

Risk Communication, Public Engagement, and Climate Change: A Role for Emotions

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This article discusses the potential role that emotions might play in enticing a lifestyle that diminishes climate change. Climate change is an important challenge for society. There is a growing consensus that climate change is due to our behavior, but few people are willing to significantly adapt their lifestyle. Empirical studies show that people lack a sense of urgency: they experience climate change as a problem that affects people in distant places and in a far future. Several scholars have claimed that emotions might be a necessary tool in communication about climate change. This article sketches a theoretical framework that supports this hypothesis, drawing on insights from the ethics of risk and the philosophy of emotions. It has been shown by various scholars that emotions are important determinants in risk perception. However, emotions are generally considered to be irrational states and are hence excluded from communication and political decision making about risky technologies and climate change, or they are used instrumentally to create support for a position. However, the literature on the ethics of risk shows that the dominant, technocratic approach to risk misses the normative-ethical dimension that is inherent to decisions about acceptable risk. Emotion research shows that emotions are necessary for practical and moral decision making. These insights can be applied to communication about climate change. Emotions are necessary for understanding the moral impact of the risks of climate change, and they also paradigmatically provide for motivation. Emotions might be the missing link in effective communication about climate change.

KEY WORDS: Climate change; communication; emotion; ethics; risk

1. INTRODUCTION

Climate change is one of the major challenges facing the world in the 21st century (and beyond). There is a growing consensus that climate change is due to our behavior, but few people are willing to significantly adapt their lifestyle in order to reduce their ecological footprint. Several scholars have proposed that emotions might play a role in enticing a lifestyle that diminishes climate change. This article will support this idea by providing a theoretical framework according to which emotions can be

a source of practical wisdom and motivation, drawing on insights from recent emotion research from psychology and philosophy and connecting it with research about the role of emotions in climate change communication.

Emotions are important determinants in risk perception. Yet, emotions are generally excluded from communication and political decision making about risky technologies and climate change, or they are used instrumentally to create support for a position. However, this article presents a framework that shows that emotions can play a vital role in moral judgments about risks, and they also paradigmatically provide for motivation. Emotions might be the missing link in effective communication about

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climate change. By providing theoretical foundations about the importance of emotions in practical and moral decision making, this article lends additional strength to the findings of empirical climate communication scholars.

2. EMOTIONS AND CLIMATE CHANGE

Climate change is an extremely urgent problem that presumably will affect the environment for generations to come, and it will also have effects on the health and way of life of present and future generations (*cf.* Hulme⁽¹⁾ and Moser⁽²⁾ for reviews of the literature on climate change). Despite the fact that many people are aware of this, they seem to be unwilling to adapt their behavior. Sheppard states that “there is an alarming gap between awareness and action on climate change.”⁽³⁾ Several researchers who study the perceptions that people have of climate change have stated that people lack a sense of urgency.^(4,5) A recurring theme in explanations of this lack of urgency is the lack of personal, emotional involvement with the possible effects of climate change:⁽⁶⁾ “most Americans lack vivid, concrete, and personally relevant affective images of climate change.”⁽⁷⁾

Lorenzoni and Pidgeon⁽⁵⁾ argue that people feel like their own contribution would be futile; people demand action on a collective-policy level instead. However, we should note that at least in democratic societies, public policies are driven by the preferences and demands of citizens. It could be the easy way out for people to claim that the government should take care of policies to address climate change. It is arguably necessary that citizens put this topic on the political agenda and show that they are supportive of policies that might require sacrifices from the public. Yet, it is doubtful whether there currently is indeed such support, as Leiserowitz found that “the public largely supported policy action at the national and international levels, but opposed two tax policies that would directly affect them.”⁽⁴⁾ Leiserowitz^(4,7) and also Meijnders *et al.* explain this reluctance to make sacrifices by the fact that people perceive the risks of climate change to be remote:

The farther away in time and space people think a threat is, and the more difficult it is for them to visualize the threat, the less involved they are . . . This nicely captures one of the key challenges in climate change policy: How to legitimize drastic policy measures against a problem as “far away” and as “abstract” as climate change.⁽⁸⁾

Because of this problem, Elke Weber⁽⁹⁾ argues that risk communication strategies should explicitly appeal to emotions, but in a careful way. Similarly, Meijnders *et al.*⁽⁸⁾ argue that communication about climate change should appeal more directly to feelings such as fear. Now it might be argued that appeal to emotions and feelings such as fear is rather tricky, as feelings and emotions are generally seen as irrational and biased states that are inferior to rational forms of information processing. However, Meijnders *et al.* think that this is not the case:

The present study may contribute to the ethical debate by showing that fear appeals do not result in thoughtless acceptance of whatever is suggested. On the contrary, fear appeals may stimulate people to think and to be critical decision makers.⁽⁸⁾

This is the idea that I will develop in more detail in this article. My aim is to contribute to the discussion about emotions and climate change in the risk communication literature from a philosophical, conceptual, and normative perspective. I will argue that rather than being a threat to rational deliberation about climate change, emotions are a necessary source of reflection and insight concerning the moral impact of climate change. In addition, emotional engagement also leads to a higher degree of motivation than a detached, rational stance on climate change. Hence, emotions might be the missing link in communication about climate change, in a two-fold way: they lead us to more awareness of the problems and to being motivated to do something about climate change.

I will first discuss the role of emotions in risk perception and risk communication in general. I will then argue in more detail how emotions might contribute to a more thorough understanding of the moral impact of climate change. Accordingly, I will address the importance of emotion in communication about climate change and the role emotions play in moral motivation in general, and in the case of climate change specifically.

3. RISK AND EMOTION

It is generally taken for granted that emotions, specifically those of laypeople, are irrational and distort political decision making about risks. However, there is growing evidence that this view is unjustified.

Empirical research by Paul Slovic and others shows that emotions are a major determinant in risk perception (they call this the “affect heuristic” or

“risk as feeling”;^(10–13) cf. Lerner and Keltner⁽¹⁴⁾ for the different roles that specific emotions can play in risk perception). Most researchers in this field assume that reason and emotion are distinct faculties (dual process theory).^(15–22) Slovic⁽²³⁾ writes that emotion and reason can interact and that we should take the emotions of the public seriously since they convey meaning. Yet, other scholars think that emotions should be excluded from decision making about risk⁽²⁴⁾ or that they should at most be accepted as an unfortunate fact of life^(25,26) or used instrumentally in order to create acceptance for a technology.^(27,28)

However, there is reason to doubt that such a strict dichotomy between reason and emotion is correct.^(29,30) Various philosophers and psychologists have argued that we need emotions in order to be practically rational.^(31–42) According to some forms of so-called cognitive theories of emotions, emotions are judgments of value.^(33,43) Emotions are cognitive and affective at the same time.^(44,45) Emotions provide us with privileged epistemic access to moral values, especially when it comes to particular moral judgments where a complexity of moral considerations needs to be assessed.⁽⁴⁶⁾ Such an approach can show that emotions are an important source of ethical knowledge about risk.^(30,47–51)

As argued by many scholars, risk is not only a quantitative notion; rather, it also involves ethical considerations, which are insufficiently addressed in conventional methods for risk assessment.^(52–56) Current approaches in risk assessment are based on technocratic methodologies that leave out explicit reflection on ethical values. Various scholars have pointed out that technocratic approaches are far from value-neutral as these approaches make assumptions as to which kinds of consequences matter and by focusing only on statistical information.^(52–53,55,57) Technological risks pose important ethical questions, which need to be explicitly addressed through ethical reflection.⁽⁵⁸⁾

Cass Sunstein^(24,59) argues that emotions lead to various errors in risk perception, amongst which is “probability neglect.” However, technocratic approaches to risk leave out important ethical issues leading to “complexity neglect.”⁽⁶⁰⁾ We need ethical intuitions and emotions in order to have well-grounded insights into whether a technological risk is morally acceptable or not, and how to balance various moral considerations about risks.^(50,61) For example, enthusiasm for a technology can point to benefits to our well-being, whereas fear and worry can

indicate that a technology is a threat to our well-being; sympathy and empathy can give us insights into a just distribution of risks and benefits, and indignation can be an indication of violations of autonomy by technological risks that are imposed on us against our will.⁽⁵⁰⁾ My this approach provides for a conceptual and normative framework that supports Slovic’s claims about the importance of the emotions and intuitions of the public.⁽⁶¹⁾ The emotions and intuitions of laypeople reflect a broader view of risks that does include important ethical considerations.^(55,61)

4. EMOTIONS AND UNDERSTANDING THE MORAL IMPACT OF CLIMATE CHANGE

Even if one accepts that emotion can be a source of ethical insight, one might think that emotions are more notoriously misleading than other mental abilities. Disruptive emotions such as mass panics, rage, jealousy, or uncritical enthusiasm lead people to do things that are morally wrong.

However, as significant as these examples are, there are also examples of emotions that contribute to our moral insight and complement and even correct rationality. As is shown through the famous studies by the neuroscientist Antonio Damasio,⁽⁴²⁾ purely rational beings without emotions cannot make proper practical judgments, especially when it comes to concrete moral judgments in particular situations. It is wrong to think that only purely rational moral beliefs can be justified and reflectively scrutinized. To the contrary, purely rational beliefs can also be misleading, and emotions can correct such beliefs. Nussbaum even thinks that “emotions are not only not more unreliable than intellectual calculations, but frequently are more reliable, and less deceptively seductive.”⁽⁴³⁾

Here is an example of how a rational belief might trump our correct moral emotions concerning climate change and prevent us from doing something that is morally right. John cares about the environment and believes that he should fly by plane as little as possible. However, he might have some acquaintance with rational choice theory and game theory, and those theories might convince him that his small contribution will not be of much influence. This can even hold if he is aware that, if everybody thinks this way, this is what creates the whole problem. Rationally, John can conclude that if he does not fly, this will, by itself, not change decisions concerning

flying of other people.¹ Hence, John abandons his environmentalist attitudes that were initiated by his care about the environment and adopts a so-called rationalist stance that convinces him that he is entitled to fly by plane. John's case is an example where rationality can actually corrupt our appropriate moral emotions. Jane, on the other hand, finds her care about the environment more important than John's rational argument, even though she sees its logic. Jane's emotions are recalcitrant, they are contrary to our rational judgments and will not cease, although according to a rational argument, we should not have these emotions. A convinced rationalist will call such emotions irrational and claim that we should ignore them, but I think that these emotions can help us see something that our purely rational judgments are unable to detect. For example, sympathetic emotions can help to correct egoistic rational judgments.² Emotions can enable us to make better moral judgments, by helping us to reverse our mistaken rational judgments.

This idea finds support in empirical work by Paul Slovic. He has conducted a study that showed that donations for starving children in Africa increase when compassion is invoked by the picture of one starving child, but donations decrease when the picture is accompanied by statistical information about the millions of needy children like her in Africa. As Slovic puts it:

People don't ignore mass killings because they lack compassion. Psychological research suggests it's grim statistics themselves that paralyze us into inaction.⁽⁶³⁾

Slovic's article has the telling title "Numbed by Numbers." Rational information might overwhelm us with the idea that our efforts will be fruitless. Instead, coming face to face with the destiny of a single person can successfully evoke a direct sense of compassion.

In a similar way, statistical information about climate change can be shrugged away easily as it is abstract and not attached with meaning. As Moser⁽²⁾ argues, the case of climate change is especially challenging as it involves complex and uncertain information. Based on Slovic's work we can say that this can

be overcome by presenting information in a way that appeals to emotions such as feelings of justice and sympathy for victims of climate change, in present and future generations. Complex statistics can be replaced or supplemented by understandable, gripping narratives.⁽²⁾ This resonates well with the work by Nussbaum,⁽⁴³⁾ who emphasizes the role of art and narrative to expand our capacity to feel compassion from those that are close by to more distant others.

The question arises how we can distinguish disruptive emotions from justified or corrective emotions. Rationalists would propose that we need reason to assess emotions. However, as the example of John showed, reason is not necessarily superior to emotion. Rather, emotional moral judgments are justified if they can sustain reflection, but reflection is itself a process that requires emotions. In the case of risk, other-regarding, altruistic emotions can help us criticize our initial egoistic emotions as in the case of a NIMBY response.⁽⁶⁰⁾ In the case of climate change, such altruistic emotions can help us care about the needs and rights of people who are far away, even if it means that we have to make personal sacrifices by adopting a more sustainable lifestyle.

However, when it comes to risk, emotional responses can also be directed at factual rather than moral aspects of risks. For example, fear³ can be directed at factual aspects of risk, and it can be a rational but also an irrational response to risk.⁽²⁹⁾ An example of an irrational response is fear of flying, which is arguably an irrational emotion given the safety statistics of air travel. In that case, scientific evidence is needed to correct emotions, but it has to be presented in an emotionally accessible way in order to be effective. This leads me to the next section.

5. MORAL EMOTIONS AND COMMUNICATION ABOUT CLIMATE CHANGE

The main goal of risk communication is to inform the public about risks. However, in the case of climate change, this gives rise to several problems.

The first problem is that the scientific explanation of climate change is complex and not uncontroversial (although *cf.* Moser⁽²⁾ for a discussion of how the idea that the evidence is not uncontroversial might be an artifact of biased communication and framing through the media). The question arises

¹ *Cf.* Lorenzoni and Pidgeon,⁽⁵⁾ who describe this attitude amongst people whom Pidgeon and colleagues have interviewed in another study; also *cf.* Moser⁽²⁾ for similar findings. In rational choice theory these kinds of problems are characterized as prisoner's dilemmas; John's behavior could be analyzed as a free-rider behavior.

² *Cf.* Frank,⁽⁶²⁾ who emphasizes the role that otherregarding emotions can play in overcoming prisoner's dilemmas.

³ Or dread or worry; all these notions are used more or less interchangeably in the literature on risk and emotion.⁽²⁹⁾

whether it is justified to take action on the grounds of insecure knowledge. The precautionary principle addresses this point, taking the stance that it is “better to be safe than sorry,” hence to take precautionary measures despite incomplete scientific evidence (*cf.* Ahteensuu and Sandin⁽⁶⁴⁾ for an overview of the discussion about the precautionary principle). Here emotions such as worry and care can play an important role by letting us take on responsibility for our actions and making personal sacrifices, even though our contribution might be futile or insecure, as in the case of Jane in the example discussed earlier.

An additional problem is that the way risks are presented determines, to a large degree, how information is understood by the recipient, leading to distortions, misunderstandings, and biases (“framing”).⁽⁶⁵⁾ Gigerenzer⁽⁶⁶⁾ argues that this phenomenon undermines informed consent, that is, the idea that autonomous agents can make decisions about the acceptability of risks based on sound information. Intuitions and emotions are generally taken to be an unreliable source of insight concerning the quantitative aspects of risk.^(67,68) However, Gigerenzer⁽⁶⁹⁾ gives evidence that intuitions can be superior to analytical procedures. Intuitions and emotions are indispensable concerning the ethical aspects of risks.^(50,61) Such ideas can be applied to risk communication. Experts often accuse the public of being overly frightened of new technologies because they lack the relevant knowledge and are thereby basing their reactions on supposedly irrational feelings. However, in the case of climate change, scientists are presumably more worried than the general public. Experts need to communicate their emotional-ethical concerns about climate change to the public in addition to supplying quantitative information. In risk communication, emotions should not be abused for manipulative purposes; rather, they should be seriously addressed in order to trigger reflection.^(70,71)

Several authors who argue for a more important role of emotions in communication about climate change nevertheless mention that we should be aware about possible ethical problems with that approach, as it might lead to manipulation of the public.^(3,8) One might argue that as long as it is for a greater good (in this case to diminish climate change and its devastating consequences), manipulation is justified. However, this is a very consequentialist way of reasoning that is ethically dubious, as it might not respect the autonomy and reflective capacities of people. Thaler and Sunstein⁽⁷²⁾ argue that manipulation is unavoidable; no matter how options

are presented, they frame our choices and behavior. They argue that given this fact, we should provide for choice options (“nudges”) that steer us in directions that we would endorse. However, on the view of emotions I propose, emotions are not simply manipulative measures. Rather, emotions can enable moral reflection and deliberation. Recall the earlier quote from Meijnders *et al.*,⁽⁸⁾ who claim that “fear appeals may stimulate people to think and to be critical decision makers.” The approach I have outlined in this article supports this idea. Rather than being a form of manipulation or nudge, appealing to moral emotions about climate change can enable more thorough ethical reflection about the impact of climate change.

This means that emotional appeals should not be limited to alarmist images, but also provide narratives and portraits of people who undergo the effects of climate change, and who themselves may not have had the chance to lead a polluting lifestyle. This enables critical reflection about one’s own lifestyle and considerations of justice towards others. By providing people with concrete narratives, distant others who can otherwise easily be neglected come uncomfortably close by and force oneself to critically assess one’s own behavior (*cf.* Spence and Pidgeon⁽⁷³⁾ for empirical findings that confirm this). Communication about climate change should appeal to these reflective moral emotions as they give rise to critical ethical reflection.

An additional problem is possibly limited knowledge of consumers. Even if people have the goodwill and commitment to lead a sustainable lifestyle, they often have limited knowledge of the way products are produced.⁴ This points to the responsibility of producers to provide information about production processes, which probably has to be enforced through legislation, next to legislation requiring sustainable production methods. Obviously, not only consumers have the moral obligation to contribute to a sustainable world, but industry and politics have such an obligation just as well. These various actors depend on each other and can easily pass the buck around, risking that nothing happens. However, here again, emotions of compassion with potential victims and feelings of responsibility can provide a way to transcend this vicious circle (*cf.* Roeser⁽⁷⁴⁾ about the emotions of engineers and other experts). Risk communication about climate change should be directed at the emotions of politicians and people working in industry as much as of the public.

⁴ Thanks to an anonymous reviewer for addressing this point.

6. EMOTIONS AS MOTIVATION FOR CHANGING ENVIRONMENTAL BEHAVIOR

So far I have argued why emotions are needed to fully grasp the moral meaning of climate change. However, it is generally considered to be an intrinsic feature of emotions that they are motivating states.^(38–40) This means that integrating emotions in the debate about climate change can actually serve two purposes: it can lead to a more thorough understanding of the moral impact of climate change, by sympathizing with its victims and future generations, but at the same time, it can serve as a more reliable source of motivation than purely rational, abstract knowledge about climate change.

I will discuss ideas by the philosopher Linda Zagzebski about the relation between emotional moral judgments and motivation.⁵ Her ideas can help us to understand how emotional moral judgments about climate change can lead to changed motivation and behavior. According to Linda Zagzebski,⁽⁴⁵⁾ emotions are unitary states that have a cognitive and an affective aspect. On Zagzebski's theory, cognition and affect can go together but they need not necessarily do so. Zagzebski speaks of the possibility of the "thinning" of moral judgments, which means that they can become less emotional and hence less motivating. She says that "ground level moral judgments" are the most basic moral experiences on which our more abstract moral judgments are based. A ground level moral judgment is directed towards a concrete case here and now. When we reflect upon a situation we abstract from a concrete experience, and that is how the motivating emotion that was there in the initial judgment gets weaker. The most abstract and normally least motivating moral judgments concern general moral principles.⁶ This means that if the feeling aspect of emotions gets less intense, the motivating aspect gets less intense as well.

Zagzebski provides us with a plausible account. If we think of a moral principle, we consider concrete cases at most very abstractly and perhaps see a possible situation in our imagination. It does not have to be a situation that we saw with our own eyes and that deeply shocked or moved us. Concerning such an imagined case, we will generally be less moved

and motivated than concerning a case in which we directly experience something in front of our eyes. Every day we see countless pictures of wars, famines, executions, humiliations, and abuses. We rush over the headings of the newspapers that contain horrible messages, often with no feeling. But this generally changes when we are eyewitness to a scene where somebody is mistreated, humiliated, or beaten (*cf.* the discussion of Slovic's empirical findings mentioned earlier). In concrete situations, it is very common that the numbness that takes hold of us because of the flood of human misery in the media immediately disappears, allowing for a strong emotional reaction, an emotion that is at the same time a sharp, spontaneous, and basic judgment. In paradigmatic cases, an emotional reaction will lead directly to a desire to intervene, a desire that usually does not occur in more abstract judgments, for example, after having seen a headline in a newspaper.

There is, however, still a potential problem. Fear can be motivating, by, for example, enticing us to avoid the fearful object or to change our behavior, but it can also be paralyzing. Roser-Renof and Maibach⁽⁷⁵⁾ point out that using fear messages can be problematic as they might emphasize the futility of our efforts. It depends on personal and other circumstances how we respond to fear⁽⁴⁶⁾ (also *cf.* Rothman and Salovey⁽⁷⁶⁾ on the complexity of enticing behavior through specific frames). Other emotions can help to correct such paralyzing emotions.⁽⁴⁶⁾ In a similar vein, Roser-Renof and Maibach⁽⁷⁵⁾ argue that in addition to fear, hope is needed; for example, through vivid concrete examples. Hulme⁽¹⁾ makes a similar point by arguing that we should not see climate change as an insurmountable problem, but rather as a challenge and as a source of imagination about our social responsibilities.

Hence, in order to let our moral judgments result into motivational states, we have to involve our emotional capacities. This means that deliberation and communication about climate change should integrate moral emotions for two reasons: because moral emotions lead us to more substantiated moral insights about climate change, and because they provide for motivation to adapt our behavior.

7. CONCLUSION

The empirical studies cited at the beginning of this article showed that the problem with the current debate about climate change is that it is conducted in too abstract terms, which leads people

⁵ This section is based on Chapter 5 of my monograph⁽⁴⁶⁾ where I discuss this topic at greater length.

⁶ Nevertheless, Zagzebski acknowledges the possibility that people have motivational responses to abstract moral principles without necessarily being emotional about them.

to accept the facts but not to do anything about them. Several authors have claimed that the debate about climate change should appeal to emotions to create a sense of urgency. In this article, I have sketched a philosophical-theoretical framework that supports these ideas and provides further theoretical and normative arguments of how and why emotions should play a role in climate risk communication: emotions give us a more substantial grasp of the meaning of morally relevant considerations about climate change, and they provide for motivation to behave accordingly. In the case of climate change, emotional considerations might be the key to changing our behavior effectively. Communication about climate change should trigger moral emotions to entice moral reflection and motivation for a more sustainable lifestyle.

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REFERENCES

- Hulme M. *Why We Disagree About Climate Change*. Cambridge: Cambridge University Press, 2009.
- Moser SC. Communicating climate change: History, challenges, process and future directions. *WIRE's Climate Change*, 2010; 1:31–53.
- Sheppard SRJ. Landscape visualisation and climate change: The potential for influencing perceptions and behavior. *Environmental Science & Policy*, 2005; 8:637–654.
- Leiserowitz A. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change*, 2006; 77:45–72.
- Lorenzoni I, Pidgeon NF. Public views on climate change: European and USA. *Perspectives Climatic Change*, 2006; 77: 73–95.
- Lorenzoni I, Nicholson-Cole S, Lorraine Whitmarsh L. Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 2007; 17:445–459.
- Leiserowitz A. American risk perceptions: Is climate change dangerous? *Risk Analysis*, 2005; 25: 1433–1442.
- Meijnders AL, Midden CJH, Wilke HAM. Role of negative emotion in communication about CO2 risks. *Risk Analysis*, 2001; 21:955–966.
- Weber EU. Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic Change*, 2006; 77: 103–120.
- Alhakami AS, Slovic P. A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis*, 1994; 14:1085–1096.
- Slovic P. Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis*, 1999; 19:689–701.
- Finucane M, Alhakami AS, Slovic P, Johnson SM. The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making*, 2000; 13:1–17.
- Slovic P, Finucane M, Peters E, MacGregor DG. The affect heuristic. Pp. 397–420 in Gilovich T, Griffin D, Kahnemann D (eds). *Intuitive Judgment: Heuristics and Biases*. Cambridge: Cambridge University Press, 2002.
- Lerner JS, Keltner D. Fear, anger, and risk. *Journal of Personality and Social Psychology*, 2001; 81:146–159.
- Epstein S. Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 1994; 49(8):709–724.
- Sloman SA. Two systems of reasoning. Pp. 379–396 in Gilovich T, Griffin D, Kahnemann D (eds). *Intuitive Judgment: Heuristics and Biases*. Cambridge: Cambridge University Press, 2002.
- Sloman SA. The empirical case for two systems of reasoning. *Psychological Bulletin*, 1996; 119:3–22.
- Stanovich KE, West RF. Individual differences in reasoning: Implications for the rationality debate? Pp. 421–440 in Gilovich T, Griffin D, Kahnemann D (eds). *Intuitive Judgment: Heuristics and Biases*. Cambridge: Cambridge University Press, 2002.
- Haidt J. The emotional dog and its rational tail. A social intuitionist approach to moral judgment. *Psychological Review*, 2001; 108:814–834.
- Greene JD, Haidt J. How (and where) does moral judgment work? *Trends in Cognitive Science*, 2002; 6: 517–523.
- Prinz J. *Gut Reactions: A Perceptual Theory of Emotion*. New York: Oxford University Press, 2004.
- Greene JD. The secret joke of Kant's soul. Pp. 2–79 in Sinnott-Armstrong W (ed). *Moral Psychology*, vol. 3: The Neuroscience of Morality: Emotion, Disease, and Development. Cambridge, MA: MIT Press, 2007.
- Slovic P, Finucane M, Peters E, MacGregor DG. Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, 2004; 24:311–322.
- Sunstein CR. *Laws of Fear*. Cambridge: Cambridge University Press, 2005.
- Loewenstein GF, Weber EU, Hsee CK, Welch N. Risk as feelings. *Psychological Bulletin*, 2001; 127:267–286.
- Wolff J. Risk, fear, blame, shame and the regulation of public safety. *Economics and Philosophy*, 2006; 22:409–427.
- De Hollander AEM, Hanemaaijer AH (eds). *Nuchter omgaan met risico's*. Bilthoven: RIVM, 2003.
- Costa-Font J, Mossialos E, Rudisill C. Are feelings of genetically modified food politically driven? *Risk Management*, 2008; 8:218–234.
- Roeser S. The relation between cognition and affect in moral judgments about risk. Pp. 182–201 in Asveld L, Roeser S (eds). *The Ethics of Technological Risks*. London: Earthscan, 2009.
- Roeser S. Intuitions, emotions and gut feelings in decisions about risks: Towards a different interpretation of “neuroethics.” *Journal of Risk Research*, 2010; 13:175–190.
- de Sousa R. *The Rationality of Emotions*. Cambridge, MA: MIT-Press, 1987.
- Greenspan P. *Emotions and Reasons: An Inquiry into Emotional Justification*. New York: Routledge, 1988.
- Solomon R. *The Passions: Emotions and the Meaning of Life*. Indianapolis: Hackett, 1993.
- Blum LA. *Moral Perception and Particularity*. New York: Cambridge University Press, 1994.
- Little MO. Seeing and caring: The role of affect in feminist moral epistemology. *Hypatia*, 1995; 10:117–137.
- Stocker M, Hegemann E. *Valuing Emotions*. Cambridge: Cambridge University Press, 1996.
- Goldie P. *The Emotions. A Philosophical Exploration*. Oxford: Oxford University Press, 2000.

38. Ben-Ze'ev A. *The Subtlety of Emotions*. Cambridge, MA: MIT Press, 2000.
39. Scherer KR. On the nature and function of emotion: A component process approach. Pp. 293–317 in Scherer KR, Ekman P (eds). *Approaches to Emotion*. London: Lawrence Erlbaum Associates, 1984.
40. Frijda N. *The Emotions*. Cambridge: Cambridge University Press, 1987.
41. Lazarus R. *Emotion and Adaptation*. New York: Oxford University Press, 1991.
42. Damasio A. *Descartes' Error*. New York: Putnam, 1994.
43. Nussbaum M. *Love's Knowledge. Essays on Philosophy and Literature*. Oxford: Oxford University Press, 1992.
44. Roberts RC. *Emotions. An Essay in Aid of Moral Psychology*. Cambridge: Cambridge University Press, 2003.
45. Zagzebski L. Emotion and moral judgment. *Philosophy and Phenomenological Research*, 2003; 66:104–124.
46. Roeser S. *Moral Emotions and Intuitions*. Basingstoke: Palgrave Macmillan, 2011.
47. Shrader-Frechette K. Feelings, fear, and technological risk. Pp. 168–181 in Den Ouden B, Moen M (eds). *The Presence of Feeling in Thought*. New York: Peter Lang, 1991.
48. Kahan DM. Two conceptions of emotion in risk regulation. *University of Pennsylvania Law Review*, 2008; 156:741–766.
49. Bandes SA. Emotions, values, and the construction of risk. *Pennsylvania Law Review PENnumbra*, 2008; 421:412–434 Available at: <http://www.pennumbra.com/responses/03-2008/Bandes.pdf>, Accessed March 20, 2012.
50. Roeser S. The role of emotions in judging the moral acceptability of risks. *Safety Science*, 2006; 44:689–700.
51. Roeser S, ed. *Emotions and Risky Technologies*. Dordrecht: Springer, 2010.
52. Fischhoff B, Lichtenstein S, Slovic P, Derby SL, Keeney R. *Acceptable Risk*. Cambridge: Cambridge University Press, 1981.
53. Shrader-Frechette K. *Risk and Rationality*. Berkeley: University of California Press, 1991.
54. Krimsky S, Golding D, eds. *Social Theories of Risk*. Westport: Praeger Publishers, 1992.
55. Slovic P. *The Perception of Risk*. London: Earthscan, 2000.
56. Jaeger CJ, Renn O, Rosa EA, Webler T. *Risk, Uncertainty, and Rational Action*. London: Earthscan, 2001.
57. Hansson SO. An Agenda for the Ethics of Risk. Pp. 11–23 in Asveld L, Roeser S (eds). *The Ethics of Technological Risks*. London: Earthscan, 2009.
58. Asveld L, Roeser S, eds. *The Ethics of Technological Risks*. London: Earthscan, 2009.
59. Sunstein CR. Moral heuristics and risk. Pp. 3–16 in Roeser S (ed.) *Emotions and Risky Technologies*. Dordrecht: Springer, 2010.
60. Roeser S. Emotional reflection about risks. Pp. 231–244 in Roeser S (ed). *Emotions and Risky Technologies*. Dordrecht: Springer, 2010.
61. Roeser S. Ethical intuitions about risks. *Safety Science Monitor*, 2007; 11, 1–30.
62. Frank R. *Passions Within Reason: The Strategic Role of the Emotions*. New York: W. W. Norton, 1988.
63. Slovic P. Numb by numbers. *Foreign Policy*, 2007.
64. Ahteensuu M, Sandin P. The precautionary principle. Pp. 961–978 in Roeser S, Hillerbrand R, Sandin P, Peterson M (eds). *Handbook of Risk Theory*. Dordrecht: Springer, 2012.
65. Tversky A, Kahneman D. Judgment under uncertainty: Heuristics and biases. *Science*, 1974; 185:1124–1131.
66. Gigerenzer G. *Reckoning with Risk*. London: Penguin, 2002.
67. Gilovich T, Griffin D, Kahnemann D (eds). *Intuitive Judgment: Heuristics and Biases*. Cambridge: Cambridge University Press, 2002.
68. de Sousa R. Here's how I feel: Don't trust feelings. Pp. 17–35 in Roeser S (ed). *Emotions and Risky Technologies*. Dordrecht: Springer, 2010.
69. Gigerenzer G. *Gut Feelings: The Intelligence of the Unconscious*. London: Viking, 2007.
70. Sandman PM. Hazard versus outrage in the public perception of risk. Pp. 45–49 in Covello VT, McCallum DB, Pavlova MT (eds). *Effective Risk Communication: The Role and Responsibility of Government and Nongovernment Organizations*. New York: Plenum Press, 1989.
71. Ross B, Davis W. Marketing risks: The mindless acceptance of risks is promoted by emotional appeals. Pp. 61–80 in Roeser S (ed). *Emotions and Risky Technologies*. Dordrecht: Springer, 2010.
72. Thaler R, Sunstein CR. *Nudge: Improving Decisions About Health, Wealth and Happiness*. New Haven and London: Yale University Press, 2008.
73. Spence A, Pidgeon NF. Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, 2010; 20:656–667.
74. Roeser S. Emotional engineers: Toward morally responsible engineering. *Science and Engineering Ethics*, 2012; 18(1):103–115.
75. Roser-Renouf C, Maibach E. Communicating climate change. In Hornig Priest S (ed). *The Encyclopedia of Science and Technology Communication*. London: Sage, 2010.
76. Rothman AJ, Salovey P. Shaping perceptions to motivate healthy behavior: the role of message framing. *Psychological Bulletin*, 1997; 121:3–19.