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More Help Was Offered—But Was It Effective? First Responders and Volunteers in the 2021 Flood Disaster in Germany

Alexander Fekete [1,*] and Beate Rhein [2]

[1] Institute of Rescue Engineering and Civil Protection, TH Köln—University of Applied Sciences, Betzdorfer Str. 2, 50679 Köln, Germany
[2] Institute of Computer and Communication Technology, University of Applied Sciences Cologne, Betzdorfer Str. 2, 50679 Köln, Germany; beate.rhein@th-koeln.de
* Correspondence: alexander.fekete@th-koeln.de

Abstract: The floods in 2021 in Germany laid bare the need to better integrate volunteers into official disaster management. An online survey with 1767 valid interviews after the floods in July 2021 reveals the shared experiences of professional and non-professional groups. Communication and coordination problems are the main results of the survey analysis. Overall satisfaction was a bit lower for the volunteers than for the professionals. The behavior of the superiors could have been more satisfactory. The preparation and opportunity for reflection could have been better after the operation. The information provision before and during the flood operation could have been more satisfactory. Worries were higher about elderly persons, and misinformation was a perceived danger. Problems experienced in the flood operations ranged from psychological stress to hygiene, self-endangerment, assignment of tasks, and misinformation, both from the media and official sources. Infrastructure-related problems included electricity, water, communication lines, roads, and rail. The suggestions for improvements ranged from communication and information about warnings and behavior to persons that transfer knowledge between organizations, digital exchange platforms, and exchange between countries.

Keywords: German flood 2021; spontaneous volunteers; flood risk management

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1. Introduction

In research about social structures, coordination of disaster relief, and community involvement, it is long known that the integration of volunteers is a key topic [1,2]. In disaster studies from the 1950s of different types of natural hazards and man-made incidents, it has been observed that volunteers take over important roles in disaster response. For example, it was found that they are the first on the scene, and often, disaster relief professionals and police take over the same duties and activities as the volunteers after arriving on the event site later on [2]. However, "spontaneous volunteers are rarely incorporated into formal disaster and humanitarian planning" [3]. The integration of volunteers into official disaster management is an ongoing bone of contention in Germany [4]. The floods in 2013 and 2021 laid bare the need to better integrate it with existing professional and organized first response. Research points to an increasing recognition of the need to integrate volunteers better and recognize their diversity [5] to improve the cooperation between professionals and volunteers [6]. Since volunteer numbers have decreased, it is even more important to understand how to integrate volunteers better in Germany. This is especially important, since—especially by other countries—disaster response in Germany in 2021, including volunteer help, was conceived as insufficient [7]. This article, therefore, investigates the difference in perception between professionals and volunteers.

The official integration of community engagement and volunteers into formal disaster response organizations varies between countries [8,9]. In Europe, there are differences in how volunteers are officially included by insurance, for example, in Norway and Sweden [8].

Other countries, including Germany, have large organizations of registered and trained volunteers within formal organizations [10]. Hierarchical and more formal structures and professionalization of volunteers are more prevalent in Germany and Italy, for example [9]. However, spontaneous volunteers or emergent situations conduct this formal integration on an ad hoc basis [8]. In some countries like Australia, formal national strategies and handbooks for the integration of volunteers have been developed. In the United States of America, reception points are formally included in emergency operation plans. In Germany, however, this is not the case. Therefore, Germany is an interesting case study to analyze how disaster relief works within a real case and whether volunteers can still foster an effective disaster response and contribute to disaster resiliency.

Emergency management in Germany is highly reliant on organized or honorary volunteers, especially in any area outside of large cities. These volunteers are organized and trained by the Technical Relief Organization (THW), fire brigades, paramedics, or other aid and relief organizations, such as the Red Cross, St. Johns, Maltesers, and many more.

There are many methods and ways to integrate better volunteers, such as information campaigns, online registration platforms, social media communication, and many more, such as training [8]. Laws, regulations, formal documents, advice, handbooks, or official reception points could also integrate volunteers. Since this currently exists outside of Germany [8], methods and efforts regarding communication and coordination are likely aspects of volunteer integration that should be analyzed. It has to be stressed that the role of organized, formal volunteers and their inclusion in regulations and training is quite well elaborated in Germany [11]. However, for spontaneous volunteers, this is found to be almost nonexistent [8]. The demand for better integration of spontaneous volunteers is reflected by many recent lessons learned from studies and governmental strategic future agendas developed after the 2021 floods [12–16].

The flood disaster in 2021 in Germany has been one of the most significant natural hazard and disaster relief efforts in Germany [12,17]. This disaster has received international attention due to the perceived failure of warning and flood risk management in Germany [18,19]. It is, therefore, interesting to analyze this event regarding the integration and effectiveness of volunteer participation. Specifically, questions about coordination and communication are at the center of the study here.

The following research questions guide this paper:

Which communication and coordination aspects have the volunteers perceived as effective or not?

Which additional problems have hampered their efforts, and what recommendations do they have?

2. Materials and Methods

It is important to gather empirical evidence to analyze the effectiveness of volunteer integration into formal organizations. The flood disaster of 14–16 July 2021 in Germany is a significant and relevant event in which tens of thousands of volunteers were included [11]. To gather empirical evidence by asking the volunteers themselves seems appropriate. It is also important to ask them when memories are still fresh. Since the volunteer work carried on for many months even after the disaster, a method had to be selected that was suitable to capture information without hindering the relief help. Also, capturing many volunteer voices and allowing them to express their problems and concerns anonymously is important. Therefore, an online survey was designed and distributed between 1 and 21 September 2021. This is a good means, since many volunteers have been organized for their operation using online platforms and social media. It was designed to be at most 10 to 20 min in pre-test rounds to enable them to fill in the survey without too much time to be asked from their voluntary time.

The survey questions were designed according to the literature outlined in the introduction, and questions centered on coordination and communication were included. In addition, the survey was informed by a focus group discussion with people helping on-site

and within a pre-test round with national and international experts and volunteers as well. The survey design includes structured questions with a mix of 24 closed questions, including lists to select replies from and 7 additional open-ended entry options, documented in more detail in a previous publication [20]. The survey was set up on an open-source site (SoSciSurvey), which enabled translation into different languages. Information about the survey and access to the survey and the results had been distributed by creating an additional website open to the public by a renowned German disaster preparedness non-governmental and nonprofit organization (www.dkkv.org (accessed on 22 November 2023)). All surveys occurring in Germany about this flood event were collected on this platform. The survey had been approved by an ethics board at the Technical University of Cologne, and participants had been asked about their consent and had the option to abandon the survey. It was made explicit that it was voluntary and for scientific purposes only. The survey was distributed on different social media platforms (Facebook, Instagram, LinkedIn, Twitter, WhatsApp, etc.), expert networks, personal contacts and by many people active in the operations using a snowball principle. A total of 3377 responses (n = 1767 valid and used here) were collected. The figures show the ratio between only volunteers and all participants. For the statistical analysis, the data were divided into the two nonoverlapping groups of "volunteers" and "the rest", and the chi-squared independence test with $\alpha = 0.05$ was applied.

3. Results

The results description follows the scheme of first describing the main results per item and related figures. Then follows a personal interpretation of the results. More details about the quantitative questions are then derived from open-ended replies of the respondents when available to the respective questions and their items. Relations to the literature about the topic or similar studies and their findings conclude each description of results per subheading. The results section, therefore, comprises a combination of results description and discussion, clearly separated by the structure described here. The numbers of the samples for each figure always are the full sample of N = 1767 for the whole sample and N = 205 for the volunteers, if not indicated otherwise in the respective subsection.

3.1. Type of Helpers Involved and Their Role

Regarding deployment type (Figure 1), the majority was honorary (volunteers: 43%; all: 80%), followed by those not being in any organization (volunteers: 38%; all: 0%). Professional deployment was lower (volunteers: 7%; all: 5%), and some conducted both professional and honorary deployments (volunteers: 9%; all: 14%). The "other" category was selected by a few respondents (volunteers: 3%; all: 0%). The chi-squared test result was $p < 0.05$ (0.000), indicating that deployment type is significantly different for volunteers compared to non-volunteers.

Regarding qualification (Figure 1), the majority are not qualified persons (volunteers: 48%; all: 24%), followed by other training (volunteers: 17%; all: 12%). Specific training starts highest with the lowest qualification, squad leader, and ends with the leader of an association or higher. The chi-squared test result was $p < 0.05$ (0.000), indicating that qualification is related to the distributions of both samples.

Comparing and interpreting these results, it seems plausible that the numbers of honorary deployments are lower in the ranks of volunteers than within the whole sample of all respondents, because this reflects the profile of unbound, spontaneous volunteers who are not within an organization, which is backed by the great number of those volunteers who selected "no organization". But the numbers also show that this is not a strong separation and that a great number still regarded themselves as active volunteers and in an honorary role. The number of volunteers in a double role of being active and professionally deployed is relatively high, even higher than within the whole survey sample. Combining the numbers of those who selected "both" and "professional" gives us 16% of the volunteers. This reflects the situation reported in the focus group discussions

and workshop sessions: many were so engaged that they were helping in several roles, as professionals, in honorary organizations, and as volunteers. The high engagement can be explained by the unusual dimension of the disaster that motivated many to help and by the long duration of the operations, continuing months after the event and enabling many forms of participation. Many volunteers have acquired qualifications in emergency management, which is also due to the great numbers that shared roles as professionals or honorary deployed. This contradicts assumptions about untrained people in specific emergency or disaster management contexts. It also fits findings in group discussions after the floods, where some volunteers emphasized their professional background in other fields, such as construction or project management, which were very useful to self-organize.

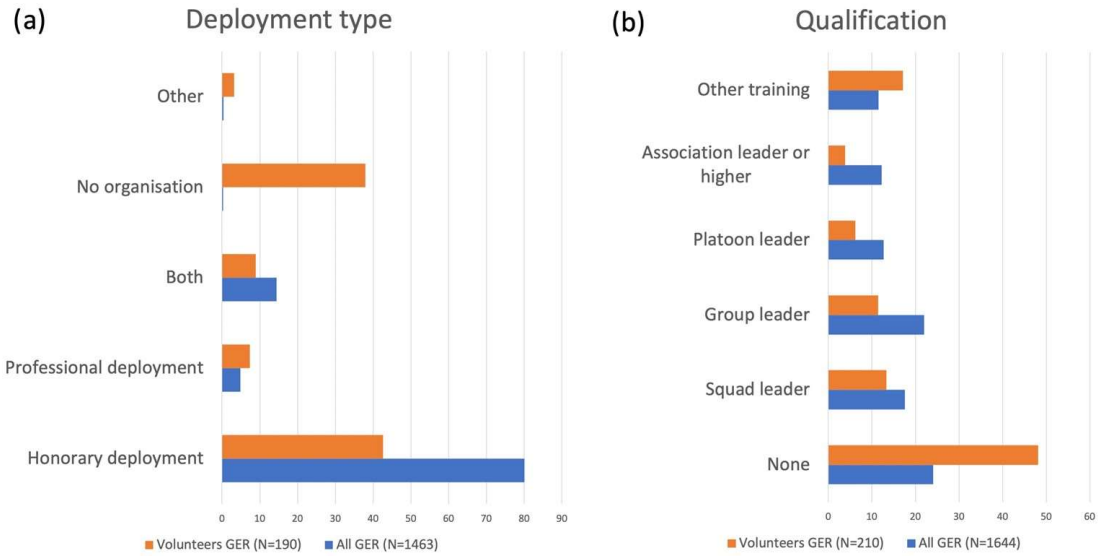

Figure 1. The (**a**) deployment type and (**b**) qualification of the respondents.

3.2. Personal Characteristics and Deployment

Regarding age (Figure 2), the majority of helpers are between 25 and 35 years old (volunteers: 35%; all: 35%), followed by 36- to 45-year-olds (volunteers: 22%; all: 22%), then 46- to 60-year-olds (volunteers: 19%; all: 13%). Young helpers under 25 differ between both the groups (volunteers: 20%; all: 29%). The fewest are within the oldest category of 60 years and older (volunteers: 3%; all: 2%). The chi-squared test result was $p < 0.05$ (0.010). Gender distribution shows the majority to be men (volunteers: 68%; all: 82%), with fewer women (volunteers: 31%; all: 17%). There were more female voluntary helpers than in the "all" group. The categories "diverse" or "no response" were up to or below 1%. The chi-squared test result was $p < 0.05$ (0.000), neglecting the "diverse" group due to its small number.

Comparing and interpreting these results, the general age distribution of volunteers across the age categories differs slightly from the overall sample. However, fewer younger people under 25 years and more people above 60 were among the volunteers. This may reflect the number of residents involved as "involuntary" volunteers (see following section) of typically older age in some affected areas, especially in the Ahr Valley, which was hit hardest, but it could also mean that retired people are more ready to employ in such relief activities than those having to perform their daily jobs, especially when cleaning up after the disaster. Another possibility is the reactivation of those recently retired professionals or honorary persons with qualifications and a lot of experience with emergency or disaster management, which has been reported in some group discussions after the floods. Regarding gender distribution, it is interesting that more females are within the ranks of volunteers than the overall sample of helpers.

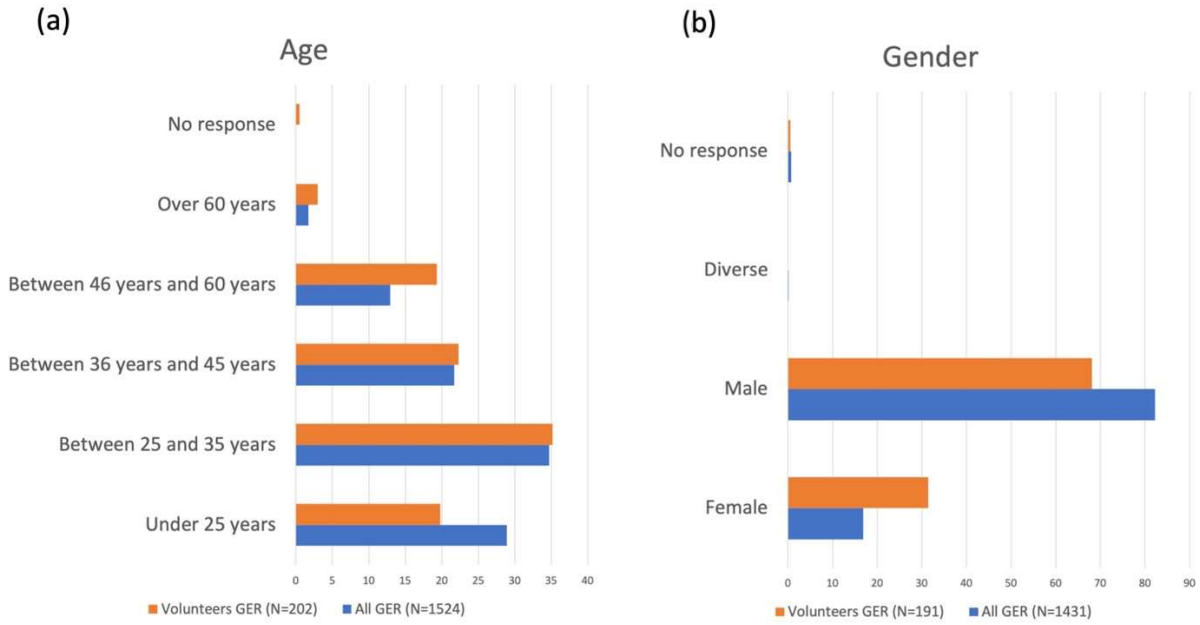

Figure 2. (**a**) Age and (**b**) gender of the respondents.

Regarding the place of residence (Figure 3), the majority lived within 50 km of the affected area (volunteers: 56%; all: 29%), and some were affected by the floods themselves (volunteers: 9%; all: 7%). A share of respondents came from an area more than 50 km away (volunteers: 24%; all: 45%), and some were more than 50 km away but lived in the same federal state (volunteers: 12%; all: 19%). The chi-squared test result was $p < 0.05$ (0.000).

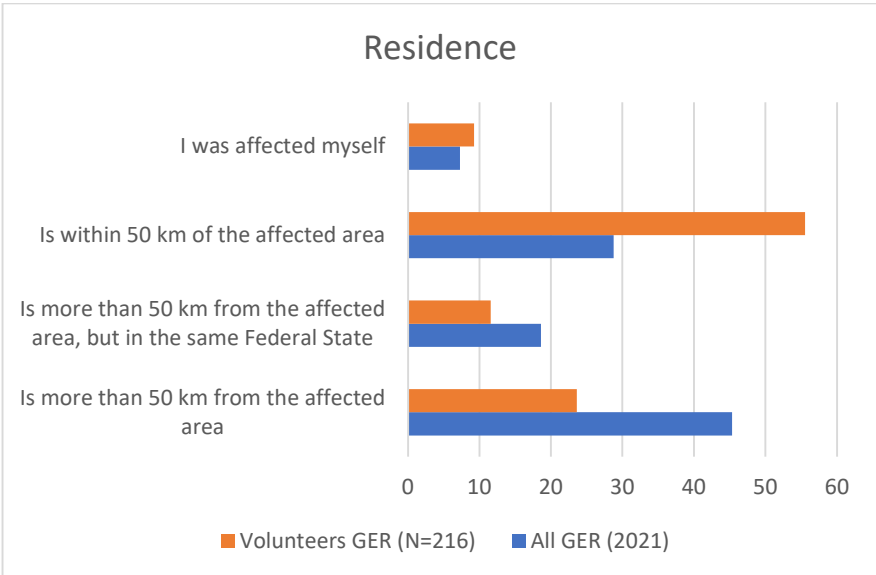

Figure 3. Place of residence of the respondents.

Regarding the type of involvement, the majority was on-site (volunteers: 95%; all: 90%). From those helping off-site, some were on pre-alert or standby (volunteers: 3%; all: 4%), followed by those involved administratively (volunteers: 2%; all: 6%). The chi-squared test result was $p > 0.05$ (0.570), but the sample for volunteers on pre-alert and administratively involved is too small, so the correlation needs to be clearer.

The number of volunteers affected by the floods is just a bit higher than within the whole sample. This shows that despite being affected themselves, many were active in helping others, too. Many more volunteers came from an area close to the affected area

than the other helpers. While this can be expected, it is interesting that so many volunteers and other helpers came from large distances, too. This reflects the situation after the flood disaster, where convoys of rescue and relief organizations from all places in Germany could be seen traveling on the highways for weeks. Also, the voluntary helpers came from far away in their private cars, for example, which was identifiable from the number plates that could be observed during our field trips to disaster-affected areas. Most volunteers were helping on the affected sites, but some also were helping administratively off-site or were just ready to help. By comparison, in the overall sample, the numbers of those on-site were a bit lower, which may reflect more options for those to engage in help administratively within their organizations from the outside. This is an interesting result, since it shows that more forms of engagement are possible in disaster management than in helping on-site.

Regarding the duration of the employment, most volunteers were in action over 3–4 weeks (volunteers: 18%; all: 10%). Both volunteers and other helpers had a wide range of different durations selected. Volunteers were also active for shorter periods, up to 24 h more often than all other helpers.

The results show that volunteers are more commonly from the area affected (Figure 3) and repeatedly engage in longer-term activities such as cleaning up. The helpers within honorary deployments and the professionals are more often acting within the structures of their organizations and civil contingencies, which sees them deployed for days or weeks until they are exchanged with other groups from other parts of Germany. The relatively higher numbers of volunteers also serving short-term engagements up to 24 h reflects the experience of this flood disaster, where many volunteers came from far away.

3.3. Satisfaction and Motivation

Regarding satisfaction (Figure 4), the commonest appraisal was "satisfied" (volunteers: 33%; all: 42%), followed by "dissatisfied" (volunteers: 25%; all: 24%) and "very dissatisfied" (volunteers: 12%; all: 6%). Neither satisfied nor unsatisfied are in a similar range as dissatisfied persons (volunteers: 24%; all: 24%). The "no rating" category was selected by a few respondents (volunteers: 2%; all: 1%). The chi-squared test result was $p < 0.05$ (0.005).

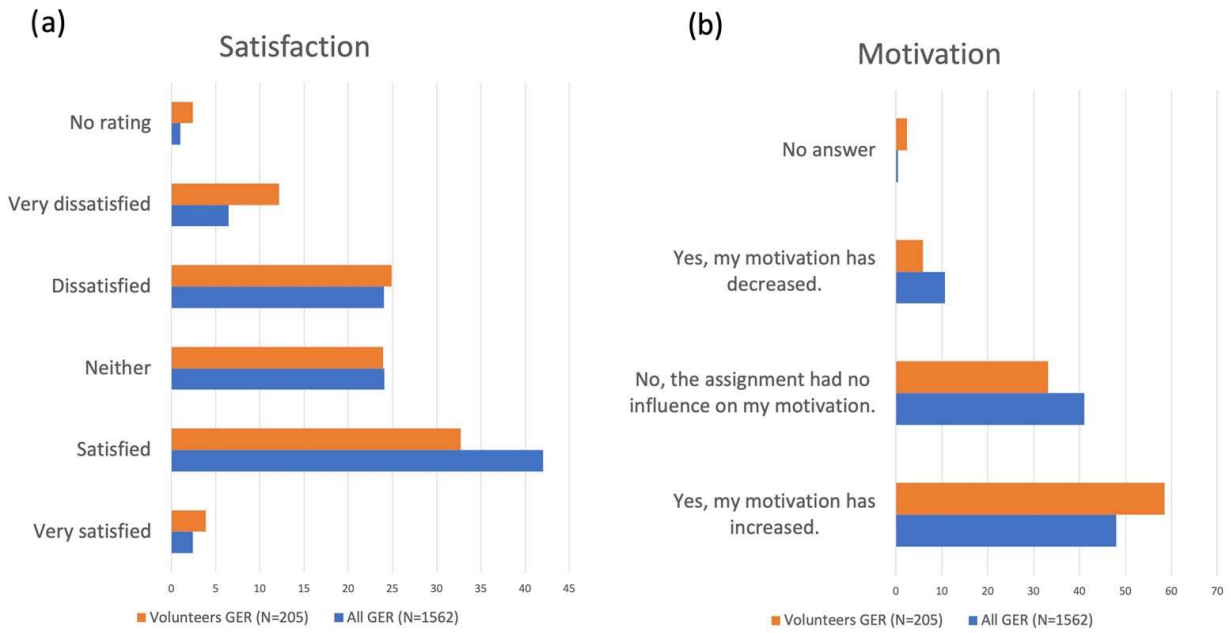

Figure 4. (**a**) Satisfaction with the flood operations and (**b**) motivation of the respondents.

Regarding motivation (Figure 4), the majority had increased motivation (volunteers: 59%; all: 48%), followed by no influence on motivation (volunteers: 33%; all: 41%). The motivation decreased for fewer persons (volunteers: 6%; all: 11%). The "no answer"

category was selected by a few respondents (volunteers: 2%; all: 0%). The chi-squared test result was $p < 0.05$ (0.000).

Satisfaction amongst the volunteers was lower than in the general sample. This is not surprising, given the general impression of dissatisfaction expressed by the affected people and volunteers after the flood disaster in public media. However, in this specific survey, we mainly addressed first responders and thus only included a few volunteers, who often were first responders at the same time. Still, the results are in line with problems with the operation overall. While overall, satisfaction is higher than dissatisfaction, the percentages for positive replies are lower than those of a previous study we conducted after the 2013 floods in Germany [20,21].

The motivation overall has increased, which is even slightly higher for the volunteers than the full sample. The assignment to this operation also influenced the motivation, and only a few reported that their motivation had decreased.

3.4. Cooperation and Information

Regarding cooperation (Figure 5), the majority perceived it as very good (volunteers: 40%; all: 40%), followed by good (volunteers: 32%; all: 40%). Cooperation is satisfactory for fewer persons (volunteers: 19%; all: 14%). Cooperation is perceived as "poor" (volunteers: 6%; all: 4%) or "very poor (volunteers: 3%; all: 1%). No rating was selected by 1% of the volunteers and 2% of all. The chi-squared test result was $p < 0.05$ (0.023) where a few classes are too small for applying the test.

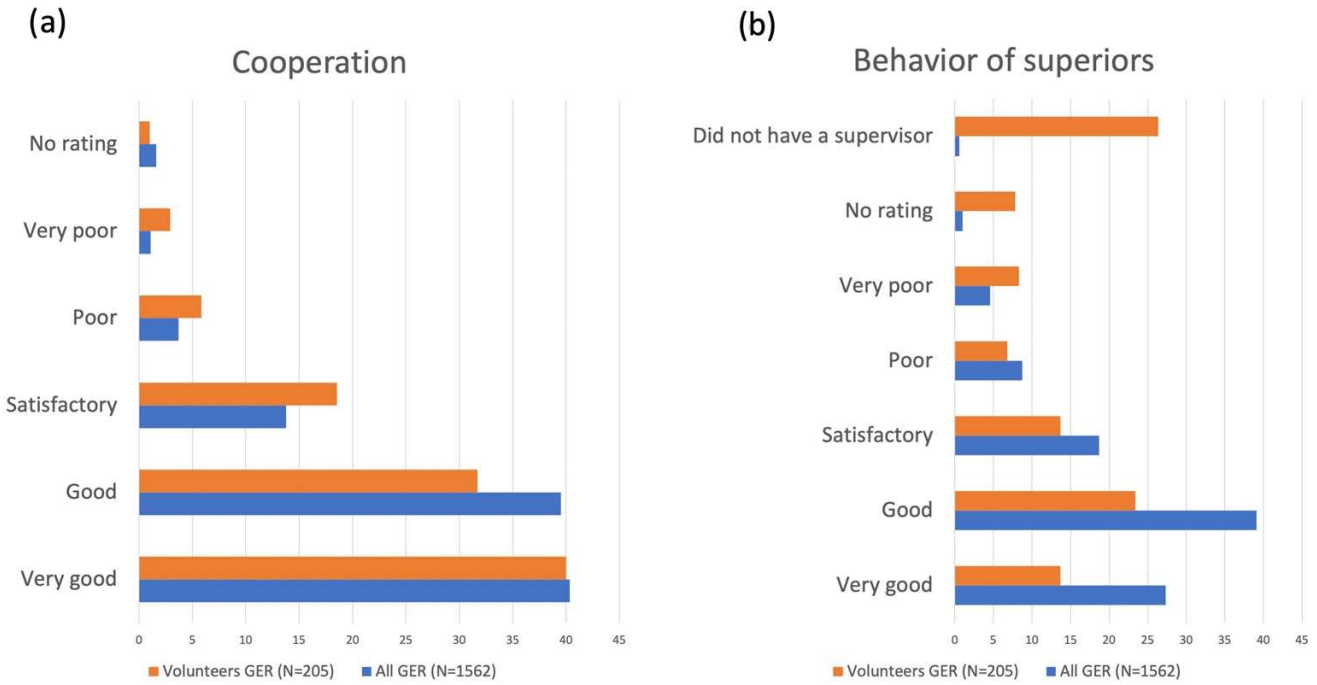

Figure 5. Perceived (**a**) cooperation and (**b**) behavior of the superiors.

Regarding the behavior of superiors (Figure 5), the majority had a positive perception of "good" (volunteers: 23%; all: 39%), "very good" (volunteers: 14%; all: 27%), or "satisfactory" (volunteers: 14%; all: 19%), followed by "poor" (volunteers: 7%; all: 9%) or "very poor" (volunteers: 8%; all: 5%). The "no rating" category was selected by a few respondents (volunteers: 8%; all: 1%). Some also reported not having had a superior (volunteers: 26%; all: 1%). The chi-squared test result was $p < 0.05$ (0.000).

Cooperation was perceived as positive overall, but slightly better by the general sample than by the volunteers. The same can be observed regarding the behavior of superiors. While overall, it is perceived as positive, it is much less positively perceived by

the volunteers. It is also interesting to note that many volunteers praise the collaboration without having a direct superior.

These results show that satisfaction is slightly more negative for the volunteers. This is related to several topics, including cooperation between people and official organizations and communication and coordination within incident command structures. This includes the behavior of superiors, but not only, as more details later in the survey reveal.

Regarding preparation (Figure 6), the majority had a positive perception of preparation: "good" (volunteers: 20%; all: 40%), "satisfactory" (volunteers: 22%; all: 24%), or "very good" (volunteers: 9%; all: 19%). Some had a negative perception of preparation: "poor" (volunteers: 20%; all: 11%) or "very poor" (volunteers: 9%; all: 5%). The "no rating" category was selected by some respondents (volunteers: 21%; all: 2%). The chi-squared test result was $p < 0.05$ (0.000).

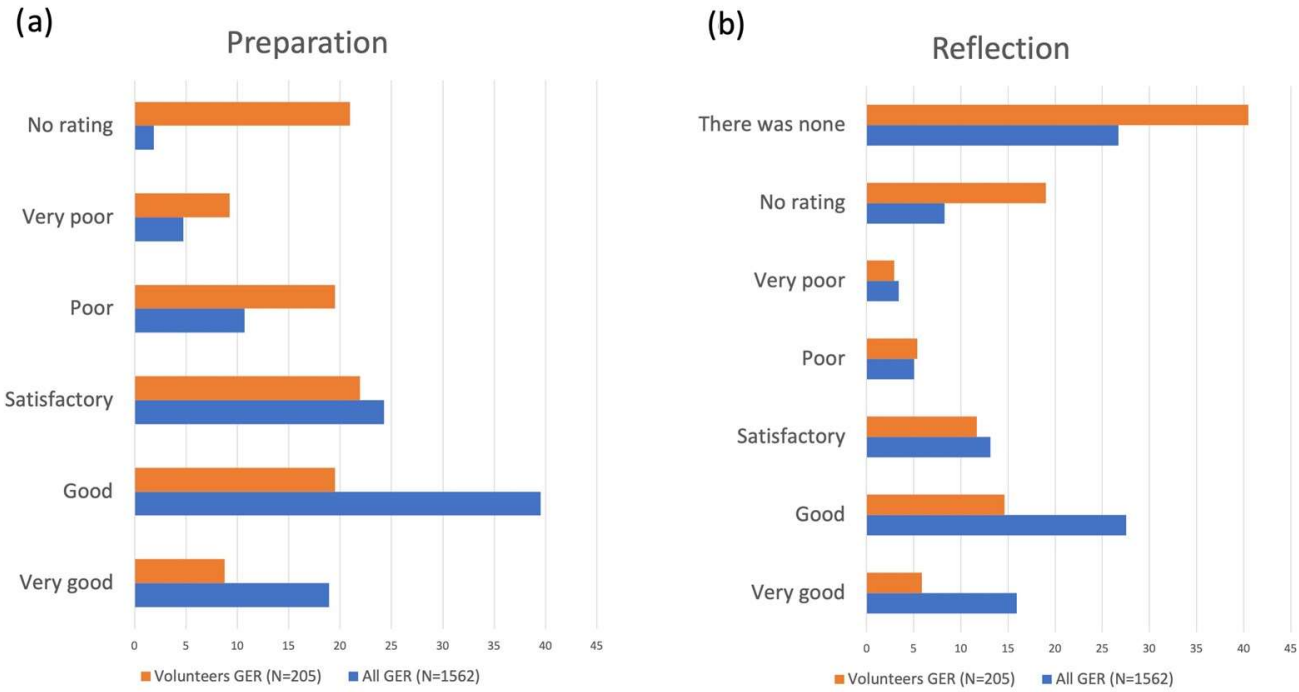

Figure 6. Perceived (**a**) preparation and (**b**) reflection after the operation.

Regarding reflection after the operation (Figure 6), the majority stated there was none (volunteers: 40%; all: 27%). The following had a positive perception of reflection: "good" (volunteers: 15%; all: 28%), "satisfactory" (volunteers: 12%; all: 13%), or "very good" (volunteers: 6%; all: 16%). Some negatively perceived the reflection as "poor" (volunteers: 5%; all: 5%) or "very poor" (volunteers: 3%; all: 3%). The "no rating" category was selected by some respondents (volunteers: 19%; all: 8%). The chi-squared test result was $p < 0.05$ (0.000).

The volunteers perceived preparation for this operation and situation as less good, and this difference is quite significant in the results. This relates to the overall impression of problems reported during the response phase, which is largely connected to lacking communication and coordination, mostly related to deficiencies in preparation and longer-term preparedness. It includes areas for improvement in digital radio equipment, coordination structures, and non-technical communication between layers of hierarchies and organizations (see further details below).

Reflection after the operation was also perceived as less positive by the volunteers. This could relate to missing official venues and organization of reflection and exchange of personnel for the volunteers compared to the work within established professional relief organizations. The relatively balanced or positive picture of the overall sample shows that reflection was there, but it does not detail how this was organized here. It can include individual reflection between team members and small groups and official

and psychologically supported feedback. We also know from interviews in the field that in many places, professional psychological support units were present and available to professional organizations almost immediately during and many weeks after the flood.

Regarding information before the operation (Figure 7), the majority had a "satisfactory" perception (volunteers: 25%; all: 32%) or a negative perception: "poor" (volunteers: 27%; all: 26%) or "very poor" (volunteers: 24%; all: 16%). Others had a "good" (volunteers: 15%; all: 20%) or "very good" perception of the information provided (volunteers: 5%; all: 6%).

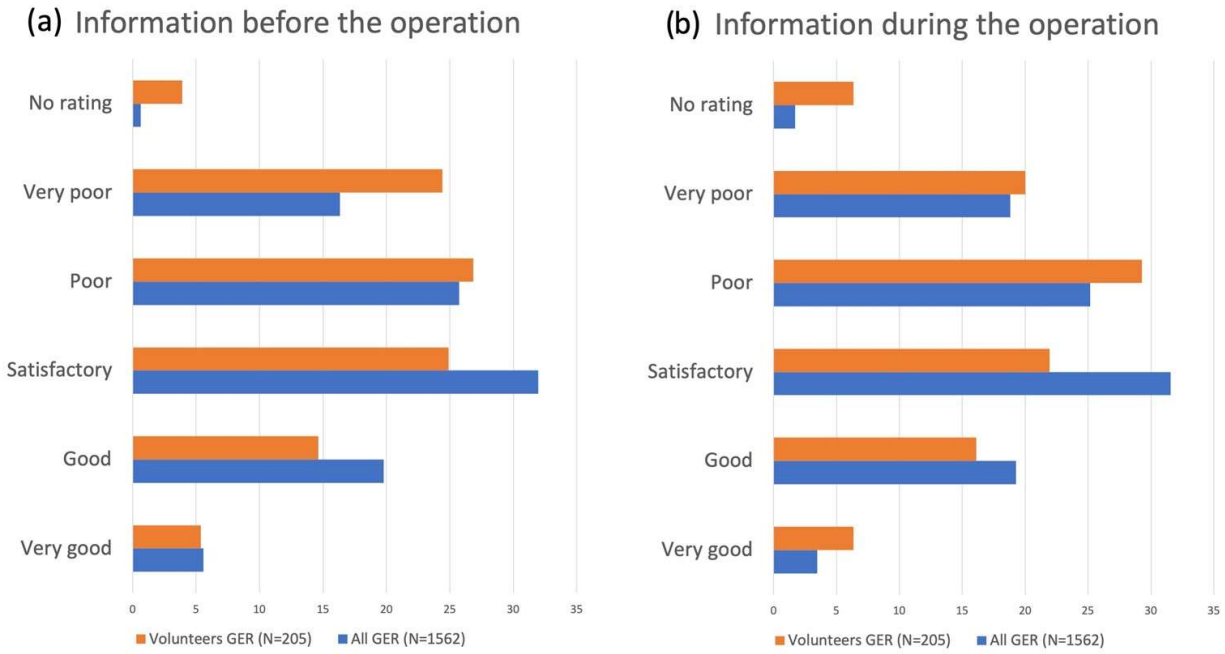

Figure 7. Information provision (**a**) before and (**b**) during the flood operation.

The "no rating" category was selected by a few respondents (volunteers: 4%; all: 1%). The chi-squared test result was $p < 0.05$ (0.000).

Regarding information during the operation (Figure 7), the majority had a "satisfactory" perception (volunteers: 22%; all: 32%) or a negative perception: "poor" (volunteers: 29%; all: 25%) or "very poor" (volunteers: 20%; all: 19%). Others had a "good" (volunteers: 16%; all: 19%) or "very good" perception of the information provided (volunteers: 6%; all: 3%).

The "no rating" category was selected by a few respondents (volunteers: 6%; all: 2%). The chi-squared test result was $p < 0.05$ (0.000).

The information provision before and during the flood operation could have been more satisfactory. Information exchange is one of the areas of critique related to missing warnings and preparation related to this flood disaster in Germany. Therefore, it is not surprising that the respondents' replies are mixed for information provided both before and during the operation. The volunteers perceived the information provided in both cases as more negative than the overall sample. This relates to other expressions by the respondents later on, who were missing information and experienced misinformation. It also relates to the specific case here that the volunteers are a subgroup of professional first responders who were unsatisfied with the flood operation. Information was also reported to be key or missing in multiple ways within the optional open question. Social media were also reported to be of paramount importance. However, these channels also pose the threat of being misused for politics, propaganda, and hate speech. There needs to be more information, and being idle, instead of engaging in action, also contributed to this.

3.5. Concerns, Perceived Dangers, and Problems Experienced

Worries when going on an operation (Figure 8) are greatest when children (volunteers: 30%; all: 32%) or elderly (volunteers: 14%; all: 8%) are involved. Another aspect of worry is an urban environment (volunteers: 15%; all: 16%) compared to a rural environment (volunteers: 1%; all: 1%). The chi-squared test result was $p < 0.05$ (0.003).

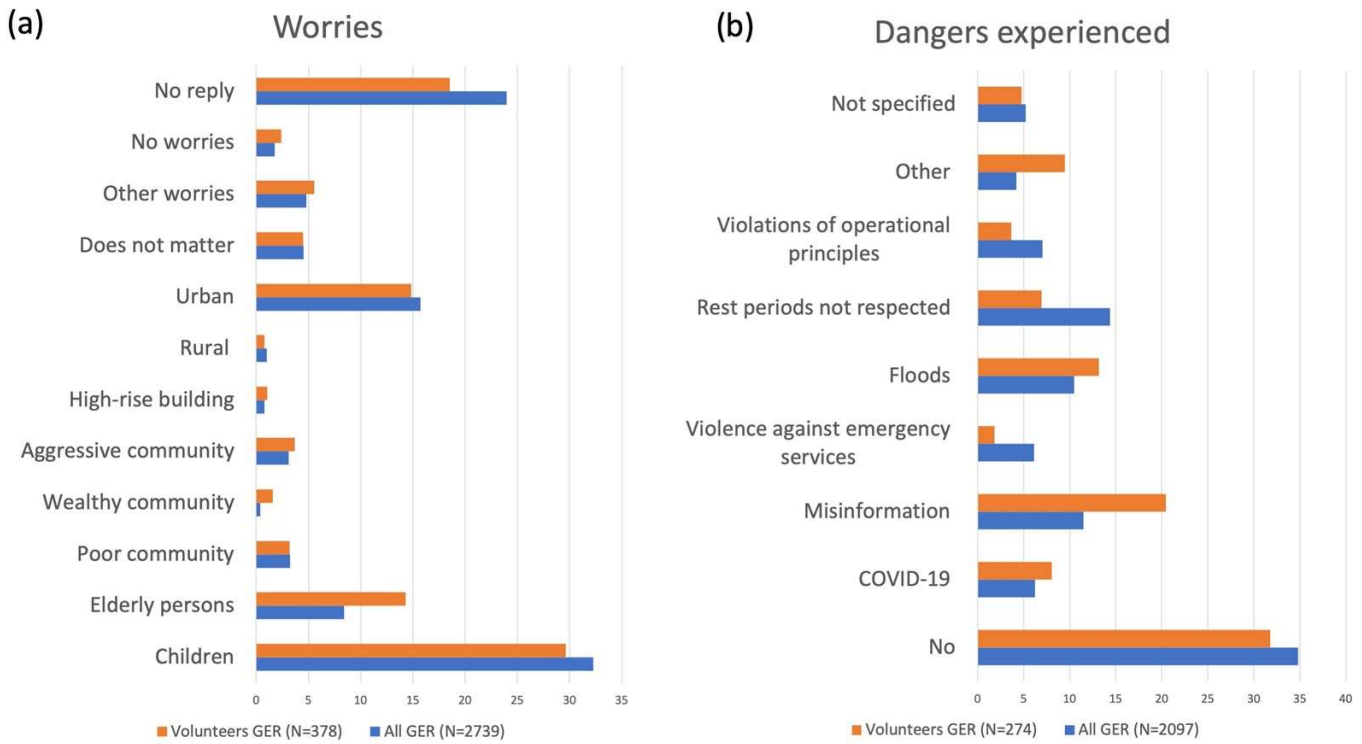

Figure 8. Perceived (**a**) worries before entering an operation in general and (**b**) dangers experienced during the flood operations.

Regarding dangers experienced during the operations (Figure 8), the majority reported none (volunteers: 32%; all: 35%), followed by reports on misinformation (volunteers: 20%; all: 11%). The floods themselves were reported (volunteers: 13%; all: 10%), rest periods not respected (volunteers: 7%; all: 14%), and COVID-19 affected some (volunteers: 8%; all: 6%). The chi-squared test result was $p < 0.05$ (0.000).

Related to motivation and satisfaction, it was important to ask the respondents about general worries and actual dangers experienced during the operation. General worries before entering an operation are high when the operation is about elderly persons, but even more when it is about children. This indicates that certain population groups are of higher concern to first responders and volunteers, and this could also be used to inform social vulnerability studies. Urban contexts raise many more worries than rural areas. This seems only partly to be an issue in question categories about whether a community is poor, wealthy, or aggressive. It is also related to types of incidents and situational context, but this needs further investigation. The groups do not differ much, except for elderly persons, which are of greater concern for the volunteers as for the overall sample.

Related to the dangers experienced during the flood operation in 2021, misinformation is the greatest problem for the volunteers. It is even higher than the danger perceived by the flood itself or COVID-19. The rest periods not being respected relates directly to the work situation and personal needs of first responders. It is a greater problem for the overall sample than for the volunteers. Additional specific worries were mentioned in the open-question option. Twelve persons reported worries about contaminated mud they had to carry out of flooded basements and cellars. Problems experienced in the flood operations

ranged from psychological stress to hygiene, self-endangerment, assignment of tasks, and misinformation, both from the media and official sources.

Regarding psychological burden (Figure 9), the majority reported it as high (volunteers: 44%; all: 33%), followed by "balanced" (volunteers: 23%; all: 29%). The psychological strain was very high for some (volunteers: 12%; all: 8%), low for others (volunteers: 10%; all: 16%), or "very low" (volunteers: 8%; all: 11%). The "no rating" category was selected by a few respondents (volunteers: 3%; all: 3%). The chi-squared test result was $p < 0.05$ (0.001), indicating that psychological strain is differently distributed in the two groups.

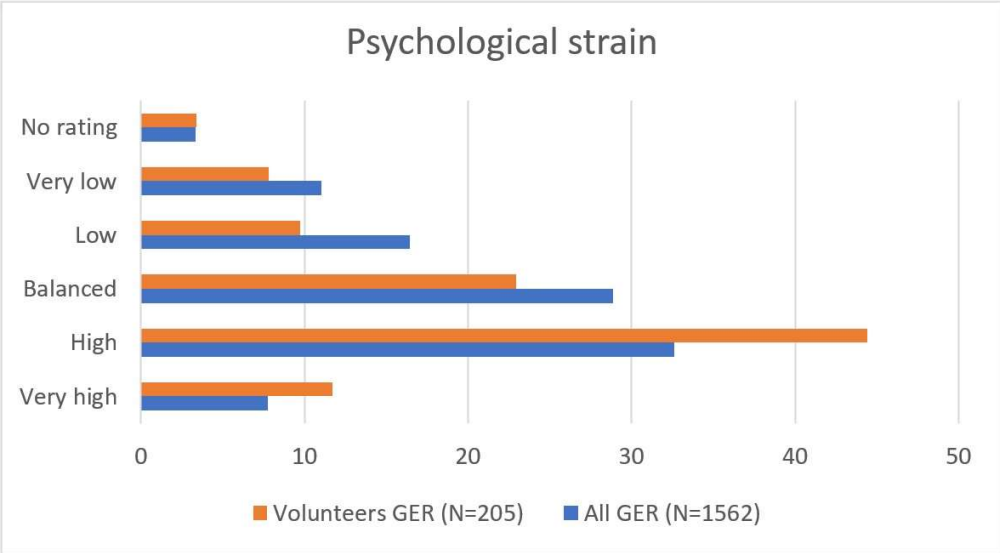

Figure 9. Psychological strains experienced.

The psychological burden of disaster operations is reflected in the responses for both groups. However, the psychological strains are even higher for the volunteers. This indicates that while the volunteers in this study sample are characterized by especially high motivation, they were also under higher stress.

4. Discussion

Challenges or improvements observed in the 2021 response are covered in a range of studies following the event. Warnings include recommendations for operational hydrological forecasts to include more localized information on the expected extent of flooding and impacts for improved impact forecasting [22]. This is an important area of improvement, since another online survey found that up to a third of the respondents did not receive any warning, which is comparable to other flood events in Germany [23]. Analysis of Twitter messages reveals that there was an "awareness of the extreme climatic conditions before the flood, but the severity was unexpected" [24].

Gaps identified in technical systems beyond warnings include a lack of integrated approaches regarding stormwater drainage, sewage systems and water management [25]. Damages to infrastructure also included bridges hospitals and schools, which is important for future validation studies [26].

Communication about the flood is another major focus of research. Mental health factors such as feelings of helplessness have been analyzed by examining how intertwined the language of journalism and politics is and how this has shaped communication about the floods [27]. Internet communication was analyzed in terms of to what extent comments on official media outlets reveal conspiracy theories and moralization [18]. The floods also shaped the outcomes of political elections in favor of the Greens, another study found [28].

A brief comparison with international responses to similar disasters offers a broader perspective on volunteer integration and challenges thereof in disaster management. Especially in developed countries with well-established professional operational forces, volun-

teers can be regarded a "nuisance or liability", prompting questions about better integration [29]. This covers both formally organized and "informal volunteers". While informal or spontaneous volunteers are a major source of relief help, their management and integration is a demand and challenge for many countries inside and outside Europe [30]. Online forms of volunteering such as crowdsourcing are an addition to types of volunteerism and forms of citizen engagement [31]. While volunteerism is a universal phenomenon, there is a demand for studies focusing more on motivational aspects and integration [32]. Risks to volunteers include health problems, injuries, or legal actions, and more training and supervision are listed as challenges [33,34]. Schools and universities could play a role in education and training as well as governments, a study finds [35].

4.1. Satisfaction

Additional information has been collected using field visits after the disaster, conversations with operational forces, students of rescue engineering, and people deployed during the disaster, and in the aftermath, either or both as professionals or volunteers, interviews with administrative staff and local government. The anecdotal evidence and sentences derived from the same survey in the open-reply fields confirm the findings overall. In addition, they provide some insights into the motivation of why many professionals were also in a double role, active as volunteers. A major factor was frustration over long waiting times, lack of coordination, being idle, and not being able to help. This is found not to be unique to Germany and the floods in 2021, but it has to be understood that it is a general pattern of volunteer firefighter forces, for example, often eager to apply their skills and resources. While on one hand, harsh critique was expressed in joint meetings, a survey in 2021 reveals the same picture as a similar survey of the 2013 flood [36]. Despite all critique, the overall motivation and satisfaction being deployed is very high or high, at least. This indicates that critique is directed at improving the system, and not to question the operation or relief effort in total. A major focus of this study is analyzing the motivations and satisfaction of first responders, and in this case, volunteers. The overall results and specific questions about satisfaction and motivation underline findings from other studies [1,2,21,37]. On the one hand, many problems are being reported, and despite this, overall satisfaction is higher than dissatisfaction. This is partly related to an increase in motivation due to being able to be active and help [10]. The positive experiences with the population and in the team support such overall satisfaction. While the statistical results do not reveal underlying reasons, we also have collected open-ended questions to some of the questions analyzed in the statistical part above. There is positive feedback on how the affected population was thankful and supportive. Positive experiences were acknowledgments and teamwork, among others. It is important to underline that positive and negative experiences balance the overall picture of satisfaction when working in a disaster relief situation. It is certainly interesting to learn about reasons for dissatisfaction. The open-ended questions and replies to problems reported incorporate a wide range of different areas.

4.2. Motivation

Some have reported that they took official vacations to be able to work directly as a volunteer. This reflects their high motivation to be active and to engage despite needing more official commands or information on where and what to do. Other studies find that information is a key issue for disaster preparedness and for acquiring and organizing volunteer help, where digital information and groups play an increasing role [38]. High motivation is also an enabling factor for volunteers in other studies about the 2021 flood disaster [10]. Several people also reported this in group discussions while preparing questions for the survey. Also, in the open responses, some stated that they were not employed because they were not on the screen of the officials, which created a lot of frustration. Many relief personnel and professional first responders would rather have helped dig out the mud than sit in the waiting station. However, some also report that

those who organized themselves as volunteers took over some units on their own initiative. This also created problems in overseeing the overall situation by having unregistered units.

Some report that they were heavily affected by expressions of the population of disappointment that the first responder organizations would not help them. This has emotionally affected those first responders, especially those who had flood damages themselves or were already helping others. In another on-site interview, we also heard that some rescue personnel had to leave their neighborhoods, which were heavily affected, to help out in other neighborhoods in the same town. This led to frustrations among their neighbors and put additional stress on them.

Overall, all these individual reports underline many findings and other studies and media reports after the floods in Germany in 2021. For this specific study, these specific aspects must be reported by volunteers, some of which were at the same time also professionals working in first responder organizations. These people could be described as especially motivated, since they went to help in the affected areas as volunteers when they could not or did not feel engaged by their official organizations already.

4.3. Problems

As a main problem, it is reported by several respondents that the coordination between official authorities and organizations with the volunteers could have functioned better. Some underline that mutual support and supply by private persons worked very well and were organized by themselves. Coordination with officials and organizations includes problems of hierarchical incident command chains into which the volunteers needed to be integrated. This matches the findings of other studies that trustful relationships were a problem in the 2021 flood operation [10]. One person stated that the communication with the incident command system with the population was perceived as arrogant. However, as other studies explain, this could also be due to different styles of communication that by the officials are understood to be within a "clear and concise manner" [10].

The problem is that local experts must sufficiently integrate into such incident command systems. A fixed single point of contact or liaison person is reported as missing.

The volunteer helpers also perceived separation of work tasks. One person reports that they worked all day while they observed relief organization personnel sitting idle at the stations and not doing anything. This relates to many reports and findings in the statistics above that waiting and idle times were reported as a problem.

Other problems that relate to dissatisfaction include missing or old equipment. Failure of communication equipment, such as the digital radio, must also be solved for the volunteers. However, such technical details again underline that this sample includes volunteers, who are at the same time professional first responders.

Other problems reported by the respondents in open-ended questions include the type of wording used between certain hierarchical structures in an abusive way. Another person stated that it was shocking how long it took to receive information on avoiding dangers, such as contaminated mud. Some reported that many people and authorities did not receive or understand the warning and were unprepared for this disaster. Visits of politicians and the press were also reported as interfering with their work.

4.4. Limitations of This Study

As a limitation, this study is not representative due to the random participation across social media platforms, and it only captured the perceptions of respondents who were mainly first responders and, in much fewer numbers, volunteers. Some studies find that there may be underlying constraints on how openly professionals express their opinions or use discretionary reasoning about collaborating with and integrating volunteers [39], but comparing this with studies that went more in depth with volunteers only to find overlaps and differences in perception is interesting. It is also important to analyze the perceptions of other stakeholder groups. Findings of other studies must be underlined here: while

there are many important opportunities for better integrating volunteers, limitations also need further research [4,10,40].

Misinformation was a greater worry than the flood itself or COVID-19. This should be analyzed in more depth and considered in future studies. While psychological strains can be related to such concrete operational factors, this area certainly needs more research, analyzing how psychological problems are also related to dissatisfaction and motivational factors. Many other factors would need to be analyzed, such as interpersonal relations and problems [2]. In addition, since this survey was carried out immediately after the flood, long-term psychological and other forms of trauma would also need to be analyzed by separate and more longitudinal surveys.

4.5. Policy Implications and Future Research

Policy implications for disaster risk managers and authorities include better integration of volunteers of all types with operational and command and control structures. While the general integration of volunteers has been captured as a main finding of the floods in 2021 and many official lessons learned from studies, it has to be differentiated between spontaneous and coordinated volunteers. Tens of thousands of spontaneous volunteers coordinated themselves and provided enormous support, especially for sorting out the debris and helping affected homeowners to overcome the damages, but the other type of volunteers addressed in this paper are organized volunteers. They are typically already part of larger officially recognized organizations of firefighters or rescue and similar relief agencies. These organized volunteers have a high degree of training and knowledge about emergency management, and to a more limited degree about civil protection and disaster preparedness. Their motivation has to be sustained by policy efforts not only by recognizing their volunteer societal work but also to better integrate them into future coordination of larger crises and disaster events. The phenomenon of double and self-employment is not novel as the anecdotes and reports suggest. It should not be neglected, and in order to avoid duplications of efforts and staff gone missing because they self-employ, it has to be better addressed proactively. This disaster, as with many disasters, by definition overwhelmed all preparatory efforts. Still, such lessons learned should proactively path future planning for how to provide those being idle and receiving no information with a better legal but also coordination framework of what they are allowed to do and what is detrimental.

Future research should address motivation and satisfaction aspects of operational forces as well as of all types of volunteers. Motivations can be very different not only according to a disaster type but also based on the official role and coordination success, which would deserve more research. Organizational research on how to better integrate all types of volunteers into existing incident command structures is one direction. Other fields should examine all the efforts and energy of volunteers that do not fit into standard practices yet. For example, there is an increasing number of digital volunteers and even virtual operation support teams. The majority of them are also integrated into organized volunteer groups. Some even form official groups within national organizations. But many others, as we heard in conversations, are reluctant to get involved in official and traditional structures. They need to be better addressed and supported to play their role and contribute to an integrated disaster management.

5. Conclusions

The survey has analyzed the formal inclusion of spontaneous volunteers in the 2021 flood operations in Germany. Using an online survey, a high number of volunteers as well as professional relief workers responded, which shows their interest. Analyzing both professionals and spontaneous volunteers enables a comparison after a real event. The anonymous online survey enabled us to capture impressions directly after the disaster and during ongoing volunteer work.

The results support the hypotheses derived from the literature that volunteers need more integration into formal organizations in Germany. The survey supports assumptions that this lack of integration also leads to lower degrees of efficiency and success. This is reflected by responses reporting problems to a higher degree within the volunteers than within the professional group. The problems are mainly misinformation, communication issues, and the need for coordination and integration into formal management structures. On the other hand, the survey shows the high potential of overall community resilience that the volunteers tap into, since they are in higher numbers in the local environment, longer involved, and sooner on-site than professional helpers.

More females participated in the relief efforts among the volunteers than within the operational forces, which shows another potential for community resilience. Volunteers were using social media information and online platforms more than others, which indicates that this form of communication should be posited more as a feature of future organizational structures. The survey also showed new results, such as that the volunteers are indeed even more dependent on critical infrastructure services, not only on communication lines but also electricity, water, and transport. Overall, the survey underlines the fact that Germany is not fully exploiting its community and disaster resilience potential by lacking formally integrated volunteers. The lack of formal acceptance, acknowledgment, and resources is another set of problems identified in this survey.

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References

1. Form, W.H.; Nosow, S. *Community in Disaster*; Harper & Brothers: New York, NY, USA, 1958; p. 273.
2. Barton, A.H. Communities in Disaster. In *A Sociological Analysis of Collective Stress Situations*; Doubleday: Garden City, NY, USA, 1969.
3. Twigg, J.; Mosel, I. Emergent groups and spontaneous volunteers in urban disaster response. *Environ. Urban.* **2017**, *29*, 443–458. [CrossRef]
4. Krüger, M.; Albris, K. Resilience unwanted: Between control and cooperation in disaster response. *Secur. Dialogue* **2021**, *52*, 343–360. [CrossRef]
5. Strandh, V. Crisis Volunteerism is the New Black?—Exploring the Diversity of Voluntary Engagement in Crisis Management. *Risk Hazards Crisis Public Policy* **2019**, *10*, 311–331. [CrossRef]
6. McCann, L.; Granter, E. Beyond 'blue-collar professionalism': Continuity and change in the professionalization of uniformed emergency services work. *J. Prof. Organ.* **2019**, *6*, 213–232. [CrossRef]
7. Eriksen, C.; Hauri, A.; Kollmann, D.N. Adapting Civil Protection to a Changing Climate. *Policy Perspect.* **2022**, *10*, 12.
8. Nahkur, O.; Orru, K.; Hansson, S.; Jukarainen, P.; Myllylä, M.; Krüger, M.; Max, M.; Savadori, L.; Nævestad, T.-O.; Meyer, S.F. The engagement of informal volunteers in disaster management in Europe. *Int. J. Disaster Risk Reduct.* **2022**, *83*, 103413. [CrossRef]
9. Puzyreva, K.; Henning, Z.; Schelwald, R.; Rassman, H.; Borgnino, E.; de Beus, P.; Casartelli, S.; Leon, D. Professionalization of community engagement in flood risk management: Insights from four European countries. *Int. J. Disaster Risk Reduct.* **2022**, *71*, 102811. [CrossRef]
10. Nick, F.C.; Sänger, N.; van der Heijden, S.; Sandholz, S. Collaboration is key: Exploring the 2021 flood response for critical infrastructures in Germany. *Int. J. Disaster Risk Reduct.* **2023**, *91*, 103710. [CrossRef]

11. BMI; BMF. *Bericht zur Hochwasserkatastrophe 2021: Katastrophenhilfe, Wiederaufbau und Evaluierungsprozesse*; Federal Ministry of the Interior: Berlin, Germany, 2022; p. 85.
12. DKKV. *Flutkatastrophe Juli 2021 Vom Starkregen zur Katastrophe*; DKKV: Bonn, Germany, 2021; p. 39.
13. Broemme, A. *Unwetterereignisse—Strategien für Nordrhein-Westfalen zur Vorbeugung, Vorbereitung, Koordinierung, Nachbereitung und zur verbesserten Resilienz*; Zukunftsforum Öffentliche Sicherheit: Berlin, Germany, 2022.
14. Broemme, A. *Unwetterereignisse—Strategien für Rheinland-Pfalz zur Vorbeugung, Vorbereitung, Koordinierung, Nachbereitung und zur verbesserten Resilienz*; Zukunftsforum Öffentliche Sicherheit: Berlin, Germany, 2022.
15. Rheinland-Pfalz. *Die Landesregierung. Der Wiederaufbau in Rheinland-Pfalz 2021-2022 nach der Naturkatastrophe vom 14–15 Juli 2021*; Ministerium des Innern und für Sport Rheinland-Pfalz: Mainz, Germany, 2022.
16. Ministerium des Innern des Landes Nordrhein-Westfalen. *Katastrophenschutz der Zukunft. Abschlussbericht des vom Minister des Innern Berufenen Kompetenzteams Katastrophenschutz*; Ministerium des Innern des Landes Nordrhein-Westfalen: Düsseldorf, Germany, 2022.
17. Merz, B.; Kreibich, H.; Thieken, A.; Vorogushyn, S. Überraschende Hochwasserereignisse: Lehren für Risikoanalysen. *Notfallvorsorge Z. BevöLkerungsschutz Katastrophenhilfe* **2021**, *52*, 19–23.
18. Kühne, O.; Koegst, L.; Zimmer, M.-L.; Schäffauer, G. Inconceivable, Unrealistic and Inhumane. Internet Communication on the Flood Disaster in West Germany of July 2021 between Conspiracy Theories and Moralization—A Neopragmatic Explorative Study. *Sustainability* **2021**, *13*, 11427. [CrossRef]
19. Mathiesen, K.; Von Der Burchard, H.; Gehrke, L. Over 100 Die in Germany, Belgium Floods despite Early Warnings. Available online: https://www.politico.eu/article/germany-floods-dozens-dead-despite-early-warnings/ (accessed on 4 September 2021).
20. Fekete, A. Motivation, Satisfaction, and Risks of Operational Forces and Helpers Regarding the 2021 and 2013 Flood Operations in Germany. *Sustainability* **2021**, *13*, 12587. [CrossRef]
21. Baumgarten, C.; Bentler, C. Analyse der persönlichen Zufriedenheit von Einsatzkräften während der Hochwasserkatastrophe 2013 in Deutschland. In *Eine Umfrage zur Steigerung der Motivation von Helfern im Bevölkerungsschutz*; Fachhochschule Köln: Köln, Germany, 2015.
22. Apel, H.; Vorogushyn, S.; Merz, B. Brief communication: Impact forecasting could substantially improve the emergency management of deadly floods: Case study July 2021 floods in Germany. *Nat. Hazards Earth Syst. Sci.* **2022**, *22*, 3005–3014. [CrossRef]
23. Thieken, A.H.; Bubeck, P.; Heidenreich, A.; von Keyserlingk, J.; Dillenardt, L.; Otto, A. Performance of the flood warning system in Germany in July 2021—Insights from affected residents. *Nat. Hazards Earth Syst. Sci.* **2023**, *23*, 973–990. [CrossRef]
24. Zander, K.K.; Nguyen, D.; Mirbabaie, M.; Garnett, S.T. Aware but not prepared: Understanding situational awareness during the century flood in Germany in 2021. *Int. J. Disaster Risk Reduct.* **2023**, *96*, 103936. [CrossRef]
25. Bosseler, B.; Salomon, M.; Schlüter, M.; Rubinato, M. Living with Urban Flooding: A Continuous Learning Process for Local Municipalities and Lessons Learnt from the 2021 Events in Germany. *Water* **2021**, *13*, 2769. [CrossRef]
26. Koks, E.; Ginkel, K.; Marle, M.v.; Lemnitzer, A. *Brief Communication: Critical Infrastructure Impacts of the 2021 Mid-July Western European Flood Event*; European Geosciences Union: Vienna, Austria, 2021.
27. Nerlich, B.; Jaspal, R. Mud, metaphors and politics: Meaning-making during the 2021 German floods. *Environ. Values* **2023**, 09632719231177511. [CrossRef]
28. Garside, S.; Zhai, H. If not now, when? Climate disaster and the Green vote following the 2021 Germany floods. *Res. Politics* **2022**, *9*, 20531680221141523. [CrossRef]
29. Whittaker, J.; McLennan, B.; Handmer, J. A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. *Int. J. Disaster Risk Reduct.* **2015**, *13*, 358–368. [CrossRef]
30. Paciarotti, C.; Cesaroni, A.; Bevilacqua, M. The management of spontaneous volunteers: A successful model from a flood emergency in Italy. *Int. J. Disaster Risk Reduct.* **2018**, *31*, 260–274. [CrossRef]
31. Kankanamge, N.; Yigitcanlar, T.; Goonetilleke, A.; Kamruzzaman, M. Can volunteer crowdsourcing reduce disaster risk? A systematic review of the literature. *Int. J. Disaster Risk Reduct.* **2019**, *35*, 101097. [CrossRef]
32. Gurung, S.; Wali, N.; Simmons, O.; Georgeou, N. The emergence of volunteerism in a post-disaster context: A systematic scoping study literature review. *Third Sect. Rev.* **2019**, *25*, 57–89.
33. Daddoust, L.; Asgary, A.; McBey, K.J.; Elliott, S.; Normand, A. Spontaneous volunteer coordination during disasters and emergencies: Opportunities, challenges, and risks. *Int. J. Disaster Risk Reduct.* **2021**, *65*, 102546. [CrossRef]
34. Johanning, E.; Auger, P.; Morey, P.R.; Yang, C.S.; Olmsted, E. Review of health hazards and prevention measures for response and recovery workers and volunteers after natural disasters, flooding, and water damage: Mold and dampness. *Environ. Health Prev. Med.* **2014**, *19*, 93–99. [CrossRef] [PubMed]
35. Ahmadi Marzaleh, M.; Rezaee, R.; Peyravi, M. Instructional Programs Influencing the Enhancement of the Knowledge Required by Volunteers in Disasters: A Systematic Review. *Bull. Emerg. Trauma* **2021**, *9*, 105–117. [CrossRef] [PubMed]
36. Baumgartner, C.; Bentler, C.; Fekete, A. Studying extreme events from the perspective of the disaster relief workers involved in 2013 floods in Germany. In *Recovery after Extreme Events. Lessons Learned and Remaining Challenges in Disaster Risk Reduction*; Fekete, A., Garschagen, M., Norf, C., Stephan, C., Eds.; TH Köln: Köln, Germany, 2017; Volume 2, pp. 87–91.

37. Fathi, R.; Tonn, C.; Schulte, Y.; Spang, A.; Gründler, D.; Kletti, F.; Fiedrich, F.; Fekete, A.; Martini, S. Untersuchung der Motivationsfaktoren von Spontanhelfern. In Proceedings of the Preis des Posterwettbewerbs in 15 DKKV Forum Katastrophenvorsorge, Berlin, Germany, 3–4 November 2015.
38. Fathi, R.; Fiedrich, F. Social Media Analytics by Virtual Operations Support Teams in disaster management: Situational awareness and actionable information for decision-makers. *Front. Earth Sci.* **2022**, *10*, 941803. [CrossRef]
39. Persson, S.; Uhnoo, S. Dilemmas and discretion in complex organizations: Professionals in collaboration with spontaneous volunteers during disasters. *Prof. Prof.* **2021**, *11*, 2. [CrossRef]
40. Max, M. Traditional organizations and crisis management in transition—Organizational perspectives on new dynamics of independent civil engagement. *J. Contingencies Crisis Manag.* **2021**, *29*, 2–11. [CrossRef]