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Cultural Beliefs and Participatory AI: Unlocking Untapped Catalysts for Climate Action

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Abstract: This review paper examines two underutilized yet transformative drivers in addressing the climate crisis: (1) the role of cultural belief systems in fostering large-scale behavioral shifts toward sustainability, and (2) the use of participatory Artificial Intelligence (AI) methods to mitigate natural disaster risks, such as flooding. Despite their potential, both areas remain largely untapped. The first driver stems from persistent inertia in behavioral change, prompting the 2023 IPCC Report to call for an ‚inner transition'—a cultural shift in which deeply held values shape socio-ecological behavior, encouraging individuals to move away from business-as-usual lifestyles. However, the mechanisms behind such a transition remain unclear, and empirical support for this approach is still emerging. The second driver highlights the untapped potential of advanced computational techniques in developing intelligent solutions for worsening ecological crises. AI development is often expert-driven, disconnected from societal needs and lived realities. To bridge this gap, inclusive technology co-design—engaging all societal groups, especially those most affected by climate change—is crucial. Additionally, effective mechanisms for networking, amplifying, and scaling these efforts are essential. This paper proposes an integrated, multi-method framework that unites both drivers, offering a novel approach to accelerating progress in climate action.

Keywords: climate resilience; cultural transformation; participatory AI; behavioral change; sustainability innovation

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1. Introduction

The pursuit of continuous economic growth in a highly globalized and diversified world has contributed to an ecological crisis of unprecedented scale. New inequalities are emerging between Western societies, Asia, and the Global South, where the most vulnerable communities face the worst consequences of environmental collapse. The World Economic Forum Global Risks Report 2025 (World Economic Forum, 2025) identifies extreme weather events and critical shifts in Earth's systems as the most pressing global challenges over the next decade. Climate action has become a priority in policy agendas worldwide. However, large-scale initiatives - such as the Sustainable Development Goals, international agreements from global climate summits like COP29 in Baku, Azerbaijan, and social movements such as Fridays for Future - often struggle to translate their momentum into lasting, systemic change. Conflicting interests and societal inertia continue to hinder meaningful progress.

The Need for Behavioral Transformation

Public awareness of human-induced climate change is higher than ever. People understand the environmental impact of energy consumption, mobility, food production, and industry. They recognize the inequalities in climate burdens and acknowledge the transformative policies required to meet climate goals. Yet, large-scale behavioral change is not materializing. Sustainability efforts often fail to translate into widespread shifts in daily habits, lifestyles, and community-level action. Despite the prominence of ecological values in public discourse, they struggle to take deep root in people's priorities and behaviors.

Why is this the case? The answer may lie in a fundamental psychological and cultural barrier. As environmental scholar Gus Speth once remarked: "Earlier I thought that the biggest environmental problems are the extinction of species, the collapse of ecosystems and climate change.

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I thought 30 years of good science would deal with these problems. I was wrong. The biggest environmental problems are egoism, greed and ignorance, and to deal with them, we need cultural and spiritual change. And we scientists do not know how to do this" (Gus Speth, Professor of Environmental Policy and Sustainable Development; Chief Scientific Advisor of Jimmy Carter and Bill Clinton; BBC Radio, October 2013). This perspective highlights a deeper challenge: environmental action requires not just policy and technology but also a shift in values, mindsets, and cultural narratives. The Intergovernmental Panel on Climate Change (IPCC) Report (2023) refers to this as the need for an "inner transition" (Chapter 17, Working Group III). Scholars suggest that a spiritual and cultural transformation, centered on a profound appreciation of nature and planetary stewardship, could drive meaningful behavioral change (IPBES, 2022; Oliver et al., 2022; Yaka, 2019). However, critical questions remain unanswered:

- What are the underlying values that can drive this inner transition?
- Who are the key agents for initiating and sustaining such a transformation?
- How can these changes scale across societies?
- Can an inner transformation genuinely lead to sustained socio-ecological behavior change?

The Need for Technological Transformation

Alongside cultural change, Artificial Intelligence is emerging as a powerful tool in addressing ecological crises. For example, AI-driven solutions are already enhancing resilience in disaster management such as floodings (Microsoft & PWC, 2018; Vinuesa et al., 2020; Cowls et al., 2023). Applications range from extreme weather forecasting and flood prediction to sensor-based water management and real-time crisis response systems (Ogie et al., 2018; Arfan et al., 2019; Abid et al., 2021; Tan et al., 2021; Saleem & Mehrotra, 2022; Schofield, 2022). AI-driven deep learning models are improving predictive accuracy in weather forecasting, while data fusion techniques integrate satellite imagery, IoT sensors, and climate data for better decision-making. AI-powered edge-computing sensors enable real-time environmental monitoring, and automated decision-support systems are optimizing water management strategies during floods. Despite such advancements as illustrated for water management, the full potential of AI in ecological crisis management remains underutilized. A major obstacle is the disconnect between AI development and societal needs. Many AI-driven climate solutions are designed in expert silos, without adequate input from the communities most affected by climate change. As Cowls et al. (2023: 284) emphasize: „leveraging the opportunities offered by AI for global climate change is both feasible and desirable, but it involves a sacrifice (ethical risks and potentially an increased carbon footprint) in view of a very significant gain (a more effective response to climate change). It is, in other words, a gambit, which requires responsive and effective governance to become a winning strategy".

An Integrated Approach

This paper explores the transformative potential of these two under-utilized drivers in tackling the climate crisis:

1. Cultural belief systems as catalysts for large-scale behavioral change toward sustainability.
2. Participatory AI as a mechanism for improving climate resilience and natural disaster management, here shown particularly for flood response.

Regarding the first driver, this paper examines the role of cultural narratives in fostering sustainable behavior and assesses whether an inner transition can lead to permanent and impactful change. Regarding the second, this paper investigates how stakeholder participation can enhance AI's effectiveness in climate adaptation, ensuring that technological solutions align with real-world needs. Finally, this paper proposes an integrative framework that bridges the gap between cultural transformation and technological innovation. By bringing together behavioral change and technological advancement, this approach aims to identify the theoretical, conceptual, and methodological resources needed for a truly transformative climate response.

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2. The Role of Cultural Belief Systems for Driving Socio-Ecological Transformation

Research must analyze, develop, and integrate the transformative potential of cultural belief systems as drivers for addressing the climate crisis—specifically, the large-scale behavioral shift of societies toward sustainability. It is essential to examine the role of cultural belief systems in fostering sustainable behavior, assess how these systems can cultivate critical mass for belief-driven socio-ecological transformation, and determine whether belief-based behavioral change is genuinely permanent, effective, and transformative in the context of climate crisis response.

The concept of 'inner transition'—the deep values and motivations that inspire behavioral change—may be found within these cultural belief systems. As defined by Clifford Geertz (1973) and others, a cultural belief system consists of the shared values, norms, practices, and worldviews held by a group within a specific culture. These beliefs shape how individuals interpret and engage with their environment, influencing behaviors, social interactions, and overall perceptions of existence. Cultural belief systems are transmitted across generations and manifest in various ways, including:

- Religious beliefs: Encompassing organized religions, spiritual practices, and notions of divine or supernatural forces.
- Ethical and moral values: Establishing what is considered right or wrong, acceptable or unacceptable, and guiding interpersonal behavior.
- Social norms: Defining expectations regarding behavior, roles, and relationships within society (e.g., gender roles, family structures, and social hierarchies).
- Worldviews: Offering a collective understanding of life, nature, time, fate, and existential meaning.
- Traditions and rituals: Embodying customs, ceremonies, and practices rooted in religious or historical significance.
- Symbols and myths: Expressed through narratives, imagery, or objects that hold deep cultural meaning and represent fundamental beliefs.

Cultural belief systems provide a framework for interpreting the world and fostering social cohesion. They vary widely across cultures and evolve in response to internal developments and external influences. These systems shape how societies interact with nature, influencing environmental practices, sustainability behaviors, and attitudes toward conservation.

The impact of cultural belief systems on environmental consciousness ranges from animistic worldviews that revere nature as sacred to anthropocentric perspectives that view nature as a resource for human use. Such differences have significant implications for sustainability, conservation, and ethical considerations regarding natural resource management. The following section explores scholarly contributions from sociology, psychology, anthropology, religious studies, environmental ethics, and ecology, analyzing how cultural belief systems shape both individual and collective attitudes and behaviors toward the natural world. The study of cultural belief systems draws on multiple disciplines, with key works providing foundational insights. Clifford Geertz's *The Interpretation of Cultures* (1973) is seminal in cultural anthropology, emphasizing the role of symbols and rituals in shaping societal beliefs and behaviors. He describes cultures as "webs of significance" that people construct, with cultural beliefs deeply embedded in the meanings individuals attach to their actions and symbols. Similarly, Richard Shweder's *Thinking Through Cultures* (1991) in cultural psychology examines how diverse cultural belief systems shape moral reasoning, emotional expression, and self-perception, offering a comparative perspective on culture's role in cognitive and emotional processes.

From a sociological standpoint, early theoretical frameworks have long established the connection between belief systems and social action (Weber 1904, 1988; Durkheim 1912; Mead 1928; Benedict 1934). Sociologists have analyzed how belief systems underpin Western rationalism, modernization, and environmental attitudes in the U.S. and Europe (Weber 1904, 1988; Schroyer 1983; Habermas 1985; Schluchter 1985; Beck 1986; West 1994; Horkheimer and Adorno 1997; Murphy 2002; Leiss 2007). In religious studies, the so-called Lynn White thesis posits that Western Christianity's anthropocentric outlook contributed to ecological degradation by promoting a dualistic worldview that views nature as subordinate to human needs (White 1967). However, contrasting perspectives highlight the potential for Christian thought to support environmental stewardship, as seen in studies on ancient monastic spirituality (Christie 2013) and contemporary Christian environmental ethics (Pope Francis 2015). Belief systems across cultures vary in their ecological orientations. Some adopt an anthropocentric view, prioritizing human dominance over nature, while others embrace ecocentrism (Naess 1973), recognizing humanity as part of a larger ecological system. However, Eastern societies' supposedly holistic or polycentric belief systems have not automatically led to stronger environmental preservation or socio-ecological responsibility on a large scale (Griffiths 2004; Tomalin 2013; LeVasseur and Peterson 2017). This is particularly intriguing given that Hinduism and Buddhism incorporate reverence for nature into their spiritual frameworks, promoting sustainability, reciprocity, and stewardship (Tucker and Williams 1998; Key Chapple and Tucker 2000). Research strongly affirms the link between cultural belief systems, environmental attitudes, and socio-ecological behaviors (Berkes 2012). The challenge for research lies in comparing and assessing the complex and diverse nature of cultural belief systems. However, scholars have identified key bridging concepts that function as "boundary objects" (Bowker and Star 1999) across various religious and cultural traditions, facilitating cross-cultural dialogue on sustainability. Christie (2013) highlights three such concepts—mindfulness, sense of place, and the vision of a better future—as central to socio-ecological sustainability and effective across diverse belief systems:

- Mindfulness: Originally a contemplative practice, mindfulness has been adopted by sustainability science as a crucial element in fostering environmental awareness, social justice, and ethical decision-making (Intergovernmental Panel on Climate Change Report 2023; Ives et al. 2023; Oliver et al. 2022; Gomez-Olmedo et al. 2020; Wamsler et al. 2018; Freyer et al. 2018; Horlings 2015; Hulme 2014).
- Sense of place: Rooted in monastic traditions as *stabilitas* (a lifelong commitment to place and community), the concept has influenced environmental psychology (Hummon 1992; Di Masso et al. 2017) and sustainability science (Montgomery 2023), supporting socio-ecological stewardship (Grenni et al. 2020; Del Baldo et al. 2024).
- Better future: Religious traditions envision a 'paradise' or 'Kingdom of God,' concepts that sustainability science repurposes to describe socio-ecological future scenarios (Yordy 2008; Rothman and Coppock 1996; Haga et al. 2023; Durán et al. 2023; Kantabutra 2020).

Although religious and cultural traditions claim to connect deep values with socio-ecological behavior (Taylor 2002; Gardner and Peterson 2002; Taylor 2004; Gardner 2006; Smith and Pulver 2009; Djupe and Hunt 2009; Carroll 2012; Christie 2013; Taylor et al. 2016; Ellingson 2016), academic evidence on their role in ecological transformation remains fragmented (Freyer et al. 2018; Shattuck 2016; Brock and Barham 2015; Vonk 2013; Taylor 2009; Taylor 2004; Taylor 2002). However, sustainability science suggests that the networking potential of embedded small communities can amplify local socio-ecological initiatives to a global scale (Koehrsen 2018; Lam et al. 2020).

In conclusion, while cultural beliefs about nature continue to evolve in response to environmental challenges, their integration with sustainability efforts requires further exploration. Contextual factors - such as cultural heritage, social embeddedness, and local vulnerabilities - play a crucial role in shaping the relationship between inner transition, technology, and planetary stewardship. Understanding these dynamics is key to addressing the climate crisis effectively.

3. Bridging Technology and Society: Co-Designing AI for Socio-Ecological Transformation

Contemporary AI governance frameworks place a strong emphasis on ethics (for a review cf. reference author). However, critics argue that this focus is often overly principle-based, resulting in a disconnect between theory and practice (Bleher and Braun 2023). Policy initiatives themselves are calling for increased societal participation in technological innovation, as exemplified by the Responsible Research and Innovation (RRI) framework promoted by the European Commission. This framework emphasizes collaboration among societal actors - researchers, citizens, policymakers,

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businesses, third-sector organizations, and others - throughout the research and innovation process to better align outcomes with societal values, needs, and expectations (reference author; Owen et al. 2013).

Innovation is fundamentally about stakeholder involvement, dynamic cooperation, and the blurring of traditional boundaries. Multi-stakeholder approaches are gaining traction, supported by conceptual models such as 'Mode 2' (Gibbons et al. 2010), the 'Triple Helix' (Etzkowitz and Leydesdorff 1997; reference author), and 'Post-normal Science' (Funtowicz and Ravetz 1993). These innovation processes often occur within networks involving the core actors of the 'Quadruple Helix' (McAdam and Debackere 2018), whose importance is particularly evident in the context of sustainability (Charli-Joseph et al. 2018; Maclean et al. 2022; Charli-Joseph et al. 2023). Inclusion of vulnerable groups in innovation is essential (Aldridge 2015). These groups—often marginalized and underrepresented in democratic or political processes—suffer disproportionately from the climate crisis. Their perspectives are valuable in highlighting injustices, inefficiencies, and failures in existing systems (DiSalvo et al. 2012; Zamenopoulos and Alexiou 2018).

Nonetheless, participatory research involving these groups presents unique ethical and methodological challenges (Lewin 1946; Lewis et al. 2012; Mulvale and Robert 2021; Ottinger 2023).

A significant obstacle is access, as these groups are often socially invisible (Amann and Sleigh 2021). Methodological and epistemic issues also arise concerning knowledge validity and the integration of diverse knowledge forms (Durán and Pirtle 2020). Despite this, their involvement is crucial for shaping climate crisis responses grounded in societal needs and widely accepted (Pérez-Escolar and Canet 2022). Vulnerable populations may include the elderly (Bischof and Jarke 2021) or historically marginalized indigenous communities (Lewis et al. 2012).

Ecological transformation is inherently socio-ecological. "A safe and just operating space for socioecological systems is a powerful bridging concept in sustainability science" (Oliver et al. 2022: e919). Ensuring 'Safe Spaces' (Oxford English Dictionary 2024; The Roestone Collective 2014) is key to mitigating the risks associated with involving vulnerable groups in innovation. The concept has been widely discussed and developed across contexts (Barrett 2010; Stengel and Weems 2010; Arao and Clemens 2013; Fitzpatrick et al. 2023), including within sustainability science (Pereira et al. 2015; Pereira et al. 2020). This approach is grounded in deliberative communication: the idea that rational discourse rooted in lived experience enables the integration of social structures into a coherent framework, ensuring citizens can fully exercise their rights to participation and communication in shaping the common good (Habermas 1992: 678). Competing interests are negotiated in an ecological context where the aim is a deliberative consensus—a 'survival of reason'—that integrates diverse viewpoints in an increasingly complex world (Kruip et al. 2024). “Effectively managed, inclusive processes of dialogue and deliberation have been shown to create shared values and assist in systemic transformation towards increased environmental justice” (Oliver et al. 2022: e924)

In computer science, 'technology co-design' bridges software development and socio-technical systems theory. It promotes participatory design methods in real-world settings, emphasizing principles such as user access to necessary resources and flexibility to support locally adaptive solutions (Greenhalgh et al. 2016: 406; reference author). Among participatory methods that have been already used in the life cycle of machine learning (Birhane et al. 2022) are auditing, public consultation such as citizen juries, joint problem formulation, model cards and datasheets for information disclosures, and artefact co-development. Participatory modelling and stakeholder-driven scenario simulations informed by a companion modelling framework (Barreteau et al. 2003; Etienne 2013) will enable co-designing desirable futures of place-based sustainability scenarios. Participatory approaches in social simulation and modelling are already extensively used for natural resource management, including water management (Barreteau et al. 2001; Bousquet et al. 2002; Lynam et al. 2007; White et al. 2010; Hirsch et al. 2010; Etienne 2013; Berthet et al. 2016; Bouamrane et al. 2016; Tuler et al. 2017; Basco-Carrera et al. 2017; Charli-Joseph et al. 2018; Redpath et al. 2018; Crevier and Parrot 2019; Siqueiros-García et al. 2019; Bakhanova et al. 2020; Abrami et al. 2021; Schlueter et al. 2021; Garcia et al. 2022). Many of them focus on application and distribution issues in water management; applications for disaster management are rare (Henly-Shepard et al. 2015). For depicting desired systems, realistic modelling is required that can represent the context-specific interaction dynamics between society and technology for anticipating, monitoring, evaluating and improving socio-ecological futures (Gilbert et al. 2018; reference author). Modelling needs to consider values and context, and it needs to be participatory to model place-based sustainability scenarios. Results can then be communicated to decisionmakers, especially via policy modelling (reference author).

Realistic and policy-relevant modelling (Gilbert and Doran 2018; Epstein and Axtell 1996), especially innovation networks (reference author), means modelling what-if scenarios of heterogeneous actors with many attributes and properties in permanently changing contexts displaying a multitude of behaviours in networks of relationships.

Especially intricated this becomes when innovation networks in Artificial Intelligence are simulated for policy (reference author). Agent architectures, developed from intermediary theories of sociology, can then be calibrated with empirical details from qualitative social research, which uses methods such as participant observation, case studies, interviews, document or discourse analysis (reference author). The quality of the simulation is particularly important for case- and context-specific policy modelling for societal transformation (reference author; Aodha and Edmonds 2017).

A review by Birhane et al. (2022) describes current AI development as expert-driven, "technically-focused, representationally imbalanced, and non-participatory" (Birhane et al. 2022: 1). In this paradigm, the relationship between technology creators and users is hierarchical. AI applications in the public sector are often obscured by technical jargon, making them opaque and inaccessible to non-experts (AlgorithmWatch 2020). However, shifts from logic-based to data-driven AI, such as deep learning, and new infrastructures for human-generated data are increasing demands for non-expert involvement in AI development (Birhane et al. 2022: 3). This evolution has given rise to the emerging field of 'Participatory AI,' where the aim is to redefine designers and users as co-creators. Yet, empirical examples remain rare, and standards for participatory AI—especially concerning reciprocity, reflexivity, and empowerment—are still undeveloped.

Preliminary findings (Deni Raj 2024) highlight both ethical concerns and opportunities for Participatory AI in water management. In forecasting extreme weather and flood prediction, community-centered approaches are needed. This includes tailoring AI outputs to local contexts, using accessible language, and ensuring equitable tool deployment. In sensor networks and automated decision systems, stakeholder involvement can enhance local relevance, technological acceptance, and transparency. River basin management calls for fairness algorithms and participatory modeling to integrate local values. In leakage detection and smart metering, transparent interfaces and ethical billing practices are essential for consumer trust (Gavorník et al. 2024).

Inclusive technology co-design must engage stakeholders across the Quadruple Helix: communities living in high-risk areas, social researchers, AI developers, public authorities, and relevant businesses. These collaborations are especially important in the sustainability domain (Charli-Joseph et al. 2018; Maclean et al. 2022; Charli-Joseph et al. 2023). However, participatory AI must go beyond this model to include vulnerable populations (reference author; Aldridge 2015).

Working with marginalized groups presents ethical and methodological complexities (Lewin 1946; Lewis et al. 2012; Mulvale and Robert 2021; Ottinger 2023). These groups often lack the capital to advocate for their needs and risk further marginalization through technological exclusion (Fazelpour and Danks 2021; Lewis et al. 2012; Pérez-Escolar and Canet 2022). Exclusion can occur through inaccessible technologies or unequal service distribution, necessitating inclusive user experience design (Benjamin et al. 2020; Bischof and Jarke 2021). Technological decision-making also raises questions about who benefits and whose knowledge counts (Caforio et al. 2021; Fazelpour and Danks 2021; Durán and Pirtle 2020). Technical validity may be challenged by competing epistemologies (Gethmann et al. 2015). Nonetheless, addressing environmental injustice requires the inclusion of marginalized voices and systemic critics, such as NGOs, alongside traditional stakeholders.

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Marginalized individuals bring critical insight into the flaws of existing systems, particularly in digital innovation and AI (reference author; Pérez-Escolar and Canet 2022). Empowering vulnerable groups to co-design AI tools—especially in water management—can lead to more inclusive, just, and effective systems (Caforio et al. 2021).

Currently, Participatory AI is not widely used in developing flood warning systems, disaster prevention apps, or sensor technologies for water management. Initial work in this area is emerging (Khadim et al. 2023; Gavorník et al. 2024), with a few promising projects underway (e.g., PREVENIR https://sites.google.com/view/prevenir-en/home; accessed 01.04.2025). However, vulnerable communities remain largely overlooked in these innovations. Their inclusion is essential to ensure that AI systems are grounded in social need and gain broader acceptance. Vulnerable populations may include the elderly (Bischof and Jarke 2021) or marginalized indigenous communities (Lewis et al. 2012). It is not enough for technology to predict extreme weather—it must also assess community vulnerability and bridge the digital divide in hazard control systems. Researchers and designers increasingly recognize the importance of engaging vulnerable groups in this domain (Fazelpour and Danks 2021; Caforio et al. 2021; Buchert et al. 2022; Pérez-Escolar and Canet 2022).

4. Discussion: Bringing Both Drivers Together

At first glance, the combination seems almost revolutionary: 'Inner transition' + Participatory AI = Effective Climate Crisis Response. 'Inner transition' is essential for catalyzing large-scale behavioral change toward sustainability, while 'Participatory AI' is vital for ensuring that technological interventions in ecological crises align with societal values and needs. Integrating these two drivers could significantly amplify our resilience and capacity to respond to climate challenges—bridging the gap between technology production and society by uniting 'change in people' with 'change in technology.'

From this perspective, inner transition toward socio-ecological justice becomes a foundational condition for Participatory AI that genuinely benefits society—particularly vulnerable communities. Without inner transition, there is a real risk that technology will be used to reinforce existing inequalities and discriminatory practices. As Oliver et al. (2022: e920) caution:

"Individualistic trends in society might be responsible for a growing pattern of private adaptation to environmental threats, whereby *new technologies* (*own emphasis*) and access to resources increasingly support individuals reducing risk for themselves, their families, and businesses. These trends can influence how people act to reduce personal exposure to environmental risks, such as extreme weather events (…) Such actions might come at the expense of mitigating environmental damage and, if they hamper resilience for others, also raise questions around environmental justice". Despite this pressing concern, the literature on inner transition remains largely disconnected from that on inclusive technology co-design and AI. Bridging this gap is an urgent task for future research. Conversely, Participatory AI can be viewed as the expression or practical realization of inner transition—its manifestation in transformative sustainability efforts. Yet, a number of challenges currently impede this potential. Participatory design and innovation are applied in highly varied ways across different contexts, particularly between the Global North and Global South. These differences include socio-cultural norms, power asymmetries among stakeholders, gender dynamics, and other structural inequalities (Hirom et al. 2017). Consequently, the benefits of participatory approaches are unevenly distributed. In both the Global South and North—though especially in the latter—there is a danger of what has been described as "participation washing." Superficial participation can mask entrenched power imbalances.

Birhane et al. (2022) warn that colonial projects have often claimed legitimacy under the guise of participation, without genuinely empowering those involved.

True participation must enable stakeholders to make meaningful contributions and influence outcomes.

Instances where inner transition is clearly absent are especially visible in data harvesting for AI used in social media. Here, participation is typically passive, unconscious, and built into the technology itself. Users are often unaware they are even participating. As Birhane et al. (2022: 3) note:

"To support the idea of a 'participatory condition' of society and technological development requires a degree of agency and intentionality".

While Birhane et al. (2022) describe emerging participatory methods in the AI lifecycle—such as public consultations, citizen juries, problem formulation, model cards, and co-development of artifacts—they express concern that these practices may be driven primarily by industry interests. Participation must go beyond system refinement and aim instead at empowerment, equity, and broader societal benefit.

Inclusive and participatory design is critical not only for giving citizens a voice in AI development and deployment, but also for identifying and addressing persistent patterns of social injustice, including masking, redlining, and algorithmic bias.

Successfully integrating the transformative potential of both inner transition and Participatory AI requires careful attention to context. Different value systems lead to diverse expectations, constraints, and implications for the application of AI in sustainability. Research must therefore explore both the influence of inner transition on socio-ecological behavior change—as a potential model for broader societal transformation—and the role of Participatory AI in supporting these responses to the climate crisis.

As discussed in previous sections, the inner transition literature emphasizes that a disconnect between deep values and everyday behavior underlies widespread inertia, lifestyle stagnation, and the failure to meet climate goals. Similarly, AI research has highlighted how technology detached from societal values has resulted in bias, injustice, and a lack of responsiveness to social change or public policy.

The consequences of these disconnects are profound: increasing exposure to flood events and life-threatening conditions, worsening conditions for vulnerable populations, stagnating progress on poverty reduction, health, food security, and mounting risks of mass migration and social conflict. Reconnecting deep inner values to both socio-ecological behavior and technology production may be part of the solution.

Hypothetically, this dual connection could both ignite behavioral transformation and enable the creation of value-sensitive, context-responsive, and dynamic AI systems, even from technologies that are currently perceived as problematic. Sociological network theory supports this view, suggesting that small, place-based communities embedded in broader social networks play a pivotal role in enabling grounded transformation—locally and globally (Wellman 2018; Montgomery 2023). These communities also facilitate the uptake of digital innovation and the diffusion of new technologies (reference author; Beaman et al. 2021).

In sum, aligning inner transformation with inclusive technological development holds promise for addressing the climate crisis more equitably and effectively. The integration of these two drivers is not only desirable but increasingly necessary for shaping a future in which climate responses are both just and sustainable.

5. Future Directions

This paper highlights the transformative potential of aligning *inner transition* - a shift in cultural values and behavior - with *Participatory AI* as a strategy for effective and equitable climate crisis response. Future research must focus on how small, place-based communities can serve as catalysts for this integration, modeling scalable pathways to sustainability through inclusive engagement and local agency.

A mixed-methods, participatory approach is essential for co-defining problems, co-designing solutions, and capturing diverse value systems. Methods such as Participatory Systems Mapping, citizen juries, scenario modeling, and companion simulations enable communities to visualize and co-create desirable socio-ecological futures. These approaches also help integrate technical

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innovation with societal values, ensuring that AI applications are context-sensitive, just, and accepted.

Ultimately, realistic, policy-relevant modeling—grounded in empirical data and social theory—can support decision-makers in shaping climate responses that are not only technologically effective but also socially inclusive. Bridging the human and technological dimensions of sustainability is not just necessary—it is the cornerstone of resilient, future-ready systems.

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