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Individual differences in the aesthetic evaluation of natural landscapes

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Chapter 6

General Discussion

The general aim of this thesis was to gain more insight into the determinants and causes of individual differences in preferences for natural landscapes. Two main questions guided this research. First, it was examined how individual differences in landscape preferences can be predicted by landscape characteristics, personal characteristics, and contextual characteristics. Second, an attempt was made to identify the psychological mechanisms underlying individual differences in landscape preferences. The introductory chapter provided a general overview of theoretical notions and empirical findings relevant to these research questions. The subsequent empirical chapters dealt with these questions in more detail. This final chapter includes an overview and discussion of the main conclusions that can be drawn from the empirical studies. To aid in the interpretation of these conclusions, this chapter will start out with some comments on how preferences for natural landscapes were assessed in the research in this thesis.

Assessing Landscape Preference

In the introductory chapter, the central dependent variable in this thesis was defined as *aesthetic response*. This variable was assumed to be similar in meaning to the concept of *preference*, or general like-dislike response. Consistent with this assumption, the research presented in Chapter 2 revealed that both dependent measures to assess people's evaluations of natural landscapes yielded highly converging results (see also Buhyoff et al., 1981; Daniel & Boster, 1976; Zube et al., 1975, for similar demonstrations). Because, in the Dutch language, it is easier to ask people how beautiful they find a landscape than to ask them how much they 'like' a landscape, beauty ratings were used as the main dependent variable in all studies presented in this thesis. However, to preserve connection with the English-American literature, in which the term 'preference' is more commonly used than 'beauty', results of these studies will be discussed mainly in terms of 'preference'.

It should be noted that preference responses and aesthetic responses were found to converge only when preferences responses were assessed by means of general preferential judgments, or like-dislike responses. When preferences were assessed by means of paired comparisons with respect to specific functions, such as living or cycling, it was found that results obtained with preference responses differed from results obtained with aesthetic responses (see Chapter 3 for a more detailed discussion). Thus, the conclusions about individual differences in landscape preferences as they will be presented in this chapter should be interpreted only in terms of individual differences in *general aesthetic* preferences for natural landscapes.

Summary of Main Conclusions

The main contributions of the research presented in this thesis can be summarized in five conclusions. The *first conclusion* is that the degree of human

influence of natural landscapes constitutes a major source of individual differences in preferences for these landscapes (Chapter 2 to 5). While people were generally found to agree in their perceptions of the degree of human influence of natural landscapes, they varied considerably in their appreciation of this landscape characteristic. The *second conclusion* is that individual differences in the preferred balance between spontaneous and human-influenced processes in natural landscapes are predictably related to personal characteristics, including farming background, environmental concern and expertise, age, and socioeconomic status (Chapter 2, 4, and 5). The *third conclusion* is that the mere context of planned change may exert a negative effect on aesthetic preferences for natural landscapes, particularly if respondents judge the landscapes from a user perspective, and if natural landscapes have a low degree of human influence (Chapter 2). The *fourth conclusion* is that associations between personal characteristics and relative preferences for spontaneous versus human-influenced nature correspond to individual differences in nature images and environmental beliefs, and to individual differences in basic needs and motives (Chapter 4 and 5). Finally, the *fifth conclusion* is that multilevel analysis appears to be a useful and much-needed new tool for the systematic investigation of the interplay between personal characteristics, contextual characteristics, and landscape characteristics in individual differences in landscape preferences (Chapter 2, 4, and 5). These five conclusions, and their implications for theory, practice, and future research, will now be discussed in turn.

Conclusion 1: Degree of Human Influence

Main Findings

The studies presented in Chapter 2 to 5 consistently showed that degree of human influence is a major source of individual differences in landscape preferences. For some, natural landscapes are favored if they are wild, unmanaged, and with a low degree of human influence. Others favor natural landscapes if they are well-kept, orderly, and with a high degree of human influence. These individual differences were found across different samples of landscapes and respondents, across different contexts, and across different measures of degree of human influence and aesthetic response. Thus, interindividual variation in the preferred balance between spontaneous and human-influenced processes in natural landscapes appears to be a widespread and robust phenomenon. Although several authors have suggested that degree of human influence may be an important factor underlying individual differences in landscape preferences (e.g., Hartig, 1993; Kaplan & Kaplan, 1989), the research described in the present thesis provides a first empirical demonstration of the links between perceived degree of human influence and individual differences in landscape preferences.

While people were found to differ in their appreciation of natural landscapes with varying degrees of human influence, they generally displayed high agreement in their perceptions of the degree of human influence of natural landscapes. Importantly, interindividual agreement in perceptions of degree of human influence was found only if degree of human influence was assessed in terms of neutral characteristics such as 'cultivatedness', i.e., the degree to which a landscape is perceived as well-cared-for, or its counterpart, 'roughness'. When such

measures were used, perceptions of degree of human influence corresponded closely to expert perceptions (Chapter 2), were sensitive to actual variations in management strategies among natural landscapes (Chapter 3, 4, & 5), and did not covary with group differences in preferences (Chapter 2 & 4). However, if degree of human influence was assessed in terms of characteristics with a general positive connotation, such as 'biodiversity', or 'naturalness', then perceptions of degree of human influence were found to covary with people's preferences (Chapter 2). Thus, degree of human influence can be measured in an objective manner, but only if it is assessed in evaluatively neutral terms, such as 'cultivatedness' or 'roughness'.

Theoretical Implications

The conclusion that perceived degree of human influence is a major dimension underlying individual differences in landscape preferences is consistent with theoretical explanations of these differences in terms of people's risk perceptions (Abello & Bernaldez, 1986; Bixler & Floyd, 1997; González Bernaldez & Parra, 1979; Ulrich, 1993). According to these explanations, people differ in their preferred balance between spontaneous and human-influenced processes in natural landscapes because they differ in their ability to cope with the risk or danger implied in wild, spectacular natural landscapes with a low degree of human influence. As pointed out by Ulrich (1986, 1993), an important implication of this explanation is that people generally agree in their preferences for unspectacular, nonthreatening natural landscapes.

The research in the present thesis casts some serious doubt on the assumption that people generally agree in their preferences for unspectacular, nonthreatening natural landscapes. Individual differences in preferences were not restricted to wild natural landscapes with an assumed high level of risk or danger. Indeed, people also consistently differed in their preferences for well-kept natural landscapes that presumably entail low levels of implied risk or danger. These findings suggest that people may be differentially repelled and attracted by low as well as high degrees of human influence in natural landscapes.

In the introductory chapter it was discussed that individual differences in preferences for natural landscapes with varying degrees of human influence may often be explained equally well in terms of spatial configuration characteristics, such as the characteristics from the model developed by Kaplan & Kaplan (1989), as in terms of degree of human influence. Although this alternative explanation cannot be definitively ruled out by the available data, it should be noted that no indications were found for interindividual variation in the relationship between people's perceptions of spatial configuration characteristics and their landscape preferences. In the field study described in Chapter 2, ratings of spatial configuration characteristics, including complexity, mystery, and coherence, were found to reflect people's general aesthetic preferences rather than perceptions of spatial configurations. These findings point to a general evaluative factor behind these characteristics, and suggest that alternative ways of measuring these characteristics are needed in order to empirically demonstrate their importance to individual differences in landscape preferences.

Practical Implications

The conclusion that perceived degree of human influence is a major source of individual differences in landscape preferences appears highly relevant to decision making in the context of nature development policy. Experts on nature development have classified natural landscapes into four broad categories ranging from approximately natural landscapes with a very low degree of human influence to multifunctional natural landscapes with a high degree of human influence (Bal et al., 1996). The interindividual variation in the preferred balance between spontaneous and human-influenced processes in natural landscapes found in the present thesis suggests that, for nature-management decisions to receive broad local support, different aesthetic interests must be carefully assessed and weighted appropriately.

With respect to the assessment of individual differences in preferences for natural landscape, the finding that these characteristics may be assessed in an objective manner suggests that it is feasible to incorporate individual differences in practically applicable visual-quality assessment models based on objective landscape characteristics. However, before engaging in costly and labor-intensive endeavors to adjust generic visual-quality assessment models, policy makers and planners may first want to know exactly how important individual differences in preferences for natural landscapes are as compared to interindividual agreement. Unfortunately, this question cannot be answered on the basis of the currently available research, because this research did not include random representative samples of people and landscapes (cf. Stamps, 1996). However, since most land-management decisions in the context of nature development policy are concerned with choosing between plans to develop wild natural landscapes, such as marshes, and plans to develop more human-influenced natural landscapes, such as flowery grasslands, it may be expected that there will generally be a considerable amount of interindividual variation in people's relative preferences for these plans.

Directions for Future Research

The research presented in this thesis suggests two major directions for future research on the role of landscape characteristics in individual differences in landscape preferences. One direction is to translate the spatial configurations characteristics from the theoretical framework developed by Kaplan & Kaplan (1989), i.e., complexity, mystery, coherence, and legibility, into more objectively measurable constructs. In doing so, future studies may extend preliminary theoretical and empirical attempts in this direction made by Brown et al. (1986), Staats (1991), and Ulrich (1983). Once objective measures to assess the perceived spatial configuration of natural landscapes become available, the relative roles of content and spatial configuration in preferences for natural landscapes become open to empirical investigation.

A second direction is to relate perceptions of degree of human influence to perceptions of risk and danger. This research strategy may provide more insight into the validity of theoretical explanations of individual differences in landscape preferences in terms of the risk and danger implied by low degrees of human influence. However, it should be noted that it may not be possible to measure risk

perceptions directly, as natural landscapes are generally not consciously experienced as risky or dangerous, unless they contain explicit elements of danger (Ulrich, 1993). Findings from the study in Chapter 5, which were not reported in this thesis, may serve to illustrate this point. In an attempt to measure risk perceptions, respondents were asked to rate, on a 5-points scale, the applicability of the description 'a landscape that may cause inconveniences and may be harmful to people' to each of the natural landscapes included in this study. The average rating of 1.7 on this dimension indicated that respondents generally did not perceive the landscapes as risky. Moreover, natural landscapes with a low degree of human influence were rated about equally riskless as natural landscapes with a high degree of human influence. These findings suggest that, if risk perceptions play a role in individual differences in preferences for natural landscapes, people may generally not be aware of this. Future work might employ more implicit measures, such as psychophysiological measures (e.g., Cacioppo & Tassinari, 1990; Dimberg, 1990), to further investigate the role of risk perceptions in individual preferences in natural landscapes.

Conclusion 2: Personal Correlates

Main Findings

Individual differences in the preferred balance between spontaneous and human-influenced processes in natural landscapes were found to be systematically related to personal characteristics, including farming background (Chapter 2, 4, and 5), environmental concern and expertise (Chapter 4 and 5), age (Chapter 5), and socioeconomic status (Chapters 2 and 5). More specifically, farmers and people who were being trained to work as farmers, older people, and people with low levels of education and income were found to display relatively strong preferences for natural landscapes with a high degree of human influence, while environmental experts and people who were highly concerned about the environment, younger adults, and people with high levels of education or income were found to display relatively strong preferences for natural landscapes with a low degree of human influence. Taken together, these findings indicate that individual differences in landscape preferences are to a large extent predictable and not, as is often thought, completely random.

Although the various groups that were examined differed in their relative preferences for spontaneous vs. human influenced natural landscapes, beauty ratings were generally in the upper halves of the scales used. Thus, group differences in landscape preferences were restricted to variations in positive evaluations. Moreover, most groups, with the exception of farmers in studies 2 and 4, displayed at least a weak positive preference for natural landscapes with a low degree of human influence. Thus, group differences were mainly restricted to variations in positive relationships between degree of human influence and landscape preferences. These findings are consistent with previous findings indicating that natural landscapes in general, and degree of naturalness in particular, are generally evaluated in a positive manner (see reviews by Hartig, 1993; Kaplan & Kaplan, 1989; Ulrich, 1986, 1993). However, the research in the present thesis qualifies

these findings by showing that people may differ considerably in their relative positive evaluations of natural landscapes with low vs. high degrees of human influences. Thus, general positive evaluations of natural landscapes and naturalness do not necessarily justify the assumption that people generally agree in their preferences for natural landscapes.

In addition to the significant findings, some nonsignificant findings also deserve mention. First, gender, a variable that has repeatedly been found to be a significant predictor of relative preferences for spontaneous vs. human-influenced natural landscapes (e.g., Abello & Bernaldez, 1986; Dearden, 1984; Sonnenfeld, 1967; Strumse, 1996), did not emerge as a significant predictor in the current studies. Furthermore, familiarity, defined in terms of the duration of exposure to the study areas included in the present thesis, was also found to be nonpredictive of individual differences in preferences for natural landscapes. These nonsignificant findings may be explained by the fact that the research in the present thesis, unlike previous studies, statistically controlled for the influences of other personal characteristics while determining the effects of single personal characteristics. Moreover, effects of personal characteristics on landscape preferences were estimated for the whole range of natural landscapes included in the studies, not just for single subcategories of natural landscapes. These results underline the importance of multilevel analysis as a tool for disentangling the relative contributions of different factors underlying landscape preferences.

Theoretical implications

Most explanations of individual differences in preferences for natural landscapes have focused on familiarity as a central influential personal characteristic (Kaplan & Kaplan, 1989). The results of the present study do not provide support for such a central role of familiarity, at least not when this variable is defined as the mere duration of exposure to different locations, regions, or landscape types. In the field study in Chapter 2, time lived or spent in the agrarian landscape of the study area did not emerge as a significant predictor of the relationship between cultivatedness and landscape beauty. In the survey in Chapter 5, landscape preferences were not found to differ systematically as a function of residential area. Respondents from only one area, a highly cultivated area, were found to display stronger preferences for natural landscapes with a high degree of human influence than respondents from the other areas. Although this finding may be interpreted in terms of a high familiarity with cultivated landscapes, it may also be interpreted in terms of other variables, such as the high percentage of farmers in this area, which may have led nonfarmers to identify with the farmers' subculture. Thus, the current research provides little support for the importance of familiarity as a predictor of individual differences in preferences for natural landscapes.

While the results of the present thesis are generally not very consistent with an interpretation of individual differences in terms of familiarity, they appear to be highly compatible with an interpretation of these differences in terms of people's vulnerability to the risks and dangers implied in natural landscapes (Bixler & Floyd, 1997; González Bernaldez & Parra, 1979; Ulrich, 1993). In general, groups that may be expected to be vulnerable to the risks implied by a low degree of human

influence, such as farmers, older people, and people with a low socioeconomic status were found to display relatively strong preferences for well-kept natural landscapes with an assumed low degree of implied risk, while groups that may be expected to be relatively invulnerable to the threats implied by a low degree of human influence, such as people with expert knowledge of natural landscapes, younger people, and people with a high socioeconomic status, were found to display relatively strong preferences for wild natural landscapes with an assumed low degree of implied risk. Thus, the ability of personal characteristics to predict individual differences in relative preferences for natural landscapes with low vs. high degrees of human influence appears to depend on the significance of these characteristics for people's vulnerability to the threats implied by natural landscapes with a low degree of human influence, rather than on the degree of familiarity with natural landscapes implied by these personal characteristics.

A recent study by Van den Berg & Koole (1999) provides some preliminary evidence for the hypothesis that individual differences in landscape preferences reflect individual differences in vulnerability to the risks implied by a low degree of human influence. Using the 'mortality salience paradigm', which has been developed within the framework of Terror Management Theory (Greenberg, Solomon, & Psyszczynski, 1997; Solomon, Greenberg, & Psyszczynski, 1991), respondents were either asked to think about their own death, or to think about a neutral topic, prior to evaluating slides of natural landscapes with varying degrees of human influence. Results of this study showed that respondents who were reminded of their own mortality displayed lower preferences for natural landscapes with a low degree of human influence, and higher preferences for natural landscapes with a high degree of human influence than respondents who were not reminded of their mortality. As thinking about one's death may be assumed to make people more anxious, and thus, more vulnerable to threats, these results provide some experimental support for the hypothesis that people's vulnerability to risks and threats is an important factor underlying individual differences in landscape preferences.

Practical Implications

The research described in the present thesis included groups of respondents that corresponded to common policy distinctions of local interest groups into farmers, residents, visitors, and special interest groups, such as environmentalists. As these groups may be found in most nature development areas, their differential response to natural landscapes with varying degrees of human influence are of great interest to policy makers and planners. In general, a distinction between farmers and environmentalists, i.e. people with a special interest in or knowledge about nature, was found to be highly predictive of individual differences in preferences for natural landscapes. However, the frequently made distinction between residents and visitors was not found to be very predictive of individual differences in landscape preferences. With respect to individual differences in landscape preferences, distinctions based on age and socioeconomic status appear to be more informative.

With respect to the development of visual-quality assessment models that are sensitive to individual differences, the finding that these differences were

systematically related to objectively measurable personal characteristics as well as to objectively measurable landscape characteristics further enhances the feasibility and potential applications of such models. Most importantly, by incorporating sociodemographic correlates of individual differences in landscape preferences in visual-quality assessment models, policy makers and planners may be able to predict preferences for alternative management plans on the basis of information about the sociodemographic composition of a plan area.

Directions for Future Research

While the findings presented in the current thesis provide important insights into the personal correlates of individual differences in preferences for natural landscapes, the present results on this topic should by no means be regarded as conclusive. In order to obtain a comprehensive overview of all personal correlates of individual differences in preferences for natural landscapes, future studies of landscape preference should continue to invest in employing heterogeneous samples. The relative importance of various personal characteristics to individual differences in landscape preferences may be studied by means of multilevel analysis.

Future research may also include dispositional characteristics relevant to risk-taking behavior, such as sensation-seeking (Zuckerman, 1979; Zuckerman, Ulrich, and McLaughlin, 1993), to further investigate the hypothesis that individual differences in preferences for natural landscapes reflect people's differential vulnerabilities to the risks implied by low degrees of human influence. Alternatively, manipulating people's vulnerability to risks implied in natural landscapes may also be a promising avenue for future research. In doing so, future studies may extend preliminary work in this direction by Van den Berg & Koole (1999).

Conclusion 3: The Context of Planned Change

Main Findings

The research described in the present thesis was carried out in the context of the introduction of nature development plans as outlined in the '1990 Dutch Nature Policy Plan' issued by the Dutch Ministry of Agriculture, Nature Management, and Fisheries. In order to obtain a preliminary assessment of the influence of the context of planned change on preferences for natural landscapes, one may compare the results that were found in the studies reported in Chapter 2 and 5, which were explicitly conducted in the context of planned change, to the results of the study that was reported in Chapter 4, which was conducted in a more neutral context. This comparison reveals that individual differences in landscapes preferences may be found under planned-change circumstances as well as under neutral circumstances. Thus, the influence of planned-change context seems unable to account for the pervasive finding that people differ in their preferred balance between spontaneous and human-influenced processes in natural landscapes. For example, in the study on the evaluation of planned changes described in Chapter 2, group differences in landscape preferences between farmers and other groups appeared to be greater than those found in the study conducted in a neutral context

(described in Chapter 4), whereas in the other study on the evaluation of planned changes described in Chapter 5, group differences in preferences between farmers and other groups appeared to be smaller than those found in a neutral context.

While the foregoing -rather casual- comparison across different studies may have offered little support for an independent influence of planned-change context, the more rigorous investigation of planned-change context described in Chapter 3 yielded more insightful outcomes. In this experimental study, natural landscapes were either described as existing landscapes, or as plans for nature development. The results showed that the context of planned change may exert a negative influence on preferences for natural landscapes, particularly if natural landscapes possess a low degree of human influence, and if respondents judge these landscapes from the perspective of a resident or a cyclist.

Theoretical Implications

The finding that the context of planned change may exert an independent influence on preferences for natural landscapes demonstrates that evaluations of natural landscapes depend to an important degree on the type of knowledge that is activated at the moment of judgment. In other words, landscape evaluations are to a large extent relative rather than absolute. In this respect, landscape evaluations appear to operate according to the same principles as evaluations of other objects and people (for a review, see Tesser & Martin, 1996). In general, the context in which a landscape is embedded may provide a frame of reference for interpretation, selection, and judgment, and thus may help people to form an impression of the landscape. Hence, the same landscape can be associated with different responses, depending on the particular knowledge that is contextually activated at the time of judgment.

What kinds of knowledge are activated by the context of planned change? The results obtained in Chapter 3 suggest that the risky information content of planned changes may be an important factor underlying effects of planned-change context on landscape preferences (cf. Lopes, 1986). First, only preferences by respondents who can be expected to be threatened by the introduction of planned changes, such as residents and cyclists, were affected by the planned change context. Furthermore, only natural landscapes that may be assumed to imply a major threat to the typical rural character of the status quo, such as unmanaged, wild landscapes, were evaluated more negatively when they were presented as planned changes.

Clearly, the results obtained in Chapter 3 are not only consistent with a risk-perception explanation. For instance, the fact that people generally have little control over planned changes may also be an important factor underlying negative effects of planned-change context on landscape preferences (Winkel, 1981). However, unlike these alternative accounts, the concept of risk is also potentially capable of explaining why people may differ in their preferences for spontaneous vs. human-influenced natural landscapes. Therefore, risk perception appears to be a powerful and parsimonious theoretical construct, that holds the promise of an integrative and parsimonious framework for understanding both contextual and interindividual variations in preferences for natural landscapes.

Practical Implications

The findings of the research presented in Chapter 3 provide some support for the popular belief that negative evaluations of plans to develop natural landscapes with a low degree of human influence by user groups such as residents and visitors may be context-induced. However, it would be premature to derive practical guidelines for policy strategies in the area of nature development on the basis of this single study, especially since the results of this study indicate that planned-change context, in and of itself, did not cause a rejection of planned changes in favor of the status quo. For the time being, given the limited knowledge about the influences of planned-change context, obtaining preference data in each specific nature development area would appear to be an important element in any nature development procedure.

Directions for Future Research

The research in Chapter 3 of this thesis fills an important void in the literature on landscape evaluation by studying the independent influence of planned-change context on landscape preferences while controlling for other variables. Naturally, because it comprises of a single study, there remain many potentially relevant variables that need to be addressed. For example, the study in Chapter 3 did not vary the characteristics of the existing landscape. Future work may systematically explore the influence of different types of existing landscapes. Furthermore, because the study in Chapter 3 included only four natural landscapes, multilevel analysis could not be applied to analyze the results of this study. Therefore, conclusions about the moderating role of landscape characteristics on the influence of planned-change context on landscape preferences had to remain tentative. By including larger samples of natural landscapes, future studies may gain more insight into the interplay between contextual and landscape characteristics in landscape preferences.

Conclusion 4: Cognitions and Motivations**Main Findings**

The research presented in Chapter 4 investigated nature images and environmental beliefs as cognitive mechanisms that may underlie individual differences in the preferred balance between spontaneous and human-influenced processes in natural landscapes. Similar descriptive and normative cognitive constructs have enjoyed considerable popularity as potential explanations of individual differences in landscape preferences (e.g., Balling & Falk, 1982; Kaplan & Kaplan, 1989; Lyons, 1983; Ulrich, 1983; Wohlwill, 1983). Nevertheless, to our knowledge, the ability of cognitive factors to account for individual differences in landscape preferences was never subjected to empirical testing prior to the research described in Chapter 4.

While environmental beliefs were assessed using an existing measure (the NEP-scale developed by Dunlap and Van Liere, 1978), no direct, independent measures of nature images were available. Therefore, an important contribution of the research described in Chapter 4 lies in the development of an independent

measure to assess nature images. This measure relied on prototypicality ratings of a selection of different instances of nature. Factors underlying these prototypicality ratings could be interpreted in terms of ecocentric versus anthropocentric nature images. Both nature images and environmental beliefs were found to vary across students from different educational disciplines. Students of agriculture displayed relatively anthropocentric nature images and environmental beliefs, while students of biology displayed relatively ecocentric nature images and environmental beliefs. Although this pattern closely matched predictions, group differences in nature images and environmental beliefs could not account for group differences in landscape preferences. In spite of this negative result, the sensitivity of the newly developed measure to group differences in nature images is a promising indication of its potential to tap variations in cognitive images of natural landscapes.

The ability of basic needs and motives to account for individual differences in landscape preferences was investigated in Chapter 5. A self-report measure was constructed, that assessed nature experience motives by asking respondents to indicate to what extent a number of reasons for visiting nature applied to them. The different reasons were generated to represent Alderfer's (1972) three basic need categories: (a) existence, (b) relatedness, and (c) growth. A confirmatory factor analysis indeed yielded a factor structure that was interpretable within this theoretical framework. Furthermore, it was found that these three need factors exerted a systematic influence on individual differences in relative preferences for spontaneous vs. human-influenced natural landscapes, that remained significant after other sociodemographic variables were statistically controlled for. Importantly, additional analyses revealed that nature experience motives were able to partly explain group differences in landscape preferences. Environmentalists' strong preferences for natural landscapes with a low degree of human influence could be explained in terms of their strong growth needs, and their weak existence/relatedness needs. In addition, farmers' strong preference for natural landscapes with a high degree of human influence could be partly explained by their strong relatedness/existence needs, and their weak growth needs. Taken together, the studies described in Chapter 4 & 5 represent a promising first step towards unraveling the psychological mechanisms underlying individual differences in landscape preferences.

Theoretical Implications

Individual differences in cognitive images of nature have been widely assumed to be an important source of individual differences in landscape preferences (Balling & Falk, 1982; Kaplan & Kaplan, 1989; Lyons, 1983; Ulrich, 1983; Wohlwill, 1983). The research presented in Chapter 4 provides some support for this assumption by demonstrating that students from different educational disciplines, who differed in their farming background and environmental expertise, displayed systematic differences in nature images and environmental beliefs. However, statistical analyses revealed that group differences in landscape preferences were still present after controlling for individual differences in nature images and environmental beliefs. Thus, these findings may cast serious doubt on the ability of nature images and environmental beliefs to explain group differences

in preferences for natural landscapes. It must be remembered, however, that the research presented in Chapter 4 represents the first systematic exploration of the role of nature images and environmental beliefs in individual differences in landscape preference. Therefore, any conclusion regarding the explanatory power of these constructs in this area must be regarded as tentative. Regardless of the outcomes that future research may bring, the new methodology to assess individual differences in nature images, whose development is documented in Chapter 4, offers a powerful new tool for the study of cognitive images of natural landscapes.

By showing that individual differences in behavioral needs may underlie group differences in landscape preferences, the research presented in Chapter 5 highlights the functional role of landscape preferences. Perceptions of beauty may contain information regarding the need-fulfilling potential of natural landscapes which may direct people towards landscapes that hold much promise of fulfilling their basic needs. Thus, people appear to be more than merely passive observers of natural landscapes. Rather, they should be conceived of as purposive agents acting upon specific needs and desires (cf. Canter, 1983; Hartig, 1993; Ittelson, 1973; Zube, 1987). Importantly, the finding that behavioral needs were predictive of people's aesthetic responses to simulations of natural landscapes provides further support for the significance of aesthetic responses as a measure of scenic quality.

While basic motives and needs, such as needs to understand and explore landscapes, play a prominent role in explanations of interindividual agreement in landscape preferences (e.g. Kaplan & Kaplan, 1989; Orians, 1980; Ulrich, 1983), motivational explanations of individual differences in landscape preferences have been largely neglected. The belief that such explanations are incompatible with evolutionary explanations of landscape preferences appears to be an important underlying reason for this neglect of motivational explanations of individual differences in landscape preferences. According to evolutionary explanations, people's landscape preferences today are still driven by basic needs and motives that enabled earlier primates to seek out adaptive environments that promote survival (e.g., Appleton, 1975; Kaplan, 1987; Orians, 1980; Ulrich, 1983). Because individual differences in the strength of basic needs and motives would lower the species' chances of survival, such differences appear to be difficult to reconcile with general evolutionary accounts.

However, evolutionary accounts do not necessarily imply that the relative strength of basic motives is similar across people. Exposure to different cultural or demographic conditions may give rise to differences in basic needs and motives without disrupting the adaptive function of human behavior (Tooby & Cosmides, 1990). Thus, the conclusion that individual differences in landscape preferences are caused by individual differences in motivations rather than by individual differences in cognitions is not necessarily at odds with evolutionary theories of landscape preferences. Likewise, it also does not provide support for cultural theories of landscape preferences. As discussed in the introduction, research on individual differences in landscape preferences generally offers little evidence for the tenability of general biological or cultural theories.

Practical Implications

From an applied perspective, the differences in nature images found across groups with agricultural and nonagricultural backgrounds have important implications for the way in which plans for nature development should be communicated to the local public. If nature development plans are communicated as plans to increase the naturalness and biodiversity of an agrarian area, then farmers may question the usefulness of these plans, because, in their conceptions, the existing agrarian landscape already is a natural and biodiverse landscape. In order to avoid such miscommunications, it is recommendable that definitions of the concepts of 'naturalness' and 'biodiversity' are made explicit by all parties involved (cf. Lamb & Purcell, 1990).

The finding that behavioral needs are an important factor underlying differences in landscape preferences between local groups such as farmers and environmentalists may enable planners and land managers to adjust nature development plans in such a way that they meet the most important needs of local interest groups. In turn, this may facilitate the task of land-use committees and other authorities to select plans that receive wide-spread local support.

Directions for Future Research

In the present thesis, cognitive and motivational explanations of individual differences in landscape preferences were investigated in two different studies, which included different sets of landscapes, different groups of respondents, and were conducted in different contexts. Therefore, conclusions about the relative importance of these two mechanisms must necessarily remain tentative. Further understanding of the psychological mechanisms underlying individual differences in landscape preferences may come from simultaneously examining the roles of cognitions and motivations. This research strategy may provide a more conceptually balanced and integrated view of individual differences in landscape preferences.

In years to come, research may also concentrate on developing and validating better instruments for measuring environmental cognitions and motivations. Given the limited amount of previous research on the role of cognitions and motivations in landscape preferences, the studies in the present thesis had to construct and employ new measures. In particular, future work may be directed toward constructing representative sets of items that cover the entire ranges of nature images and nature experience needs.

Conclusion 5: Multilevel Analysis

Main Findings

In general, people's preferences for natural landscapes may be studied at two different levels. At the level of landscapes, one may investigate the influences of systematic differences between landscapes. At the level of individuals, one may investigate the influences of systematic differences between people (cf. Dearden, 1981, 1987; Levine, 1994, 1996). Until recently, most empirical investigations of the determinants of landscape preferences were restricted to one of these two levels of analysis, leaving questions about determinants at the other level unanswered. In the

present thesis, limitations of choosing one level of analysis could be overcome by adapting a recently developed statistical technique, called multilevel analysis, to the study of landscape preferences (Bryk & Raudenbusch, 1992; Kreft & De Leeuw, 1998). In brief, individual beauty ratings were regressed on landscape characteristics as well as personal characteristics while controlling for dependencies in the data due to the fact that beauty ratings were nested within individuals. To perform these regression analyses, a two-level model of landscapes within individuals was estimated using MIn, a program for the analysis of hierarchically nested data (Woodhouse, 1995). This model accounted for between-individual variation in mean beauty ratings as well as for between-individual variation in the relationships between landscape characteristics and beauty ratings.

By employing multilevel statistical techniques, the research in the present thesis was able to address questions about individual differences in landscape preferences that until now could not be reliably assessed by single-level statistical techniques. In the study presented in Chapter 2, multilevel analysis was used to investigate the moderating role of personal characteristics in relationships between landscape characteristics and landscape preferences. In the studies presented in Chapter 4 and 5, the use of multilevel analysis was extended by investigating the mediational role of cognitive and motivational mechanisms in effects of personal characteristics on relationships between landscape characteristics and landscape preferences. Because the current research did not directly compare results of multilevel methods with results of single-level statistical techniques, conclusions about the contributions of multilevel methods to the study of landscape preferences must necessarily remain tentative. Nevertheless, the research presented in this thesis suggests that multilevel analysis is a promising new tool for studying the determinants and causes of individual differences in landscape preferences.

Theoretical Implications

The issue of which level of analysis, the level of landscapes or the level of individuals, is most appropriate for studying landscape preferences has been the focus of much debate in the field of landscape evaluation (e.g., Dearden, 1981, 1987; Jacques, 1980; Purcell & Lamb, 1984; Shuttleworth, 1981; see also Van den Berg, 1995a). As Dearden (1987) has pointed out, this issue has important theoretical implications. Analyses at the level of landscapes draw researchers' attention to interindividual agreement in landscape preferences, while leaving interindividual differences undetected. Analyses at the level of individuals, on the other hand, highlight interindividual differences in landscape preferences, while leaving interindividual agreement undetected. Thus, the application of single-level techniques appears to confirm a-priori theoretical assumptions concerning the degree of consensus among observers, rather than to provide fair empirical tests of these assumptions.

Multilevel analysis may provide an important breakthrough in the long-standing debate about the relative importance of personal characteristics and landscape characteristics to landscape preferences by offering a statistical technique that is unbiased by researchers' a-priori theoretical assumptions. Moreover, multilevel analysis allows researchers to move beyond the traditional people vs.

landscapes dichotomy by addressing more fundamental questions about the underlying causes of individual differences in landscape preferences.

Practical Implications

As pointed out before, individual differences can only be effectively incorporated in visual-quality assessment models if they can be related to both objectively measurable landscape characteristics and personal characteristics. By enabling researchers to study the interplay between personal and landscape characteristics, multilevel analysis further enhances the feasibility of developing visual-quality assessment models that comprise individual differences in landscape preferences.

Directions for Future Research

The research in the present thesis has taken a first important step to adapt multilevel analysis to the study of landscape preferences. Further steps are required to establish multilevel analysis as the new statistical standard for the field. First, multilevel packages in their present form, such as the MIn package (Woodhouse, 1995), are applicable to a wide range of research problems, which makes it very difficult to select an appropriate model from the sheer infinite possibilities offered by these packages. Developing more user-friendly statistical packages that are especially adapted to the study of landscape preferences would greatly facilitate the use of multilevel analysis in the field of landscape evaluation and enhance the comparability of results. Furthermore, in order to develop such a package, it is necessary to carry out more systematic investigations of the relative merits of various statistical models that may be applied to the study of landscape preferences, and to compare the results of these models to the results of single-level statistical techniques, such as ordinary regression analysis.

Concluding Remarks

The present thesis has highlighted individual differences in preferences for natural landscapes. In spite of many potential caveats, the present work has begun to unravel the various determinants and underlying mechanisms of individual differences in landscape preferences. Individual differences in landscape preferences were analyzed theoretically and empirically. The empirical analysis employed a novel and powerful statistical analysis, introduced the systematic study of contextual factors to the study of landscape preference, and developed new empirical measures to assess key cognitive and motivational constructs. Moreover, much effort was invested into obtaining data from a diverse range of respondents, who were sampled across different sociodemographic groups and geographic areas. Each of the studies presented, viewed in isolation, simultaneously provides answers and raises new questions. Taken together, however, these studies are remarkably consistent in demonstrating the pervasiveness of individual differences in the preferred balance between spontaneous and human-influenced processes in natural landscapes. Thus, a full understanding of landscape evaluations needs to take into account that different

people may attach different meanings to nature and may derive different satisfactions from it.

