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The local community faced with the threat of drought and flooding

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of article

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Abstract

Objectives: The aim of this study is to analyse the position of local communities towards the risk and the capacity of self-organisation for environmental security in water management in the two areas of drought and flooding. The opinions collected during the questionnaire survey and a review of past behaviour and responses to potential risks and emergencies allowed a diagnosis to be made of the current state of resilience of the communities surveyed to the threat of the water element.

Methods: In June 2022, surveys were carried out using a questionnaire. The data was analysed and graphically processed in the form of charts showing the distribution of answers to the questions asked.

Results: The results of the research process carried out indicate the current pattern of contacts and cooperation, but also the awareness, knowledge and sense of security of local communities in the face of drought and flood risks. The most important data were collated and this was also related to the nature and specificity of the respondents.

Conclusions: The research undertaken resulted in a discussion on capacity building and the role of citizens in solving the difficulties and challenges of water management in the context of future threats. In addition, a subjective pledge of solutions and tools to strengthen the resilience of social groups to environmental pressures and at the same time to comply with the principle of sustainable and balanced development is included in the conclusions.

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Introduction

The management of water resources in the face of the spectre of climate crisis and unpredictable extreme phenomena in the current configuration of forces, means and response capacities represents a long-term challenge for state structures, but also (due to the local nature of occurrence) for the local community. This is because social security combines all factors and factions through the common factor of citizens. The overriding role of the state in shaping this kind of resilience to, inter alia, political, economic, military, environmental or informational unrest should also be noted here. The very goal for social security, on the other hand, is to ensure survival, prosperity, as well as sustainable development, which is strongly correlated with the notion of generational justice (Łubiński, 2021, p. 463-470). This is particularly relevant in the context of water management in terms of the response to droughts and floods, which significantly affect the present and future pattern of the quality and quantity of drinking water resources. Management policy should therefore address the current difficulties in maintaining social security in the area being addressed. Importantly, a focus on effective measures and the correct operational structure can translate into the economics of the solutions adopted. A real threat to security and an element that triggers the need for specific and decisive action is the progressive climate change and the associated increasingly intense and unpredictable meteorological phenomena.

Within each region, as a result of an inventory of resources, strengths, weaknesses and needs, the challenges facing the area in the coming years should be identified. This is an indispensable stage in the creation of a proper development strategy for the area and the setting of further goals to improve the quality of life. The climate crisis itself, when considered in isolation from geopolitical factors, has a number of negative consequences in every sphere of human life and is itself a catalyst for the rate of change that is occurring (Lewis, Maslin, 2018). The main implications are generated by extreme weather events such as heavy rainfall causing flood waves as well as prolonged periods without rainfall, which create conditions for drought, resulting in drinking water deficits, fires and increased thermal stress. The whole range of financial, social and economic losses argues in favour of trying to take appropriate steps to mitigate, as well as partially adapt to, climate change (Ćwięk, 2019).

A series of negligence, diluted responsibility for water management and a lack of adequate planning thought have now created extremely difficult and complex conditions for organising countermeasures. In many places, there is an increased risk of flooding, which is amplified by sealed development, improperly executed drainage, inadequate retention or lack of blue-green

infrastructure solutions. (Huang, Shen, 2018). Furthermore, it should be noted that water cycle disruptions leading to deficits or overloading of sewerage systems are currently a growing phenomenon. Furthermore, heat waves generate the problem of increased demand for domestic and cooling water, which, as a result of prolonged periods without rain, manifests itself in drinking water deficits, agricultural drought and even local rationing of the resource.

The face of an emergency resulting from a flood or drought, i.e. the risk, threat, crisis and post-event period, requires adequate preparation, countermeasures, real-time response and recovery. These aspects do not only concern governmental and local authorities, but above all citizens, who are the ones who have lost their intangible or material assets (Jarmoszko, Barszczewski, 2017). It is therefore essential that the entire crisis management system is able to respond adequately and effectively to the challenges of extreme weather events related to the element of water. In order to achieve this, the synchronisation of many activities and the correct attitude of the public, who are often at the front line of contact with the crisis, are essential. A key research objective in this study will be to try to answer the question of whether the surveyed community is resilient to the threat of the water element. The research process will look at verifying and analysing the level of awareness of the selected group regarding climate change, adaptation and mitigation, but also their sense of security as well as self-organisation during crisis events and assessing the contribution of crisis management actors.

1. Methods

The source material for the research is a survey conducted among the local community using a questionnaire, which is attached as Annex 1 to this study. A review of the attitudes, behaviours and responses declared as well as tracked during emergency event coverage will allow a complete picture of the local community's condition in the face of drought and flood risk to be created.

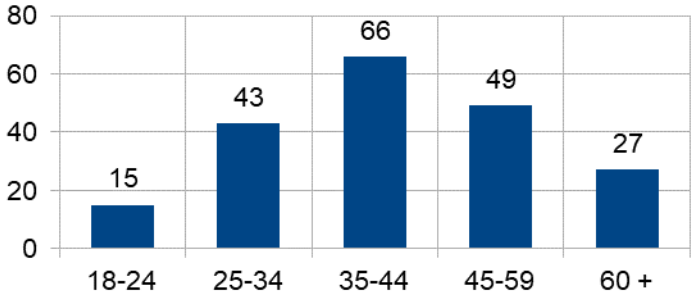

Fig. 1. Distribution of respondets by age
Source: own elaboration based on source material

The majority of participants in the survey were of working age. It can also be presumed that they may have been exposed to flood and drought incidents during their lifetime due to past emergency events.

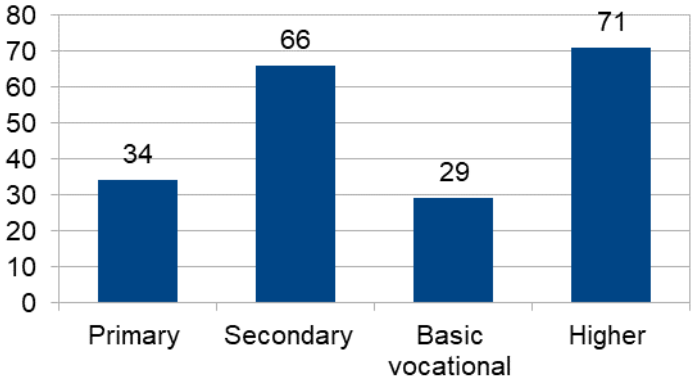

Fig. 2. Distribution of respondents by educational background

Source: own elaboration based on source material

A significant number of respondents have a secondary or tertiary education. In contrast, around 32% of respondents have a primary or basic vocational qualification.

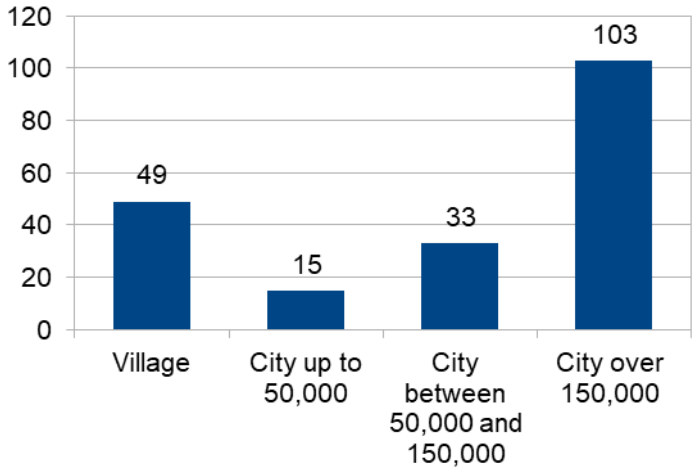

Fig. 3. Distribution of respondents by place of residence

Source: own elaboration based on source material

The main representatives in the survey were residents of a large city with a population of more than 150,000. Citizens from the countryside also made up a relatively large group (around 25%), which will give a cross-section of information due to the varied nature of the housing stock.

2. Results

In the research process carried out, respondents were asked questions to further assess and form a position on the situation of the sense of security and the quality of the elements influencing it in the face of drought and flood risk.

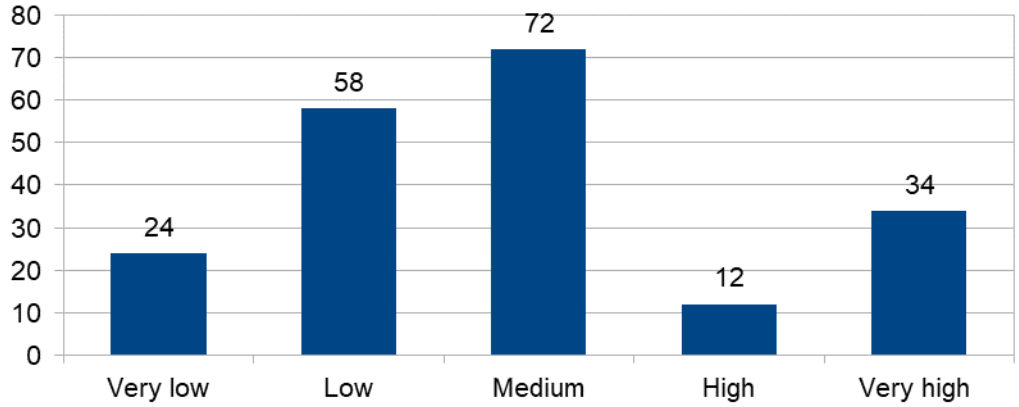

Fig. 4. How would you rate the overall level of security of water management in your locality?

Source: own elaboration based on source material

The level of security of water management is rated as very low, low or medium by 77% of respondents. The opinion is directed in particular from men regardless of age and women aged 35-44 and 45-59 with an equal distribution by place of residence.

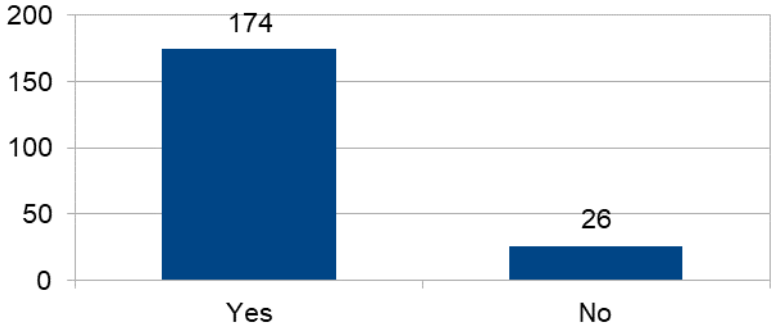

Fig. 5. Do you think there if a flood risk in your locality?

Source: own elaboration based on source material

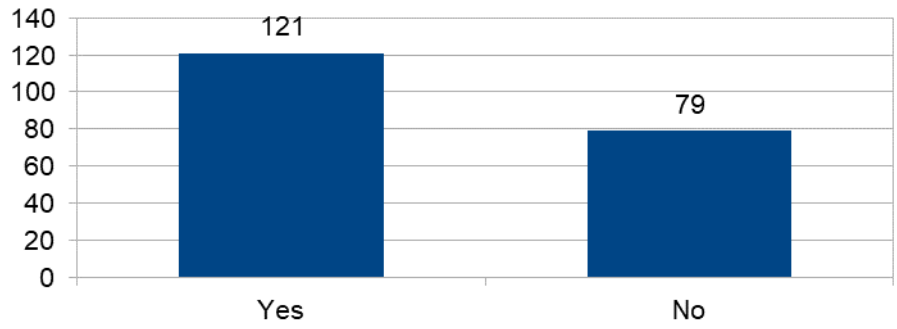

Fig. 6. Do you think there is a threat of drinking water shortage in your locality?

Source: own elaboration based on source material

Almost 87% of the residents surveyed indicate that there is a threat of flooding in his/her village. On the other hand, according to Fig. 6, the threat of a lack of drinking water supply is not so much observed by respondents. Confirmatory responses are recorded mainly from people in rural areas and small towns.

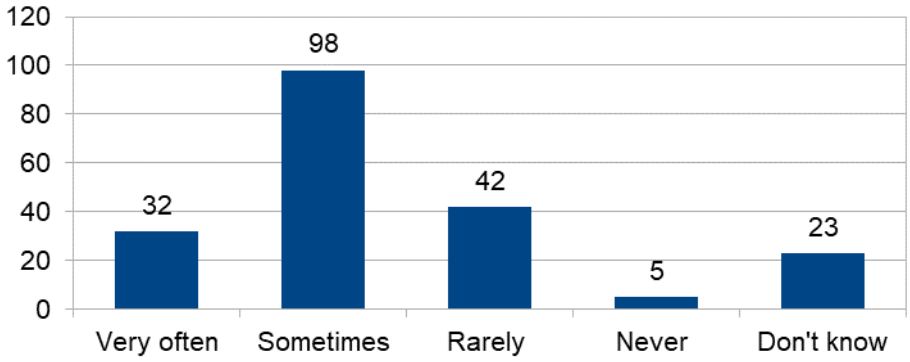

Fig. 7. With what frequency do flooding and waterlogging occur in your locality?

Source: own elaboration based on source material

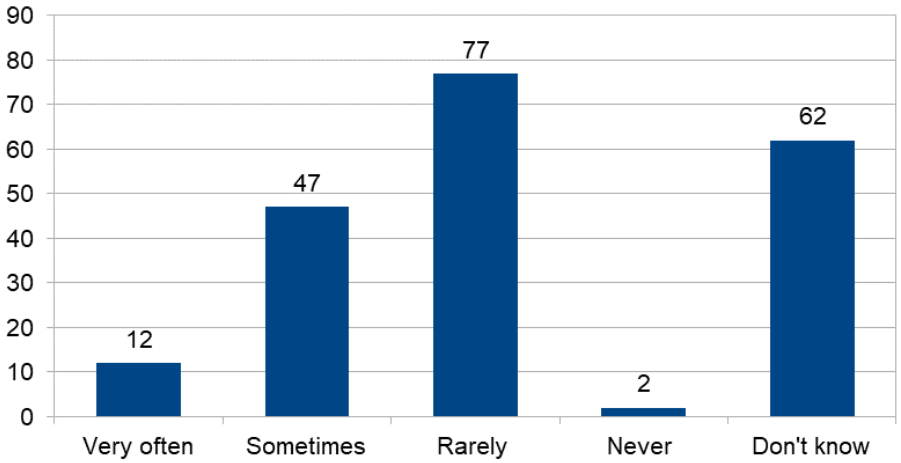

Fig. 8. With what frequency do water supply interruptions?

Source: own elaboration based on source material

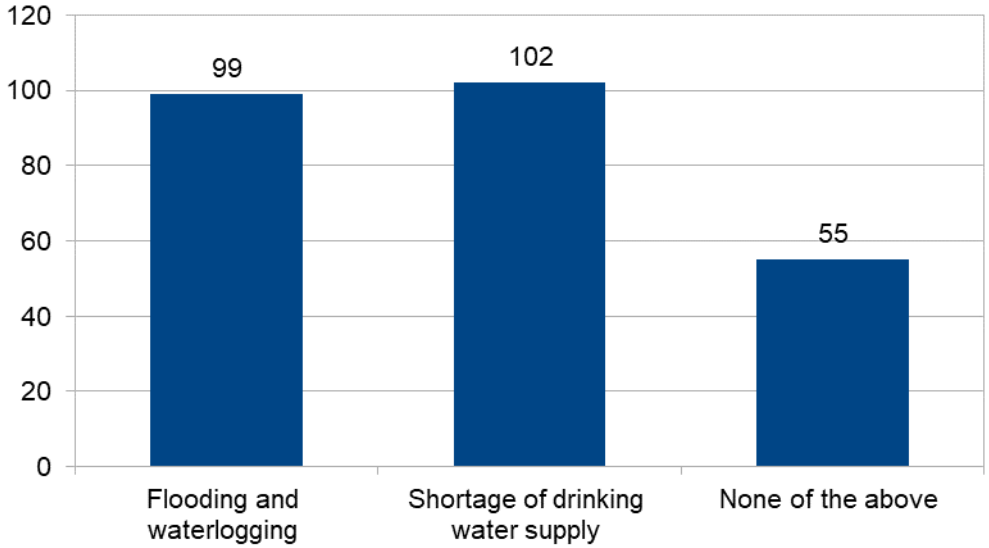

Fig. 9. Do you think your locality is adequately prepared for an incident: (you can tick more than one answer)

Source: own elaboration based on source material

One of the main questions in the survey questionnaire concerned the assessment of preparedness to respond to flood and flooding crises or drinking water supply shortages. Respondents gave a positive opinion of the preparedness of structures for both emergencies.

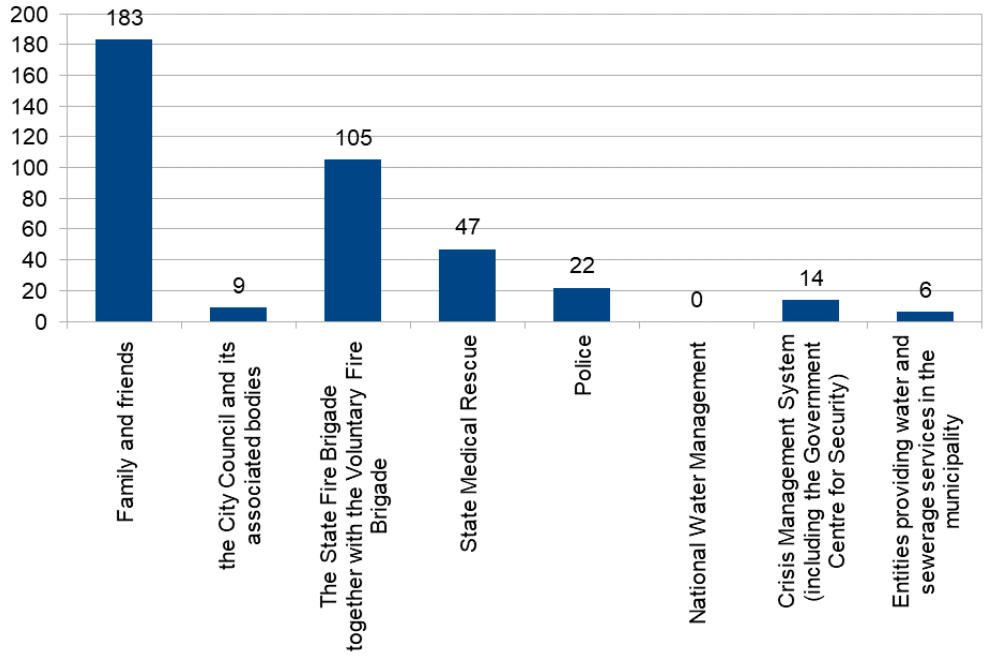

Fig. 10. Whose help can you count on in the event of floods and flooding and drunking water supply shortages? (you can select more than one answer)

Source: own elaboration based on source material

From the point of view of trying to verify the level of functioning of the system of organisation of actions against emergency events concerning water management, it is a priority to determine the structure that citizens use for assistance during an emergency. As Fig. 10 indicates, citizens mostly rely on family and friends, but also use the assistance of the National Fire Service, the Volunteer Fire Service and the Emergency Medical Service. The other listed units were indicated by respondents to a marginal extent. It is noteworthy that none of the respondents stated that they can count on a unit specialised in this subject area, such as the State Water Management Authority Wody Polskie.

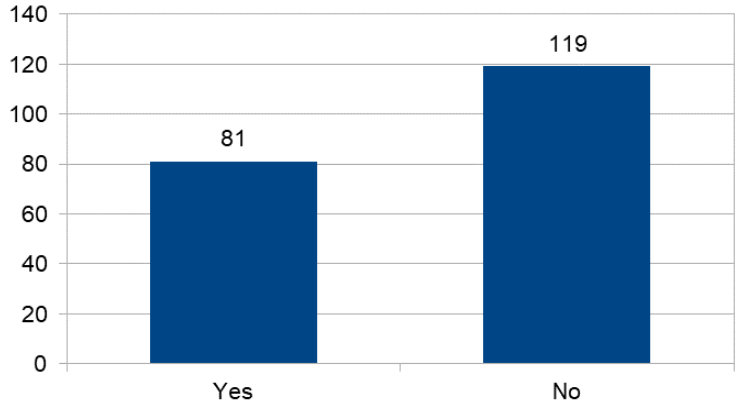

Fig. 11. Do you know how to behave in case of floods and flooding and ahortages of drinking water supply?

Source: own elaboration based on source material

Residents were also confronted with a question about their knowledge of correct behaviour during the crisis events in question. The majority of respondents denied knowledge of behaviour patterns.

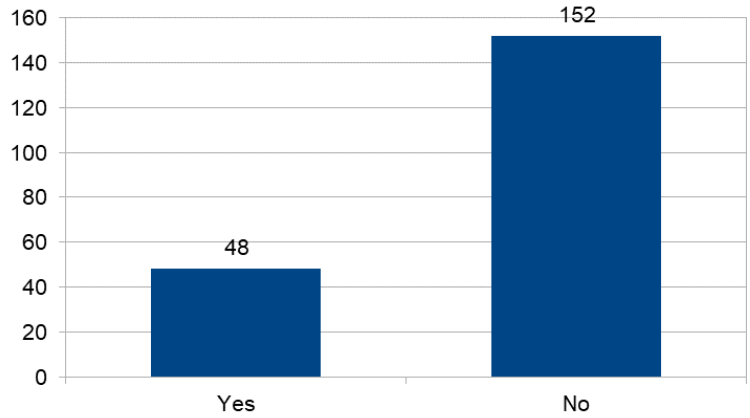

Fig. 12. Do you notice educational campaigns on how to behave during floods and lack of drinking water in your locality?

Source: own elaboration based on source material

Significantly, as Fig. 12 shows, the population in the public space does not notice campaigns or educational actions informing them about how to respond to an emergency situation.

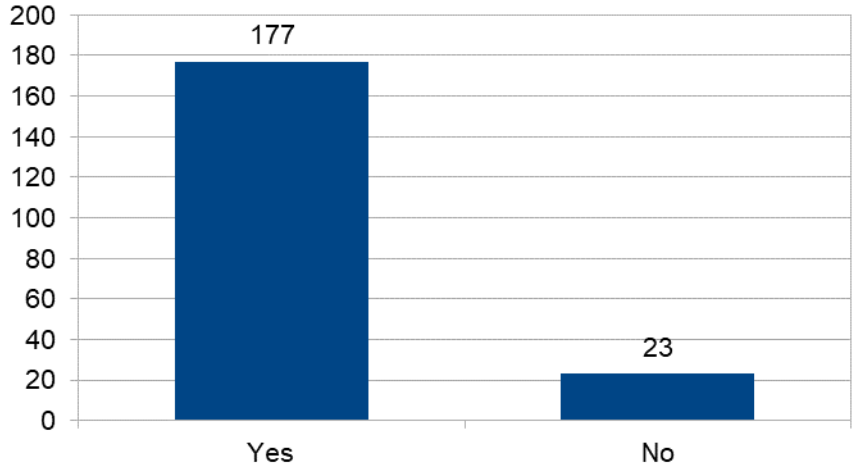

Fig. 13. Do people help each other in your locality during floods or lack of drinking water?

Source: Own elaboration based on source material

The vast majority of citizens (over 88%) indicate that during floods or drinking water shortages, people help each other to face the crisis together.

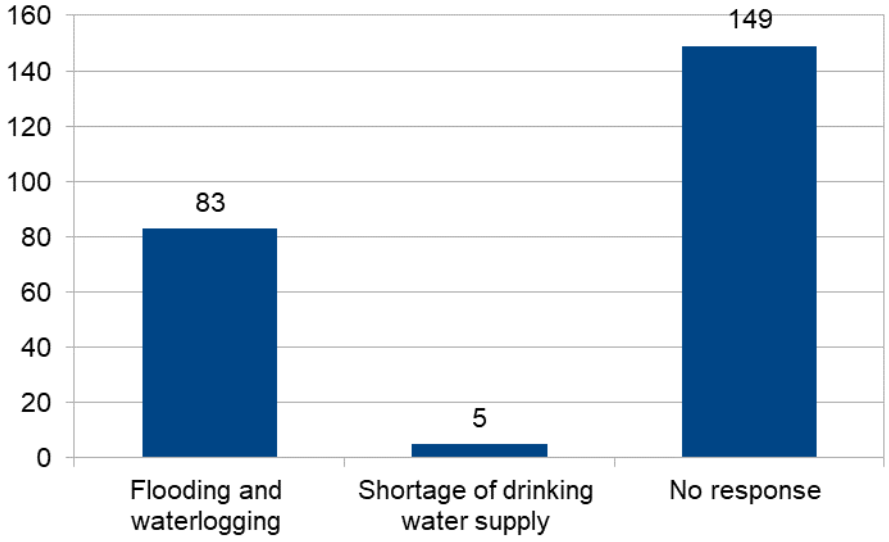

Fig. 14. Do you think you have a real influence on the incidence and/ or magnitude of impacts: (you can tick more than one answer od leave the question unanswered)

Source: own elaboration based on source material

One of the last questions asked about the proficiency of the population towards reducing the consequences of emergency phenomena. As can be seen from the answers given, residents

mostly do not have a structured opinion on the subject, with a small proportion seeing their person as having the potential to reduce the frequency and magnitude of the aftermath in the event of floods and flooding.

In the survey questionnaire, due to the closed nature of the questions so far, it was decided to include an open question to collect any comments. The surveyed community pointed out a whole range of difficulties related to the practical aspects of water management in the area where they live. Representatives of villages and smaller towns stressed the frequent need to find new sources of drinking water due to the lack of a water supply system, while residents of larger administrative units referred to the phenomenon of rapid urban flooding, which is exacerbated by compact buildings and inefficient sewage systems. However, there was unanimity among respondents on the need for self-organisation in the face of emergency phenomena, as care and assistance from external structures is at too low a level or does not appear in the right place at the right time.

Conclusion

The analysis was intended to be a means of identifying the current situation and trends in public opinion on drought and flood risk, as the community is the most important element in the crisis management process. Referring to the research questions posed, it should be stated that the resilience of the local community is difficult to determine, on the basis of the research carried out, but it certainly retains the potential in the form of a willingness to self-organise and to cooperate for the benefit of the threatened and affected. As the respondents indicate, their awareness, knowledge and preparedness is not at a high level and the contribution of the actors of the crisis management system is insufficient. There is, therefore, a need to continue the research - to extend it in terms of finding out opinions through in-depth interviews precisely in the entities performing duties in this area, in order to see the whole spectrum of the picture of Polish water management in a crisis situation.

The complexity and interdisciplinarity of the issue also translates into the need for cross-sectoral action. The climate crisis and its consequences require comprehensive management to protect the population. The Polish localities lack a unified system of information dedicated to the inhabitants and channels of transmission of information, ways of reacting to precipitating situations, possibilities of obtaining assistance, as well as rules of cooperation in the face of a threat, which means that the population by its behaviour does not support the crisis management system. It is therefore noted that there is a need to standardise cooperation between

decision-makers and citizens to counteract the multifaceted effects of both "rainy weather" and "dry weather" (Działek et al., 2017).

In view of the problems, barriers and challenges identified both locally and at a supra-local level, it seems necessary to set priorities and a specific course of action so that the negative effects of drought and flooding incidents can be mitigated in cross-sectoral cooperation and with full public involvement and participation. A fundamental step is certainly to increase the emphasis on education about the causes and consequences of crisis events, but also about specific behaviour. Such training should be two-pronged and be implemented for both decision-makers and communities at all stages of life. It is important to be able to use hydroinfomatics tools in an accessible form, which would clearly and precisely indicate the location of hazards or effective solutions. The ISOK Hydroportal (Information System for National Defence, 2022) can serve as an inspiration and a good example. Insufficient knowledge of such solutions results in reduced awareness in society. It would be worthwhile for systems and platforms to be equipped with a network of sensors, which, through integration with expert systems, would indicate optimal decision-making options. Furthermore, an element that increases the contribution and responsibility of local society is the promotion of good practices for participation in programmes that subsidise the implementation of blue-green infrastructure or renewable energy sources, thus contributing to reducing the negative impact on further climate change (Mierzejewska, 2015, p. 5-11). A standardised and, importantly, rehearsed scheme for informing and managing a crisis situation with citizens is another and necessary milestone to achieve effective crisis management in real time. It is important that all arrangements are standardised on a supra-local basis in order to be able to organise prevention and response to flood and drought risks in the same way. Furthermore, as the answers of the respondents show, the cooperation of individuals, companies and local authorities itself needs a lot of improvement in this aspect of the problem. Fostering patriotism, a sense of community and empathy, and instilling self-organisation in local communities will also contribute to increasing the quality and effectiveness of the tasks carried out (Działek, 2017, p. 158-162). The above subjective set of proposals for remedial action requires appropriate planning thought and, above all, synchronisation across multiple levels of crisis impact.

Security in a time of widespread climate crisis and difficulties in managing water resources during droughts and floods is being redefined and generates the need for an immediate revision of existing measures. Focusing on the issue of increasing retention, rational land reclamation, drainage and drainage or rainwater reuse, as well as appropriately planned developments to shape and develop blue-green infrastructure is an indispensable part of

prevention, but it does not prepare communities to respond. Increasing the awareness of responsibility, proposing further solutions with the presentation of long-term benefits and the prospect of reducing the number or intensity of crisis events should also prepare the community and equip them with the skills to act during droughts and floods, as the extent of material or personal losses often depends on their behaviour. It is therefore important at this time to design and implement an action plan, shared by all stakeholders, that will familiarise the population with both the theoretical and practical aspects of preparation, response and recovery during a given crisis, thus building the future resilience of the community and the administrative unit's structure to the threat of the water element.

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