Ethics of environmental research in the context of climate change: the case of the 2019 flood in Aq Qala, Iran

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Brief description of context

Continuous heavy rain and snowfall over 5 days, along with a drop in temperature starting on Sunday, March 26, 2019, in the Caspian Sea coastal provinces of Mazandaran and Golestan, in northern Iran triggered significant flooding in these regions. The situation was further aggravated by soil erosion and excessive exploitation of local forests[i]. Between 1984 and 2018 more than 100000 hectares of deforestation in Golestan province occurred[ii]. These events culminated in a severe environmental disaster in the region, particularly affecting the area around Aq Qala a town located in Golestan province, which received around 300 mm of rain 48 hours before the flood, the amount that is normally gained in one year. Contributing factors to the catastrophe included heavy rains before and during the flood, dams already at capacity before the onset of the rains, and inadequate dredging of local rivers.[iii] As a result of the flood 13 people died and more than a hundred were injured[iv,v]. A brief report from a temporary military hospital shows a surge in infectious diseases during the time of flood in the region[vi]. Later, findings of a survey showed that the flood adversely affected local farmers' land, irrigation, livestock, residential units, infrastructure and income opportunities [vii]. The flood damaged 270000 hectares of agricultural land and 12000 houses[viii]. The total damage was devastating and estimated at around 500 million USD[ix]. Shortly after the start of the flooding, a research paper, published in the winter of 2017[x], over two years before the flooding, by a group of researchers from Tabriz—a city in the northeast of Iran and far from the flooded areas— that predicted and warned of the risk of flood in the town of Aq Qala drew attention from the general public, policymakers and the academic community. They questioned why the published results were not taken up by the authorities and why no action was initiated based on the findings of this research. The study underlined the need for a comprehensive evacuation strategy in Aq Qala, particularly for areas along the river path. The paper proposes several recommendations, including sustainable urban planning, infrastructure improvements, identification of risk areas, and ensuring accessibility and the necessity of evacuation. Although these findings could have guided local authorities in Aq Qala in their urban planning and crisis management efforts, and also served as crucial input for developing flood insurance mechanisms and disaster preparedness strategies, a pressing question remains: Why did local authorities not pay attention to this research? This case study will address this question from an ethical point of view.

Discussion of ethical issues

The role of funding agencies: The question of who gets to ask research questions is critical. The inquiry made by the researchers was highly relevant and scientifically sound, with results that were reviewed and published in a peer-reviewed journal and could be counted as scientific evidence and were soon proven correct in the real world. Yet, one reason that the findings were overlooked might stem from who initiated the question. This project was initially inspired by the second author of this

paper who was a master's student at that time, on vacation to the region. During this trip, he found the river and surrounding area intriguing for a potential research evaluation by detecting some risk factors such as the topographical characteristics of the river and inadequate dredging of local rivers. After returning to his university, he sought assistance from faculty members, who guided him to shape and carry out the project as an investigator-initiated study without external funding. It could be argued that had local authorities funded the study, the findings might have been more likely to influence decision-making. This situation underscores the vital role of research governance and funding bodies, not only in supporting research but also in ensuring that results are utilized effectively by those who need the results. Researchers can conduct investigator-initiated projects that they think are interesting or beneficial for various motivations. This means that the importance and significance of the research question and its social and societal benefits are evaluated by players inside academia and the results would be isolated inside the circle of academic players and less waited and absorbed by the end users. To enhance the efficiency of the research sector it is crucial to bring the research sector and research finding end users as close as possible. It does not mean that end users should be part of the research sector but this gap could be addressed by strategies such as the establishment of well-organized research funding agencies or improving the quality of work of current funding agencies that can connect those who need the scientific evidence to pursue their missions to those who can produce such evidence. This is an ethical issue since it could result in more efficient use of scarce research resources. According to the Water Research Institute (WRI) of Iran's Ministry of Energy, despite the social value of this research, the problem is that its findings were not shared directly with relevant authorities. One official letter of WRI emphasizes the need for targeted strategies to effectively integrate insights from such academic publications into governmental processes.[xi] The letter attempts to explain why the Ministry of Energy did not respond to the study's findings to help the organization because this inaction led to the Minister of Energy being called to parliament to address the failure to implement the study's recommendations. So, a good governing system and wise public policy would support the availability of well-organized funding agencies that can direct researchers toward sponsored projects with findings that are more likely to be implemented and integrated into practice, compared to those from investigator-initiated projects.

Participatory research, collaborative partnership and engagement of local communities and related authorities: This case study highlights the crucial place of engagement of local communities and authorities in various steps of the research process including proposing, reviewing, conducting and even post-publication. Aq Qala's study, while focusing on the technical aspects of flood modelling and control, does not include elements to ensure that the final results are adopted and utilized effectively by strategies such as the engagement of local authorities and community members. If the project had been funded and conducted in a manner that included local authorities and community members in the process, it is more likely that the outcomes would have directly benefited those communities. As one of the investigators of the study mentioned, the main barrier to such an engagement with local authorities was their lack of cooperation in providing enough data about the river despite the investigators' approach and request. The main problem for local community engagement was the lack of education and consequently enough sensitivity in the research team for this issue. Other potential barriers could be related to the highly technical nature of the project, which can make it challenging for local communities to participate meaningfully, as one of the investigators says. Another unanswered question in this study stems from the long distance between the university in which the project was conducted and the town where the flood happened, while scientific literature includes examples of academic work that shows the capacity for this kind of project was available in the Golestan province, which is the host of several public and private universities. The ethics of research priority setting requires the engagement of the target population and impacted stakeholders[xii] and in the domain of health research, community engagement and collaborative partnership are ethical obligations according to international guidelines for health research such as CIOMS guidelines[xiii] and therefore, are a part of research ethics education programs. Because these ethical standards are mainly discussed in the biomedical research domain, and their implementation is perused by bodies such as research ethics committees which are mostly established in the medical sector, there is less

sensitivity in areas such as engineering, construction and other non-medical fields about such issues. The project of this case study is in the civil and environmental engineering discipline and despite its huge impact on human health and well-being was not the subject of ethical review and approval because such mechanisms are not usually implemented in academic disciplines other than biomedicine or rarely some areas of social sciences in some countries such as engineering.[xiv] Promoting a holistic understanding of health by various stakeholders mainly policymakers through e.g., advocating for including environmental dimensions and inviting other disciplines such as engineering and encouraging interdisciplinary and transdisciplinary approaches to research fields that are directly related to the health of the community can help researchers from various fields learn more from each other which could help bridge the gap between technical expertise and community needs.

Need for a holistic approach to health: The impact of climate change on human health[xv] and the interconnectedness of the health of animals, plants and humans, are increasingly noticed and discussed by the introduction of close but different concepts of one-health and planetary health[xvi, xvii] which enable us to better understand that health and other fields such as environmental and even engineering are intertwined. Climate change and resulting global warming adversely impacts global health in several ways including by increasing the frequency and distraction power of floods which have direct and indirect effects on various aspects of human health. In some cases, specific aspects of public health such as antibiotic resistance are negatively influenced by flood[xviii]. This significant impact of climate change on the health of human communities requires a more careful review of relevant ethical standards for environmental research projects. For example, this case study demonstrates that community engagement and collaborative partnership are not only ethical approaches in biomedical research but also essential standards to be addressed and considered in other fields, particularly those where results significantly impact human health and the environment. From a governance standpoint, this case underscores the need for extending relevant components of the current biomedical model of research ethics frameworks, traditionally focused on studies involving human participants to research studies with a significant environmental impact, recognizing the interconnected nature of our planet and its inhabitants. Such frameworks have both substantive ethical content such as ethical necessity for community engagement as well as procedural and governance components such as requirements for ethical approval of proposals by research ethics committees. One example of such extensions could be expanding the scope of ethical review beyond what is traditionally confined to health or life sciences. The research study used in this case was not approved by any ethics committee. Imagine that the study had been reviewed by a competent research ethics committee, which may have required the research team to engage with local authorities and communities and could have asked them to explain how they would inform the impacted communities about the results. Ethical review is not the only procedure of the biomedical research domain that could be expanded to environmental studies. Other examples could be ethical approval as a condition for publication in related scientific journals, establishing platforms for registration of environmental studies at the point of approval of the proposal and before commencement similar to clinical trial registries to make them transparent and available to the public, requirements for disseminating the research results to potentially impacted individuals or participants, informing incidental findings. In summary, those successful experiences that improved the ethical aspects of biomedical research could be exploited for improving a wider scope of health-related studies such as environmental research. This case study demonstrates how disciplines can learn from each other and how interdisciplinary, multidisciplinary, and transdisciplinary approaches are not merely beneficial but could be necessary for research to be effectively utilized and to benefit society since such an approach could improve the efficiency and inclusiveness of health research and could enhance their alignment with a new holistic understanding of health and increase the chance of uptake of research findings.

Improving the social value of research by facilitating its translation to policy or action: This study presents a research project of significant value to the target population and broader society. However, the social value remains theoretical unless there is sufficient willingness and infrastructure to facilitate an adequate level of result uptake. For research to achieve tangible social value, it's not

enough to be socially valuable on its own; it also requires collaborative efforts from all stakeholders, including policymakers, to translate research findings into effective, beneficial policies and actions. In this case, heightened sensitivity of authorities and policymakers to available scientific evidence, more advocacy by researchers, science advisory structures and other stakeholders for procedural values including evidence-based decision-making, transparency, inclusion, and accountability, are missing parts of the puzzle necessary for bridging between research findings and the policy-making process. However, the extent of researchers' responsibility to inform the related communities and authorities about the important and meaningful results of their studies in fields similar to this case study remains a valid question.

Conclusion: This case study underscores the significance of:

- Specification of research ethics norms and principles, participatory research approach, collaborative partnership and community engagement, whose absence could lead to the isolation of the findings from public attention, practical application and policymaker attention in the context of environmental research.
- Ethical governance of research studies within a wider domain than biomedical studies including the potential benefits of extending some aspects of contemporary biomedical research ethics standards such as the ethical review process to environmental and climate change studies.
- Understanding that the onus of this ethical requirement should not be put only on researchers but also on funding agencies, research governance and oversight bodies, universities and research institutions, scientific journals and others.

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