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PERSPECTIVE

Using participatory video in environmental research

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Abstract

1. Tackling environmental challenges that face humanity requires us to acknowledge new ways of working and to cross disciplinary boundaries. However, the methodological toolkit used by environmental researchers to explore the human attitudes, knowledge and behaviours that drive global challenges such as biodiversity loss and climate breakdown remains constrained.
2. Here, we describe participatory video, a methodology for capturing and communicating knowledge, which goes beyond interviews, focus groups and participant observation. We draw from the literature and our own experience of conducting participatory video projects in Nepal, Guyana and Peru. We demonstrate the diverse ways in which the methodology can be applied to environmental research and highlight its strengths and limitations.
3. Participatory video provides a more holistic understanding of environmental issues by using multiple types of data, its longer-term engagement with issues, opening channels of communication between stakeholders, engaging a diversity of knowledge systems and advocating for transformative change.
4. By taking a participatory video approach, environmental researchers may begin to counter commonplace criticisms about lack of diversity and entrenched colonialism. This simultaneously responds to wider calls for environmental research to engage with social justice issues, represent diverse voices, understand different contexts and acknowledge the role of power. Crucially, this helps build trust amongst all those involved.
5. By demonstrating how we have successfully used participatory video in projects in conservation, ecology and climate science, we provide guidance for researchers looking to expand their methodological toolkit. Ultimately, we seek to improve

the use of participatory methods to help support communities to tackle the environmental challenges that they face.

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KEYWORDS
biodiversity conservation, climate science, ecology, environmental social science, inclusive, interdisciplinary, participatory videography, visual methods

1 | INTRODUCTION

Human society is threatened by the loss of Earth's biodiversity and by climate breakdown (Gardner & Wordley, 2019; IPBES, 2019). These two challenges can only be addressed by promoting equitable and sustainable solutions for both people and the environment (Pörtner et al., 2022; Raworth, 2017; Sutherland et al., 2018). Public concern over environmental issues has soared in recent years and is beginning to influence policy on many levels (Gardner et al., 2020). However, the demand for certain types of evidence to inform policy tends to be imbalanced and biased towards the agenda of top-down decision-makers who prioritise economic prosperity (Robra & Heikkurinen, 2021). To bring about genuinely transformative change (a fundamental, system-wide reorganisation across technological, economic and social factors including paradigms, goals and values, needed for the conservation and sustainable use of biodiversity, good quality of life and sustainable development: IPBES, 2019), more emphasis must be placed on understanding the human attitudes, knowledge and behaviours that drive these global challenges. Integrating this understanding can make policies both more equitable and effective (Barnett et al., 2016; Sutherland et al., 2018).

Despite increasing assimilation of social science methods into environmental research disciplines, the methodological toolkit used to explore human attitudes, knowledge and behaviours remains constrained (Bennett, 2016; Sutherland et al., 2018). Participatory research approaches engage different relevant groups in the process, analysis and/or outcomes, enabling a deeper understanding of these dimensions. Indeed, participatory methods capture and communicate knowledge beyond the scope of traditional social science methods such as interviews, focus groups and participant observation (Mukherjee et al., 2018; Pink, 2014) and can offer important insights that feed directly into the development of policies and practices. For instance, involving local communities in the co-development of species conservation programmes has helped align the interests of different relevant groups, thereby improving their success and sustainability (Hunter & Heywood, 2012).

Participatory approaches have been applied successfully and widely in disciplines such as anthropology, geography and public health for many years (Baumann et al., 2020; O'Donovan et al., 2019). The environmental social sciences have also had a long-standing engagement with a range of participatory methods, including participatory rural appraisal (Chambers, 1994), participatory mapping (Laituri et al., 2023), serious games (Madani et al., 2017) and participatory workshops (Chambers, 2002). However, more traditional participatory methods have several limitations. For instance, researchers tend to retain control over the methodological design and application, which often results in power imbalances between researchers and research participants (McDonald, 2021). This can be particularly problematic in cases where relevant groups have historically been marginalised or delegitimised by researchers and other more powerful actors as part of a knowledge system that centres around academic privilege (Reed & Rudman, 2023). Further, sensory data, or data that includes sound (Bates, 2013), environmental context (MacDougall, 2021), body language and expressions (Grimshaw & Ravetz, 2009), are often not captured with traditional participatory methods (Baumann et al., 2020; Murray & Nash, 2017). While it is widely recognised that human attitudes, knowledge and behaviours affect environmental issues, research methods for capturing contextual details and nuances are limited (Baumann et al., 2020).

Visual participatory methods can address some of these limitations. Although visual methods are widely used within anthropology and sociology (Pink, 2013), their use in environmental research remains limited. This presents a missed opportunity for gaining a deeper understanding of the social dimensions of environmental issues. Visual, video-based methods such as participatory video expand beyond photos, capturing movements (e.g. traffic), gestures (e.g. emphatic hand movements) and sounds (e.g. birdsong) (Baumann et al., 2020), while giving embodied suggestion to concepts like texture (e.g. soft fur) or smell (e.g. slurry; Kaley et al., 2019). Participatory video is a group-based activity, involving the creative use of video equipment to produce films as a basis to explore a specific issue (Shaw & Robertson, 2008). The visual aspects of this process can offer a more holistic understanding of environmental issues compared to insights derived from data based on verbal or written material (Baumann et al., 2020; Glaw et al., 2017). Another important aspect of participatory video is the group-based nature of the approach. The fact that a group of people works together in cycles of filming, editing and reflecting can provide substance for deeper learning on a particular issue (Richardson, 2022). Furthermore, participants can have more agency over the research process since they can, depending on the specific approach employed, decide what to film and how to edit their footage. This can lead to a better consideration of power dynamics between researchers and research participants (Koningstein & Azadegan, 2021). However, the extent to which participants control the research process depends on a variety of factors including

the project type, specific aims and the characteristics of the participant group. In the messy reality of participatory video practice, issues of social representation and entrenched power dynamics are not easily overcome (Shaw, 2016). Employing techniques such as reflective questioning, rotating leadership roles and structured feedback sessions can aid in navigating these challenges, promoting equitable participation and representation (Cornish et al., 2023). Nonetheless, effectively addressing these issues in participatory video projects requires continuous attention to social context and power relations (Egid et al., 2021).

Filming equipment can range from simple mobile phone footage (Mitchell et al., 2018) through to formal, multiple camera setups (Bignante et al., 2016). The rise of affordable and easy-to-use technology has starkly improved the accessibility of participatory video in recent years (Schwab-Cartas & Mitchell, 2014). Unlike typical top-down approaches in research, a key feature of participatory video is that it can be set up to support participants to critically analyse their own problems and find solutions (Campbell et al., 2016). Moreover, the process of conducting a participatory video project can be flexible and adaptable to the needs and available resources of the researchers and participants (Figure 1). For the environmental sciences, insights from participatory video may be valuable in co-developing sustainable practices/policies and encourage participants to reflect on the environmental challenges they face (Shaw & Robertson, 2008). In North America for example, Bali and Kofinas (2014) employed participatory video to explore how social–ecological changes have affected Indigenous caribou-user communities. Participants expressed satisfaction that their views and knowledge were presented more directly, rather than the researchers interpreting their messages entirely, as common in other qualitative research methods. As such, the use of film enabled the project to contribute both to community and research goals.

Here, we draw from the literature and our own trans-disciplinary experience of developing and conducting participatory video projects in environmental research. Using three examples spanning ecology, conservation and climate science to represent different strands of environmental research, we illustrate how this method can be applied, and highlight areas of strengths and limitations. We then discuss features that characterise the methodology, which we felt were pivotal to the choice of participatory video over other methodologies, and with the aim of supporting researchers who wish to use it in their own work.

2 | PARTICIPATORY VIDEO APPLICATIONS FROM ECOLOGY, CONSERVATION AND CLIMATE SCIENCE

2.1 | Exploring how greenspaces are linked to mental health in Kathmandu, Nepal

The prevalence of mental ill-health is rising amongst residents of rapidly urbanising low-income countries (Cox et al., 2018). To investigate the potential of urban greenspaces to improve people's mental health in such settings, Nawrath et al. (2021) used participatory video in combination with focus groups and the Q-methodology in a sequential mixed-methods study design. This project worked with participants living in slum settlements in Kathmandu, Nepal, one of the fastest growing cities in South Asia (Lamichhane & Thapa, 2012). Many different greenspace

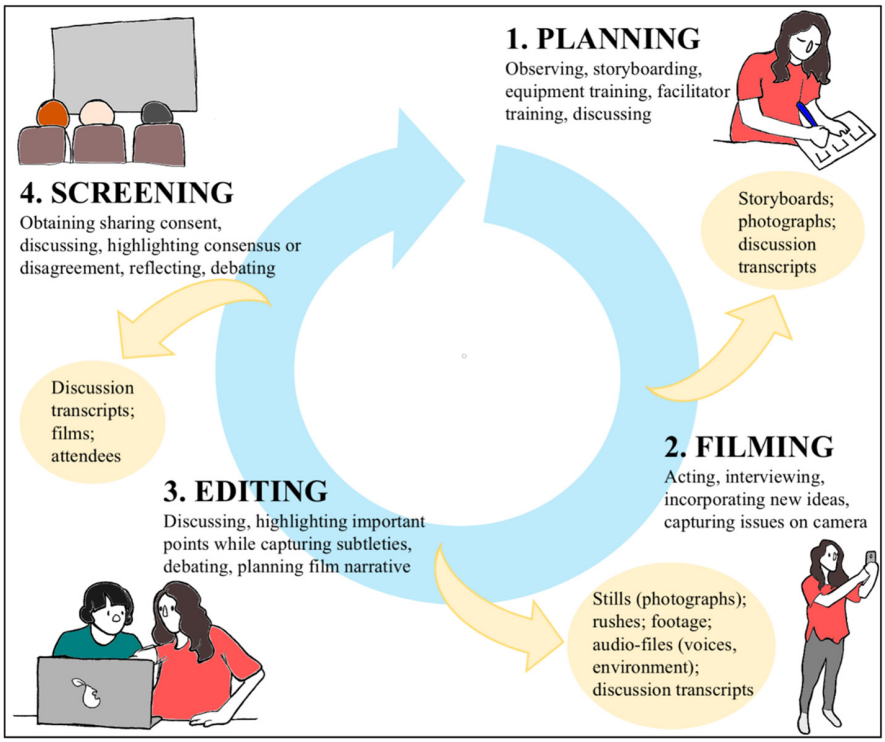

FIGURE 1 Example stages of the participatory video process (blue) and data types that can be produced at each stage (yellow). The process may involve any number of stakeholders at any stage (e.g. participants, facilitators, decision-makers, wider community, researchers from within and outside the community). The cycle may be repeated across many iterations, across different locations and time periods. Analysis and outcomes can emerge throughout all stages of the process. Figure adapted from Berardi et al. (2015).

attributes can affect mental health, including colours (e.g. green leaves) and sounds (e.g. bird song). The study participants were encouraged to create films about nearby greenspaces. The films were then screened within focus groups to explore how other participants perceived the multisensory aspects of greenspaces. This provided the researchers with much more nuanced insights into the specific attributes of greenspaces that might be linked to mental health compared to using verbal or written methods. In this context, using participatory video removed traditional research barriers such as language and literacy, encouraging a wider range of people to participate in the project. This was crucial for successfully representing a diversity of perspectives from low-income neighbourhoods in Kathmandu, where illiteracy is widespread (Dhakal, 2018).

2.2 | Sharing experiences of green and blue spaces with decision-makers in urban Guyana

Previously described as 'the garden city of the Caribbean', the capital of Guyana, Georgetown, sits where the Demerara River flows into the Atlantic Ocean and contains numerous urban greenspaces. Recent discoveries of offshore oil are transforming Guyana's economy, with demand for infrastructure and housing likely to put pressure on its green/blue infrastructure. This project explored how people experienced Georgetown's green/blue spaces using participatory video (Fisher et al., 2021) and was combined with quantitative ecological and questionnaire data as part of a wider mixed-methods approach (Fisher et al., 2020, 2021). Groups of participants visited the urban green/blue spaces and set out to capture 'what affects your emotions in a positive or negative way?'. Through an iterative process of filming and discussing this question across 5 weeks, the participatory video process facilitated participants to reflect upon how they related to specific aspects of the urban environment and why they were, or were not, meaningful. Across two further weeks, a composite film summarising the experiences of participants was shared with decision-makers including park managers, Government ministries and the Mayor and City Council. In response, decision-makers relayed their intentions to change the way the city's green/blue spaces are managed for the well-being benefit of residents.

2.3 | Indigenous food systems and climate change adaptation in the Peruvian Amazon

Food insecurity and malnutrition amongst Indigenous Peoples in the Peruvian Amazon is documented as amongst the worst in the world (Zavaleta et al., 2018). However, little is known about how Indigenous Peoples understand and cope with this issue, especially in the context of climate change (Arotoma-Rojas et al., 2022). Arotoma-Rojas and the Women Organisation for the Ashaninka People (OMIAASEC) in the central rainforest of Peru co-designed a participatory video process in which Indigenous female youth (15 to 25 years old) were trained to understand and communicate past, current and future risks of their food systems in their communities. Participatory video was set up over two phases. First, the aims of the research were introduced, and participants learned to use the video equipment. Participants then conducted video-recorded interviews and participant observation within their communities and began to uncover past and present changes around their food system. The second phase involved another workshop where participants shared their results to OMIAASEC representatives and the researchers, together identifying key messages about the most pressing issues affecting their communities, considering climate change and editing a set of short films around these key messages.

3 | FEATURES OF PARTICIPATORY VIDEO

3.1 | Multiple types of data

Multiple types of data can be outputted from participatory video, including language-based data (e.g. interviews, focus groups), visual data (e.g. drawn images of storyboards, or photos used to elicit discussion, known as photoelicitation), audio data (e.g. recordings from discussions or interviews) and audio-visual data (e.g. video and rushes used to create film; Figure 1). These data can also be used in various ways at different stages of a project. For instance, storyboards can be used to stimulate the development of ideas amongst participants at the project outset, and for eliciting discussion amongst the wider community. Similarly, participatory video can be combined with quantitative data to triangulate, consolidate, and enrich the understanding of environmental issues. For instance, Fisher et al. (2020, 2021) demonstrated positive relationships between biodiversity and human well-being in Georgetown's green and blue spaces, but through participatory video, participants unveiled nuances that might otherwise have been overlooked (e.g. place attachment through historical monuments, fear of crime, cultural beliefs associated with specific species). The audio, visual and audio-visual data from participatory video, therefore, brings additional insights that contribute to the understanding of environmental issues.

Film created by research participants as the basis for language-based interviews or focus groups can promote dialogue between researchers and participants that allow meanings to be revealed where they are otherwise typically hidden. For instance, Indigenous communities created films to address gorilla conservation issues in Cameroon (Amir, 2019). The films highlighted the complexity of the conservation issues and underlined the challenges of aligning conservation targets with the needs of local communities (Amir, 2019). Using film and gorillas as a plot device enabled the participants to express contextual nuance to challenges such as marginalisation, modernity and corruption, therefore, helping to articulate Indigenous values that might have otherwise been overlooked or misunderstood by local conservation managers using language-based methods only (Swanson & Ardoin, 2021).

Beyond the spoken word, participatory video provides unique insights into the lived experiences of research participants (Barbour, 2019; Literat, 2013). Video can capture multisensory experiences, the expression of emotions and feelings that are difficult to communicate through words (Rose et al., 2016), and the articulation of ideas and concepts not easily explained by language-based methods (Fischer & Young, 2007; Mitchell & Sommer, 2016; Wills et al., 2016). For instance, the use of films helped participants to explore how multisensory experiences of local greenspaces (e.g. variety of flower colours) affected their emotions and feelings, to elicit mental health effects (e.g. contributing to attention restoration and stress reduction) in Nawrath et al.'s (2021) research in Nepal. Therefore, participatory video may be particularly useful for unpacking complex environmental issues through tapping into audio, visual and audio-visual data in addition to language-based data.

3.2 | Longer-term engagement with environmental issues

Much environmental social science research is cross-sectional, capturing snapshots of society through short survey periods at one time interval. While less resource intensive, these approaches struggle to represent changes (e.g. in severity or complexity) of systems or issues (Connelly, 2016), which is a key characteristic of the environmental challenges that face humanity. Moreover, building trust and relationships with participants can help ensure that research outcomes are perceived as both fair and socially just (Saif et al., 2022). Participatory video processes are versatile in length, taking place across several weeks (Fisher et al., 2021) or multiple years (Bali & Kofinas, 2014; Mistry et al., 2016; Mistry & Berardi, 2012), dependent on community and research objectives, time and resources. The three environmental research participatory video projects we introduce in Section 2 took place over 4 weeks, 7 weeks and 9 months, respectively. While short-term projects are still more in-depth than cross-sectional research, they are not without limitations. For instance, particularly in short-term projects, assumed community consensus can lead to missing differences in experiences or opinion amongst people, or even silencing of dissent (Mistry & Shaw, 2021).

Projects that last for much longer, on the other hand, are advantageous in capturing real depth and complexity. They can reveal unexpected and previously undocumented findings that are both complementary and contradictory to the original research aims and can support building capacity in long-term participants and facilitators while becoming integrated into the lives of the community (Mistry et al., 2021). For example, Mistry and Berardi (2012) used participatory video to develop an integrated conservation and development project in Guyana, linking local Indigenous livelihoods with biodiversity conservation. They engaged community researchers over 18 months. Through iterative cycles, the researchers produced video interviews with various relevant groups, subsequently screening them to the community at different temporal stages of the project. The iterative process of mutual reflection, action and feedback played a crucial role for gaining important knowledge throughout the project's extended duration (Mistry & Berardi, 2012). By affording participants the time and space to express themselves, relationships and trust are established between participants and researchers. This is fundamental to open communication, and thus, insights from longer-term participatory video projects can produce more nuanced representations of issues and stronger trust. In turn, this can contribute to more effective outcomes for policy and practice through better-representing issues facing the intended beneficiaries of the research. However, the longer-term nature of some participatory video projects can be both resource intensive and time consuming (Marzi, 2021). Despite this, participatory video can contribute to building towards more creative, informative and transformative routes to social and environmental change (Mitchell et al., 2018; Walsh, 2016).

3.3 | Opening channels of communication between relevant groups and engaging a diversity of knowledge systems

Helping to tackle environmental challenges requires acknowledging the biophysical, political and socio-economic processes that comprise social–ecological systems (Plieninger et al., 2013). The preparation, collection and dissemination of research that engages an inclusive and diverse set of voices, while managing the power dynamics and being sensitive to the context within which the research is perceived (Reed & Rudman, 2023), is more likely to lead to legitimate impact and actionable policy outcomes (Cook et al., 2021; Mueller et al., 2010). Some participatory video projects have shown successes in this respect. In the Philippines, community members produced a participatory video on climate change mitigation measures that was screened to local decision-makers, leading to stated intentions to push through legislative changes to benefit the community (Haynes & Tanner, 2015). Likewise, Fisher et al. (2021) shared a composite film produced by Georgetown residents with decision-makers, which led to the declared intention to change the way these spaces were managed for the benefit of people at large. By design, the participatory video process can lead to negotiated differences and new, shared understandings between different groups (Cook et al., 2021; Figure 1). While participatory research methods acknowledge issues with power, context and diverse voices more prominently than other social science approaches, the overrepresentation of certain groups at the expense of others can still lead to biased research outcomes (Fritsch & Newig, 2012).

In order to produce socially just and equitable research outcomes, projects should account for variations in race, ethnicity, gender, age and represent marginalised population groups (Allmark, 2004). To date, environmental research often fails to appropriately represent these needs (Alderman et al., 2012; Shayo et al., 2012). Failing to include this diversity can have serious ethical and research consequences. It can impede our ability to generalise study findings and

prevent some population groups from experiencing the benefits of policies (Kukull & Ganguli, 2012). Including a diversity of viewpoints can provide a path for integrating the needs of marginalised population groups into policy-making processes (Pratt, 2019). For instance, through broadening the scope of mediums through which people can communicate (language, audio, visual and audio-visual, see Section 2.1 Multiple types of data), participatory video enables involvement from those with physical and sensory disabilities (e.g. participatory video is more accessible to people with different abilities because of the variety of mediums that can be employed), psychological difficulties (e.g. to make the lived experiences of people with disabilities visible; Bezzina, 2022), and to raise awareness of their marginalised status (Kaley et al., 2019), and communication difficulties or language barriers (Simpson Reeves & Hinthorne, 2019). In Nawrath et al.'s (2021) research in Kathmandu, using visual methods helped facilitate participants with literacy and language difficulties.

Likewise, participatory video can help engage children and youth in research, particularly those who are not able, or comfortable, with written or verbal responses (Barriage et al., 2017), as well as uncover topics that adults may not have previously considered (Leitch, 2008; Noyes, 2008). Children and youth often find video methods engaging (Christensen & James, 2008) and enjoyable (Einarsdottir, 2005). Moreover, participatory video can encourage children and youth to take active roles in the research process, enhancing their sense of agency and building capacity (Julien et al., 2013). For example, in the Peruvian Amazon, Arotoma-Rojas Indigenous female youth used participatory video to understand and record climate change related shifts in their food systems. The female youth participants interviewed community leaders and elders about drivers and consequences of food changes and explored common food practices using film. The films were then used as a starting point to identify common issues and solutions for climate related changes in the food system together with all relevant groups. Using film provided the female youth participants with knowledge and skills regarding food system changes and was an opportunity for them to advocate for climate change adaptation through communicating the films to decision-makers. This process gave autonomy to the female youth participants to represent community issues from their own perspectives. Participatory video can also help leverage transformative change through addressing young people specifically. For instance, Eastwood et al.'s (2023) research in Scotland demonstrates that participatory video can not only transform the way previously disengaged young people viewed local greenspaces but also how they use and benefit from it, and ultimately change their behaviours towards it. While the benefits of conducting inclusive research with a diverse set of groups outweighs many of the challenges, it should be acknowledged that it usually is more time and resource intensive and involves a much larger pool of participants (Walmsley et al., 2018).

As the limited success in tackling environmental challenges demonstrates, there is a need for engaging local ecological and Indigenous knowledge (Pörtner et al., 2022; Tremblay & Jayme, 2015). Participatory video can facilitate this by integrating community members into the research process, allowing us to tap into already-existing solutions (Mistry et al., 2021) and new ways of conceptualising environmental issues. For instance, in Arotoma-Rojas' research with Indigenous communities in the Peruvian Amazon, the films produced include guidance for other relevant groups, e.g. local municipalities and NGOs, as to how they can best support communities in addressing socio-environmental changes impacting their food systems. However, it should be acknowledged that existing power dynamics are sometimes difficult to overcome and that using participatory video can in fact perpetuate inequalities (Walsh, 2012). For instance, if not approached carefully, projects can engage with the most powerful gatekeepers in a given community or exclude marginalised population groups. Nevertheless, participatory video remains a useful tool to open channels of communication between relevant groups and to engage a diversity of knowledge systems in their environmental research.

3.4 | Advocating for transformative change

In participatory video, participants can be involved in the choice of topics and subjects being filmed, contribute to the filming stage, provide feedback to film footage, give input into editing or initiate their own film project without or with minimal outside assistance (Figure 1; Mistry & Berardi, 2012). This devolution of the research agenda to the community means that the 'researched', are now the 'researchers' (Milne, 2016). They can thus voice their issues according to how they feel they should be represented, shape how they think the data should be used and have a chance to engage with groups relevant to the issue at hand (i.e. the wider community, decision-makers and researchers; Mitchell et al., 2018). Participating in the process (e.g. planning the fieldwork, collecting the data, editing the content, managing a team) can promote local innovation and transformative change, helping to foster a sense of agency and build capacity in the community to become social and environmental advocates (Figure 1; Lunch & Lunch, 2006) that is further supported by the group-based nature of the approach (Richardson, 2022). In the process, participants can undergo a process of reflecting upon, and re-shaping, their personal values, attitudes and behaviours. For example, Fisher et al. (2021) demonstrated that participants altered their negative attitudes towards wildlife after taking part in the participatory video process, through interacting with others and hearing their views. Indeed, critical reflection of the participatory video process as a whole is encouraged when interpreting and communicating data and can lead to more thoughtful research methodologies, such as better consideration of power dynamics and the ethical implications for different relevant groups and audiences (Koningstein & Azadegan, 2021; Plush, 2013). Such issues are pertinent to the environmental sciences, where commonplace criticisms include lack of diversity and entrenched colonialism (Milner-Gulland, 2021; Reed & Rudman, 2023).

The research outputs from participatory video projects are not limited to peer-reviewed journal articles, policy briefs, or reports (Shaw, 2012). Indeed, such outputs can be typically shelved, hidden

behind inaccessible paywalls (Day et al., 2020) and rarely consumed by the beneficiaries they seek to represent (ElSabry, 2017). In contrast, films produced in the participatory video process can be audio-visually engaging and are often publicly accessible when there is a dissemination plan. Fisher et al. 2021), for example, was able to use film to capture the sounds and colours of Georgetown's green and blue spaces. These features help engage the audience and are, therefore, more likely to result in tangible action leading to transformative change. Arotoma-Rojas's research output will be a short advocacy-focused film, co-designed by the local community, that communicates the need for actions required by different relevant groups in relation to adapting their food systems to climate change.

3.5 | Challenges of applying participatory video

Participatory video projects must navigate a complex landscape of challenges spanning ethical, operational, relational and methodological issues. These arise from power relations, the sensitivity of working with vulnerable population groups, and reconciling the expectations and interests of diverse relevant groups. Ethical challenges of participatory video lie in power dynamics within the process, working with vulnerable population groups, the ownership of data, and the complexities associated with anonymity in photo/video footage (Moletsane et al., 2008). The participatory video literature has tended to present the use of cameras as unquestioningly positive, with little attention to any real-life issues in the project context (Milne et al., 2012). There is a need to acknowledge the 'messy reality of practice' and to interrogate the power dynamics inherent in the process (Shaw, 2016). Deciding who participates must involve careful recognition of power relations, not only between researchers and participants, but also between the various groups of participants (Moletsane et al., 2008). Depending on the project aims, representation must, therefore, be encouraged from different relevant groups and consideration of potentially conflicting agendas of variously positioned project actors (Shaw, 2016). In Nawrath et al.'s (2021) research in Kathmandu, one particular challenge was to navigate power relations within the diverse participant groups. Despite the successful recruitment of participants from various genders, castes and income brackets, the participatory video process brought to the forefront power dynamics that hindered equal contributions, such as those between high-caste male and low-caste female participants. In this example, the difficulty was in how to acknowledge power structures within the participant groups themselves. This required constant reflection and adaptation of the research process to effectively manage how these power dynamics shaped interactions within the group and with the researchers.

The identity of facilitators during different stages of the participatory video process can make an important contribution to how positive, equal, or authentic the outcomes are. Involving community members as trained facilitators can reduce negative consequences, acting as a bridge between the researchers and the researched and help ease complications surrounding language, cultural sensitivity and lasting legacy (Mistry et al., 2015). In Fisher et al. (2021), facilitators were Guyanese students, thus better reflecting locally relevant ideas and potentially ensuring better communication from participants. However, the involvement of community facilitators can also impact trust in the process from wider community participants. Carefully managed and transparent ethical procedures for consent, privacy and confidentiality can help mitigate these issues throughout the participatory video process (Varghese et al., 2020). For instance, workshops at the project's outset can outline consent procedures, allowing participants to understand and control the use of their images and stories, and consent forms can be designed to be iterative, enabling adjustments based on participants' comfort with disclosure (Gubrium et al., 2014). Such clear consent protocols that communicate the project's purpose, process and potential uses can enhance trust and ensure that all involved groups understand the goals and expectations of the project (Gubrium et al., 2014).

Tensions often arise between different agendas in participatory video projects (Shaw, 2012). For example, between community interests and pre-defined project aims required by funders, or from the differing expectations and understandings of the participatory video process. Mistry et al. (2014) reflect on a participatory video project in Guyana, which involved local communities, academic researchers and civil society organisations from local to international level. This project was initiated by the funders and academic institutions, with community ownership of the process limited by access to capacity and technology. Involving all relevant parties from the initial conception of the project, and accounting for differing motivations throughout, could help evaluate whether an eventual change in attitudes or behaviour might be sustained (Mistry et al., 2014). Some encourage better scrutiny of how the participatory video process affects society beyond the scope of the original project (Milne, 2016; Mistry et al., 2021). The respective role of relevant groups at different stages of a participatory video project is dependent on each project's aims. Nevertheless, participatory video can be a useful tool for contributing to transformative change within and beyond the involved communities. Mechanisms include social learning processes, where participants not only gain technical skills but also engage in critical thinking and problem-solving (Plush, 2013); changes in values and motivations, reflecting on personal beliefs and fostering empathy and cooperation (Varghese et al., 2020); and dissemination that leads to transformative change, amplifying voices through local events, screenings, or online platforms to mobilise action (Eastwood et al., 2023; Mistry et al., 2023). These mechanisms underscore the potential of community created content to foster ownership and sustain commitment to project initiatives.

Moreover, working with vulnerable population groups (e.g. people on low-incomes, children, or people with disabilities) can expose them to risks as a result of engaging with participatory video research, leading to further marginalisation or impacting their well-being (Moletsane et al., 2008). For instance, films that engage children with sensitive issues such as sexuality and gender-based violence can challenge local cultural norms and thus put them at

risk (Moletsane et al., 2008). It is, therefore, crucial for participatory video projects to reflect on potential risks, mitigating them within the planning phase and taking responsibility for them throughout the project (Figure 1). In some cases, where participatory video does not allow for participants to maintain their anonymity, it may not be the right choice when researching sensitive or stigmatised issues (Fraser et al., 2022). For instance, Fraser et al.'s (2022) participatory video project with Indigenous LGBTIQ+ people who had experienced homelessness in Aotearoa New Zealand failed due to the lack of anonymity afforded by the method which led to the withdrawal of most participants. Pseudonyms, actors, or voice-overs may offer solutions in some cases.

Another ethical challenge involves the ownership of the different outputs from the participatory video process. Ownership can lie with the project leader, researchers, participants who made the videos or a combination thereof. If participants have ownership over the films, the researchers have little control over distribution (Sitter, 2012), which may impact other potential research participants, or could violate agreements for copyright or ethical approval required by research funders or institutions. In Fisher et al. (2021), participants were given ownership of the film they created and were encouraged to keep copies (with consent from other members of their filming group) but were asked not to share them publicly. Striking a balance between empowering participants by giving them ownership and maintaining some level of control for ethical and project management reasons is a complex challenge. It requires careful negotiation and clear communication between researchers and participants.

It is critical that all those involved in the participatory video process, from academics, through community researchers to decision-makers, engage with these ethical considerations early and to the fullest extent possible and that these considerations are reconsidered throughout the project. This will ensure trust is built, therefore, maximising the likelihood that the participatory video process is perceived as socially just by all relevant groups and subsequently leading to more effective outcomes.

BOX 1 Take home messages for environmental scientists.

1. Data based on written material often cannot tell the whole story. Participatory video generates audio, visual and video data to enable a deeper, more nuanced understanding of the environmental issue beyond what data based on written material can convey. The visual medium of participatory video captures multisensory experiences and emotions that are challenging to convey through written words-based methods alone.

2. Participatory video enhances opportunities to involve diverse relevant groups. Through broadening the scope of mediums through which people can contribute (audio, visual, video), participatory video enables the involvement of groups such as people with disabilities, psychological or communication difficulties. It can, therefore, provide opportunities for marginalised groups to be involved and thus better represent diverse voices and knowledge systems.

3. Advocacy is improved through audio-visual engagement. Films produced in participatory video projects, unlike traditional research outputs, are engaging and can be made publicly accessible. Advocacy-focused films can communicate research findings effectively, potentially resulting in tangible action.

4. Careful navigation of ethical challenges is required. Ethical challenges in participatory video include complex and fluctuating power dynamics, working with vulnerable population groups, ownership of data, issues around anonymity and the legacy of projects. Researchers must engage with these challenges early on to ensure that trust is built and that projects are ethically sound.

4 | RECOMMENDATIONS AND CONCLUSIONS

The global environmental challenges that we face today require interdisciplinary thinking, research and knowledge co-production to solve. Here, we (a) illustrate how participatory video can be applied in environmental research projects and (b) shed light on the advantages and challenges of using participatory video. We summarise our guidance in Box 1, to encourage environmental researchers to broaden their methodological toolkit to better tackle the many global environmental issues in our changing world.

The creativity afforded by the process can also enable participants to express themselves in a variety of ways, both audio-visually and verbally. It can be a useful tool for understanding human attitudes, knowledge and behaviours that drive global environmental challenges. The use of participatory video in environmental research may, therefore, contribute to wider calls to address environmental and social justice issues (Reed & Rudman, 2023). We believe these benefits outweigh many of the challenges of participatory video such as resource intensiveness. However, as with any research method, participatory video may not be suitable in all cases, such as when ensuring anonymity is imperative.

While we hope to shed new light on the use of participatory video in environmental science, users must be open to transforming typical ways of knowing, working and understanding that are embedded in the discipline. As well as a stand-alone method, participatory video can be used alongside more traditional research approaches as one way to triangulate, enhance or even contradict existing knowledge. Further, those engaging with participatory video outputs must be open to acknowledging its cross-disciplinary origins. Without this, such work can lead to the emergence of

methodological flaws, misinterpretation of results and unsubstantiated conclusions (e.g. Martin, 2020), and difficulty publishing (i.e. with journal choice and peer-reviewer expertise), amongst other issues. To this end, we encourage those working in disciplines with a long history of using participatory video to work alongside those within conservation, ecology and climate science, and think about how inter- and trans-disciplinary teams can, together, help to solve the global environmental challenges we all face.

AUTHOR CONTRIBUTIONS

Maximilian Nawrath: Conceptualisation, methodology, formal analysis, investigation, writing—original draft, writing—review & editing; **Jessica C. Fisher**: Conceptualisation, methodology, formal analysis, investigation, visualisation, writing—original draft, writing—review & editing; **Ingrid Arotoma-Rojas**: Conceptualisation, methodology, formal analysis, investigation, writing—original draft, writing-review & editing; **Zoe G. Davies**: Writing—review & editing, supervision; **Helen Elsey**: Writing—review & editing, supervision; **Paul Cooke**: Writing-review & editing, supervision; **Jayalaxshmi Mistry**: Writing—review & editing, supervision; **Martin Dallimer**: Conceptualisation, writing—review & editing, supervision.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare. Martin Dallimer is an Associate Editor for *People and Nature* but was not involved in the peer review and decision making process.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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