Psychological Perspectives on the Geological Disposal of Radioactive Waste and Carbon Dioxide

Judith I.M. de Groot and Linda Steg

Abstract Public acceptability of risky technologies is not only related to the objective risks involved, but to a number of subjective factors as well. Therefore, various studies examined psychological factors related to acceptability judgements. In this chapter we demonstrate the relevance of psychological factors that contribute to the explanation of the acceptability of radioactive waste disposal and carbon dioxide (CO_2) disposal technologies. The acceptability of CO_2 disposal has received far less attention in psychological studies than the acceptability of radioactive waste disposal, and therefore we have made an assessment of possible psychological determinants based on research on the acceptability of the latter. We conclude that the acceptability of CO_2 disposal may be explained by similar factors to those influencing the acceptability of radioactive waste disposal, i.e. risk characteristics (dread and the unknown), affect, values and worldviews, fairness and trust. We argue that these psychological factors are directly related to the acceptability of CO_2 disposal as well as indirectly, via the perceived risks and benefits of CO_2 disposal. Furthermore, we discuss group differences (i.e. lay *versus* experts, and cross-cultural differences) in acceptability of radioactive waste disposal and, again, translate these results for possible consequences in psychological research in the area of the acceptability of geological disposal of CO_2. Finally, we integrate the psychological factors into a conceptual model and discuss the limitations of current research, future research directions and policy implications for the acceptability of both types of technologies.

J.I.M. de Groot (✉)
School of Design, Engineering and Computing, Bournemouth University, Psychology, Poole House, Fern Barrow, Poole, BH12 5BB, United Kingdom
e-mail: jdgroot@bournemouth.ac.uk

L. Steg
Faculty of Behavioural and Social Sciences Department of Psychology, University of Groningen, Grote Kruisstraat 1/2, 9712 TS, Groningen, The Netherlands
e-mail: E.M.Steg@rug.nl

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1 Introduction

Responses to new and large-scale technologies are related to individual perceptions of the risks they pose. For this reason, research on risk perception is of great importance to industries and governments trying to assess and implement new technologies. Two relevant examples of current risky technologies involve the geological disposal of radioactive waste (RW) and carbon dioxide (CO_2). Their fortunes ultimately depend on social acceptability of the technology rather than its technological advantages or disadvantages. Therefore, we focus on these technologies in this chapter.

We will demonstrate the relevance of various psychological factors to explain the acceptability of technologies associated with RW and CO_2 disposal. Acceptability is affected by perceived risks caused by uncertainty and lack of control, and therefore risks are interpreted as the perceived negative consequences or costs related to these technologies. The expected benefits are seen as the positive consequences of the risky technologies (Hisschemöller and Midden 1989). Thus, the perception of risks and acceptability of technologies are not the same. However, a lot of studies focus on 'perception of risks', 'acceptability of risks' and/or the 'acceptability of a technology' and use these concepts interchangeably. Throughout this chapter, we refer to 'acceptability' as the acceptability of RW or CO_2 disposal technologies. In Sect. 4, we will explain how we assume the perception of risks and benefits are related to acceptability.

There is a growing consensus that public involvement is essential for the success of virtually any risky technological facility (Short and Rosa 2004). Therefore social scientists have worked to understand why the public is highly concerned about new technologies such as the geological disposal of RW for many years. As a result, there is now considerable understanding of which factors determine public support or opposition to RW disposal. The geological disposal of CO_2 has received far less attention, mainly because this technology has been developed more recently. In this chapter we review psychological factors that contribute to the acceptability of RW disposal (Sect. 2). We also explain to what extent these factors may be relevant for the acceptability of CO_2 disposal (Sect. 3). Finally, we summarize our findings (Sect. 4), we discuss the theoretical implications of current psychological research in research on the acceptability of RW and CO_2 disposal (Sect. 5), and suggest future research directions and policy implications for the acceptability of both types of technologies (Sect. 6).

2 Psychological Factors of the Acceptability of Radiation Waste Disposal

Individuals are inclined to overestimate the probability that a serious accident may happen with risky, large-scale technologies such as RW disposal (e.g. Daamen et al. 1986; Fischhoff et al. 1978). For example, results show that the average yearly

fatality rates related to RW and the subjective judgements of the seriousness of the risk posed by RW are barely correlated, indicating that judgements of the general public are based on other factors than the objective probability of the risks of death involved with the disposal of RW (Gowda and Owsley-Long 1998). Thus, acceptability of large-scale technologies is not based on purely quantitative aspects such as expected morbidity. Subjective or qualitative aspects of risks, such as values and affect, play an important role in supporting or opposing these technologies.

Because public acceptability is not only related to the objective perception of risks involved with RW disposal, a lot of research has focused on psychological factors related to acceptability. Especially (general and specific) attitudes towards nuclear energy and RW disposal are seen as main predictors of the acceptability of RW disposal (van der Pligt and Midden 1990). Attitudes are assumed to be based on expectancy-valence models as proposed by Fishbein and Ajzen (1975). In these models, the acceptability of risky technologies is seen as a trade-off between risks and benefits: the more a person believes that the attitude object (e.g. RW disposal) has beneficial rather than negative consequences, the more favourable the attitude towards the object tends to be and the more acceptable the technology is judged.

Which factors are important in the formation of attitudes towards RW disposal? Psychological research has focused on different factors. These factors include the extent to which the technology is perceived as 'dreaded' and 'unknown', affect, moral aspects (i.e. values and worldviews), fairness and trust (Sect. 3.1–3.5). There is also some psychological research concerning group differences in the acceptability of RW disposal (Sect. 3.6). In Sect. 3, we explain how these aspects are related to the acceptability of the geological disposal of RW and we also indicate to what extent these factors may be relevant in the acceptability of the geological disposal of CO_2.

3 Psychological Factors Related to the Acceptability of Radiation Waste and CO_2 Disposal

3.1 Dread and Unknown Risk Factors

Most studies on nuclear energy show that individual attitudes are based upon perceptions of a limited number of potential negative and positive aspects of nuclear energy in general and RW disposal in particular (van der Pligt 1989). These aspects can be characterized along two dimensions, namely the *dread* and the *unknown* risk factor (e.g. Peters et al. 2004; Slovic 1987). Dread risk refers to the extent to which individuals experience: (1) a lack of control; (2) feelings of dread; (3) a catastrophic potential of the technology; and (4) an unfair distribution of risks and benefits involved with the technological risks. Unknown risk is characterized by the extent to which a hazard is perceived as unobservable, unknown, new, and delayed in producing harmful impacts. RW disposal tends to be judged highly on both dread and unknown risk factors (Peters et al. 2004; Fischhoff et al. 1978; Vlek and Stallen 1981; Verplanken 1989). The radiation risk is, for example, described as unknown,

invisible and dangerous to health and for the environment, in the short as well as in the long run (MacGregor et al. 1994). Therefore acceptability of RW disposal is generally low.

The geological disposal of CO_2 may probably also be judged as highly dreaded and unknown because CO_2 disposal carries potential risks, such as leaks from underground disposal or CO_2 seepage. These risks are uncertain and potentially dangerous to health and for the environment. It could be argued that the possible consequences of CO_2 disposal are even more unknown than the consequences of RW disposal, because experts as well as lay people have less experience with CO_2 disposal compared to RW disposal, and consequently the acceptability of CO_2 disposal may be lower. However, some explorative research on the role of psychological factors in explaining the acceptability of CO_2 disposal does not fully confirm this view (Bradbury et al. 2009; Tokushige et al. 2007). In contrast with the acceptability of RW disposal, the perceived benefits of CO_2 disposal seem to be the most predictive factors when explaining the acceptability of this technology. These initial results could imply that there is a difference in perception of the costs (i.e. risks) and benefits of CO_2 disposal and RW disposal. Consequently, the risks of CO_2 disposal may be perceived as less dreaded. Future research should examine why the perceived benefits seem more important when explaining the acceptability of CO_2 disposal than when explaining the acceptability of RW disposal.

The perception of a risk as 'unknown' may also affect the stability of acceptability judgements. New information shapes attitudes towards a technology more when people know little about the subject than when people are familiar with it. However, various studies show that many people have a strong and relatively stable opinion on the pros and cons of the acceptability of RW, while RW technologies are perceived as highly unknown. The 'affect heuristic' may explain why people oppose RW disposal without knowing exactly why (see Sect. 3.2).

We think that the affect heuristic does not play an essential role yet in explaining the acceptability of CO_2 disposal. Because the consequences of CO_2 disposal are more unknown to the general public, and less emotionally charged discussions are known regarding these than on the consequences of RW disposal, the acceptability toward this type of technology may be based more on 'non-attitudes': 'Apparent attitudes that have little meaning in the world outside the interview' (Rosema et al. 2008: p. 353). For example, de Best-Waldhober et al. (2009) examined the differences in attitudes towards CO_2 disposal technologies among Dutch inhabitants with well informed and uninformed opinions. They concluded that the Dutch public is largely uninformed about CO_2 disposal, while they are still inclined to express their opinion about this technology. The few studies on public perceptions of CO_2 disposal confirm that this technology is largely unknown to the general public (de Best-Waldhober et al. 2009; van Alphen et al. 2007). Obviously, non-attitudes are less stable and relatively easy to change via communication (de Best-Waldhober et al. 2009; Sjöberg 2003). In comparison to RW disposal, more people will be 'indecisive' about CO_2 disposal; therefore discussions with the general public about this type of technology will be less controversial than for RW disposal.

3.2 *Affect*

Recently it has been suggested that affect may be an important factor in risk perception of large-scale technologies (Peters and Slovic 1996; Peters et al. 2004; Siegrist et al. 2006; Slovic et al. 1991a, 2004; Summers and Hine 1997). Along this line of reasoning, scholars argue that humans base their acceptability towards RW disposal not only on how they think about it (i.e. cognitive aspects), but also, or even more strongly, on how they feel about it (i.e. affective aspects).

Various studies on (the geological disposal of) RW have found that affect is indeed related to the acceptability of RW (Peters and Slovic 1996; Peters et al. 2004; Slovic et al. 1991a, 2004; Siegrist et al. 2006; Summers and Hine 1997). One of the findings was that perception of risks and society's responses to these risks were strongly related to the extent to which a hazard evoked feelings of dread (e.g. Slovic 1987; Slovic et al. 2007). Activities associated with the disposal of RW are seen as riskier, less acceptable, and more in need of regulation than activities with less dreaded forms of energy generation, such as energy produced by windmills. The amount of dread of a certain risk, as mentioned in Sect. 3.1, and someone's affect therefore seem closely related.

Another result of research on affect and RW disposal was that individuals who had positive feelings about nuclear energy and RW evaluated the negative consequences associated with this technology low and its potential benefits high, indicating that they found the risks associated with RW disposal more acceptable (Alhakami and Slovic 1994; Slovic et al. 2007). Furthermore, Slovic et al. (1991a) found that affect provoked by images of an RW repository was related to voting in favour or against an RW repository, and to how risky people judged activities related to RW disposal to be. When the image was judged negatively and thus provoked negative feelings, participants were more inclined to vote against an RW repository and believed that the risks involved with RW disposal were higher than when the image was judged less negatively. This finding was replicated by a study of Peters and Slovic (1996). Slovic and colleagues (Slovic et al. 2004, 2007) refer to the *affect heuristic* to explain these results. The affect heuristic implies that representations of objects and events in people's minds are marked with positive and negative feelings to varying degrees. Individuals consider these positive and negative feelings about the object or event to make a decision on the acceptability of RW disposal. If individuals only experience negative feelings, this will result in less acceptability of RW disposal without them rationally considering the costs and benefits of this technology. It is assumed that affective reactions may serve as a quicker, easier and more efficient way to make decisions in a complex and uncertain world than cognitive reasoning, and therefore serve as a 'heuristic'.

Like RW disposal, and as reasoned in Sect. 3.1, CO_2 disposal is probably perceived as highly dreaded and unknown. Consequently, it will evoke negative affect in a similar way as RW disposal does. However, people will probably be less able to use an affect heuristic with CO_2 disposal; because CO_2 disposal is very new and unknown, no stigma is associated with the object yet. Peters et al. (2004) show that

RW from nuclear power plants, radiation from nuclear weapons, and nuclear power plants in general, are strongly stigmatized subjects. Consequently, they provoke negative feelings such as fear and anger, which in turn results in a higher risk perception and less acceptance of the stigmatized object. The disposal of RW is stigmatized and it can be used as a heuristic partly because people have received a lot of negative information associated with nuclear energy and RW. For example, most people are aware of major or minor accidents that have occurred with nuclear energy, so they know something bad can happen (e.g. Slovic et al. 1991b). Research showed that attitudes towards nuclear energy became more negative when people were faced with an accident (e.g. Hohenemser and Renn 1988; Verplanken 1989). CO_2 disposal is not as yet associated with unfortunate events such as accidents, evidence of mismanagement or discoveries of CO_2 releases. Therefore CO_2 disposal is probably less stigmatized and consequently the affect heuristic will be less important than for RW disposal.

The influence of affect and the affect heuristic is one of the most thoroughly examined aspects in explaining the acceptability of nuclear energy and the disposal of RW. In contrast to most studies that explain the acceptability of RW disposal, correlational as well as experimental designs were used and a clear theoretical paradigm was followed for which support outside the domain of RW disposal was found as well. Future studies should reveal to what extent and under what specific conditions affect will influence the acceptability of CO_2 disposal.

3.3 Values and Worldviews

Various studies focused on relationships between moral aspects and the acceptability of RW disposal (van der Pligt 1989). It is argued that public reactions to the disposal of RW are not only based on perceptions of health and environmental risks, but are based on values and worldviews as well (e.g. Gowda and Easterling 2000; Peters and Slovic 1996; Short and Rosa 2004; Sjöberg and Drottz-Sjöberg 2001). The acceptability of RW disposal and CO_2 disposal may be viewed as moral issues, that is, a function of general beliefs on what is the right or wrong thing to do. Acting on the basis of moral considerations generally implies choosing behavioural options that will result in public (or environmental) benefits (de Groot and Steg 2009; Thøgersen 1994, 1996). We will review to what extent two types of general beliefs are related to the acceptability of RW disposal and CO_2 disposal: values and worldviews.

3.3.1 Values

Several scholars suggest that the importance of various risks and benefits of a new technology depends on the values someone upholds (Short and Rosa 2004; van der Pligt 1989). Values are defined as ‘desirable transsituational goals, varying in

importance, that serve as guiding principles in the life of a person or other social entity' (Schwartz 1994: p. 21). Two value orientations are particularly relevant in explaining the acceptability of RW disposal: self-transcendence or altruistic *versus* self-enhancement or egoistic value orientations. Some scholars have proposed that a third value orientation is important in the environmental domain. This 'biospheric' value orientation emphasizes the intrinsic value of nature (e.g. de Groot and Steg 2007, 2008; Stern 2000; Stern et al. 1993). These three value orientations seem to be important in explaining the acceptability of RW, since most studies support the belief that economic (i.e. egoistic), community health and safety (i.e. self-transcendent, 'prosocial' or altruistic), and environmental (i.e. biospheric) considerations are important for understanding the acceptability of RW, as we will explain next.

Most studies on the acceptability of the disposal of RW assume a conflict between benefits and risks of RW. For example, nuclear energy is relatively cheap; however, this conflicts with the perceived risks involved with RW disposal, which threaten other people and the environment. Or, nuclear energy produces less CO_2 emissions, which helps to reduce global warming. However, the geological disposal of RW is a problem in the long term and it is hard to estimate the risks for future generations.

An often mentioned concept within RW research which emphasizes these conflicts is NIMBY (Not In My Back Yard) (Gervers 1987; Sjöberg and Drottz-Sjöberg 2001). People who are driven by NIMBY motives are supposed to profit from the benefits of nuclear power, but at the same time they refuse to accept the associated risk involved such as the siting of an RW repository within a nearby area.

NIMBY assumes that a low acceptability of RW disposal is rooted in egoistic or self-interest. However, is this assumption a realistic perspective? People may have profound prosocial or environmental reasons why they oppose RW disposal, for example concerns about the risks involved for the health or safety of people in the community. Therefore, is it really selfish to oppose RW disposal? Results of studies on RW suggest the opposite. Krannich and colleagues (Krannich et al. 1993) showed that the opposition to the siting of an RW facility does not reflect a NIMBY response on the part of area residents. They emphasized that risk perceptions are mainly influenced by concerns about future generations (i.e. prosocial considerations), and that these concerns are especially important in determining responses to an RW repository. However, they did not correct for the fact that residents may use future and environmental concern arguments as an excuse for not wanting a waste facility anyway. Other studies also showed that prosocial and environmental consequences, such as consequences for health, community, safety and environment, are more predictive of acceptability of nuclear power in general and RW disposal in particular, than are personal consequences (Sjöberg and Drottz-Sjöberg 2001).

Results of these studies indicate that, next to personal or egoistic concerns, the acceptability of RW disposal, and presumably of CO_2 disposal, depends on the conflict between considerations that are 'non-selfish' in origin. For example, is it morally more correct *to oppose* RW disposal or CO_2 disposal because people are concerned about the health of future generations and a decrease in environmental quality than *to support* RW or CO_2 disposal because of concerns about global warming for future generations? Both concerns are real and based on unselfish

considerations, but which choice do people regard as morally most correct when altruistic and/or biospheric considerations conflict? As yet, no studies have focused on the effect of these conflicts between various altruistic and/or environmental values on the acceptability of RW or CO_2 disposal.

3.3.2 Worldviews

Worldviews can be important in explaining the acceptability of RW disposal (e.g. Peters and Slovic 1996; Peters et al. 2004; Sjöberg and Drottz-Sjöberg 2001). Worldviews are defined as generalized attitudes toward the world and its social organization and function as orienting dispositions that guide people's responses in complex situations (Dake 1991, 1992). In this way, the definition of worldviews is highly compatible with the definition of values as proposed by Schwartz (1992).

The cultural theory of risk perception (Douglas and Wildavsky 1982) is the most common theory used when explaining risk perception with worldviews. According to this theory, people decide upon the riskiness of a technology on the basis of their cultural orientation. Dake (1991, 1992) proposes four basic worldviews that differ on two dimensions. The first dimension distinguishes people who are more group-oriented from those who are more individually oriented. The second dimension focuses on the extent to which someone believes that socially stratified rules are needed to control behaviour. Based on these dimensions, four basic worldviews emerge that determine a person's risk perception: hierarchical, fatalistic, individualistic and egalitarian. In a hierarchical worldview, people are believed to be group-oriented and prefer a high level of stratified prescriptions. A fatalistic worldview suggests that someone is focused on individuals instead of groups, but believes that socially stratified rules are necessary. The individualist is individually oriented, but believes that only few rules are needed to guide behaviour. Finally, people with an egalitarian worldview are group-oriented, but believe in low levels of stratified rules.

Support for the cultural theory in relation to the perception of nuclear energy and RW disposal is mixed. Peters and Slovic (1996) found some support for the relationship between worldviews and support for nuclear energy. Especially fatalistic, hierarchical and individualistic worldviews were associated with a stronger support towards nuclear energy. An egalitarian worldview was negatively related to support for nuclear energy. However, correlations were moderate indicating that other factors may be more important when explaining the acceptability of RW disposal. Indeed, some scholars argue that cultural theory hardly adds any additional variance when more powerful determinants such as lack of fairness and risk for future generations are entered into the same model (Sjöberg and Drottz-Sjöberg 2001; see also Sjöberg 1997).

In conclusion, values and, to a lesser extent, worldviews may influence the acceptability of RW disposal. People will evaluate the acceptability of RW disposal and CO_2 disposal largely on the basis of the extent to which important values are perceived to be affected by the consequences of these technologies. We believe that it is important to study to what extent values and worldviews are related to acceptability of RW and CO_2 disposal because specific attitudes towards new

objects must be built on something more stable and relatively enduring, and general antecedents (i.e. values and worldviews) may provide such a basis (Stern et al. 1995; Stern 2000). This is especially relevant in the domain of relatively new technologies, such as RW disposal, but even more for CO_2 disposal, because this technology is even more unknown.

3.4 Fairness

Fairness is another factor that is relevant for explaining the acceptability of RW disposal. Scholars argue that the acceptability of policies, including policies to implement repository sites, is strongly related to their perceived fairness, that is, policies are more acceptable when they are perceived to be fair (e.g. Cvetkovich and Earle 1994; Tyler 2000). Some studies on the acceptability of RW disposal measure fairness in general, or do not distinguish between various types of fairness (e.g. Summers and Hine 1997; Sjöberg and Drottz-Sjöberg 2001), which makes it difficult to draw conclusions about which specific type of fairness contributes to acceptability. Others distinguish between different types of fairness (e.g. Ahearne 2000; Gowda and Easterling 2000; Hisschemöller and Midden 1989; Short and Rosa 2004; Shrader-Frechette 2000), but mostly use non-theory-based data to provide support for their distinction. Therefore, we will use literature from both within and outside the RW and CO_2 disposal domain to provide possible frameworks for explaining the relationship between fairness and acceptability of RW and CO_2 disposal.

It is important to distinguish distributional from procedural fairness (e.g. Gowda and Owsley-Long 1998; Schuitema 2010). Distributional fairness concerns how risks and benefits that are associated with policies, such as implementing a repository, are distributed across various groups in society (Deutsch 1975, 1985). Some people may be disproportionally affected by a decision to implement a waste repository in their neighbourhood, because they are exposed to risks without receiving any compensation for the potential risks. Therefore distributional fairness seems to be crucial for implementing hazardous waste facilities such as those for RW and CO_2 disposal (see van der Pligt 1989).

Various principles may be followed when deciding whether a particular distribution of outcomes is fair, such as the equity principle, the equality principle, social justice, and environmental justice (Schuitema 2010). As yet, most studies do not differentiate between these different principles, and it is not known which principle is most influential in acceptability judgements. The equity principle implies that risks and benefits should be distributed in proportion to an individual's contribution (Adams 1965). Those who benefit most should carry the most risk. Policies to implement a repository site would be acceptable if people believed that the risks of implementing a repository (e.g. potential risks) did not exceed the benefits of the repository (e.g. financial compensation, possibilities for work). The equality principle suggests that everyone should be affected to the same extent by the policy (Deutsch 1985), that is, no groups may be affected disproportionally. This principle

implies that implementing a repository site would be fair and acceptable if the risks were the same for everyone. When equality is the most dominant fairness principle, people are likely to oppose RW and CO_2 disposal unless the disproportionally affected group is highly compensated. Social justice refers to striving for a greater degree of equality in general, that is, outside the domain of RW and CO_2 disposal as well. Finally, environmental justice refers to the protection of nature, environment and future generations (e.g. Clayton 2000; Montada and Kals 1995; Opotow and Clayton 1994). This principle overlaps with intergenerational equity (Ahearne 2000; Gowda and Easterling 2000; Shrader-Frechette 2000), which refers to concerns about how future generations and the environment may be affected by the current generation's choices. In contrast to Gowda and Easterling (2000) and Clayton (2000), we interpret this principle as a specific type of distributional fairness because it concerns a distribution of risks and benefits among the present and the future generations. All four principles seem important in relation to the acceptability of RW and CO_2 disposal. Future research should examine which fairness principle is prevalent in acceptability judgements.

Distributional fairness is closely related to values, that is, which distribution of risks and benefits is considered to be fair depends on one's value orientation (cf. Deutsch 1975). Nuclear energy and implementing a waste repository may have egoistic, altruistic and biospheric benefits and risks. People who value egoistic aspects most will judge the implementing of an RW or CO_2 repository to be fair when the egoistic benefits (e.g. employment) outweigh the risks associated with it (i.e. they prefer the equity principle). For people who value altruistic aspects, a policy to implement a repository would be considered fair when the altruistic benefits (e.g. cheap energy for everyone) of the repository outweigh its risks (i.e. they prefer the social justice principle). And, when people have a strong biospheric value orientation, they perceive implementing a repository as fair when the outcomes of this policy would benefit nature and the environment (e.g. no CO_2 emissions, i.e. they prefer the environmental justice principle).

It is difficult to decide how the risks of an RW facility can be distributed in a fair way. When the potential host community perceives itself as bearing an unjust burden (i.e. unequal distribution), most people will oppose the siting even though they are compensated by financial or economic benefits to increase distributional fairness. In this case, the question is how to translate subjective risks to health, safety and the environment into financial or economic compensation to make the distribution fair again. The few studies on monetary compensation and acceptability of RW disposal show that such measures have mixed success only (Sjöberg and Drottz-Sjöberg 2001; Summers and Hine 1997; van der Pligt 1989). Compensations do often not result in higher acceptability levels. People may view the financial compensations as a 'bribe', which may intensify concerns about unequal distributions and increases suspicion and distrust of relevant authorities (van der Pligt 1989). Other ethical considerations are at play as well: A relatively poor community may be more in need of monetary payments than a rich community. Consequently, residents of a poor community may also be more inclined to accept a repository because they benefit more from it, although they still believe that the risks and benefits are distributed unequally.

The second type of fairness is procedural fairness, which involves the use of fair procedures (e.g. Lind and Tyler 1988), for example, to come to a decision over an RW repository. These procedures should be perceived as fair and consistent towards all parties involved. When a potential host community perceives the decision making process as unfair or inconsistent, opposition is more likely to occur (e.g. Gowda and Owsley-Long 1998; Sjöberg and Drottz-Sjöberg 2001; Summers and Hine 1997). Procedural fairness can be promoted via communication and public involvement. For example, people were slightly more willing to accept an underground RW repository when they were involved in the planning process (Summers and Hine 1997). Sjöberg (2004) showed how extensive information programmes in four Swedish municipalities have positively changed the extent to which people accepted a local RW repository. However, no (field) experiments have been conducted in the area of perceived procedural fairness and the acceptability of RW disposal, thus conclusions about changes in acceptability judgements remain tentative.

The extent to which and how (distributional and procedural) fairness considerations influence acceptability of RW and CO_2 disposal may vary across situations. In the case of a large physical distance between the host community of a siting and the repository site, the relevance of distribution and procedural fairness can decrease because people experience less direct individual risks of the repository. At the moment, different possibilities of CO_2 disposal locations are being explored. For example, in the Netherlands experts propose the possibility of offshore CO_2 repositories. When the exact policies hardly affect people directly (e.g. large physical distance of repository), people are less committed and less likely to experience benefits and risks involved with CO_2 disposal directly. In such cases, aspects related to distributional and procedural fairness may play a less prominent role. Therefore we expect that structural factors, such as the location of a repository, will influence concerns about distributional and procedural fairness and this will affect acceptability of CO_2 disposal.

Both procedural and distributive fairness are important for public support of policies (e.g. Clayton and Opotow 2003; Cohen 1987; Cook and Hegtvedt 1983; Deutsch 1975, 1985; Rawls 1999; Tyler 2000) and often the two types of fairness interact. Unfair distributions may result in perceived procedural unfairness and *vice versa*. For example, the acceptability of a siting for RW or CO_2 disposal could be increased by monetary payments or by emphasizing economic benefits of the repository (i.e. distributional fairness), but only when relevant stakeholders are involved in the planning process (i.e. procedural fairness). Reasonably, both types of fairness are necessary for explaining the acceptability of RW and CO_2 disposal, and future studies should examine possible interaction effects.

3.5 Trust

Trust is seen as a crucial factor for the acceptability of RW disposal (e.g. Binney et al. 1996; Earle and Cvetkovich 1995; Flynn et al. 1992; Gowda and Owsley-Long 1998; Katsuya 2002; Kasperson et al. 1992; Slovic et al. 1991c; Summers and Hine 1997). Among other things, it is reasoned that trust may enhance feelings of

general and personal control, and therefore people experience less dread. They will perceive the threat as less risky and consequently they are more willing to accept the technology (Slovic 1993).

Although the assumption of a strong relationship between trust and risk perception seems plausible, empirical data shows mixed support (Sjöberg 2001). Some studies reveal that trust in government and risk management agencies explains risk perception and acceptability of RW disposal to a large extent (e.g. Biel and Dahlstrand 1995; Katsuya 2002; Summers and Hine 1997), but results of other studies have shown moderate to weak relationships (e.g. Bord and O'Connor 1990, 1992; Mushkatel et al. 1993; Pijawka and Mushkatel 1991/1992). A possible explanation for the weak relationship between trust and risk perception is that people believe that science and the experts themselves also do not fully understand the effects of the technology of RW disposal yet (Sjöberg 2001). Thus, even though experts, governments and corporations promoting nuclear energy are perceived to be trustworthy, the general public can still disagree with the conclusion that the risks associated with RW disposal are negligible. In this case, the public does trust that authorities are honest, but they do not believe that authorities can control the technology. For example, Sjöberg (2001) showed that a lack of scientific knowledge of RW technologies tends to be a more important predictor of risk perception than trust in authorities that communicate this knowledge to the public. In the case of the acceptability of CO_2 disposal, a similar line of reasoning may be followed: the public may be uncertain about whether experts have sufficient knowledge of the risks of CO_2 disposal; consequently, the public may perceive that authorities in this domain have little control over the situation, which will decrease the acceptability of this technology. The limited research in the area of the acceptability of CO_2 disposal and trust indicates that trust is indeed an important factor that affects the acceptability of CO_2 disposal (Huijts et al. 2007; Tokushige et al. 2007). More specifically, research among Japanese university students showed that trust had an indirect impact on the acceptability of CO_2 disposal via the perceived risks and benefits of this technology. Higher trust was associated with perceiving more benefits and slightly less risks from CO_2 disposal.

Trust has not been integrated into a general theoretical model, and studies that did include trust have hardly been replicated. Typically, trust is assessed in different ways and within specific samples and specific areas of risk. Therefore the concept is still relatively unexplored empirically, and even more so in the field of the acceptability of RW and CO_2 disposal.

3.6 Group Differences in the Acceptability of Radiation Waste and CO_2 Disposal

Several group differences exist in the acceptability of RW and CO_2 disposal. Below we discuss the two most common group differences that are studied in the domain of RW disposal, namely lay *versus* experts and cross-cultural differences.

3.6.1 Lay People *Versus* Experts

Studies on risk perception of RW disposal show that lay people assess risks very differently from experts (Sjöberg 1998). A common finding is that lay people exhibit higher perceptions of hazardous risks involved with RW compared to experts (e.g. Flynn et al. 1993; Purvis-Roberts et al. 2007; Sjöberg 1998). For example, experts assessed risks associated with high-level RW as lower, they showed more trust in programme managers, they perceived more positive consequences of a repository project, and they had more positive images of an RW repository than the general public (Flynn et al. 1993). In another study, Purvis-Roberts and colleagues (Purvis-Roberts et al. 2007) found that lay people were the most risk-averse group, followed by physicians and scientists.

There are several reasons for the difference in risk perception between experts and the public. Experts tend to evaluate the acceptability of a technology on quantitative aspects, while the public focuses on qualitative characteristics (Drottz-Sjöberg and Sjöberg 1991; Gardner and Stern 2002). Experts tend to assess the risks in terms of the probable number of human deaths and the costs of building and operating a power plant, and tend to overlook damage caused to ecosystems and non-human forms of life. Experts judge whether the technology is acceptable overall to society based on whether the technology's quantitative benefits outweigh its quantitative costs. If the benefits exceed the costs, the technology should be acceptable to society. As described in the sections above, various qualitative aspects are important for the acceptability of a technology to the public, such as the extent to which the risk affects future generations or the environment or whether the benefits are equitably distributed among those who bear the risk. Thus, the public uses a broader and more complex definition of risks and acceptability than do experts (Gardner and Stern 2002).

Furthermore, scholars argue that experts perceive hazardous technologies such as RW or CO_2 disposal as more acceptable than the public because they perceive higher levels of personal control and are more familiar with the risky activity than the public (Sjöberg 1998). Either way, the public perceives the risk of dreaded and unknown technologies such as RW disposal as more severe than experts and therefore judge it as less acceptable. As this is a general phenomenon, we have no reason to expect this to be different for the perception of risks and the acceptability of CO_2 disposal.

3.6.2 Cross-Cultural Differences

There are only few psychological studies that have focused on cross-cultural differences in the acceptability of nuclear energy. And, to the authors' knowledge, there are no cross-national studies that have specifically examined cross-cultural differences of attitudes towards RW disposal. From the studies that have been conducted, we can draw some general conclusions on the relationships between cross-cultural aspects on the acceptability of RW and CO_2 disposal.

Wiegman et al. (1995) made a cross-national comparison of risk perception of nuclear energy between France and the Netherlands. In contrast to their expectations, they found that the French had a higher risk perception and a more negative attitude toward nuclear energy than the Dutch. They provided two possible explanations for these results. First, they indicated that French citizens have less power in the decision making process. The government seems to mobilize aversive reactions against nuclear power, because the general public can participate less in decisions on, for example, whether to build a nuclear power plant. This probably results in decreasing perceived procedural fairness. Second, Wiegman and colleagues argue that nuclear technology is more developed in France and therefore the French are probably more exposed to these technologies and the risks they entail. However, other explanations are possible as well, and future research should more specifically examine which explanation is most plausible.

Hohenemser and Renn (1988) showed that attitude stability differs cross-culturally. They assumed that in countries with well formed nuclear attitudes (i.e. where respondents score less on 'don't know' categories), such as the USA, Finland and the UK, acceptability towards RW disposal may be more stable than in countries in which individuals have less formed attitudes, such as Greece or former Yugoslavia. They provided some empirical data on the acceptability of RW before and directly after the Chernobyl accident and a year after the accident. Results showed that in countries in which respondents were more indecisive about supporting or opposing nuclear energy, acceptability changed to a larger extent in a negative direction after the accident than for other respondents. Furthermore, results indicated that countries with well formed attitudes returned faster to their pre-accident level of acceptability towards nuclear power than countries with less formed attitudes. Therefore, for countries with citizens with well formed attitudes, acceptability judgements might be more stable over time even after a negative event than in countries with a large proportion of undecided citizens.

In conclusion, countries vary in the degree to which they oppose or support nuclear energy and RW disposal, and the extent to which these attitudes towards RW are stable. Institutional and structural factors, such as the political system, technological advances and knowledge, have been proposed as possible determinants to explain these differences. However, results of studies on cross-cultural differences have not tested and validated these assumptions. Furthermore, they have not focused specifically on the acceptability of RW and CO_2 disposal. Therefore conclusions remain tentative and future research should reveal which of these factors explain cross-cultural differences in relation to the acceptability of RW and CO_2 disposal most.

4 Summary of Psychological Factors

As explained in Sect. 1, the perception of risks and acceptability of the technology are different constructs. However, some studies used these terms interchangeably. We think both concepts need clear conceptualizations. In our view, the acceptability of

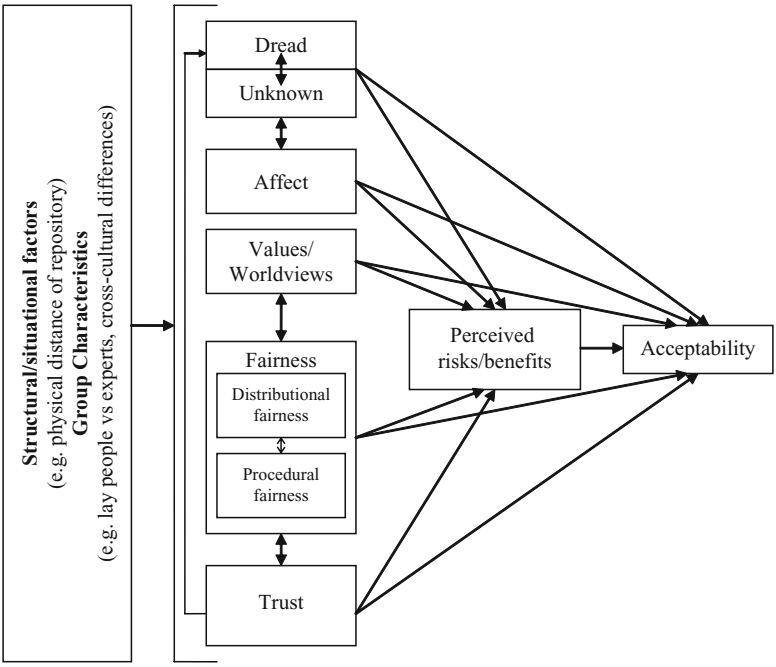

Fig. 1 Psychological factors related to the acceptability of CO_2 disposal

RW and CO_2 disposal is based on the trade-off between perceived costs (the negative consequences) and benefits (the positive consequences), in which the perceived costs are mostly interpreted as the perceived risks involved with RW or CO_2 disposal, as many costs are uncertain. Consequently, acceptability is not solely an evaluation of risks, but is based on weighing risks and benefits (Hisschemöller and Midden 1989): the more a person believes that RW and CO_2 disposal have positive rather than negative consequences, the more RW and CO_2 disposal are evaluated as acceptable.

Figure 1 summarizes the assumed relationships between the psychological factors, perceptions of risks/benefits and acceptability of CO_2 disposal. All these relationships are based on our current knowledge of research in the area of the acceptability of the disposal of RW. The acceptability of CO_2 disposal has received far less attention in psychological studies than the acceptability of RW disposal; therefore we have only made some assumptions on possible psychological determinants of the acceptability of CO_2 disposal based on research on the acceptability of RW disposal. As shown in Fig. 1, the acceptability of CO_2 disposal depends on risk characteristics (dread and unknown), affect, values and worldviews, fairness and trust. We believe that these factors are directly related to the acceptability of CO_2 disposal as well as indirectly, via the perceived risks and benefits of CO_2 disposal. For example, people with strong egoistic values will especially consider risks and benefits of technologies for them personally: when the perceived personal benefits exceed the perceived personal risks they will more likely accept the technology and

vice versa. Another example: If people show more trust in the information that the national government provides about the risks and benefits of the disposal of CO_2, they will more likely perceive the risks and benefits in accordance with this information than people who do not trust this information. These differences in perceived risks and benefits will result in a difference in the acceptability of CO_2 disposal.

Figure 1 also includes some interrelationships between the different psychological factors that we have described in Sect. 3. For example, dread factors are related to affect: previous research showed that the perception of risks and the affective responses to these risks were strongly related to the extent to which a hazard evoked feelings of dread (e.g. Slovic 1987; Slovic et al. 2007). The potential of a high perception of dread for risks associated with CO_2 disposal, such as CO_2 seepage, provide people with negative feelings, and this will consequently result in an acceptability judgement of CO_2 disposal that is not only based on how they think about it, but also on how they feel about it. Another example is the relationship between fairness and values: what people perceive as 'fair' depends on what they value in life. For people who mostly value altruistic aspects in life, a policy to implement a CO_2 disposal would be considered fair when the perceived altruistic benefits (e.g. cheap energy for everyone) of implementing a disposal site would outweigh its perceived costs or risks (i.e. social justice). We also expect that trust may be related to the perceived fairness: if people lack trust in the authorities' judgement about the distribution of risks and benefits when planning to implement a CO_2 disposal site, they will perceive these distributions probably as more unfair than if people do trust the choices that governments or other relevant stakeholders make. Also, it is reasoned that trust may enhance feelings of general and personal control, and therefore people experience less dread. Figure 1 summarizes all the potential relationships between these psychological factors.

Finally, Fig. 1 also shows how structural, situational and group characteristics directly affect the psychological factors of dread and unknown risk characteristics, affect, values and worldviews, fairness and trust, while they affect the perceived risks and benefits of CO_2 disposal and the acceptability of this technology indirectly. For example, in some countries the discussion about CO_2 disposal sites may already be more advanced than in other countries. A difference of this kind may influence to what extent people perceive the risks and benefits based on cognitive aspects or affective aspects (e.g. stigmatizing CO_2 disposal) and, consequently, the extent to which they perceive it as an acceptable technology. We also described how structural and situational factors could change perceived fairness. In the case of a large physical distance between the host community of a CO_2 disposal site and the actual disposal site, the significance of fairness for the perception of risks and benefits and acceptability can decrease because people experience less direct individual risks from the disposal site. So structural factors, such as the location of a CO_2 disposal site, will result in concerns about distributional and procedural fairness, and this will affect acceptability of CO_2 disposal.

Figure 1 summarizes *how* some potential psychological factors may be related to the acceptability of CO_2 disposal. Table 1 summarizes *to what extent* these factors could contribute to the explanation of the perceived risks and benefits and

Table 1 Summary of factors that are regarded as most important determinants of acceptability of radioactive waste and CO_2 disposal

	Acceptability of	
	RW disposal	CO_2 disposal[a]
Risk characteristics:		
– Dread	+	+
– Unknown	+	+
Affect	+	+/–
Values	+	+
Worldviews	+/–	+/–
Fairness:		
– Distributional	+	+[b]
– Procedural	+	+[2]
Trust	+	+

+ = important
+/– = sometimes important, sometimes not important
– = not important
[a] These comparisons are based on assumptions by the authors, as only limited empirical research on CO_2 disposal is available yet
[b] Depends on structural aspects such as the location of site

the acceptability of CO_2 disposal. Table 1 is based on theories and empirical research on the acceptability of RW disposal; we assume that relationships are similar for the acceptability of CO_2 disposal. We emphasize once more that these comparisons are based on our assumptions, because hardly any empirical research on the acceptability of CO_2 disposal is available yet.

The first factor in Table 1 is the amount of dread and the extent to which the risks are unknown. As discussed previously, research has shown that the risks of RW disposal are generally perceived as highly dreaded and unknown and we argued that CO_2 disposal may also be judged as highly dreaded and unknown. Therefore we assume that these risk characteristics are also important factors for explaining the acceptability of CO_2 disposal.

Although research shows that affect is an important factor for the acceptability of RW disposal, we think that the affect heuristic does not play an essential role yet for explaining the acceptability of CO_2 disposal. The consequences of CO_2 disposal are more unknown, and people generally know little or nothing about this type of technology (e.g. de Best-Waldhober et al. 2009). Also, no stigma is associated with this technology yet. Therefore the acceptability towards CO_2 disposal may be mostly based on 'non-attitudes' rather than on affect.

People evaluate the acceptability of RW disposal on the basis of the extent to which important values and worldviews are perceived to be affected by the consequences of this technology. We argued that it is important to study to what extent values are related to acceptability of CO_2 disposal as well, because specific attitudes towards new objects, such as CO_2 disposal, must build on something more stable and relatively enduring in life, and values may provide such a basis (Stern 2000). Worldviews are also perceived as relatively stable; however, empirical research on the acceptability of

RW disposal shows mixed support regarding the contribution of worldviews to explain acceptability judgements. Therefore, we assume that worldviews and especially values will be relevant when explaining the acceptability of CO_2 disposal.

We also argued that policies, such as decisions on RW or CO_2 disposal, are more acceptable when they are perceived to be fair. There is some support for the assumption that fairness is an important predictor for the acceptability of RW disposal (e.g. Ahearne 2000; Summers and Hine 1997; Sjöberg and Drottz-Sjöberg 2001). We believe that both procedural and distributional fairness may be important to explain acceptability of RW and CO_2 disposal. Future research should examine which distributional fairness principle is most prevalent in acceptability judgements.

The final psychological factor that we list in Table 1 is trust. It is assumed that when people have higher levels of trust in decision making authorities and experts, they will perceive the threat as less risky and consequently they evaluate the risky technology as more acceptable. Although empirical data of the relationship between trust and the acceptability of RW shows mixed support (Sjöberg 2001), we do assume that trust is important to explain the acceptability of RW and CO_2 disposal. The limited research in the area of the acceptability of CO_2 disposal and trust shows that trust is indeed an important factor that affects the acceptability of CO_2 disposal (Tokushige et al. 2007). Whether trust is a strong contributor mainly depends on the way it is measured because research measures trust in different ways (i.e. Trust in whom? Trust in what?).

5 Theoretical Implications

Various studies have focused on the acceptability of nuclear energy and, more specifically, on the acceptability of the disposal of RW. Most of these studies were descriptive and explorative in nature. Although of great importance, they have provided less information about which and to what extent psychological factors uniquely contribute to the explanation of acceptability. Moreover, a clear theoretical framework or model on factors influencing acceptability is generally lacking. This makes it hard to compare and relate results from different studies. In this section, we provide frameworks from other domains which might be relevant to understand the acceptability of RW and CO_2 disposal.

A relevant theory that may be used to explain and change acceptability of RW and CO_2 disposal is the 'protection-motivation' theory (Rogers 1983) or its modified version (Gardner and Stern 2002). The theory assumes that acceptability depends on two aspects, namely the perceived costs and benefits of the risks, and the perceived efficacy or amount of control one experiences. We assume that the cost-benefit assessment of the risky activity depends on the risk characteristics of the technology (i.e. dread and unknown), affect, values/worldviews and distributional fairness. In the case of RW and CO_2 disposal, the perceived efficacy and control depends on (possible) responses of relevant authorities to the risky technology, and therefore procedural fairness and trust may be the most relevant factors in this respect.

Another model that may be relevant in explaining the acceptability of RW and CO_2 disposal is the norm activation model (NAM) (Schwartz and Howard 1981). This model focuses on the role of moral obligations to act in favour of the common good, and some extended versions of this model (see e.g. Stern 2000) also explain how egoistic, altruistic and biospheric values may be related to acceptability (e.g. de Groot et al. 2008; Stern 2000). According to the NAM, personal norms, i.e. 'feelings of moral obligation to perform or refrain from specific actions' (Schwartz and Howard 1981, p. 191), influence the acceptability of policies related to RW and CO_2 disposal. When personal obligations towards accepting nuclear energy and CO_2 disposal are strong, there will be more support for policies promoting RW and CO_2 disposal and *vice versa*. Personal norms are activated when someone acknowledges that not accepting RW/CO_2 disposal will lead to negative consequences for self, others or the environment (awareness of consequences), and when someone feels responsible for these negative consequences (ascription of responsibility). If actors fail to activate personal norms, no actions will be recognized as appropriate and no change in acceptability of RW or CO_2 disposal will follow.

The NAM has successfully been applied to explain moral acceptability judgements, such as the acceptability of policies to reduce household energy consumption (Steg et al. 2005) and the acceptability of policies aimed at reducing car use (de Groot et al. 2008). Various scholars have indicated that moral considerations are of primary importance for explaining the acceptability of high risk technologies such as RW and CO_2 disposal (e.g. Gowda and Easterling 2000). De Groot and Steg (2010) provided some first support that the NAM is indeed useful to explain risky technologies such as opposing or supporting nuclear energy. Therefore, the NAM may function as a relevant framework for explaining the acceptability of RW and CO_2 disposal.

Knowing which and how factors are related to acceptability of RW and CO_2 disposal can assist decision makers in choosing which antecedents can best be targeted in programmes to change acceptability. In order to do so, we should systematically study the acceptability of RW and CO_2 disposal via questionnaire as well as (field) experimental studies from a clear theoretical perspective. Such 'diagnostic' studies give specific insight into which factors are most important for changing acceptability. Based on this information, decision makers can select a strategy to change acceptability and monitor how determinants and acceptability are affected by such strategies. The protection-motivation theory and the NAM could function as a point of departure for such studies.

6 Conclusions

Based on this review, we expect that the acceptability of RW and CO_2 disposal has some important commonalities but also some differences that policymakers should take into account when translating psychological research from the acceptability of RW disposal to the acceptability of CO_2 disposal. In this final section we will summarize our findings and discuss some practical implications.

First, CO_2 disposal tends to be evaluated as a highly dreadful and unknown risk because, like RW disposal, CO_2 disposal carries potential short- and long-term risks that are uncertain and potentially dangerous to human health and for the environment. The possible consequences of CO_2 disposal are even more unknown than the consequences of RW disposal because the technology is relatively new. Consequently, the stability of acceptability judgements of RW disposal is probably higher than for CO_2 disposal. A policy implication is that acceptability judgements of CO_2 disposal can be changed more easily than acceptability judgements of RW disposal. Attitudes that are generally stable, such as for the acceptability of RW disposal, are more difficult to change by, for example, media and communication strategies. The 'social judgment theory' (Sherif and Hovland 1961) suggests that the more extreme one's attitude (i.e. towards RW disposal), the greater the amount of rejection of new information, and thus the more difficult it is to persuade someone, no matter what kind of strong or weak arguments you use. This is especially the case when the new information deviates strongly from one's attitude.

We argued that CO_2 disposal is relatively more unknown. The technology suffers less from stigmatization. Yet, and consequently, affect is expected to play a less dominant role in explaining acceptability compared to RW. But still, for both domains, affect should be considered when explaining and changing acceptability judgements. A study by Meijnders et al. (2001) showed that high levels of fear of global warming resulted in more positive attitudes towards the fear reducing object (i.e. using energy saving bulbs), no matter whether arguments were weak or strong, while moderate levels of fear had only a positive effect on attitudes when strong arguments were used (Meijnders et al. 2001). These results indicate that, also in the domain of RW and CO_2 disposal, decision makers should take affect (e.g. fear) into account in their communication about new technologies to the public because communication strategies have to be adjusted based on the amount of affect people experience.

Another important conclusion is that for both the acceptability of RW and CO_2 disposal, conflicts between egoistic, altruistic and biospheric considerations. Therefore moral aspects, such as values, are important when considering acceptability of both technologies. For implementing CO_2 disposal, values and worldviews are even more relevant, as research indicates that acceptability towards new objects is mostly built on stable and relatively enduring antecedents of behaviour, such as values and worldviews (Stern 2000; Stern et al. 1995). Thus, the acceptability of RW and especially CO_2 disposal strongly depends on the extent to which important values are perceived to be affected by these technologies.

Future research should focus on how and to what extent policies related to RW and CO_2 disposal threaten or support values and worldviews. Decision makers can adjust their policies based on this information. For example, when altruistic considerations contribute most to the explanation of acceptability of CO_2 disposal, acceptability should increase when policies focus on benefits for other people (e.g. everybody should have equal access to energy sources; better for the health of people in the community because of less CO_2 emissions). Another advantage of knowing which values and worldviews are threatened by certain policies is that relevant authorities can provide tailored information based on this knowledge.

Tailored information refers to highly personalized and specific information (Abrahamse et al. 2005). For example, for people who are egoistically oriented, information about individual (dis)advantages will be more effective, while for someone who is biospherically oriented, environmental (dis)advantages should be emphasized and environmental risks minimized in interventions to change acceptability. Therefore it is important to study which value orientation (i.e. egoistic, altruistic or biospheric) or worldview is most relevant in explaining the acceptability of RW and CO_2 disposal in more detail.

Distributional and procedural fairness are also important to consider in policies related to RW and CO_2 disposal. Authorities should examine to what extent and why the general public evaluates policies on RW and CO_2 disposal as fair or not, because this will affect acceptability. Different fairness principles may play a role in this respect. However, which distributional fairness principle influences acceptability most? Studies that explicitly studied the role of fairness principles in the transport domain (Schuitema 2010) revealed that environmental justice plays an important role. This suggests that respondents judge policies as fair when these policies are believed to protect nature, environment and future generations. The contribution of various fairness principles in explaining acceptability should also be examined when trying to change the acceptability of policies in the domain of RW and CO_2 disposal.

Policy and decision makers should also consider procedural fairness when implementing policies related to both RW and CO_2 disposal. When the general public does not believe that fair procedures have been used, trust in relevant authorities and acceptability decreases. Therefore communication and public involvement seem pivotal for increasing procedural fairness and, simultaneously, trust and acceptability.

Finally, trust in authorities involved with RW and CO_2 disposal is relevant for explaining acceptability judgements. Trust enhances feelings of general and personal control, which affects the acceptability of these technologies (see Fig. 1). Again, communication and public involvement is of major importance for decision makers to decrease the perceived uncertainty and lack of control, which in turn may increase acceptability as well.

In this chapter we have described psychological factors that have been most relevant in studies on the acceptability of the geological disposal of RW. We have also discussed how these factors may explain the acceptability of the geological disposal of CO_2. On the basis of these findings, we described how acceptability of RW and CO_2 disposal can be changed. Policymakers may adjust or design policies for changing acceptability in connection with RW and CO_2 disposal. We hope that this chapter will help researchers and decision makers to better address acceptability issues in their work and to develop plans that will change acceptability in the intended way.

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