decisions and discourse. Post-normal science is claimed to be the preference when 'facts are uncertain, values in dispute, stakes high and decisions urgent' (Funtowicz & Ravetz, 1991). This typically becomes apparent when knowledge from science intersects with strongly held values, as in the case of climate change and climate science (Bray & Storch, 1999; Lorenzoni, Jones, & Turnpenny, 2007; Saloranta, 2001). As such, the claim is made that it is necessary to include an extended peer community which would include

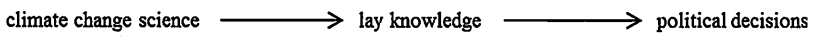
Pattern 1

Truth to Power: *science as independent variable, political decisions as dependent variable*



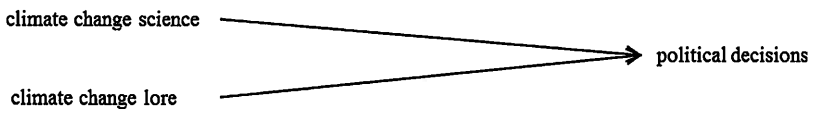
Pattern 2

Post-normal science: *lay knowledge as intervening variable*



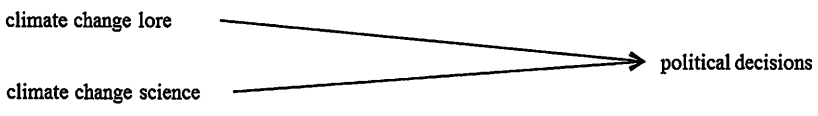
Pattern 3

Displaced science stage 1*: climate change lore as interaction variable*



Pattern 4

Displaced science stage 2*: climate change science as intervening variable*



Pattern 5

Post-science deliberations: *climate change lore as independent variable, climate change science as indirect effect*

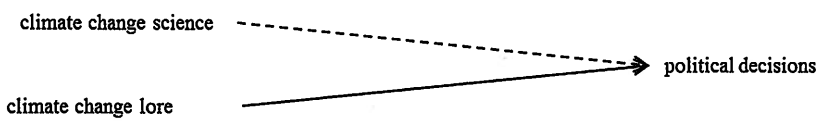


Fig. 12. Patterns of policy deliberation.

local knowledge in a science–policy-public dialog, and this would also be an advancement of civil society (Adger, 2003; Newell, 2008; Ravetz, 2011). The main difference between the two approaches is the validity assigned to the types of knowledge, traditional/local lay knowledge and scientific knowledge, truth-to-power excluding traditional/local knowledge, post-normal science endorsing its use. To this duality of knowledge, an additional type, namely lore, can be added. The introduction of lore suggests the possibility of five configurations of knowledge–policy interfaces. These patterns are represented graphically in Fig. 12.

In the above it is hypothesized that environmental decision making and its relationship to climate-change science is in a process of transition, and science is becoming, or will become, a secondary consideration in the deliberation of the response to climate change. One of the main contributors to the transition is the role of climate-change lore. (Note that climate-change lore can both overestimate and underestimate the certainty, magnitude and temporal scale of expressions of climate change as provided by science.)

In pattern 1, the truth to power pattern of science communication, information is given to decision makers who then use the information to develop a response to climate change; public input is minimal, if at all. On many occasion this is the current pattern of ths science–policy interface.

In pattern 2, the practise of post-normal science, indigenous knowledge is weighed against science in formulating solutions. In effect, this is a truth plus local knowledge to power search for policy solutions. This describes the direction being advocated in the present state of regional responses to climate change. However, in some instances, as this case study demonstrates, there is a tendency to renegotiate the order of importance, and climate-change lore has the potential to become the main force shaping decisions.

In pattern 3, climate-change lore becomes an equal contributor to the decision making process. At this point, science could be interpreted as sometimes being an intervening variable, likely used to support or refute climate-change lore, but not likely to change the outcome. In some instances, this pattern of interaction mingles with pattern 2.

In pattern 4, climate-change science is all but removed from the equation and climate-change lore drives the decision making process. Sentiments replaces science and science simply provides a framework in which to couch lore and culture.

In pattern 5, post-science deliberations, climate-change science has become, at best, an indirect effect on political decisions, whereby it is either used or discarded as seen fit. Climate-change lore becomes the main driver of change.

Considering the data, the state of the development of climate change responses in the study region is between pattern 3 and pattern 4, where science plays a minimal role. In answer to our question 'why adapt?', the answer seems to lie more towards climate-change lore than towards climate-change science or regional empirical observations. The data supports the hypothesis that science has increasingly become an interaction variable, and climate-change lore has come to play a the greater role in the decision making process. That is, scientific projections of climate change/sea level are becoming a secondary, rather than a primary, considerations in the development of responses to climate change.

In summary, the data presented represents the perceived visibility of the first order impacts of climate change as expressed by RPDMs on the German Baltic coast. These perceptions stand in contrast to empirical measurement. The expectations of climate change by RPDMs also stand in contrast to scientific projections. This difference represents the difference between scientific knowledge claims and climate-change lore. Projecting the evolution of the climate-change debate there is the possibility that climate-change lore has the potential to supersede scientific knowledge in the decision making process concerning regional climate change in the German Baltic coastal region.

When conducting an assessment of regional adaptation strategies it is imperative to consider: (1) Regional scientific assessments of impacts of climate change; (2) Local traditional knowledge of climate change, and; (3) Regional lore of climate change. After having done so, it is necessary to determine which policy interface is driving local decisions: truth to power, post-normal science or post-science deliberations.

To repeat, the data suggests that at the regional level, there are three competing (and sometimes complementary) sources of knowledge pertaining to climate change: scientific knowledge, traditional/local knowledge and climate-change lore. The use of each type of knowledge leads to different configurations of the knowledge–policy interface: scientific knowledge to the truth-to-power interface; traditional/local to a post-normal science interface, and; climate-change lore to post-science deliberations.

References

Adger, N. W. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography, 79*(4), 387–4040.

Akerlof, K., Maibach, E. W., Fitzgerald, D., Cedeno, A. Y., & Neuman, A. (2012). Do people "personally experience" global warming, and if so how, and does it matter? *Global Environmental Change.*

Anderson, A. A., Scheufele, D. A., Brossaerd, D., & Corley, E. A. (2012). The roles of media and deference to scientific authority in cultivating trust in sources of information and emerging technologies. *International Journal of Public Opinion Research, 24*(2), 225–237.

Bray, D. (2000). Visioning event horizons: Where do we go from here? *Climate Research, 15*(83), 94.

Bray, D. (2010). *SurBACC 2010: A survey of the perspectives of climate scientists concerning climate change and climate science in the Baltic Sea basin, International BALTEX Secretariat Publication No. 48.*

Bray, D., & Martinez, G. (2011). *A survey of the perceptions of regional political decision makers concerning climate change and adaptation in the German Baltic Sea region, International BALTEX Secretariat Publication No. 50.*

Bray, D., & von Storch, H. (1999). Climate science: An empirical example of post normal science. *Bulletin of the American Meteorological Society, 80*, 439–455.

Bray, D., & von Storch, H. (2010). *CliSci2010: A Survey of the Perspectives of Climate Scientists Concerning Climate Science and Climate Change, GKSS Report 2010/9.* Available from http://www.hzg.de/central_departments/library/publications/reports2010/index.html.en

Bascom, W. R. (1954). Four functions of folklore. *Journal of American Folklore, 67*(206), 333–349.

Ben-Amos, D. (1983). The idea of folklore: An assay. In I. Ben-Ami & J. Dan (Eds.), *Studies in Aggadah and Jewish Folklore, Folklore Research Center Studies VII* (pp. 11–17). Jerusalem: Magnes Press.

Best, J., & Horiuchi, G. T. (1985). The razor blade in the apple: The social construction of urban legends. *Social Problems, 32*(5), 488–497.

Blake, S., Rappaport, E. N., & Landsea, C. W. (2007). *The Deadliest Costliest, and Most Intense United States Tropical Cyclones from 1851 to 2006 (and Other Frequently Requested Facts) Updated 15 April 2007 for return period information NOAA Technical Memorandum NWS TPC-5.*

Brossard, D., & Nisbet, M. C. (2007). Deference to scientific authority among a low information public: Understanding U.S. opinion on agricultural biotechnology. *International Journal of Public Opinion Research, 19*(1), 24–52.

Byg, A., & Salick, J. (2009). Local perspectives on a global phenomenon – Climate change in Eastern Tibetan villages. *Global Environmental Change, 19*, 156–166.

Connell, J. (2003). Losing ground? Tuvalu, the greenhouse effect and the garbage can. *Asia Pacific Viewpoint, 44*(2), 89–107.

Davis, A. B. (2002). Devil's night and Hallowe' the linked fates of two folk. *Festivals Missouri Folklore Society Journal, XXIV*, 69–92.

Dégh, L. (1994). *American folklore and the mass media.* Bloomington: Indiana University Press.

Dorson, R. M. (1968). In T. P. Coffin (Ed.), *Our living traditions* (Vol. xiv, p. 166). .

Dundes, A. (1965). *The study of folklore.* Prentice-Hall: Englewood Cliffs, NJ.

Dundes, A., & Pagter, C. R. (1975). *Urban Folklore from the Paperwork Empire.* American Folklore Society.

Dutfield, G. (2003). *Protecting traditional knowledge and folklore A review of progress in diplomacy and policy formulation. ICTSD-UNCTAD project on IPRs & sustainable development.*

Edelson, M., Sharot, T., Dolan, R. J., & Dudai, Y. (2011). Following the crowd: Brain substrates of long-term memory conformity. *Science, 1*(July), 108–111.

von Englehardt, D. (1981). Zu einer Sozialgeschichte de Romantischen Naturforschung. *Südhoff's Archiv, 65*(3), 362–368.

Fankhauser, S., & Soare, R. (2012). *Strategic Adaptation to Climate Change in Europe Report prepared for the European Investment Bank March 2012.*

Funtowicz, S. O., & Ravetz, J. R. (1991). A new scientific methodology for global environmental issues. In R. Costanza (Ed.), *Ecological economics: The science and management of sustainability* (pp. 137–152). New York: Columbia University Press:.
Goldstein, D. (2004). *Once upon a virus: AIDS legends and vernacular risk perception*. Logan: Utah State University Press.
Gross, D. (2010). The 'Blue Star' LSD Tattoo urban legend page. *The Lycaeum Drug Archives* http://lycaeum.org/~sputnik/Tattoo/ Accessed February 2014.
Hamilton, M. B. (2010). *Online survey response rates and times: Background and guidance for industry*. http://www.supersurvey.com/papers/supersurvey_white_paper_response_rates.pdf Accessed 12.02.10.
Harely, T. A. (2003). Nice weather for the time of year: The British obsession with the weather. In S. Strauss & B. Orlove (Eds.), *Weather climate and culture* (pp. 103–118). Oxford Berg Publishers.
Holbrook, A., Krosnick, J., & Pfent, A. (2007). The causes and consequences of response rates in surveys by the new media and government contractor survey research firms. In J. M. Lepkowski, N. Clyde Tucker, J. Michale Brick, E. D. DeLeeuw, L. Japec, P. J. Lavrakas, M. W. Link, & R. L. Sangster (Eds.), *Advances in telephone survey methodology*. New York: Wiley.
Hulme, M. (2009). *Why we disagree about climate change: Understanding controversy. Inaction and opportunity*. Cambridge: Cambridge University Press.
Hulme, M. (2014). *"Is it possible to see global climate changing – and is it possible to see what's causing it?" talk given at intrepid explorers seminar series, King's College London, 3rd February 2014*. Accessible from http://www.youtube.com/watch?.v=eB9gFiEbtgY
Johnson, M. (1992). *Research on traditional environmental knowledge: Its development and its role*. Ottawa, ON, CA: IDRC http://idl-bnc.idrc.ca/dspace/handle/10625/19629.
Jones, M. O. (2002). *Putting folklore to use ICSU Study Group. Science and traditional knowledge, Report from the ICSU Study Group on Science and Traditional Knowledge*. Lexington: University of Kentucky Press.
Kupperman, K. (1982). The puzzle of the American climate in the early colonial period. *The American Historical Review, 87*(5), 1262–1289.
Light, D. W., & Schuller, A. (Eds.). (1986). *Political values and health care: The German experience*. Cambridge, MA: MIT Press.
Lorenzoni, I., Jones, M., & Turnpenny, J. R. (2007). Climate change, human genetics and post-normality. *Futures, 39*(2007), 65–82.
Maretzki, T. (1989). Cultural variation in biomedicine: The Kur in West Germany. *Medical Anthropology Quarterly, New Series, 1*(March (1)), 22–35.
Maretzki, T., & Seidler, E. (1985). Biomedicine and naturopathic healing in West Germany: A historical ethnomedical view of a stormy relationship. *Culture, Medicine and Psychiatry, 9*(4), 383–422.
Moser, S. C. (2010). Communicating climate change: History, challenges, process and future directions. *Wiley Interdisciplinary Reviews: Climate Change, 1*, 31–53.
Mosier, J. (2005). War myths: An exchange historically speaking. *The Bulletin of the Historical Society of Boston University (in Myths), VI*(March–April (4)).
Nature Editorial (Anonymous) (2011). Value judgments. *Nature, 473*, 123–124.
Newell, P. (2008). Civil society, corporate accountability and the politics of climate change. *Global Environmental Politics, 8*(3), 122–153.
Pietikäinen, P. (2000). The vold and its unconscious: Jung Hauer and the 'German Revolution'. *Journal of Contemporary History, 34*(4), 523–539.
Price, D. (1965). *The scientific estate*. Cambridge, Massachusetts: Harvard University Press.
Ravetz, J. R. (2011). Climategate' and the maturing of post-normal science. *Futures, 43*, 149–157.
Roediger, H. L., III, & McDermott, K. B. (2011). Remember when? *Science, 333*(1 July), 47–48.
Rothschuh, K. E. (1983). *Naturheilbewegung, Reformbewegung, Alternativbewegen*. Stuttgart: Hippokrates Verlag.
Rudiak-Gould, P. (2013a). The influence of science communication on indigenous climate change perception: Theoretical and practical implications. *Human Ecology, 42*, 75–86.
Rudiak-Gould, P. (2013b). "We have seen it with our own eyes": Why we disagree about climate change visibility. *Weather Climate and Society, 5*(2), 120–142.
Saloranta, T. M. (2001). Post-normal science and the global climate change issue. *Climate Change, 50*, 395–404.
Simmons, D. J., Franconeri, S. L., & Reimer, R. L. (2000). Change blindness in the absence of visual disruption. *Perception, 29*, 1143–1154.
Spencer, R. W. (2009). *An expensive urban legend*. http://www.drroyspencer.com/2009/10/an-expensive-urban-legend/ Accessed February 2014.
Steudel, J. (1962). Geschichte der Bäder- und Klimaheilkunde. In A. Amelung & E. Evers (Eds.), *Handbuch der Bäder- und Klimaheilkunde* (pp. 1–18). Stuttgart: F. Schattauer Verlag.
Sullenberger, T. E. (1974). Ajax meets the Jolly Grean Giant: Some observations on the use of folklore and myth in American mass marketing. *Journal of American Folklore, 87*(343), 53–65.
Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., Stern, P., & Weber, E. U. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges*. http://www.apa.org/science/about/publications/climatechange-booklet.pdf Accessed 29.02.12.
Thomas, W., & Thomas, D. (1928). *The child in America: Behavior problems and progress*. New York, NY: Knopf.
Viser, P. S., Krosnick, J. A., Marquette, J., & Curtin, M. (1996). Mail surveys for election forecasting? An evaluation of the Columbian Dispatch poll. *Public Opinion Quarterly, 60*, 181–227.
Weber, E. U. (1997). Perception and expectation of climate change: Precondition for economic and technological adaptation. In M. H. Bazerman (Ed.), *Environment, ethics, and behavior: The psychology of environmental valuation and degradation* (pp. 314–341). San Francisco: New Lexington Press.
Zacher, E. M. (2010). Urban legends: Modern morality tales (18 July, 2010). *The Epoch Times* http://www.theepochtimes.com/n2/life/interpreting-the-message-in-urban-legends-39382.html Accessed February 2014.