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Cultural and space-based factors influencing recreational conflicts in forests. The example of cyclists and other forest visitors in Freiburg (Germany)

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More and more people are visiting forests for recreational and leisure purposes. Against this backdrop, conflicts have become rampant mainly due to limited spaces and conflicting recreational expectations. Recreational conflicts have the tendency to diminish the satisfaction that a visitor derives from leisure activities in the forest. This is a challenge not only to forest management but also to tourism product development. The study investigates recreational conflicts in forests by conducting a nationwide online survey. Conflicts were described based on how intensively they are discussed in public, how emotionally they are treated, and based on the willingness of the respondents in finding solutions to the conflicts. In order to investigate the factors that contribute to conflict genesis, the example of conflicts between cyclists and other forest visitors was researched by an on-site survey in Freiburg (Germany). The results show that cultural factors influence conflict genesis. For example, the activity style of recreationists and their mode of experience play an important role in conflict genesis. Both are cultural factors, when following a value-based understanding of culture. However, not all recreational conflicts are judged as highly emotional; instead, they seem to be an expected part of forest visits. The study concludes with recommendations for tourism product development and forest management.

KEYWORDS

activity style, mode of experience, resource specificity, goal interference, social value conflict

Introduction

Forests are increasingly important for leisure and recreational activities (Mann et al., 2010; Riccioli et al., 2019). This trend has intensified, especially in times of COVID (Derks et al., 2020; Kim et al., 2023). The rise of nature-oriented lifestyles is contributing to this as well (Hunziker et al., 2011; Hermes et al., 2021). Against this backdrop, the number of people visiting forests has increased (Türk et al., 2004; Wilkes-Allemann et al., 2022). The demand for forest space has grown and previously unused landscapes are being used for

leisure purposes (Dufft, 2019). This contributes to the genesis of recreational conflicts (Arnberger and Mann, 2008; Vaske, 2019).

Conflicts can be understood as an “indicator of social carrying capacity in recreation” (Tynon and Gómez, 2012, p. 532). This means that forest landscapes have a limited ability to absorb a growing number of recreationists, especially if they practice different kinds of activities or bring in different kinds of recreational aspirations. Slow and fast activities or visitors with the need for tranquil relaxation may cannibalize each other (Wilkes-Allemann et al., 2015a).

However, these conflicts often can't be described objectively (Vaske et al., 1995; Cessford, 2003). Subjective perceptions, values and expectations play an important role. Thus, there might be divergent opinions as to how forests should be used as recreational spaces. However, cultural drivers have received little attention in conflict research up to now (Watson et al., 1994; Vaske et al., 2000; Volz and Mann, 2006). By following the value-based concept of culture as defined by Hofstede (1980), this is where this paper makes its contributions.

Firstly, the paper looks at the main conflict issues in the forests. The spectrum of forest conflicts is broad and ranges from conflicts between forest visitors, to conflicts with forest management, or with nature conservation (Graefe and Thapa, 2004; Mann and Absher, 2008; Wilkes-Allemann et al., 2017). With the help of an online survey, which was undertaken nationwide in Germany, the main issues and characteristics of recreational conflicts in forests are identified. Secondly, the paper investigates the factors that influence conflict genesis. The focus is on cultural and space-based factors. The conflict between cyclists and other forest visitors is analysed more in depth because it is a recent phenomenon in Germany (Rousek, 2021; Könen, 2023).

The rest of the paper is structured as follows: firstly, a literature review is done, which sheds light on the core concepts of the study and on key drivers of recreation-based conflicts. This is followed by the methodology. The paper includes two studies, which were carried out on different geographical levels (national versus regional) and complement one another in terms of contents. Both studies are reported on methodologically. The results section contains the most important results of the two studies. The discussion section of the paper relates the results to existing research as reported in the literature review. The two research questions will be answered in the discussion part as well. The paper concludes with recommendations to inform policy decisions by management of forest resources.

Literature review

Research on conflicts is done in a wide variety of disciplines, including psychology (Böhm et al., 2020), sociology (Rahim, 2023) and politics (Wolak, 2022). With regard to recreational

conflicts, various groups of outdoor activities have been researched, e.g., skiers and snowboarders (Vaske et al., 2004) or skiers and snowmobiles (Knopp and Tyger, 1973; Jackson and Wong, 1982), hunters and non-hunters (Vaske et al., 1995), hikers and mountain bikers (Ramthun, 1995; Carothers et al., 2001), riders and backpackers (Stankey, 1973) or canoeists and motor boaters (Lucas, 1964; Adelman et al., 1982). However, it should be noted that most of these studies are rather old. New studies do not focus much on sources of conflicts, but on the governance of forest recreation and solutions for potential conflicts (Wilkes-Allemann et al., 2015a; Wilkes-Allemann et al., 2015b; Wilkes-Allemann et al., 2017). Nevertheless, it is clear that recreation-based conflicts are diverse and need to be understood in their character before solutions may be developed (Mann and Absher, 2007; Needham et al., 2008; Wong and Yu, 2012; Pröbstl-Haider et al., 2018).

Definition of recreational conflicts

To understand recreation-based conflict it is helpful to distinguish between two traditions of concepts (Graefe and Thapa, 2004; Vaske, 2019; Kleiner et al., 2022). According to the first tradition, recreation-based conflicts are based on conflicting goals. This is when one group is disturbed by the activities of another group (Jacob and Schreyer, 1980; Bury et al., 1983). For example, this might happen if two recreational groups meet each other and sense a “lack of courtesy” or even behaviour that gives reason to safety concerns (Carothers et al., 2001, p. 49). For this kind of conflict, social contact is necessary. This might be direct face-to-face contact. But also indirect social contact, such as someone perceives other people's traces of use in the forest and does not appreciate that (Jacob and Schreyer, 1980; Thapa and Graefe, 2003). Conceptually, this conflict is defined as an *interpersonal conflict* (Vaske et al., 2007; Vaske, 2019).

The second tradition does not require social contact for conflict genesis. At the heart of this view are ideas about what behaviour is socially acceptable (Vaske et al., 2000; Vaske et al., 2007; Vaske, 2019). These conflicts are based on expectations of the behaviour of others and the question of what appropriate behaviour is (Tynon and Gómez, 2012). In particular, it concerns ideas on how recreational infrastructures or spaces should be used (Wilkes-Allemann et al., 2015b). For this conflict, it is not necessary to directly experience deviant behaviour. Instead, hearing about it, might be enough. This group of conflicts is termed *social norm conflicts* (Vaske et al., 2000; Carothers et al., 2001; Tynon and Gómez, 2012).

Both traditions are intertwined in reality. Vaske et al. (2007) point out that interpersonal and norm-related conflicts are usually experienced simultaneously. This means more than one type of conflict might be sensed at the same time. For the definition of the term “conflict” it is therefore useful, to merge both traditions. In this vein, conflicts can be defined as “perceived

incompatibility of goals or values between two or more individuals” (Schachinger, 2020, p. 11).

Types of recreational conflicts

Recreational conflicts usually are idiosyncratic. That means that they cannot be compared easily and exhibit a unique character. Thus, conflicts may exhibit a different extent of symmetry. A symmetric conflict is perceived equally problematic by all parties involved. Asymmetry, on the other hand, means that groups involved do not perceive a situation similar conflictual (Vaske et al., 2000; Tynon and Gómez, 2012). For example, Kleiner et al. (2022) report that hikers feel more disturbed by mountain bikers than *vice versa*. The reasons for the different judgement vary widely and range from expectations (Fredman and Hörnsten, 2001; Budruk et al., 2002) to previous experiences and the recreationists abilities (Thapa and Graefe, 2003). In principle, it must be noted that conflicts are subjective and socially constructed: “It is important to recognize that conflict [...] is not an objective state but must be understood as an individual’s interpretation [...]” (Jacob and Schreyer, 1980, p. 369).

Secondly, conflicts may relate not only to recreationists performing different activities, but also to individuals who do the same sport or activity. Whereas the first constellation is termed out-group-conflict, the second one is an in-group-conflict (Thapa and Graefe, 2003; Tynon and Gómez, 2012; Kleiner et al., 2022). An example for this is the group of mountain bikers. Mountain biking may be divided into several subgroups like touring, down-hill or enduro. Usually, the motives and lifestyles of these sub-groups differ, thus giving rise to potential conflict (Mann and Absher, 2007). Similarly, the conflict between mountain biking and e-mountain biking is reported (Schachinger, 2020). Overall, however, recreation-based conflicts appear to be more a matter of out-group-, than in-group-relations (Kleiner et al., 2022).

A third aspect characterizing conflicts is intensity. Vaske et al. (2000) and Carothers et al. (2001) sketch a continuum of undesirable recreation behaviour, ranging from a lack in awareness to actively inconsiderate behaviour. Other studies record the extent of conflicts by measuring the satisfaction of recreationists, in particular, the satisfaction with meeting others while performing their leisure activity (Watson et al., 1991; Wong and Yu, 2012; Kleiner et al., 2022).

Space and culture as drivers of recreational conflicts

One factor that influences conflict genesis is recreational space (Jacob and Schreyer, 1980; Vaske, 2019). Recreational space includes recreational infrastructures such as hiking trails

as well as geographic features, such as slope, outlooks or vegetation. Recreationists might be dependent on these features in performing their leisure activities. Thus, a downhill MTB needs a slope or suitable mountain bike trails. Dependency on certain features, however, results in a limited ability to change the place. This means that experiencing the place according to one’s own expectations is even more important, since there are no alternatives. Place dependency, therefore, contributes to conflict sensitivity (Mann and Absher, 2007). However, it is not only the physical dependency on a place, but also an emotional or subjective preference for the place, which might trigger conflict.

In addition, norms and values might have an effect on how sensitive recreationists are to conflicts. Here, culture as a component of conflict genesis comes into play. Culture, in this context, is understood as shaped by values, which are shared by groups (Straub et al., 2002). In this vein, already Kluckhohn (1951) conceived culture as “patterned ways of thinking, feeling and reacting” (p. 86). Erez and Earley (1997) speak of culture as the “shared way a group of people view the world” (p. 23). The present study’s understanding of culture is based on Hofstede (1980), who defines culture as “the collective programming of the mind which distinguishes the members of one human group from another” (Hofstede, 1980, p. 260). Taken this together, outdoor recreation is understood as a culturally bound activity, in which recreationists attribute values to forest visits, which might vary according to their group-membership. They also might dispose of certain normative expectations what to do in forests or how to behave in forests, which might be group-specific. These differences in attitudes towards forests, in turn, might result in incompatible modes of forest visitation that, in the end, might lead to conflicts (Thapa and Graefe, 2003; Vaske et al., 2007; Vaske, 2019). In this regard, Thapa and Graefe (2003, p. 17) speak of a “clash of cultures” recreationists experience in recreational conflicts.

Spatial aspects

The single factor most frequently mentioned for conflict genesis is *resource specificity* (Thapa and Graefe, 2003; Wong and Yu, 2012; Schachinger, 2020). Resource specificity refers to the degree of dependence of an activity on a specific site (Jacob and Schreyer, 1980). It is measured, for example, by asking recreationists how important a place for a certain recreation activity is, how their relationship to the place is and how important visiting the place is for their everyday life (Wong and Yu, 2012). In many cases, a positive correlation was demonstrated between resource specificity and conflict. That means, recreationists with a high resource specificity, and thus a high dependence in a functional sense, hold a higher degree of sensitivity to conflicts (Mann and Absher, 2007).

Resource specificity, however, is not necessarily determined by the area’s natural or infrastructural features. Recreationists may depend on a place from an emotional point of view. Jacob

and Schreyer (1980) point out that recreationists who know an area very well, and who are very familiar with its physical features, will hardly find identical conditions elsewhere. The same applies to emotional bonds: if a person has developed a personal attachment to an area, or even draws identity contributions from it, another place can hardly serve as a substitute (Mann and Absher, 2007).

Both aspects correspond to the concepts of *place identity* and *place dependency* (Lewicka, 2011; Ramkissoon et al., 2012): While place identity describes an emotional attachment to a place, place dependency addresses functional aspects, in particular whether an area is suitable for a leisure activity (Vaske and Kobrin, 2001). Mann and Absher (2007) analysed the resource specificity of older adult hikers and found that this group of hikers had strong emotional bonds to certain hiking trails, mainly because they served as volunteers in maintaining the trails over decades.

Cultural aspects

The field of cultural drivers of conflicts is broad. They include personal traits of recreationists (McCrae and Costa, 2003; Tynon and Gómez, 2012; Schachinger, 2020), as well as aspects like their lifestyle tolerance, mode of experience and activity style (Watson et al., 1991; Vaske et al., 2000; Graefe and Thapa, 2004; Mann and Absher, 2007; Schachinger, 2020). Lifestyle tolerance relates to the extent to which recreationists accept diverging values, attitudes and norms—thus cultural aspects (Vaske et al., 2007; Vaske, 2019). Mode of experience sheds light on how intensively recreationists immerse themselves in their surroundings and activities (Watson et al., 1991). Recreationists may focus on nature and on their companion, while being outside. And they might immerse themselves into the activity itself. Where they put the emphasis, depends on what value they assign to nature experiences, to the outdoor activity and their social company. In one word, it's their way of thinking or world-view, and thus cultural aspects, that shape mode of activity. Finally, activity style is another driver of conflict. It targets the question of how important leisure activities are in everyday life. Some recreationists might organize their entire life around leisure activities. Their world-view is a leisured-centred one. Their preferred mode of conduct, and thus a cultural phenomenon, is their leisure activity (Mann and Absher, 2007).

Lifestyle tolerance is defined as a “tendency to accept or reject lifestyles that differ from one's own” (Wong and Yu, 2012, p. 350). Different lifestyles are based on diverging “goals, values and personal philosophies” (Jacob and Schreyer, 1980, p. 376). Recreationists with shared values are assigned to one's own group (Kelly, 2019; McCormack, 2017; O'Reilly and Chatman, 1986). Conflicts based on lifestyles occur when generalizations are made. This is the case, for example, when a certain group is categorized as “weird, morally inferior or inscrutable” (Jacob and Schreyer, 1980, p. 376). It is generally assumed that a higher level of lifestyle tolerance leads to fewer conflicts (Vaske, 2019). An interesting group, in this context, are

recreationists that engage in several leisure activities and thus belong to several groups. It could be assumed that they report fewer conflicts (Graefe and Thapa, 2004; Kleiner et al., 2022).

Lifestyle tolerance is usually measured by asking recreationists to judge the similarity of attitudes or values of others compared to their own (Needham et al., 2008). Also judgements on similarities in socio-demographic characteristics are used (Vaske et al., 2000). However, the most common approach to measure lifestyle tolerance are recreation motives. They are considered to be a proxy for values or attitudes (Mann and Absher, 2007). Two typical motive groups are physical exercise and mental relaxation (Iwasaki and Mannell, 2000). There are also motives that include social aspects, e.g., having experiences that you can tell your friends about (Mehmetoglu and Normann, 2013).

Mode of experience refers to the extent to which recreationists immerse themselves in their surroundings and activities (Thapa and Graefe, 2003). For example, it has been shown that visitors to wilderness areas exhibit a greater immersion in the natural environment than recreationists who are outside designated protected areas (Watson et al., 1991). Different degrees of immersion are usually measured by asking recreationists to judge the extent to which they focus on their activity, on nature and their companions (Vaske et al., 2000; Wong and Yu, 2012). It is assumed that recreationists with a focus on natural environments perceive disturbance less intensively (Schachinger, 2020). This is very close to research in environmental psychology. There, it is known that people perceive environments selectively and subjectively (Wells, 2002; Heft, 2022). In particular, people perceive those elements that correspond to their needs and abilities, and might overlook others (Tsaour et al., 2012; Tsaour et al., 2014).

Finally, *activity style* is defined as the degree to which people identify with their leisure activities (Jacob and Schreyer, 1980; Wong and Yu, 2012). According to Kelly (2019), leisure time is a time for self-actualization. Leisure offers us the opportunity to express ourselves to others (Ramthun, 1995; McCormack, 2017). Activity style is usually measured by asking recreationists how long the activity has been practiced, how important the activity is in everyday life and how experienced one is (Schachinger, 2020). It is assumed that a pronounced activity style leads to an increased conflict sensitivity (Vaske et al., 2000; Wong and Yu, 2012). However, Thapa and Graefe (2003) show the opposite effect: experienced skiers who are good at their sport deal with problematic situations more calmly.

Methodology

The paper contains two studies. Firstly, a nationwide online survey in Germany with the aim of identifying and describing the main conflicts. Secondly, a case-based study in Freiburg (Germany), which looked into the reasons why conflicts

occur. The national-wide study was carried out, because according to anecdotic evidence there are some major conflicts in forests, one of which is the conflict between hikers and bikers. The study aimed at investigating whether these well-known conflicts prevail or whether there is a broader field of relevant conflict issues. The study was carried out in a quantitative way to gain standardized information from as many respondents as possible to create relevant and informative data, which goes beyond a regional or local level.

Freiburg was chosen because in the nation-wide survey, the region received a high number of responses. Additionally, an expert group judged Freiburg as an interesting region to investigate on conflicts between different kinds of recreationists. The expert group consisted of representatives of associations in the field of outdoor sports and nature protection as well as of academics, working in the field of outdoor recreation. The study in Freiburg was conducted as a standardized on-site survey, because it aimed at testing the effects of a pre-defined set of conflict drivers. The Freiburg survey was longer than the nation-wide survey and aimed at in-depth analysis; the nation-wide survey, in turn, was short and provided a frame for further analysis.

The nationwide study captured responses from recreationists through a survey link which was distributed via clubs, associations, agencies and other institutions from forestry and timber industry, nature conservation, outdoor sports and tourism sectors all over Germany. The online survey was conducted using the SoSci Survey tool. The survey used several questions to elicit responses on the main issues of recreational conflicts. It also included questions on the motives for visiting the forest.

The variables were designed as follows: To identify the main conflicts, participants were asked to select conflicts they had already experienced from a list of 15 topics. The list was based on the work of [Hegetschweiler et al. \(2022\)](#), [Mann and Absher \(2008\)](#), [Volz and Mann \(2006\)](#) and [Diekmann et al. \(1999\)](#). It contained topics like littering, crowding or visual disturbances, i.e., by wind turbines or radio masts. The responses were recorded dichotomously by ticking the topics (1 = conflict was experienced, 2 = conflict was not experienced).

To characterize the conflicts, the questionnaire included statements on the conflicts' emotionality, their media coverage and past solution attempts. A total of seven items was formulated. The items were newly developed for the study. Participants were able to express their agreement on a five-point scale (1 = strongly disagree, 5 = strongly agree). The items were subjected to an exploratory factor analysis.

The motives of forest visitors were recorded using a list of nine items ranging from statements such as "When I am in the forest, it is important to me to find peace and relaxation" to "When I am in the forest, it is important to me to do sport." The content of this list was based on the work by [Hegetschweiler et al. \(2022\)](#), [Koep et al. \(2019\)](#), [Volz and Mann \(2006\)](#) and [Zeidenitz](#)

[\(2005\)](#). For each item, participants were asked to indicate the importance of the motive on a five-point scale (1 = not important, 5 = very important). The items were integrated into variables by mean scores after a principal component analysis.

The second study was also a standardized survey, conducted in the limited geographical area of Freiburg i. Breisgau (Germany) and related to one specific conflict. This topic was "conflicts between cyclists and other forest visitors." The survey was carried out on-site in the south-east of Freiburg's city forest, where several paths for leisure activities (including cycle paths, hiking trails and walking paths) converge. The survey was carried out in 3 days in June 2023, at three time intervals (morning, noon, afternoon). It took about 30 min to answer the questions.

The questionnaire was divided into several sections; each of which contained several questions and items. Most prominently, drivers of conflicts were analysed. These drivers were mode of experience, resource specificity and activity style. Mode of experience was assessed by three statements, measuring the degree of the recreationists' immersion: "While I am doing my leisure activity, I concentrate a) on the activity, b) on the environment and nature, c) on my companion." Participants answered on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree; alternative option: don't know). These items were based on the work of [Schachinger \(2020\)](#) and [Watson et al. \(1991\)](#).

Resource specificity was assessed by four statements: "The area where I usually do my leisure activity a) means a lot to me, b) is the best place to do it," "A large part of my life is organized around the area where I usually do my leisure activity," "I identify strongly with the area where I usually do my leisure activity." Again, respondents used a 5-point Likert scale for their answers (1 = strongly disagree to 5 = strongly agree; alternative option: don't know). The design of the statements was primarily based on the work of [Schachinger \(2020\)](#), [Wong and Yu \(2012\)](#) and [Williams and Vaske \(2003\)](#).

Activity style was surveyed using three questions, which centred on the centrality of leisure activities in the participants' lives: "A large part of my life revolves around my leisure activities," "I try to do my leisure activities with people who are at about the same level as me," "My leisure activity makes me happier than my work" (5-point Likert scale: 1 = strongly disagree to 5 = strongly agree, alternative option: don't know). These items are primarily based on the work of [Xiong et al. \(2022\)](#), [Schachinger \(2020\)](#), [Koep et al. \(2019\)](#), [Vaske \(2019\)](#), [Thapa and Graefe \(2003\)](#) and [Vaske et al. \(2000\)](#).

Another main component of the questionnaire was the degree to which respondents had experienced the conflict. This was evaluated using two item batteries containing the following questions: "(How often) Have you already experienced the following situations in the forest? (Answer options: never, 1–2x, occasionally, often, almost always)." The question related to five items, which described conflictive

TABLE 1 Forest visitation motives.

Item	Mean	SD	Relaxation and being-away	Physical health	Novelty and company
To be in nature	4.78	0.479	.737	-.017	.067
To find peace and relaxation	4.48	0.725	.837	-.053	-.059
To distance from everyday life	4.51	0.742	.719	.207	.072
To do sports	3.68	1.118	-.026	.873	.103
To do something for my health	4.00	0.987	.179	.795	.204
To experience something	3.09	1.165	-.115	.371	.625
To be with other people	2.29	1.142	-.108	.269	.696
To be outside with my children	2.43	1.496	.062	.042	.642
To see new landscapes	3.44	1.106	.212	-.032	.723

“How important are the following aspects when you visit the forests?”, $n = 1,507$. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in four iterations. Cronbachs Alpha: 0.648/0.684/0.628.

behaviours of cyclists and other forest visitors (behaving rudely, showing no consideration, walking or riding on MTB trails/hiking trails, walking or riding off the trails, wilfully disturbing others). The items are based on the work of Kleiner et al. (2022), Vaske (2019), Tynon and Gómez (2012), Vaske et al. (2007), Cessford (2003), Carothers et al. (2001) and Vaske et al. (1995).

A regression analysis was done to identify factors that influence conflict genesis based on the data collected in the second study. In the regression, mode of experience, resource specificity and activity style were independent variables. The dependent variable was deduced from the answers on conflictive behaviour by calculating a sum score (cyclists/other forest visitors behave rudely, show no consideration, are on MTB trails/hiking trails, are off the beaten track, wilfully disturb others). The online survey and the visitor survey in Freiburg were both analysed using SPSS (version 29).

Results

The following chapter presents the results of the nationwide survey and the results of the case-based study in Freiburg. It focuses on characterising the main conflict issues experienced by recreationists in forests and the factors that influence these conflicts.

Nationwide survey on conflict characteristics

Between 28th November 2022 and 8th January 2023, 1,507 data sets were generated. About 51% of the respondents are between 40 and 59 years old. 30% are younger than 40, and less than 20% are 60 years or older. Two-thirds of the

respondents are females and one-third are males. According to the Federal Statistical Office, the current distribution in Germany is around 49.3% men and 50.7% women (Statistisches Bundesamt, 2023b). Of these, about 27% are between 40 and 59 years old (Statistisches Bundesamt, 2023a). The collected data, therefore, is not representative for Germany. With regard to their main leisure activity, most respondents stated that it was riding (36.8%), walking with/without a dog (21.7%), cycling/mountain biking (14.1%) or hiking (14%). Almost 95% have been practising their leisure activity for more than 3 years.

Visitation motives

Respondents agreed to most of the nine motives. Intensive agreement was stated to the motives of “to be in nature” (4.78), “to find distance from everyday life” (4.51) and “to find peace and relaxation” (4.48). The motives “to be with other people” and “to be outside with my children” received smaller agreement. Here the mean values are at 2.29 and 2.43 only (see Table 1). If these items are subjected to a principal component analysis (Varimax rotation), three main motives can be identified: “Relaxation & Being-Away,” “Physical Health” and “Novelty & Companionship” (see Table 1). For all three main motives a mean score was calculated, which showed that most respondents visited the forest for relaxation (M 4.59, SD 0.51), the second motive was physical health (M 3.85, SD 0.92), last novelty (M 2.87, SD 0.88).

Conflict issues

As regards conflict issues, littering was experienced by 69.5% of respondents, followed by conflicts with other forest visitors (60.6%) and rule violation (53.6%). Conflicts due to crowding were reported by 36.3%. There was just a third who mentioned conflicts with forest management (33.9%). All other issues of conflicts in forests are listed in Table 2.

TABLE 2 Conflict issues in forests.

Conflict issue	Already experienced (%)
Litter	69.5
Conflicts with other forest visitors	60.6
Violation of rules	53.6
Dogs	43.4
Obstacles on paths (e.g., trees, branches)	39.3
High number of visitors	36.3
Activities off path	35.2
Conflicts with forest management	33.9
Messy paths	28.5
Vandalism	23.8
Hunting	21
Noise	17.5
Infrastructure deficiencies (e.g., at huts, signage)	14.4
Fire and barbecue sites	13.3
Visual disturbances, i.e., wind turbines, radio masts	8.7

“Below, you will find a list with potential conflicts in forests. Please indicate which of these conflicts correspond to the situation you experienced in forests” $n = 1,507$.

Conflict characteristics

Out of the list of conflict issues, participants chose their main conflict. They characterised their main conflict by stating how emotionally the conflict was, the presence of it in the media, and the extent to which they were willing to contribute to conflict solution. The results show that the respondents are willing to contribute to conflict solution. The mean value is at 3.70. It is reported that there have been attempts to solve the conflict in the past, however on a low scale (2.62). It is noteworthy that respondents attribute themselves a large rule competency—that is, they feel well informed on applicable rules (4.23). To other conflict parties, however, rule competency is attributed to a lower degree; “others are not well informed” is at a mean of 2.93. Looking at the emotional side, conflicts do not seem to be very emotional (3.28). Conflicts hardly are being reported in media (2.27). Detailed statistical information on these characteristics is available in Table 3. The exploratory factor analysis across these items shows the following results. Firstly, one’s own knowledge on applicable rules and willingness to participate in conflict solution form a factor. Secondly, the assumed lack of knowledge on applicable rules in others and the extent to which the conflict is treated emotionally loads on another factor. However, Cronbachs Alpha for this factor is very low. Lastly, the three items on media coverage, public discourse and attempts at finding solutions in the past, form the third factor.

Case-based study on conflict drivers

Between 8th June 2023 and 10th June 2023, 224 data sets were collected. About half of the responses were generated by cyclists (59.5%). In this group, mountain bikers took the largest part. Hikers were another significant group of participants with 29% of responses. About half of the respondents (49.5%) are between 18 and 45 years old. The largest group is between 26 and 35 years old (23.8%). Older individuals over 65 made up for only 10% of the sample. Cyclists are on average younger than other forest visitors. Men are overrepresented among cyclists. The group of recreationists surveyed cannot be considered representative for the German population (Statistisches Bundesamt, 2023a; Statistisches Bundesamt, 2023b).

In the following, respondents are characterized. Respondents show a high level of expertise in practicing their leisure activities. Over half of them rate themselves as very experienced. About 89.6% of the respondents practise their leisure activity at least once a week.

Respondents are satisfied with the Freiburg city forest as a place for their leisure activities (95.5%). For almost all of them, conflict-free leisure time is important (93.2%). If conflicts occur, more than a third do not take this too seriously (34.7%). However, 24% actively avoid direct confrontation or do not enter certain areas where conflicts might occur (12.4%).

Conflict intensity

Results on conflict intensity show that conflicts are not experienced as particularly severe (see Table 4). The most pronounced issue is “cyclists are on footpaths” with a mean value at 3.47. However, standard deviation is quite high for this item, indicating that answers vary. A similar item is “cyclists are off track” (2.63). Both items relate to cyclists’ usage of forest infrastructure, in this case pathway infrastructure. However, agreement to both items isn’t high. The statement “cyclists wilfully disturb others” is not shared by the respondents (1.61). Similar statements were analysed for conflicts with recreationists in general. Also here, statements like “recreationists behave rudely” (2.48) received a higher degree of agreement than “recreationists deliberately disturb others” (1.88). The items related to cyclists were aggregated to the variable “conflict intensity with cyclists” by calculating a sum score. The same was done with the items related to other recreationists, aggregating them into the variable “conflict intensity between recreationists.” Both variables served as the dependents in two following regression analyses. The mean values of both aggregated variables are at 11.82 (SD 3.93) and at 10.55 (SD 3.85). When comparing these mean values, a significant difference could be identified, although effect size is small ($t(212) = 4.213, p < 0.001, d = 0.289$).

Conflict drivers

As deduced from theory, mode of experience, resource specificity and activity style were considered potential conflict drivers. The

TABLE 3 Characteristics of reported conflicts in forests.

Item	Min.	Max.	M	SD	Public presence	Willingness to engage	Emotional conflict
The conflict is an issue discussed publicly	1	5	3.13	1.164	0.641	0.036	0.084
The conflict is reported in media	1	5	2.27	1.198	0.739	-0.027	0.061
There have been attempts to solve the conflict in the past	1	5	2.62	1.180	0.421	0.151	-0.108
I am willing to help solving the conflict	1	5	3.70	1.123	0.015	0.723	-0.014
I am well informed about applicable rules	1	5	4.23	0.886	0.061	0.388	0.006
The conflict is being treated emotionally	1	5	3.28	1.235	0.227	0.150	0.511
People involved in the conflict are not well informed about applicable rules	1	5	2.93	1.195	-0.140	-0.116	0.514

“Please characterize the conflict you are reporting on”/“Please indicate your agreement to the following statements” *n* = 1,507.

Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in four iterations.

Cronbachs Alpha: 0.625/0.429/0.366.

TABLE 4 Conflict intensity between cyclists and other recreationists in Freiburg.

Item	Min.	Max.	M	SD
Cyclists behave rudely	1	5	2.22	0.930
Cyclists show no consideration	1	5	2.34	0.947
Cyclists are on footpaths	1	5	3.47	1.029
Cyclists are off track	1	5	2.63	1.202
Cyclists wilfully disturb others	1	5	1.61	0.903
Recreationists behave rudely	1	5	2.48	1.058
Recreationists show no consideration	1	5	2.27	0.931
Recreationists are on MTB trails	1	5	2.17	1.023
Recreationists are off trails	1	5	2.38	0.977
Recreationists deliberately disturb others	1	5	1.88	0.931

“How often have you encountered the following situation?” *n* = 224.

variables’ items are listed in Table 5. The mean values range from 2.62 to 4.46. The item agreed most to is “The area means a lot to me” (4.46). This indicates a high place identity. The item “during the leisure activity I focus on nature and environment” received a high mean value as well (3.95). All items were subject to a principal component analysis. Three factors could be extracted, as expected. The factor “activity style” included three items, the factor “mode of experience” three items and the factor “resource specificity” four items. The Kaiser-Meyer-Olkin criterion for the factor analysis is at 0.746 and the Bartlett test was highly significant (*p* < 0.001). Total variance explained is at 59.2%. However, Cronbachs Alpha for the factor mode of experience is very low.

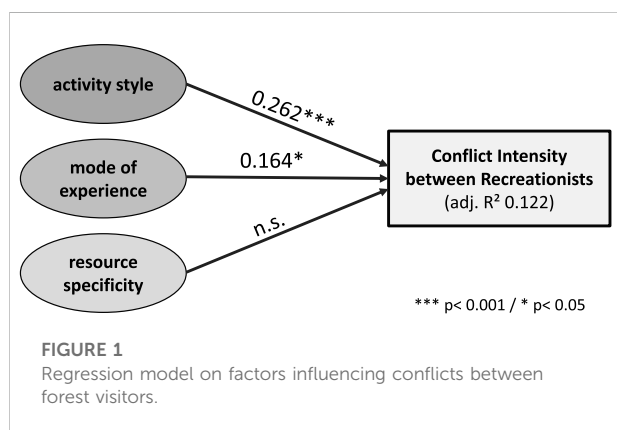
The calculation of medium values shows that respondents agreed strongest to the aggregate variable of resource specificity (M 14.98; SD 3.7), indicating that the Freiburg city forest cannot be substituted by another leisure area easily. The aggregate variable of mode of experience is nearly just as important (M 10.94; SD 1.99). The mean value for the aggregate variable of activity style, instead, is at 8.72 (SD 2.83) only. The variables served as independent variables in the following regression analyses. There were two regressions; one analysing the effects of mode of experience, resource specificity and activity style on the variable “conflict intensity with cyclists.” The second one looked at the effect of the drivers on the variable “conflict intensity between recreationists.”

The regression on conflicts with cyclists had no significant result. The regression model was insignificant ($F(3,213) = 1.415, p = 0.240$). The regression analysis on conflicts with other recreationists, instead, yields a significant model ($F(3,210) = 10.833, p < 0.001$). Results show that activity style has a positive effect on conflict intensity between recreationists ($\beta = 0.262, p < 0.001$). Mode of experience exerts a positive effect as well. However the regression coefficient is smaller ($\beta = 0.164, p = 0.016$) (see Figure 1). It is noteworthy that if the three items of mode of experience are included in the regression on conflict intensity between recreationists separately, the item “I concentrate on the activity” yields a significant positive effect ($\beta = 0.192, p = 0.006$). Immersion in the activity, therefore, accounts for conflict genesis. Nature immersion and focus on social company, in turn, did not yield significant effects. As regards resource specificity, there is no significant effect on conflict intensity between recreationists. Adjusted R2 of the regression model is at 0.122. The prerequisites for the multiple regression analysis were checked. The Durbin-Watson statistic had a value of 2.135. There is no multicollinearity between the predictors (VIF = 1.117, 1.113,

TABLE 5 Conflict drivers for cyclists and recreationists.

Item	Mean	SD	Activity style	Mode of experience	Resource specificity
Leisure activity (LA) is central to life	3.24	1.121	0.696	0.158	0.170
LA determines career	2.62	1.270	0.747	0.058	-0.034
LA determines friends	3.16	1.185	0.725	0.066	0.197
During LA focused on activity	3.64	1.079	0.266	0.521	0.032
During LA focused on nature	3.95	0.807	-0.082	0.732	0.263
During LA focused on company	3.46	0.962	0.111	0.749	-0.062
Area means a lot	4.46	0.780	0.168	-0.005	0.806
Area is central to life	3.40	1.175	0.232	0.046	0.797
Area is best place for LA	3.67	1.034	-0.126	0.136	0.778
Identification with area	3.80	1.130	0.162	0.083	0.843

“Please state how far you agree to the following statements” *n* = 224.
 Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
 Rotation converged in 5 iterations. Cronbachs Alpha: 0.592/0.395/0.816.



1.076). There is homoscedasticity of the residuals. Residuals follow normal distribution (Shapiro-Wilk test *p* = 0.074).

Discussion

The first research question aimed at identifying and characterizing the main recreational conflicts in forests. The second question addressed the potential drivers of conflicts. Both questions are discussed in the following by referring to the reported results and by relating them to relevant literature.

Concerning the main conflicts, the nation-wide survey showed that recreational conflicts in forests are diverse. Conflicts with other forest visitors and littering were the issues stated most frequently. High numbers of visitors are of concern to a third of the respondents. Although the survey was not representative to the German population, results show that

there is not only one single conflict in forests (i.e., hiking vs. biking) but a broader field of conflict issues.

Above that, the findings are consistent with similar findings by Volz and Mann (2006) which indicate that 43% of the respondents across various visitor groups (hikers, cyclists/mountain bikers, paragliders, horse riders and joggers/walkers) perceived litter as a nuisance. Nearly half of the visitors (45.1%) of the same study perceived crowding as having negative effects. Conflicts with other forest visitors, instead, are not reported as intensively as in the present study (Volz and Mann, 2006). Here, a statistical effect due to the characteristics of the sample might occur. However, growing numbers of forest visitors and their diverse recreation patterns might also explain the reported increase in conflicts between recreationists.

The first part of the research question one, thus, is answered as follows: conflicts in forest are diverse. The most important issues of conflicts in forests, as identified in this study, have been known before. However, one result is that conflicts with other forest visitors have increased. This could be due to the growing number of forest visitors compared to some years ago, or due to the diverse range of activities practiced in forests. Further research could shed light on this by looking at the relationships among visitor numbers, diversity of activities and reported recreational conflicts based on a representative sample of the German population.

It is noteworthy, that most respondents in Freiburg showed high degrees of satisfaction with their forest visit. Also, their conflict sensitivity is moderate. More than a third feels relaxed about existing conflicts. This is supported by the finding in the nation-wide survey that conflicts are not experienced as too emotional. This might justify the interpretation that

recreational conflicts in forests are a well-known phenomenon. Forest visitors know about them and might even expect them, but do not get emotional when encountering them. One could, therefore, term these conflicts as “expected every-day conflicts” which do not bother too much and do not curtail the quality of forest visits. This applies although respondents of the nationwide survey attributed themselves a high degree of knowledge on applicable rules, and to others a lower degree of rule competency instead. Media coverage was reported on low to a medium scale. Further research could use these insights to look into circumstances under which rule competency and/or media coverage might decrease emotionality or even enhance factual reasoning in conflict solving.

In the past, in- and out-group conflicts in various recreational activities have been researched on (Watson et al., 1991; Ramthun, 1995; Carothers et al., 2001; Cessford, 2003; Thapa and Graefe, 2003; Vaske et al., 2004; Vaske et al., 2007). Several studies conclude that there are significantly fewer conflicts within an activity group than between different groups (Vaske et al., 2000; Carothers et al., 2001; Mann and Absher, 2008; Kleiner et al., 2022). The present study does support these findings. Differences could be identified between conflicts caused by cyclists and those caused by other recreationists regarding conflict intensity. However, the present study did not differentiate between various groups of cyclists (like MTB and touring), nor between different kinds of other forest visitors. Further research could therefore do exactly this, and analyse whether, for example, in-group conflicts between different groups of cyclists are more intense than out-group conflicts between hikers and a certain group of cyclists, like Schachinger (2020) proposed.

Taking the results together, the second part of research question one can be answered as follows: Recreational conflicts in forests can be characterized as expected everyday conflicts that are not treated too emotionally. Most forest visitors are satisfied with their visits and deal with conflicts calmly. Conflict intensity across groups differs to some extent. Conflict asymmetry, as stated in the literature review, therefore, could be verified. Conflict parties think of themselves as well informed and are willing to engage in solutions. This pictures a constructive atmosphere, in which management initiatives could be received favourably.

Research question two related to three potential drivers of recreational conflicts: activity style, mode of experience and resource specificity. Activity style and mode of experience were described as culturally coined, since both of them are closely related to values and world-views. Thus, activity style refers to the importance of the recreational activity in one's everyday life and thus to recreation as an expression of an underlying value system. Mode of experience, instead, refers to how recreationists immerse themselves into their environment—be it with a focus on nature or on their activity. What focus prevails depends on the recreationists

attitudes—that is on their mind-set or way of thinking. Both were termed as constituents of the concept of culture. Resource-specificity, instead, was categorized as a space-related factor.

From the descriptives, respondents in Freiburg stated a medium degree of activity style. They are experienced in their leisure activities, the majority of the respondents practice them frequently. This result relates to Schachinger (2020), who surveyed 1,248 mountain bikers in German-speaking countries and found a pronounced activity style in this group. Regarding the impact of activity style on conflict intensity between recreationists, results show that it is the most influential driver. On an absolute level, the effect size is moderate. The result is consistent with other studies that assume that a pronounced level of activity style leads to increased conflict sensitivity (Vaske et al., 2000; Wong and Yu, 2012).

Mode of experience is another driver of conflict intensity, although the effect size is small. If the variable is split into its items, the respondents' immersion into their leisure activity yields a positive and significant effect on conflict intensity. Here again, an activity-related (immersion in activity) factor spurs conflict intensity, just as reported above for activity style. Besides this, it is worthy to note that, despite the fact that respondents reported a relatively high mean score for nature immersion while visiting forests, this item did not yield a significant effect on conflict intensity in the sample. This is consistent with similar findings by Schachinger (2020), who found no influence of nature immersion on conflict perception. The reason for this is undefined. Maybe nature-related recreationists visit other places, maybe they do not focus on others. This begs a closer analysis by future research.

Resource specificity as a space-related factor did not yield significant effects on conflict intensity. This applies although respondents rated their leisure area as highly important. Respondents in Freiburg highly agreed to the statement that the area was important to them or even that they identified with the area. In literature, resource specificity has been identified as a driver of conflicts. Mann and Absher (2007) showed that resource specificity is a decisive factor for walkers to perceive conflicts—especially infrastructure-related conflicts (e.g., on paths). The results of this study differ from this. This begs the question under which circumstances resource specificity may or may not have impacts on conflict intensity. Future research could look at different leisure activities, different geographical areas or different lifestyles of recreationists, which may moderate the effect of resource specificity.

Another cultural component, motives, were analysed to describe expectations and values associated with forest visits. Results of the nationwide survey show that a major part of respondents visits forests for relaxation motives and for being away. This is also consistent with studies by Mann and Absher (2007) and Mann (2009) where the most frequently named motive is nature/body. Although the effect of motives (as a

proxy to lifestyle tolerance) on conflicts was not analysed in this study, findings from literature suggest that the stronger a recreational motive, the lower the conflict perception (Mann and Absher, 2007). In this study, a high degree of nature as a visitation motive (“to be in nature”) could be identified. It, therefore, can be assumed that forest visitors with this motive do not perceive conflicts as intensively as others. This corresponds to the missing statistical effect of nature immersion on conflict intensity in mode of experience as discussed above.

In summary, the second research question can be answered as follows: Both mode of experience, and activity style have significant impacts on conflict intensity although R² of the regression model is moderate. Both drivers were described as culturally coined. Visitation motives as another cultural factor show that recreationists visit forests primarily for relaxation and being-away. Based on findings from literature and the missing effect of nature immersion on conflict intensity, the conclusion is drawn that nature-relatedness might contribute to a smaller conflict sensitivity.

It is against this background that recommendations are formulated. As seen in literature, major conflicts in forests arise due to conflicting goals or due to norm violations. Conflicts based on conflicting goals need direct interaction between recreationists, which norm-based conflicts do not. The first one was termed “interpersonal conflict,” the second one “social norm conflict” (Vaske et al., 2007). According to literature, social norm conflicts are best addressed by information of visitors, while interpersonal conflicts need product development (Tynon and Gomez, 2012). By this, forest management would need to embrace a two-faceted strategy.

Firstly, visitor information is central. Many times, however, forest communication does not reach the targeted visitor groups. Or communication is not targeted at any specific group at all, thus, being too general and hardly able to match the visitors’ information routines. This is underscored by the fact that the two drivers with significant effects on conflict intensity are cultural: mode of experience and activity style. Both drivers could profit from information and discourse. Activity style insofar as recreationists could be informed about other leisure activities and their importance to other forest visitors. In this way, cyclists and hikers could learn that they share more than they differ. For both parties their leisure activities could be important in everyday life. Both could agree to find most of their friends there. Discourse between the groups, therefore, could contribute to mutual understanding. The same applies to mode of experience. The immersion in the activity yielded a positive effect on conflict intensity. Thus, training foresight and mutual consideration could contribute to conflict prevention. Also, forest management could contribute by information as well as active on-site training programmes, i.e., training courses for different groups of recreationists. The same would apply to conflicts based on a lack in lifestyle tolerance. If nature-connectedness as a

cultural practice contributed to fewer conflicts, then forest management could invest in courses to strengthen nature-connectedness in forest visitors.

Interpersonal conflicts, instead, require product development. Thus, trails for cyclists and hikers could be separated. However, these measures are costly and in many regions trail density is already very high. Alternatively, trail concepts could dedicate existing trails to different user groups. Here, resource specificity comes into play. As seen in the literature, hikers developed an emotional bonding to trail systems which they had maintained for years. Drawing up a trail concept for different user groups, therefore, would have a communicative component, too. In summary, a cultural discourse on forests could help to redefine norms and expectations of forest recreation and ultimately prevent recreational conflicts.

This article has some methodological limitations. The distribution of the nationwide online survey via various associations and clubs could possibly have led to a bias in the responses. Riders, for example, were relatively well represented. In addition, the survey was done online, thus a lack of participation from older citizens or citizens without a reliable internet-access might apply. For the study in Freiburg, it should be noted that the survey was conducted on site. This may result in a bias due to the fact that individuals could not be interviewed, who do not visit forests any more (due to conflicts).

Conclusion

This article looked at main recreational conflicts. Littering, rule violation and conflicts with other visitors are the most frequently reported conflicts in forests. Although conflicts are diverse, respondents of a nation-wide survey in Germany do not rate them as very emotional. Instead, recreational conflicts in forests seem to be expected everyday conflicts. Respondents are willing to contribute to conflict solution, based on a good knowledge about applicable rules.

With regard to drivers of conflicts, results show that mode of experience, and activity style have a significant influence on conflict intensity. Both are cultural factors, since they are rooted in the recreationists’ values and world-views. The impact of both drivers on conflicts could be mitigated by visitor information, communication and training. Forest management could take an active part in this, also by inducing a new cultural discourse on how forest recreation could look like. The same applies to visitation motives as proxy for lifestyle tolerance. A number of recreationists visit forests for being in nature. Nature-connectedness as a cultural practice, thus, could help mitigate conflicts. Forest management could take an important role in enhancing nature-connectedness in forest visitors.

Resource specificity as a space-based factor did not have a significant effect on conflict intensity. This applies even though recreationists stated a high degree of emotional dependence on

their leisure area. If this was the case, a solution to this would be product development, which includes infrastructural measures for different user groups. Separated trails or trail concepts could help prevent conflicts. However, since certain groups might depend on trails emotionally, communication and deliberate discourses are important here as well.

Based on these findings, research gaps were identified which revolve around interrelations between the increased number of forest visitors, diversity of activities and conflict sensitivity. Above that, the effect of rule competency and media coverage on the emotionality of conflicts was identified as potential field of research. And the question whether in-group conflicts could be more severe than out-group conflicts, if different sub-groups of cyclists were analysed could be looked at. Lastly, it could be interesting to investigate into the role of nature-connectedness or nature immersion in conflict genesis.

Data availability statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

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Author contributions

MH and PH conducted the surveys and collected the data. MH and MB did the data analysis. MB and PH wrote the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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