

## **Why Technology Alone Cannot Save Us: The Critical Role of Social and Behavioural Sciences in Achieving Sustainability**

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### **Abstract:**

This paper contends that sustainability is fundamentally a human and societal challenge rather than merely a technical or ecological one. While natural sciences have extensively documented the biophysical limits of our planet, the drivers of environmental degradation are deeply embedded in social structures, cultural norms, economic systems, and human psychology. Therefore, this research argues that social and behavioural sciences are not supplementary but essential to achieving sustainability. Through a comprehensive synthesis of literature spanning sociology, psychology, anthropology, economics, and political science, the paper examines three interconnected themes: (1) diagnosing the roots of unsustainability by analysing how social norms, values, inequalities, and institutional frameworks perpetuate destructive systems; (2) understanding and facilitating behavioural change through theoretical models and practical interventions aimed at fostering pro-environmental action at individual and collective levels; and (3) reimagining institutions and governance structures to support sustainable economic models, policy frameworks, and participatory decision-making. The paper concludes that meaningful progress toward sustainability demands transdisciplinary collaboration that integrates social science insights with technical solutions. Such integration is imperative for designing strategies that are not only effective but also equitable, culturally resonant, and politically viable. Ultimately, the sustainability project requires transforming the social worlds that shape humanity's relationship with the environment, moving beyond the narrow goal of "fixing" nature toward fostering just and harmonious coexistence within planetary boundaries.

**Keywords:** Sustainability, Social Sciences, Behavioural Change, Pro-environmental Behaviour, Social Norms, Environmental Governance, Sustainable Consumption, Inequality, Institutional Transformation.

### **1. Introduction: The Imperative of the Human Dimension**

The concept of sustainability, crystallised in the Brundtland Commission's 1987 report *Our Common Future* (Brundtland, 1987), has become a dominant global paradigm. It is traditionally framed through an interlocking triad: environmental protection, economic viability, and social equity. For decades, the primary scientific response has emanated from the natural sciences climate science, ecology, and engineering, focusing on quantifying planetary boundaries, modelling climate change impacts, and developing green technologies. While this

work is indispensable, it has often treated the human component as a black box: a source of emissions to be regulated or a set of consumers to be nudged towards eco-products.

This paper contends that this approach is insufficient. The crises of climate change, biodiversity loss, and resource depletion are, at their core, outcomes of human decisions, behaviours, and systems. Why do societies prioritise short-term growth over long-term stability? Why do individuals consume beyond their needs despite awareness of environmental costs? How do power dynamics and inequality shape vulnerability and response capacity? These are quintessential social and behavioural questions. Therefore, the path to sustainability must be paved with a deep understanding of human societies, cultures, minds, and collectives.

The social sciences and behavioural studies offer the theoretical frameworks and methodological tools to unpack this complexity. They move beyond the "information deficit model" (the assumption that providing facts leads to action) to interrogate the intricate web of motives, constraints, and contexts that guide human action. This paper synthesises key contributions from these fields, structured around diagnosing the problem, prescribing behavioural interventions, and envisioning systemic transformation. It argues that without leveraging these insights, sustainability initiatives risk being technically sound but socially irrelevant, politically inert, or unjust.

## **2. Understanding the Roots of Unsustainability: Social Structures, Culture, and Inequality**

Unsustainability is not an accidental byproduct of progress but is woven into the fabric of modern industrial societies. Social sciences help excavate these deep-seated drivers.

### **2.1 The Sociological Lens: Norms, Values, and Systems**

Sociology examines how macro-structures and shared meanings shape action. Key concepts include:

- **Consumerism and the Growth Paradigm:** Modern economies are predicated on continuous growth, driven by and driving a culture of consumerism. Sociologists like Thorstein Veblen (conspicuous consumption) and later, Juliet Schor (2010), have analysed how consumption becomes a primary source of identity, status, and social belonging. Schor's concept of "plenitude" argues for a shift away from this growth-centric model towards personal and ecological wealth. The "treadmill of production" theory posits that firms must continuously expand output to survive, locking societies into a cycle of increased resource extraction and waste.
- **Social Practices:** Scholars like Elizabeth Shove argue that sustainability cannot be achieved by targeting individual attitudes alone. Instead, we must examine "social practices" as routinised, socially shared bundles of activities (e.g., commuting, heating homes, eating). Practices are sustained by linkages between materials (infrastructure, technology), competences (skills, knowledge), and meanings (norms, expectations). Changing a practice (e.g., from car-driving to cycling) requires reconfiguring all three elements, not just persuading individuals (Shove, 2010).
- **Values and Worldviews:** Cultural sociology and environmental psychology distinguish between materialist/post-materialist values and self-transcendent/self-enhancement values. The New Ecological Paradigm scale measures adherence to a worldview that sees humans as part of a fragile web of nature, versus a dominant social paradigm of human mastery. Societies

emphasising the latter are correlated with lower support for environmental policies (Stern, 2000).

## **2.2 The Economic Lens: Markets, Externalities, and Beyond**

Neoclassical economics has been critiqued for fostering unsustainability by treating the environment as an infinite resource sink and assuming rational, self-interested actors.

- **Market Failures:** The failure to price environmental "externalities" (like carbon emissions) means the true social and ecological costs of production and consumption are not borne by the polluter. This creates a systematic bias against sustainability.
- **Critiques and Alternatives:** Ecological economics challenges the growth dogma, advocating for a steady-state economy operating within biophysical limits. Behavioural economics, discussed later, further undermines the model of *Homo economicus*. Concepts like "doughnut economics" (Raworth, 2017) propose a social foundation within an ecological ceiling as a new compass for human prosperity, directly challenging GDP-focused models.

## **2.3 The Equity and Justice Lens: Inequality and Vulnerability**

Sustainability is inseparable from justice. The social sciences rigorously document how environmental burdens and benefits are unequally distributed.

- **Environmental Justice:** Research, originating in activism against toxic waste siting in minority communities in the US, demonstrates that poor and marginalised groups disproportionately bear the costs of pollution and resource degradation while having the least access to environmental amenities (Bullard, 1990). This framework is essential for analysing the social reception of sustainability projects, such as the siting of renewable energy infrastructure (Gupta, S., 2023).
- **Climate Vulnerability:** Anthropological and geographical work shows that vulnerability to climate change is not a function of physical exposure alone but is shaped by social factors like poverty, gender, race, and access to resources and power. For example, women in agrarian societies often face greater risks due to gendered divisions of labour and limited land rights.
- **Global Inequalities:** The historical responsibility for ecological damage lies overwhelmingly with industrialised nations, while the impacts are often felt most acutely in the Global South. This raises profound questions of historical justice and fair burden-sharing in international agreements, a key stumbling block in global climate negotiations.

These perspectives reveal that unsustainable outcomes are systemic, not merely aggregations of individual failings. They are produced by economic structures that incentivise waste, cultural narratives that equate consumption with success, and power asymmetries that offload risks onto the powerless (Gupta, S., & Singh, V., 2025).

## **3. Analysing and Influencing Behavioural Change: From Nudges to Deep Engagement**

Given this systemic backdrop, how can behaviour be shifted? Behavioural sciences provide a nuanced understanding of the individual actor within their social context.

**3.1 Beyond Rational Choice: Insights from Psychology and Behavioural Economics** The rational actor model is inadequate. Human decision-making is bounded by:

- **Cognitive Biases:** We use mental shortcuts (heuristics). The status quo bias favours existing behaviours; present bias leads us to discount future rewards/punishments; and optimism bias makes us underestimate personal environmental risks.

- **The Value-Action Gap:** A well-documented chasm exists between pro-environmental attitudes and actual behaviour. This gap is explained by numerous barriers: habit (automatic behaviours), contextual constraints (lack of public transport, high cost of alternatives), perceived effort, and social influences (Steg & Vlek, 2009).

### **3.2 Frameworks for Understanding Pro-Environmental Behaviour Several models attempt to map the determinants of behaviour:**

- **Theory of Planned Behaviour (TPB):** Posits that behaviour is driven by intention, which is shaped by attitude towards the behaviour, subjective norms (perceived social pressure), and perceived behavioural control. While influential, it often over-predicts intention and underexplores habit and context.
- **Value-Belief-Norm Theory:** Links broader values (e.g., altruism) to beliefs about environmental conditions and adverse consequences, which activate personal norms (feelings of moral obligation) to act (Stern, 2000). This theory is powerful for understanding activism and high-cost behaviours.
- **COM-B Model:** A more comprehensive framework stating that for any behaviour (B) to occur, there must be sufficient Capacity (psychological and physical), Opportunity (social and physical context), and Motivation (automatic and reflective). This model underpins many modern intervention designs.

### **3.3 Intervention Strategies: From Nudges to Boosts**

Based on these insights, a spectrum of interventions has been developed:

- **Nudges:** Light-touch, choice-architecture changes that steer behaviour predictably without restricting options or changing economic incentives. Examples: making green energy the default option (exploiting status quo bias), providing social norm feedback ("80% of your neighbours reduce energy use"), using salient prompts for recycling (Thaler & Sunstein, 2008).
- **Limitations of Nudges:** Critics argue that nudges can be paternalistic, address symptoms rather than root causes, and are often ineffective for complex, high-cost behaviours (like retrofitting a home). They may also let powerful actors off the hook for systemic change, a point emphasised by scholars of practice theory like Shove (2010).
- **Boosts and "Think" Strategies:** An alternative approach aims to enhance people's **competence** (e.g., carbon literacy education) and **agency** to make their own informed decisions, fostering intrinsic motivation and long-term capacity.
- **Social Marketing:** Applies commercial marketing principles to promote social goods, using audience segmentation and targeted messaging to promote behaviours like water conservation. Ultimately, effective behavioural strategies must move beyond individualistic approaches. **Community-Based Social Marketing (CBSM)** integrates psychological insights with community engagement, focusing on removing barriers and enhancing benefits within specific social contexts, recognising that behaviour is socially embedded (Steg & Vlek, 2009).

## **4. Reimagining Institutions and Governance for Sustainability**

Lasting change requires transforming the rules of the game, the institutions, policies, and economic models that structure societal action.

### **4.1 Transforming Economic Institutions**

Moving towards a sustainable economy requires institutional innovation:

- **Beyond GDP:** Advocating for alternative welfare indicators (Genuine Progress Indicator, Happy Planet Index) that value ecological and social health, as argued by Raworth (2017) in her critique of economic metrics.
- **Circular and Regenerative Economics:** Designing institutional and legal frameworks that support closed-loop systems, extended producer responsibility, and product-as-service models, moving from ownership to usership (Gupta, S., 2023). This aligns with Schor's (2010) vision of new economies based on sharing and reduced material throughput.
- **Green Finance and Divestment:** Creating institutions that channel capital towards sustainable ventures and away from fossil fuels, leveraging the power of pension funds, banks, and insurance companies.

#### **4.2 Governance and Policy Innovation**

Effective governance must be polycentric, adaptive, and participatory.

- **Overcoming the Tragedy of the Commons:** Elinor Ostrom's (1990) Nobel-winning work showed that communities can self-govern common-pool resources through locally crafted rules, monitoring, and graduated sanctions, challenging the notion that only privatisation or state control works. Her principles for robust institutions are foundational for community-based resource management (Gupta, S., & Mishra, U., 2024).
- **Participatory and Deliberative Governance:** Methods like citizens' assemblies on climate change bring diverse citizens together to learn, deliberate, and make recommendations, building social legitimacy for difficult transitions that top-down policies often lack.
- **Policy Mixes:** No single policy is sufficient. Effective strategies require smart **mixes of instruments:** regulatory standards (e.g., fuel efficiency), economic instruments (carbon taxes with dividend schemes), information tools (eco-labelling), and infrastructure investment (public transit) (Shukla, P., Singh, V., Sonwani, S., Dixit, M., & Gupta, S., 2025). The social sciences are crucial for designing policies that are perceived as fair and effective, considering the equity dimensions highlighted by Bullard (1990).

#### **4.3 Cultivating Social Movements and Cultural Shifts**

Top-down policy often fails without bottom-up social support and pressure.

- **The Role of Social Movements:** Movements like Fridays for Future or Extinction Rebellion play critical roles in agenda-setting, shifting public discourse, and holding elites accountable. They create new social identities (e.g., "climate activist") and norms, directly influencing the subjective norms component of behavioural models (Stern, 2000).
- **Transitions Theory:** This multi-level perspective (Geels, 2011) analyses how niche innovations (e.g., community energy projects), landscape pressures (e.g., climate events), and regime dynamics (the dominant socio-technical system) interact to enable or hinder systemic transitions in sectors like energy or food (Gupta, S. 2023). It provides a framework for understanding how social, technical, and political changes co-evolve.

### **5. Synthesis and Conclusion: Towards an Integrated Social Science of Sustainability**

The journey towards sustainability is a collective, societal endeavour of unprecedented scale and complexity. This paper has demonstrated that the social and behavioural sciences provide indispensable tools for this journey across three domains:

1. **Diagnosis:** They reveal that the roots of unsustainability lie in normalised social practices (Shove, 2010), growth-dependent economic institutions (Raworth, 2017; Schor, 2010), cultural narratives of consumption, and structures of inequality that distribute risk unjustly (Bullard, 1990).
2. **Intervention:** They offer a sophisticated understanding of human behaviour, moving from simplistic information campaigns to strategies that address cognitive biases (Thaler & Sunstein, 2008), leverage social norms, remove contextual barriers, and build community capacity (Steg & Vlek, 2009). The key lesson is that behaviour change must be understood as a social, not just individual, process.
3. **Transformation:** They provide blueprints for institutional and economic redesign, from rethinking welfare metrics to crafting polycentric governance systems (Ostrom, 1990) and supporting the social movements and socio-technical transitions (Geels, 2011) that drive cultural change.

The critical implication is that sustainability science must be fundamentally **transdisciplinary** Gupta, S., & Singh, V. (2024). It requires deep collaboration between natural scientists, engineers, social scientists, and humanities scholars from the outset. A technological fix like carbon capture and storage is not just an engineering challenge; its adoption depends on public perception, regulatory frameworks, economic incentives, and political lobbying across all social domains. Furthermore, the social sciences bring an essential normative focus on **justice and equity**. A transition that deepens existing inequalities or imposes burdens on the vulnerable is neither socially sustainable nor politically durable. Concepts of a *just transition* for workers, *climate justice* between nations, and *energy democracy* are central to this discourse, building directly on the foundations of environmental justice research (Bullard, 1990; Gupta, S. (2024)). In conclusion, achieving sustainability is not about humans saving a separate "environment." It is about humans transforming their social worlds—their economies, their political systems, their daily practices, and their shared values—to enable a harmonious and just coexistence within the biophysical limits of our planetary home. The social sciences and behavioural studies are the compass and the map for this essential transformation. By placing human understanding at the heart of the sustainability project, we can hope to navigate towards a future that is not only viable but also equitable and flourishing.

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