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Bridging Mythology and Science: Lessons from a Mental Mapping Workshop on the Perception of Environmental Health Crises

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Abstract: This article presents a report on a mental mapping workshop conducted in Estonia within the framework of the CHRYSES project, examining the methodological, ethical and analytical insights gained at the workshop and situating them within a broader theoretical context. Drawing on both the structure and outcomes of the workshop and making comparisons with other topical case studies, the article demonstrates how mental mapping can serve as an effective tool for uncovering differences and gaps between scientific and grassroots (for example mythological-folkloric) approaches to environmental health crises (EHC). These variations – manifested in spatial priorities, narrative emphases, and related risk assessments – offer critical lessons for improving public communication and engagement in the face

of future EHC scenarios. By highlighting best practice considerations, this study contributes to advancing participatory methods that bridge knowledge systems and enhance resilience in environmental health governance.

Keywords: maps, mythological legends, environmental health crises, mental mapping workshops, ethics

Introduction

Environmental health crises (EHC) demand not only scientific expertise or active stakeholder input but also meaningful public engagement to foster resilience and collective action. Yet, gaps often exist between expert knowledge and the mental models held by the wider public, shaped by cultural narratives, myths, spatial perceptions and lived experiences. Project CHRYSES (Mapping Environmental Health Crises – Public Understanding Through Myths and Science, carried out in 2025–2026) pursues an interdisciplinary approach to investigating the interplay between myths and science. It looks at how our societies conceptualise and represent environmental health crises, utilising the versatile representation medium of maps to unify the corresponding perspectives of mythological-folkloric (and other grassroots) approaches and science to enhance public understanding of such global crises.[1] One of the central methods that CHRYSES uses to acquire crucial new knowledge of spatial crisis response is through various map workshops (organised by folklorists, geographers and visual designers) that engage decision-makers, politicians and policymakers, media organisations and lay people, thus enabling mutual learning through dialogue and feedback. As part of this objective, a mental mapping workshop[2] was conducted in Estonia in October 2025 by folklorists Reet Hiiemäe and Mare Kalda, bringing together members of the general public, local community leaders, and experts. Its aim was to discuss the cartographic depictions of crises in traditional mythological legends (picked from an anthology of plague legends, Hiiemäe 1997), contemporary media reports about COVID-19 and African swine fever in Estonia's bigger newspapers (from 2020 and 2025) and scientific maps accompanying such reports to identify possible gaps as well as similarities in understanding and reasoning, for example in spatial narrative models and related risk assessment of environmental health crises. Participants commented on the material

verbally and draw their own mental maps based on this material; in addition, they were asked to draw a mental map of a potential major future environmental health crisis that they subjectively considered most threatening and likely to occur in their area and their imagined response to it. Their comments were recorded, transcribed, coded into motif clusters and analysed.

The insights gained from the Estonian workshop will serve as input for the next CHRYSES mapping workshops (for example a policymaking workshop in Ireland, map-creation workshops thematising COVID-19 and water pollution experiences in England, a workshop seeking feedback to maps and visual narratives in Finland with the aim to create an informative exhibition on the topic) and thus this article is also a presentation of the current state of knowledge. As ethics-related choices and other meta-level decisions significantly determine what material is received and how it is engaged, we will first analyse ethical and related methodological considerations, and then provide an overview of the central findings on the content level. Thus, this report springs from two anchor questions. First, what methodological and ethical considerations need to be targeted when applying mental mapping as a participatory tool for environmental health governance? Second, how do spatial priorities and related narrative emphases differ across scientific and grassroots perspectives on environmental health crises, and how can these insights inform risk communication strategies?

Ethical Considerations Guiding Researcher Choices

Environmental health crises place diverse communities under pressure while simultaneously demanding trustworthy research and ethical interactions with these communities, who serve as partners in data creation (for example by providing their mental maps). Our mental mapping workshop made us more aware than before that ethical practices are not neutral 'plug-and-play' instruments, they actively shape how participants perceive risk, agency, and their own well-being and how they narrate crises (or are willing to reflect on a given topic at all). Although our discussion on ethics revolves around experiences gained during one specific project, we assume that drawing on other topical case studies will enable wider generalisations about data collection, the structuring of workshops, and the interpretation of individual mental maps. This section distils the lessons learned, emphasising the need for contextualised ethics that

support the same agency and (subjective) well-being that participatory mapping methods aim to cultivate.

Some ethical dilemmas arise in relation to the specificity of international collaboration. International projects often presume that ethics can be standardised across countries and disciplines, deriving from centralised ethics approvals. However, although Estonia follows the same regulations as the rest of the European Union,[3] some debates about ethics, which were held in Western European countries several decades ago, only reached Estonia (as well as several other post-Soviet states) after the adoption of the GDPR in 2018. Traditionally, direct, informal and relationship-driven practices tend to function better and align with established community norms in Estonia. Thus, formal documents need to be drafted carefully and context-sensitively as they can function as moral technologies: their form and tone co-produce participants' experiences of research.

Certainly, when preparing ethics documents, the focus should not be solely on the 'right' phrases to pass ethics approval, but on whether they really protect. However, our experience underscores how even consent language is not merely informational but also performative. While scientific literature generally talks about the need to use simple language in consent forms (cf. for example Feinberg et al. 2024; Wilson et al. 2018: 15), specific cultural nuances are also important. Long formal consent forms that include sections about legal recourse, detailing which court participants could contact if their rights were violated, which are perfectly acceptable in some Western European countries, might have a particularly frightening effect on the older generation in Estonia, who have experienced the injustice of Soviet bureaucracy. For them, such standard consent forms can subtly convey how participation, or even merely signing a document, might be precarious or legally fraught. In earlier practice, we have experienced situations when participants say that they would be happy to give an interview but refuse to sign a consent document. The lesson is not that formal is bad and informal is good, it is that local resonance is crucial for participant trust and engagement. Therefore, the length, tone, and legal framing of consent materials should be adapted not only to applicable policies and institutional risk tolerance but also to vernacular traditions and expectations.

Ethical Approval as a Magical Protective Charm?

Obtaining approval from an ethics committee often creates a misleading sense that all necessary ethical obligations have been fulfilled once the application is accepted and participants have signed the informed consent form. This perception raises a fundamental question: whom do these procedures primarily protect? While ethical requirements and signed consent forms are intended to safeguard participants as well as researchers, in practice they frequently appear to protect rather the researcher. Even after reading an information sheet, participants might lack a comprehensive understanding of what will happen to the materials (for instance, hand-drawn maps) they provide. Yet, sensitive data will not become less sensitive after a participant signs a consent form; rather, consent increases the researcher's responsibility to handle that data properly. But even researchers themselves might not always know the full trajectory of these materials, which is why informed consent documents typically include vague statements such as "the map drawings may be used in academic research and publications". For non-specialists, the nature and dissemination of academic publications might remain opaque, although participants rarely express concern about this ambiguity as they consider it sufficient for trust if the researcher is nice and shows understanding.

Another common assumption is that minimising data collection and processing automatically enhances ethical integrity. While reducing data can mitigate risks, it should not compromise the analytical potential or the meaningfulness of the material. For example, in our mapping workshop two participants drew a detailed micro-map of their surroundings. One of them placed a house with the label "home" at the centre, the other wrote the exact address of her home on the house. This is an example where a detail is important on the level of analysis but simultaneously sensitive on the level of data protection. The same tension becomes even more evident in the context of open science requirements. An increasing number of academic journals now require authors to provide the underlying raw data alongside their manuscripts as a condition of publication to promote the transparency and reproducibility of results. While voice recordings are classified as more sensitive data than transcripts because the voice can reveal identity, health conditions, and other personal traits (cf. for example Cychozs 2020), providing only transcripts

could seem preferable. However, in the case of the comments provided in our workshop it seemed that even high-quality transcripts failed to capture nuances conveyed through tone, intonation, humour and voices talking simultaneously. Consequently, making only transcripts available appears inadequate, as they are less representative than the original audio recordings leading researchers to conclude that it might be better not to share this material at all.

It is also tacitly assumed that the core ethical principles (i.e., autonomy, dignity, maleficence, non-maleficence, justice) are universally valid. Although there is no doubt that these principles are crucial, in practice, however, we experienced a certain dynamic relationality, realising that choices necessary to grant them depend on cultural context, scientific tradition (including related established power dynamics), research discipline, sets of participants and related trauma and safety issues. Several proponents of participatory methods call for a fundamental shift in the dynamics of knowledge production, one that transfers significant decision-making power to participants in order to uphold their justice and autonomy (see for example, Gaventa & Cornwall 2001). However, our earlier experience indicates that such a transfer is not always welcomed: in one case, women with a history of intimate partner violence did not value the opportunity to participate in such a decision-making; instead, they perceived it as coercive and burdening (and thus, needed help with their traumas first). Further research points out that power-sharing can be difficult to achieve due to participants' traditional perceptions of the roles of researchers (cf. for example Wilson et al. 2018: 12). In addition, particular approaches should differ when studying, for instance, the spatial vocabulary of drug couriers or the mental maps of intimate partner violence victims or those of an indigenous group in the midst of heated land debates – where immediate risk and trauma could be present – compared to research focused on the mental maps of a generally well-functioning community that aim not to address imminent threats but to improve future crisis communication. Even the same well-tested participatory method might be considered minimal risk in one context and moderate or high risk in another, with the potential to replicate colonising or traumatising effects (cf. Coombes, Johnson & Howitt 2014: 847; Lake & Wendland 2018: 16).

Some authors find that sometimes academia is even not interested in generating space for fair co-creation (cf. Heron & Reason 2001: 179). Nevertheless, inclusive vocabulary, such as 'transformatory', 'radical', 'speculative', 'inclusive', 'critical or participatory mapping', 'co-ownership' and 'co-creation', abounds in

most research that involves human participants, evoking a vision of egalitarian collaboration and shared authority. But when it comes to practice in the context of vernacular map creation, a pain point highlighted at some anthropology and religion conferences in recent years relates to examples of how inclusive mapping frequently remains inclusive only in a formal sense. Even with properly drafted ethics documents, institutions use anonymised mental maps created by communities as a basis for establishing oversight mechanisms, extractive economic models, or political agendas that diverge from a community's interests (cf. similar observations made decades ago in Leal 2007).

It is usually easy to recognise gross ethical abuse, although sometimes ethical doubts arise even in mutually pleasant cooperative situations. As mentioned above, many Estonians do not trust bureaucracy, but at the same time they often trust science and scientists (according to a recent report 73% of the Estonian population trusts scientists and only 4% don't, see Kree 2023: 12–13). Similarly, in the described workshop (and also in other similar situations) participants were satisfied that their comments were found useful for research and that dialogue took place. They didn't fear that their data could be misused, nor did they express any wish to control or co-design the research further, mainly because they knew and trusted the main organiser of the workshop, Reet Hiiemäe, and had heard her giving presentations on other community events. When asked if they wanted to be updated in any phase about what we will write based on their map input, only one participant wished to see the completed study *after* publication. Another participant said that it would be interesting to know about the researchers' conclusions on how different the spatial depictions were in mythological legends and on participants maps. Anonymous feedback forms that the participants completed after the workshop also mediated high feedback scores. However, since Reet Hiiemäe also explained the project research interests and her own researcher views and conclusions during our group discussion, it seemed to her that this could, to some extent, have influenced or guided what the participants highlighted in their comments. Thus, in our opinion, when there is equal interaction, there is always a dialogue that serves for better mutual understanding, although it also somewhat shapes what material is produced and what emphases dominate.

There are other situations where the lines between ethical, selective, and exploitative approaches can get blurred, depending on researcher's choices; therefore, self-reflexivity is necessary to recognise and mitigate such an im-

pact (cf. Lake & Wendland 2018: 24). Some key decisions are related to the study sample. In many research fields, the first choice of researchers is to use students as participants (for example in the research of psychology or psychology of religion more than 80% of participants are students) because they are easily accessible and often required to comply with course-related instructions (Basil 2024: 11). However, this practice can raise ethical concerns related to power imbalances and create tensions in interdisciplinary cooperation with disciplines that rely more on fieldwork and community-based research (such as folkloristics and anthropology). Even in community-based research the question arises as to who has the right to represent a community. For example, there is a tendency to include community leaders, but this could leave the voices of some community members out. Such a problem can be prevented with 'slow' praxis that includes preceding relationship building and learning about local contexts (Amauchi et al. 2021: 1), which was also the case with our workshop. Nevertheless, while community leaders and other active individuals tend to attend such workshops on their own initiative, less active members might need targeted invitations, although simultaneously such invitations would alter the natural dynamics of participation. Being aware of such dynamics, we still invited some less active members in order to have a more balanced sample, although ultimately some of them still didn't show up. This circumstance leads us to a further discussion about representativeness in the sphere of mapping.

Decolonising and critical cartography and feminist approaches often stress that maps reflect subjective experience and can privilege certain voices (for example, community leaders, men, literate participants) while marginalising others such as women, children or immigrants (cf. Blidon & Zaragocin 2019: 915). Thus, face-to-face research tends to focus on clearly framed populations considered vulnerable, while vast literatures examine mental maps and narratives of conspiracy theorists and other radically alternative thinkers mainly through their online presences. There seems to be a tacit assumption that these actors can't be dialogical partners let alone co-creators of knowledge. Yet, for a complete societal picture, we should also access and analyse the mental crisis maps sketched by such groups because they show how they perceive crises, the risks they prioritise, and the causal chains they believe in. Understanding these perceptions can better help anticipate behaviour, identify potential collaboration routes, and design crisis communication. Therefore, we are considering organising an additional mapping workshop designed to incorporate alternative

voices. However, presenting these actors publicly as research partners or citing passages from their comments could be perceived as legitimising harmful narratives, thus it might be necessary to articulate scholarly perspectives and analysis of these topics alongside such alternative views, which, in turn, might be interpreted by the proponents of those views as an attempt to override or diminish their positions.

Another critical issue concerns the representativeness of academic conclusions. When the interpretation of maps or narratives from specific groups is conducted solely by a single researcher or research team, findings inevitably reflect that team's perspective. Selected participant comments should not serve merely as illustrative fragments that lend a 'community-led' veneer to the researcher's own preconceptions. A more advanced approach could involve reciprocal analysis whereby one local group examines mental maps produced by another and comments on how these align with the second group's views. Researchers could simultaneously also draw their own mental maps on the same topics (such a practice has previously been used for better understanding of spatial information while collecting place-related narrative folklore, see Kalda 2013: 158).

Participant engagement also requires consideration of financial aspects. In many research projects, expert contributors are routinely compensated, whereas ordinary participants are less frequently paid, often under the assumption that monetary incentives might compromise the authenticity of their engagement by motivating participation solely for financial gain. In the interest of equality, no payments were made to any participant in our workshop. Previous projects have addressed this dilemma through non-monetary recognition, such as offering certificates or skill-building opportunities (see Banks & Brydon-Miller 2018). In our case, food was provided as a gesture of appreciation. This practice, however, raises questions about whether even such gestures might influence participants to provide more favourable feedback than they otherwise would. Our anonymous feedback forms indicated that all participants felt they were treated ethically and that their voices were heard. Yet, this prompts further reflection if such positive feedback is sufficient for researchers to claim an ethically sound process, or if courtesy or social norms lead participants to exaggerate their satisfaction, even in anonymous formats. While extreme discomfort would probably prevent positive feedback even under anonymity, the

possibility of subtle bias remains a consideration when evaluating the integrity of participatory research.

Implementation of Ethics as a Continuum to Support Agency and Well-Being

Our mental mapping workshop confirmed that the implementation of ethics, much like responses to environmental health crises themselves, is situated and context-sensitive (see more about situated ethics in Simons & Usher 2000). Therefore, we conceptualise approaches to ethics as a continuum: on the one extreme is paternalistic over-precaution where participants are treated as uniformly vulnerable, placing them within a frame of non-agency. On the other extreme is full co-governance, where participants co-decide what data are collected, how they are analysed, and which solutions are designed, even extending to decision-making in relation to informed consent and treatment of data. Some projects belonging to the latter pole question the necessity of any independent ethics review (e.g. Hoonaard & Hamilton 2016; see also examples in Lake & Wendland 2018: 28). However, the majority of projects – as well as our project – will probably live somewhere between these two poles. Some research suggests involving besides researchers and participants also a risk analyst (Lake & Wendland 2018: 31) as a third party to balance the possible biases of the two former parties.

In current practice, consent forms often carry a binary mandate (at least in the European Union): if there is no signature, participation is not possible. We find that, at least in some cases, participants could serve as a primary ethical instance alongside (not instead of) formal ethics committees (cf. Banks & Brydon-Miller 2018); processual or continuous consent formats (cf. Klykken 2022) could be an option, and consent-giving should be possible not only in writing but also via recording. In this way, participants could be treated as ethical agents, not objects of protection, without diluting legal safeguards. Institutional review should ensure baseline compliance and harm mitigation, whereas participant ethics sessions could be used to review consent drafts (for example, for localising consent language to ensure the use of culturally familiar metaphors and the proper length of text, and to cover actual risks) in order to avoid all-inclusive over-securitised framings. Although some

authors define community-based research or community-based participatory research in rather strict terms (see for example Amauchi et al. 2021: 11), we believe that forms of participation can be also viewed as a continuum, and if a workshop participant does not wish to participate in power-sharing and co-design of research in a way that a researcher knowledgeable in the latest trends of participatory research considers appropriate, then the participant should have the right to participate in a less inclusive, but for him or her more suitable and meaningful, way.

Finally, in recent years, the focus of anthropology and folkloristics has increasingly shifted toward human and more-than-human relationships, which raises the question of to what extent ethical considerations can also extend beyond human participants. At the HERA Crisis Knowledge Exchange Kick-Off conference in November 2025, one statement captured this emerging challenge: "As long as we don't consider more-than-human ethics in ethics policies and ethics committees, they cannot be truly ethical." Yet our understanding of what lakes, plants, insects, or even supernatural entities 'want' remains mediated through research conducted by humans. This paradox underscores the complexity of operationalising entirely inclusive ethics within participatory frameworks.

Repetitive Key Motifs in Vernacular Narratives and Mental Maps of EHC

Ethical considerations do not end once a mapping workshop is over: the maps produced need to be integrated into research. These maps often contain complex information (for example, multisensory aspects, landscape dynamism, symbols, reflections of local knowledge, folklore or rumours), making their interpretation far from straightforward. Researchers inevitably make decisions about which aspects to foreground, but such choices raise questions about representation bias and the potential silencing of certain perspectives embedded in the original mapping process. As Wilson, Kenny and Dickson-Swift (2018: 8) also note, ethical dilemmas persist throughout the research cycle, including during data analysis and dissemination. This underscores the need for reflexivity and transparency in documenting how and why certain elements are emphasised over others.

Recent research has begun to question the dominance of Western scientific perspectives in the use of maps as supposedly objective vehicles for public communication (e.g. Duncan 2006: 411), thus various community-based participatory grassroots mapping approaches have been suggested as an opportunity to add plurivocality and cultural embeddedness. However, upon closer inspection, several commonalities can be observed between scientific and vernacular mapping. For example, in the case of COVID-19, not only the scientific maps and news media, but also vernacular storytelling constantly tried to draw clear narrative maps of safe, affected, or threatened areas and people, as has been shown historically (Hiiemäe 2016). One of the goals of our workshop was to identify these dynamics comparatively, although as a hitherto under-used aspect we also examined the depiction of maps and trajectories in mythological legends about epidemics.

Below, we describe some of the recurring elements of grassroots map imagery that we consider relevant for future crisis communication. Our analysis draws on the maps and accompanying comments created by nine participants (seven women and two men); to support broader generalisations about cultural patterns, we occasionally reference other contemporary materials depicting environmental health crises.

The results of this workshop showed that similarities in mythological legends, scientific maps, media reports, and the participants' own mental maps occurred most often in the clear separation of dangerous and safe areas, as illustrated most clearly by the following map depiction:

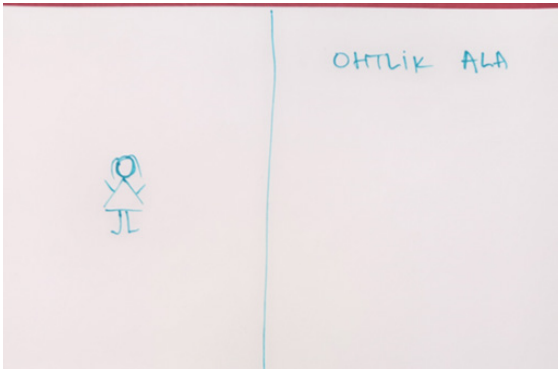

Figure 1. The most concise map image clearly delineating the position of the participant who draw the map. On the other side of the border is an area clearly marked "dangerous zone" (woman N9, F08-004).

The clear boundaries of the threat were also evident in the contrast between the city and nature (or further, the rural region) depicted on some maps. Earlier analysis of responses to COVID-19 in 2020 in Estonia similarly revealed that beautiful natural places were perceived as safe, a notion reinforced by some official recommendations that encouraged walks in nature, implicitly equating such environments with desolation, emptiness and thus reduced risk. But in reality, during the COVID-19 period some easily accessible bog trails in Estonia were more crowded – mainly by urban residents – than city-centre malls. Part of the reason for the popularity of these natural areas was, of course, also the fact that compliance with official isolation requirements was not checked there. In Estonian mythological legends about the plague spirit, hiding in deep forests and impassable bogs is often described as a way to survive, underscoring the practical as well as symbolic role of isolation as a protective measure. People who hide like this are depicted as refuges whom the plague spirit is not able to find. Modern community mental maps also included other micro-level and real-context-based landscape elements as markers of safety: for instance, water bodies and hills were perceived as safe or as granting safety, opposed to the city which was depicted as the embodiment of danger. These elements remained the same regardless of whether the mental map was drawn as a retrospective reading of mythological legends where the plague spirit cannot cross a lake or hill, or when depicting potential future crises (such as a military crisis). One male participant (M8) sketched a sign pointing towards the nearest town on his mental map, adding the words: "City. Noise and information clutter", hinting simultaneously at audible noise and disruptive information overload.

On some workshop maps, the boundaries of danger were marked with colours, with in one case this choices explained using categories of purity and impurity (similarly to the symbolism described by Douglas 1966), highlighting how spatial representations can echo cultural frameworks of order and contamination:

> I have a very colourful map… I just thought that if I'm standing here on the road now, that there's already danger in Äksi village, right? I'll make it black [*must*][4], because black is a kind of like devastated land, exactly. And then the villages of Lähte and Pupastvere and Puhtaleiva – that they're still clean now, that they're a little bit yellow, and then I'll

> demarcate them with these different colours, that this point is clean and that one is [clean] and that one is [clean] (woman N1, F08-004).

It is interesting to observe that while on scientific geographical maps and in safety coding systems red is the colour most commonly used to indicate danger, while yellow refers to caution (usually for physical hazards) and orange is a warning, especially in relation to hazardous machinery and the risk of injury (OSHA-ANSI 2025; Rosen et al. 2024), vernacular colour codes seem here to rely more on another cultural symbolism with hints at darkness, light and purity. More map examples would be needed to make broader generalisations about map colour preferences and about compatibility with colour preferences in other contexts (cf. also Sutrop 2000 about the use of colour terms in Estonian).

Unlike conventional maps, several maps that were produced in our workshop included the mapmaker and his or her home, suggesting that these representations were not merely spatial but also personal, reflecting the intertwining of place and identity as well as revealing the participants' own priorities and values embedded in the mapping process. The focus of the drawn mental maps was mainly on the micro-level. The following spontaneous discussion that accompanied reading a media article about COVID-19 exemplifies how places that are perceived as more distant and therefore less dangerous are vague and non-relevant also on a person's mental crisis map, even if references to the same places (in the given case, to Wuhan) were constantly made in the news (cf. Hiiemäe et al. 2020: 26). Among other things, one of the commentators sees in the vaguely worded media information about Wuhan parallels with folktales that don't deserve to be taken seriously:

> N9: It's also written here "the disease is said to have originated in Wuhan" – it sounds like a folktale.
>
> Interviewer: Did you ever look for where Wuhan is on the map?
>
> M8: In China [laughing]. Somewhere on the other side of the map.
>
> Interviewer: Does it matter to us whether the disease started in Wuhan?
>
> M8: No. For us, the disease started in Milan.

Thus, for these two participants, Wuhan is somewhere far enough not to trigger a behavioural response related to fear, yet Milan – one of the earliest European epicentres of COVID-19 epidemic – is considered the beginning of the disease in their eyes.

It is possible that because our initial discussion centred on mythological legends about the trajectories of the plague spirit, participants were somewhat more eager to employ personifications when mapping threats related to modern environmental health crises. However, the use of personification is, even today, a common practice as it "allows us to make sense of phenomena in the world in human terms – terms that we can understand on the basis of our own motivations, goals, actions, and characteristics" (Lakoff & Johnson 1980: 34). Personifications continue to play a significant role in modern imagery as a means of embodying abstract concepts such as fears or crisis, something that is closely tied to tradition-based thinking, which often results in community-level 'trust maps' diverging from official scientific representations. Similar to the binary categories of good and evil in fairy tales, material collected in 2020 about COVID-19 revealed a perception that close, trusted individuals could not pose a threat because love and danger were seen as incompatible within the same person, for example one respondent in 2020 expressed the opinion that her grandchildren just can't infect her. In two cases of our current workshop, female participants even depicted the threat as gendered – specifically male –, which could reflect symbolic associations with stereotypes of danger and dominance. At the same time, personified representations can inspire the depiction of certain forms of agency; for instance, when a threat is mapped in the form of a clear living creature, it creates the possibility to imagine countermeasures such as physical resistance or strategic intelligence, or at least to imagine better how far away the danger is.

Here we can see notable parallels with mythological plague legends in which liberation from the plague is achieved through physical violence against the plague spirit, a shrewd verbal response, or outwitting it. A gendered dimension again emerged: maps and comments by female participants more frequently reflected reliance on escape or strategic thinking, whereas one male participant's (M8) map and another's (M7) comment introduced the theme of combat, one even rendered humorously as a fight between the historical plague spirit and the personification of the modern African swine fever. But here too, the boundaries between different threats are depicted as absolute and clear:

> The big pig farm at the end of the lake is indeed there – it's not exactly at the end of the lake, but still quite close to it –, and there's African swine fever there on my map. There are people by the church who are

> watching the [human] plague – it came from somewhere. There are people by the pig farm who are actually hoping that if there are pigs and the usual [human] plague here, they will fight each other and then it will clear the air – both [swine fever and the human plague] will end. The usual [human] plague can't come here [to the pig farm], because there's swine fever here – the human plague is afraid of it. There's another plague [swine fever] here by the farm and it's safe [for people] here, but dangerous for pigs. Here [by the church] it's dangerous for people (man M8, F08-004).

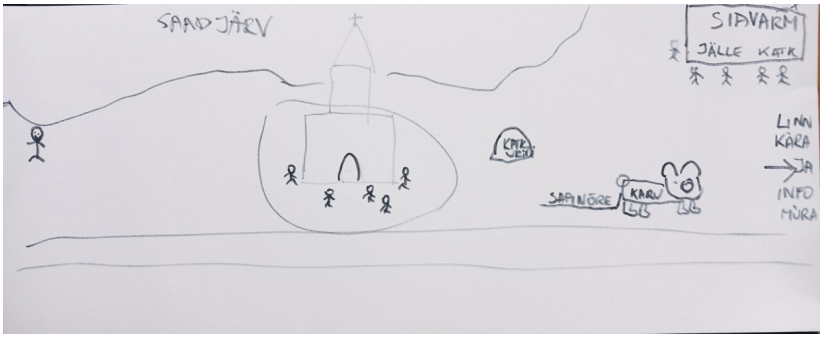

Figure 2. One of the mental maps that placed the church at the centre. Narrative explanation in the previous passage spatially contrasts the area around the church to the area around the farm ("*siavarm*").

Overall, the dominant emphasis in participant imageries – as tends to be the case in mythological plague legends – was on survival and coping (see a similar conclusion in relation to COVID-19 folklore in Hiiemäe et al. 2020: 25). Notably, none of the workshop participants envisioned scenarios in which they or their loved ones would die (except for one woman who briefly mentioned that she doesn't want to think that her sons could be mobilised in the war if there were to be a military crisis), suggesting a cultural and psychological inclination toward resilience rather than fatalism. Vernacular spatial narratives thus serve as mental encouragement when they delineate escape routes, imaginary hindrances to stop danger (high walls, gates, invisible tunnels) or differences of scale (for example on a map depicting a future military crisis, military equipment and bombers were drawn small). The mapmaker herself commented: "To feel safe, there are no very dangerous weapons on my map" (woman N2, F08-004).

Official conventional crisis maps and media news (for example the maps related to COVID-19 or African swine flu) on the contrary tend to focus more on risk, danger and the statistics of deaths (for example numbers of victims going up or down), which functions besides information sharing as affective infrastructure that circulates anxiety, fear, and urgency, shaping how crises are lived and governed (see more on the affective functions of maps in Bosworth 2023). The perception that official communication on major epidemics focuses too much on danger and hopelessness and not enough on constructive agency also becomes evident in the following comparative participant comment:

> There was one-on-one similarity of the African swine fever with this corona time. What's the difference at all? Swine flu – everyone is dangerous; with coronavirus it was the same – those who are unvaccinated are dangerous, going out is dangerous, everything is dangerous. Frankly, no solutions are proposed in the official approach (woman N9, F08-004).

Official crisis management guidelines usually try to cover all crises, but two of our workshop participants who discussed such recent crisis training, organised by local governments and the state, found that recommendations such as "Share phone numbers with your neighbours and call them" may not work if, in people's mental map, neighbours are not part of the solution but are instead part of the problem. Thus, community-level mental support maps (indicating who helps whom in a particular crises) are probably influenced, at least to some extent, by elements of reciprocity rooted in traditional peasant culture as well as by current community relationships. For instance, one of our participants (woman, N1) described in a relatively detailed spatial manner to whom exactly she would send e-mails to warn these people about a military crisis. Two participants (woman, N1 and woman, N3) provided a mental map of their family ties, describing how they would bring their close relatives who live in various cities to their rural home, which they considered would be safe(r) in a military crisis. The discussion developed an interesting spatial dynamic between moving and staying, expressing imagined routes of escape in a gradual manner, up to the point where even the rural home wouldn't be perceived as safe and flight to other countries across the Baltic Sea would be undertaken. Here again, spatial inspiration was sought from a previous similar crisis in 1944, during the final stages of World War II, when over 70,000 Estonians fled across

the Baltic Sea, mainly by boat, before the Soviet Union reoccupied Tallinn and other major cities.

Similarly, on conventional crisis maps, crises are often given a uniform, homogeneous representation, depicting danger as equal concentric circles radiating from the epicentre. In contrast, the micro-level of the maps drawn to represent specific crises allows attention to be focused on landscape features, for instance considering that an epidemic is less prone to move over large lakes. In mythological legends about plague epidemics, landscape forms often have a decisive role, for example, the plague spirit cannot cross a flowing stream. Only one workshop participant noted that her map did not have landforms, while for others they clearly played a significant role. For example, one participant explicitly wrote on her map, which visualised the trajectory of the plague spirit based on a mythological legend: "The plague cannot cross the lake or [go over] the hill" (woman N3, F08-004).

It is more difficult to interpret why several participants placed the church at the centre of their maps. It is clear that huge sacral buildings are important knots even on the maps of non-religious people. The proximity of the sacred and danger also appears in mythological legends, for example Anttonen (1996, 2000), who has written extensively about sacrality in relation to boundaries, danger, and prohibition in folk belief, argues that sacrality is often constructed through categorical boundaries that separate what is considered pure or inviolable from what is dangerous or polluting. Research in cognitive geography and landscape studies confirms that people prioritise landmarks that are both visually striking and culturally significant, and sacral architecture fulfils these criteria by linking spatial perception to shared heritage, making them highly memorable reference points regardless of personal belief (cf. Liutikas 2023). One of the workshop participants clearly said that although she placed a church at the centre of her map, it didn't have a sacral meaning. Yet in another participant's description, below, we can find hints to sacrality and religious connotations:

> [The plague] came from the direction of the 'sea' [big lake] of Tabivere and then it entered there, right here the church, because it wanted the people who go to this church, like well – the plague is evil –, so it wanted to destroy these good Christians and this rooster has been added here as if it were supposed to protect them. But well, it didn't work out as the plague came here on this rooster. Yeah, and then it'll probably go from

> here to Tartu. But I'll stay here, and I'll feel safe because I'll have the lake Saadjärv, the big hill and then the lake Soitsjärv in between, well the plague won't get over these borders anytime soon. But if it starts coming closer to my place here in this direction, then I'll run away somewhere in this [opposite] direction (woman N3, F08-004).

A parallel can be drawn with discussions about safe and unsafe places during the COVID-19 period, when the belief emerged in various settings in Estonia that the virus could not spread in churches as well as saunas. The latter view could be linked both to the sauna's cultural status as a quasi-magical or sacred space and to the practical notion that heat acts as a disinfectant. Echoing Estonian folk legends that portray sacred groves as places for healing rituals, face masks began appearing at natural sacred sites soon after the onset of the COVID-19 pandemic. Tied to trees, these masks seemed to reflect a continuation of traditional health practices aimed at seeking protection from illness. Thus, the category of sacredness needs nuanced attention even in the spatial depictions of a modern, generally secular population.

Conclusions

Project CHRYSES has provided an unparalleled opportunity to learn a more nuanced approach to understanding the spatial depictions of environmental health crises as well as ethical issues related to research design. Our experience confirmed that such mapping workshops can provide richer evidence grounded in embodied, situated, and collective grassroot knowledge arising from local environmental peculiarities, spatial experience and narrative tradition, to finetune scientific research and public health crisis communication. However, we also realised that, when misrepresented, environmental health crises themselves as well as maps and spatial comments and narratives based on such crises can become a geography of injustice (cf. Soja 2010). Therefore, to move towards a geography of balance, such workshops should go beyond formal engagement of community members and act as sites of knowledge formation and dialogue, since conversations with participants often prompt reconsideration of concepts, categories, and interpretative choices. Ideally, such a research process will contribute to better understanding between grassroots and scientific realms as well as across disciplines. We hope that this report

will give impetus and serve as a catalyst for subsequent, even more refined, practice-based case studies.

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Note

[1] More information on the project can be found on the project webpage: chryses.aalto.fi.

[2] In this article we use the following definition of mental map: "Mental map refers to the spatialization of meaning in the minds of individuals or a group of people. It is a theoretical construct that becomes accessible to scrutiny through its behavioural, oral, textual, or graphical manifestations.… A mental map is a variety of any such model that is neither graphically fixed nor otherwise articulated but rather exists implicitly as part of a mindscape" (Götz 2024).

[3] For instance, research ethics in Estonia is regulated by the Estonian Code of Conduct for Research Integrity (https://etag.ee/wp-content/uploads/2025/06/HEA-TEADUSTA-VA_eng_2023.pdf); an increasing number of reports and handbooks addressing research ethics are being published.

[4] *Must* can mean both black and dirty in Estonian.

Archival sources

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Declaration of interests

The authors declare no conflicts of interest regarding this manuscript.

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