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Sociological perspectives on climate change and society: A review

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Review

Sociological Perspectives on Climate Change and Society: A Review

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Abstract: Society is at an important intersection in dealing with the challenges of climate change, and this paper is presented at a critical juncture in light of growing recognition that the natural sciences are insufficient to deal with these challenges. Critical aspects of sociological perspectives related to climate change research are brought together in this review in the hope of fostering greater interdisciplinary collaboration between the natural and social sciences. We fervently argue for the need to inculcate interdisciplinary approaches that can provide innovative perspectives and solutions to the challenges we face from the impacts of climate change. As such, some critical sociological perspectives are addressed, with two objectives: (a) to provide a foundational opening for readers seeking an introductory perspective and potential core contributions of sociological insights on climate change; and (b) to explore opportunities and obstacles that may occur with increased interdisciplinary cooperation and collaboration. We lay out fundamental ideas by assembling a loosely connected body of sociological research, hoping to develop and advance the collaborative research agenda between sociology and other disciplines for the near future.

Keywords: sociology; climate change; adaptation; mitigation; sociological perspectives

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1. Introduction

Climate change is a critical problem, spanning across national boundaries and socioeconomic-political spheres. Due to the wide-ranging and deep-seated nature of its causes, researchers and policymakers face a massive task coordinating and developing effective policies to mitigate its impacts. To complicate matters, the worsening conditions and ineffective strategies developed to deal with the problems have become another pressing concern. Thus, although incremental steps have been taken to acknowledge and address climate change, a more all-encompassing strategy is needed to deal with its spectrum of issues. Framing and coordinating a research agenda and policies to mitigate and adapt climate change is the cornerstone to achieving substantive progress. There have been critical contributions to climate change research from various disciplines. However, each has viewed it through its own lens, without making a concerted effort to integrate the disconnected parts. We contend the problem must be approached in a coordinated fashion, which can only be attained by integrating the current knowledge and avoiding the intra-disciplinary tunnel vision currently attached to the topic. By adopting an interdisciplinary approach and undertaking collaborative efforts, we intend to advance and widen our perspective on the relationship between climate change and society.

Sociological research on global climate change has been extensive but loosely connected, and exchanges with the other social sciences and natural sciences have been limited. Ironically, until now the social sciences have played only a minor role in climate change reports and discussions [1–4], because scientific research has been deeply entrenched in the natural sciences. While the scientific community has made good progress in developing our

ecological imagination related to, for example, climate change, further progress is needed to develop a sociological imagination on it. "The application of a sociological imagination allows us to powerfully reframe four central questions in the current interdisciplinary conversation on climate change: why climate change is happening, how we are being impacted, why we have failed to successfully respond so far, and how we might be able to effectively do so" [4].

However, due to a growing view that the natural sciences are insufficient to deal with the complex dynamics and challenges of climate change, the need to incorporate social science research and analyses has become increasingly acknowledged [5]. In fact, the primary driver behind global climate change is socio-structural in nature. Its issues are embedded within institutions, cultural beliefs, values, and social practices. Thus, climate change is undoubtedly a sociological concern. Dunlap and Brulle [5] claim that sociology brings two distinct and advantageous approaches to climate change research by examining its social dimensions. First, they contend sociology is equipped with the tools to examine and provide insight into the causes, consequences, and solutions attached to climate change. Efforts to ameliorate or adapt to its impacts require a deeper understanding of the social dynamics at varied scales, from the global to the local level. Sociology can contribute to interdisciplinary engagement and discipline-specific matters related to socio-structural processes.

Second, sociology provides a form of social critique by examining and questioning the belief systems that reinforce current socioeconomic institutions and practices. This is vital, because critiquing the dominant ideologies illuminates the constructed nature of these belief systems. In turn, these elucidate how such hegemonic notions sustain particular interests and therefore restrict policy options. Sociological research highlights the notion that the anthropogenic forces of climate change cannot simply be rectified by technical fixes but must take effect in concert with other influences on human behavior such as social, political, and economic structures [6].

This paper reviews some of the critical sociological perspectives with the following objectives: (a) provide a foundational opening to readers seeking an introductory perspective to sociological insight on climate change, highlighting the core contributions sociology provides for wider audiences beyond the field; and (b) point out the vast potential for adapting sociological perspectives to the wider body of climate change research. We lay out the fundamental ideas by bringing the loosely connected body of sociological research together to develop and advance the collaborative research agenda between sociology and other disciplines for the future.

2. Keynote Matters Addressed

This review adapts four broad topics highlighted in *Climate Change and Society: Sociological Perspectives* edited by Riley E. Dunlap and Robert J. Brulle and set out to engage climate change through a sociological lens by (a) examining the contributors to and impacts of climate change; (b) exploring equitable mitigation and adaptation strategies; (c) investigating the socio-political dynamics of advocacy; and (d) looking at public opinion, social theory, and methodology. These ideas have provided a framework for future research and the policies to methodologically inculcate sociological sensitivity into the aforementioned topics. Using the insights gained from sociological inputs, the development of future climate change adaptation and mitigation strategies, in conjunction with other disciplines, could strongly anchor itself within and between the seams of social networks, thereby boosting its success and efficacy. The following sections reflect the broad topics addressed in the book by attempting to succinctly present the development of the authors' ideas without overly compromising the depth of sociological research to date.

2.1. Social Structure and Processes: The Forces Driving Climate Change

Climate change is affected by anthropogenic factors where increases in greenhouse gases (GHG) are largely produced by human activities. Pressures on the environment such as GHG emissions and various other environmental pressures can be simplistically

traced back to two principal driving forces: population and consumption. Two dominant theories, including treadmill of production theory (TOP) [7,8] and ecological modernization theory (EMT) [9–12], have illustrated the theoretical polarities found by examining the development–environment continuum. Proponents of TOP have argued that the capitalist system has prioritized economic growth over social inequality and environmental protection, whereas advocates of EMT have asserted that as society modernizes, the ecological rationality underpinning the need to protect the environment from the strains of human development will present itself. EMT may seem to be supported by the reduction in environmental harm and GHG emissions in developed nations. However, deeper assessment has revealed that the more developed nations have been able to export the effects of their environmental problems to less developed nations. Salleh [13] brought forth the notion of a metabolic rift that "denotes the effect of a specific mode of production, namely industrial capitalism, which destroys the humanity–nature metabolism in an endless pursuit of profits" (p. 206). She highlighted the deep-rooted problems connected with the race toward resource accumulation that have created the transcontinental rift, and the extensive ecological footprint that has destabilized global climate patterns [13,14]. The mode of production has influenced the ways in which governments have pursued development that brings about inequality and has created differences between nations.

Less developed nations have feared international restraints on their efforts to grow economically to meet their own needs. Concurrently, the more powerful developed nations, which are responsible for 60% of GHG emissions, have refused to curtail their own emissions. Accordingly, the less developed nations have become less willing to make sacrifices on behalf of the environment [15]. Robert and Parks [15] argued that global inequality inhibits collaborative efforts by reinforcing the structuralist worldview and political pluralism while eroding trust across nations. According to them, this may deepen policy gridlock within the international arena if global inequality remains unresolved. The phenomenon elucidates two vital points regarding the global capitalist economy imbued with inequities of power and competition for resources: (1) ecologically unequal exchanges and (2) the transnational organization of production, both of which have had an impact on global climate change. TOP and EMT have not been examined as opposing sets of theories, but rather have been seen as a spectrum in which economies and political systems reside [16]. The TOP–EMT spectrum has presented itself as an analytical tool for assessing market structure, organization, and policies that can serve as a foundation for cross-comparative understanding at the global level (Table 1).

Table 1. Key Points of the TOP–EMT Spectrum.

TOP	EMT
• Carrying capacity of the planet is finite.	• Modernization can evolve to find sustainable solutions.
• Industrialism and development cause ecological and environmental damage.	• Possible to increase the productivity of resources.
• Rates of resource extraction is unsustainable.	• Societies will be able to develop while the environment remains viable for the future.

Economic and political systems reside across this spectrum.

Related to pollution, market organizations have been one of the main actors with linkages within market institutions, and they have been alternatively regarded as both agents and subjects of larger forces. These organizations have played a prominent role in affecting the environment, either by contributing to environmental degradation or by helping to mitigate climate change threats. Perrow and Pulver [17] noted that such choices could be influenced by internal organizational dynamics, external economic forces, or governmental action. However, by and large, most of the economic structures governing market organizations have permitted environmental pollution and efforts to change corporate environmental practices and revealed the power of some market actors to withhold

positive initiatives. By possessing structural, instrumental, and discursive powers, market organizations have acted as agents, attempting to influence and shape the political, legal, social, cultural, and informational contexts of climate politics [8,17–19]. Market environments have also been vital determinants that have affected organizational choices over environmental pollution, and in particular GHG emissions. Perrow and Pulver [17] conducted case studies of three different economies: neoliberal market economies, coordinated market economies and rapidly emerging economies, represented by the United States, European Union, and the economic leaders of the global south, or BRICs (Brazil, Russia, India and China). These studies represented variations in the ways environmental issues were handled. The neoliberal market economy favored limited restrictions on market organizations to circumvent governmental regulations. The coordinated market economies had a more evenly distributed balance of power between the market organizations and state regulators, compared with the liberal market economies. The attempts to address climate change in emerging economies had mixed results. In some places, market organizations resisted regulation, but there was some success from international policy initiatives such as the clean development mechanism (CDM) and the reduction of emissions from deforestation and forest degradation REDD.

An examination of the macroeconomic forces that have driven global climate change would not be complete without recognizing that individuals and household consumption have been major contributors to carbon and GHG emissions. It has been easy to overlook the impacts of micro consumption behavior as being a causal influence on environmental strain when blame could so readily be placed on large industries. However, experts have widely agreed on the large effect of growing affluence on carbon emissions through the consumption of food, water, goods, and services, through either the direct or indirect use of energy [20–23].

Ehrhardt-Martinez et al. [24] found considerable documentation on household impacts related to consumption-related emissions, although their study had limitations and inadequately addressed household consumption with its multitude of facets. These facets have presented themselves in the form of energy and food consumption, and household transportation and lifestyle practices, all of which may directly or indirectly bring about an increase in carbon and GHG emissions. Nevertheless, current climate policies have neglected the role of households or individuals and have focused on market incentives by proposing adjustments to economic policies and education [25–27]. The reports and analyses have overlooked the indirect implications of consumption and have specifically failed to adequately address household consumption.

Nevertheless, barriers to mitigation at the household level, attributed to the constraints of current social and cultural norms, have been acknowledged [24]. By recognizing these socio-structural barriers, researchers and policymakers may better understand the human dimensions that affect mitigation and adaptation strategies. At this juncture, the factors set out to shape household behavior and consumption patterns have proved to be a challenge. However, sociological insights could benefit the current understanding of individual decision-making processes by implementing social constructs and agency in decision making, and exploring facets such as status, identity, and lifestyles together with the habitual or routine practices of consumption patterns. In the long run, this could direct effective policies to ameliorate the impact of consumption on climate change.

2.2. Impacts of Climate Change: Strategies for Equitable Mitigation and Adaptation

Consumption patterns have had direct and indirect impacts on climate change when they have been primarily driven by the desire for social status, conspicuous consumption, and leisure that secure one's position in society [28,29]. This pattern of consumption has created a notion of climate injustice, with three underlying assumptions. First, social inequalities have driven overconsumption. Second, the impacts of climate change have been experienced unequally by the rich and poor, which may extend to future generations. Third, policies that have been designed to deal with climate change have had unequal

consequences for the unrepresented and the poor [30]. Harlan et al. [30] posited that to attain a level of understanding on climate disruption, researchers and policymakers must be sensitive to the inequalities of wealth, power, and privilege. The notion of inequality has been extended to the rich–poor dichotomy not only within but also between nations. Within nations, toxic and polluting industries have been located in the poorer districts, because properties in such locations have been considered less valuable [31]. Likewise, between nations, ecologically unequal exchanges have occurred due to resource plundering and pollution from the externalities of production [32,33]. A plethora of studies have extended beyond the inequalities of wealth to racial, class, and age inequalities to show both economic and environmental impacts [34–38].

The response to vulnerability "includes not only how climate change contributes to vulnerability, but also how climate change policy and response measures may magnify the effects of many existing drivers of vulnerability" ([39] p. 21). In the short term, the largest impact on the disadvantaged and vulnerable has resulted less from climate change and more from the adverse consequences of climate change policy and the efforts that have been overlooked by policymakers [39]. This has brought about the need to consider vulnerability in the context of climate change and the implications of policies in addition to the social dimensions of the climate change agenda. In turn, these have related strongly to the impacts of climate change and policies. As climate impacts have been experienced differently across populations, enhancing the adaptive capacities of the most afflicted should offer a way to rethink policy with justice as its focus. As a discipline, sociology has argued for an integrated socio-ecological approach [13], "just sustainability" [40], and "plural environmental governance" [41]. The underlying reasoning has been to forge a new paradigm with a social dimension focused on both the durability of the environment and the equal treatment of people.

Adaptation to climate change requires mitigating its effects, such as the intensity and frequency of extreme weather, the consequences of temperature variations, or the impacts on food security, livelihoods, and human health. It is also vital that attention be paid to three elements: exposure, sensitivity, and the adaptive capacity of populations. Some communities are more vulnerable than others, and in particular there are people who are socially isolated due to their limited ability to cope with environmental stressors. There are three main pathways to adaptation, which include an array of structural (engineered, technological, ecosystem-based), institutional (laws and regulations, government policies, economic) and societal (educational, informational, behavioral, social services, sociodemographic) options to reduce vulnerability and enhance adaptive capacity [42]. Sociological research and the other social sciences have offered insight into the methods used to attain adaptation goals, featuring the crucial need to understand social institutional dynamics. World systems theory has highlighted the enduring global division of labor in which the developed or "core" nations have engaged in unequal exchanges of labor and natural resources with the poorer "peripheral" nations. This concept has shown the underlying power dynamics and self-interest inherent in international relations. Fundamental social problems like vulnerabilities and tensions between entities with different self-interests have contributed to and blocked efforts to address climate change. Carmin et al. [42] explained that an understanding of the political economy and developmental trajectories is crucial to the formulation of effective adaptation strategies.

Alternatively, mitigation strategies have been seen as technological hurdles that have ignored the possibility of social and cultural change and have failed to acknowledge the limited effectiveness of the current technologically focused strategies. For example, reports from the International Panel on Climate Change (IPCC) and America's Climate Choices (ACC) did not consider the importance of social organization and culture, which included a range of issues such as governance, power structures, political activism, labor policies, and consumption [43]. However, there has been value in examining how social psychology and social movements have reshaped policies through individual agency and collective action. Social change has occurred at many levels, including individual,

community, national, and international. Ehrhardt-Martinez [43] explained that households can take action by reducing their own emissions and shifting their consumption practices, which can then encourage social movements and changes to political processes. At the meso level, which includes organizations, companies, and local governments, mitigation efforts have been influenced by networks and operating environments, especially in the political and economic contexts. Some environmentally detrimental industrial norms could be challenged by aggregating power and influence to form collective interorganizational coalitions opposing the status quo of large organizations and setting a precedent for shifting industrial norms. Finally, at the macro level, international policies and implications have also been influenced by global norms and the institutionalization of cultural models. As noted, treaties are more likely to be ratified when strong states engage in collaborative efforts to develop an international culture of environmentalism.

One main obstacle to these efforts has been the resistance from nation states when environmental efforts have been interpreted as having adverse effects on national economic ambitions [44]. If the urgency of climate change fails to supersede political obstacles by ignoring ecological concerns or providing meaningless symbolic responses, there could be dire consequences for the future. A race for power and development could ensue, possibly culminating in the "tragedy of the commons" [9]. Given this scenario, we are unable to deal with environmental issues without addressing the problem of inequality. This matters for three principal reasons: (a) there has been inequality in suffering, with the poor and vulnerable populations suffering more; (b) the poorer and less developed nations have had less bargaining power than the richer and more developed nations; and (c) the lessons from the failures of the Kyoto Protocol and the Copenhagen Accord (see [9,45]) have shown that an effective climate agreement cannot be achieved without addressing global inequality [9].

2.3. Sociopolitical Actors and Societal Recognition: Advocacy and Public Opinion

Climate change has been a major political issue across the globe and climate change movements at the international and national levels have been seen as a critical component of social change [46]. Sociological studies have highlighted that the institutions of civil society can play a critical role in starting social change through citizen mobilization [47–53]. Civil society interactions have taken place outside of market or governmental actions, and their importance has been recognized by the IPCC, which pointed out that such movements can change policy through three actions: policy advocacy, policy research, and opening space for political reforms [25]. Movements have changed the social landscape in a basic way by framing grievances in a resonating manner: providing definitions of problems, directing blame and responsibility, and examining the options for solving the problems raised. However, effort alone has been inadequate without the mobilization of human and financial capital for social change, for example, shifts in policy outcomes, the establishment of new institutions, and international regimes [46]. Transformation has also come from the top down, typically led by established institutions. However, these top-down approaches have had a tendency to favor the powerful and wealthy, who have been able to secure political advantages by manipulating public opinion [54–56]. Nevertheless, movements and political opportunities have been dependent on the socio-political contexts in which they have operated, and these may be influencing factors determining success or failure.

Public support for climate change has been an important factor that has shaped the societal response [57]. Although some research has reported a strong psychological dimension to climate change opinions, sociology has sought to explain how public opinion may be shaped by the larger multidimensional forces of social, economic, cultural, political, and environmental factors [58]. These multidimensional factors have been dynamic and differentiated, covering a range of issues, beliefs, attitudes, perceptions, thoughts, and concerns. The contrast between the pioneering findings from Gallup's 1992 Health of the Planet Survey, which examined concerns over the environment across richer and poorer nations [59], and the World Values Survey, which examined individual-level postmaterialist/materialist values [60], against recent polls (such as [61–63] has shown indications of an increasing

trend toward greater awareness and understanding of climate change. This understanding has included greater concerns over climate change and general support for policies that have addressed the associated problems. Shwom et al. [58] gleaned from these studies that environmental concerns, influenced by gender and political orientation, have been consistent predictors of climate change views, whereas age and education have been less consistent factors. A variety of theoretical perspectives that have sprung from these studies have attempted to explain this phenomenon. These have included gender socialization theory, postmaterialist values theory, cultural theory of risk, and values-beliefs-norms theory [58]. These social psychological theories have suggested not only that differing public opinions have been centered at the individual level, but also that shifts in public opinion may be influenced by other factors, with significant impacts from media coverage and the extent to which importance is attached to the issue of climate change. Other public events like wars, unemployment, and economic prosperity have competed with climate change for public concern, and most importantly there has occasionally been a polarization of climate change issues that has tended to influence public opinion [64]. Hence, in light of how public opinion has been swayed, Habermas [65] suggested that continuous public communication was necessary to maintain support in the face of opposing message campaigns.

Despite the general consensus over the detriments of global warming and climate change, the discourse has not achieved universal consensus. The countermovement against climate change had its roots in the anthropocentric view of the natural world, which was created for human use. The impact of this has intensified with advances in science and technology, along with the capitalist-driven Industrial Revolution. With the rise of neoliberalism and its unfettered and unregulated world markets, it has been within such global roots that climate change has presented itself as a growing problem [9]. It is no coincidence that mobilization against climate change has emerged to deny the existence of the underpinning problems associated with it. Conservative movements and those with industrial neoliberal agendas have largely been blocking climate change policymaking. Without attacking climate change policy directly, the conservatives and their industrial allies have used the "second dimension of power", which has attempted to oppose inputs directly affecting their vested political and economic interests [66–68]. Their use of strategies like manufacturing uncertainty have undermined scientific reports by highlighting the inadequacy of evidence and contesting methodologies and analyses [69,70]. Dunlap and McCright [71] promoted the idea of contrarian scientists who had the explicit goal of generating uncertainty by exploiting the complexities of scientific investigation. The challenges from contrarian scientists have had two aims: (1) to undermine the validity and legitimacy of climate change and (2) to attack the authority and integrity of individuals or other groups of scientists. Apart from denials by scientists, industrialists, media, politicians and campaign groups have organized to counteract global and national-level advocacy networks.

2.4. Addressing Social Theory: The Value of Sociology

Climate change has anthropocentric causes that have been driven by socially organized activities rooted in production and consumption practices. Its direct drivers have also been embedded in wider social conditions such as economic, technical, cultural, and governance systems in addition to social values, ideals, and material interests, which vary across geographical locales [72]. Due to the extensive nature of climate change issues, which have permeated across a wide range of social processes, social theories have been able to integrate multiple types of knowledge and inquiries. One of the theories identified by Catton and Dunlap [73,74] called for a new ecological paradigm. It developed as a shift away from the "human exemptionalist paradigm" and the notion of a neoliberal growth imperative, both of which assumed that human societies have the ability to transcend biophysical limits and have the capacity for ever-increasing economic expansion. The association between economic growth and human development has been unsustainable over the long run. The new ecological paradigm has taken into account society's embeddedness in nature and has

drawn linkages across disciplines while allowing for culture–nature relations. Kais and Islam [72] noted that the role of environmental sociology is to direct attention and sensitize policymakers to the biophysical impacts and limits of human development.

Thus far, we have emphasized the need for an interdisciplinary approach to climate change and other relevant issues, which has moderated our efforts to deal with these pressing challenges. Chen, Boulding, and Schneider [75] noted the importance of moving away from "what if" questions towards the issue of "so what," and how people and institutions can help to mitigate the consequences of climate change. They reinforced the notion that scientific research is a process, and the accumulation of new insights is slow, fraught with considerable uncertainty over whether targeted research should examine questions that can advance reasonable actions. Sociology has engaged climate policies at the theoretical level, with a constructivism–realism split that has revolved around climate studies and has generally debated the social processes that have shaped scientific problems, methodologies, applications, and questions pertaining to science's authority over the public. Other theoretical considerations have included the intersection of modern social theories, such as globalization and the ecological crisis. Although these issues may not be directly related to climate change, they have nevertheless focused on facets of political–economic systems and social institutions and have been vital considerations with a long-term influence on climate change and environmental sustainability [72]. Sociology as a discipline has therefore contributed to the body of literature by predicting that realistic engagement with ecological problems requires an acknowledgment that human societies are embedded within our biosphere and are certainly limited by it.

The value of sociology has revolved around its sensitivity to climate change within the framework of its contexts and across populations. Despite the shared understanding between sociologists, there have been points of contention where criticisms have shown the current sociological approaches to be too vague on precise actions or too preoccupied with the international politics of inequality. Urry [76] contended that sociology has paid little attention to the role of resource dependency. Societies are dependent on resources, but they have constructed social systems that have been unable to effectively downsize their current dependency on high GHG emissions. This shows that the dependency on resources has been inevitably tied to the structure and networks that have inhibited our ability to reduce the human impact on climate change.

There is a need for synchronized action that can deal with these structural and network-related problems. Given that sociology may not have found a concrete solution, it is acknowledged that research is a process of continuously building knowledge. Sociology can play a complementary role by expanding on and contributing to climate change research. Whether this materializes depends on researchers and policymakers' general agreement and acceptance of the tremendous benefits and innovations interdisciplinary collaborations can bring. Dunlap and Brulle [5] brilliantly made an exceptional case for why a broader interdisciplinary approach could be used to further mitigate and adapt climate change policies and practices. They suggested deepening our understanding of the social or human aspects at varied levels across dimensions, such as institutional or cultural dynamics. Hence, based on the aforementioned issues, we claim that collaborations between the social and natural sciences will broaden our perspective by adopting a multifaceted approach to climate change in an equitable and just manner.

2.5. Opportunities and Obstacles for Interdisciplinary Collaborations

Interdisciplinary collaborations should go beyond serving as an amalgamation of different perspectives. We suggest that from its onset, collaborations should be an interactive process of iterations across disciplines to develop theory and establish implications. As Karl Popper ([77], p. 59) highlights that "Theories are nets cast out to what we call 'the world': to rationalize, to explain, and to master it. We endeavor to make the mesh ever finer and finer". Across disciplines, the scientific method serves as a common tool that supports collaborative ventures. The scientific method follows logical processes that are

falsifiable and open to amendments: (1) observing empirical facts, (2) arriving at a theoretical model that will account of these observed facts, and finally (3) deducing from this hypothesis or model the potential consequences, which can be tested by observation [78]. Our understanding of any social phenomenon remains as a general set of simplified but empirically supported propositions due to the complex nature of our social world. While simplified models enable us to understand complex social mechanisms, we should also begin to take wider strides in examining multi-faceted phenomenon with a set of broader lenses–to widen and extend nets cast.

1. On the flip side, there are concerns about adopting broader lenses. The inclusion of more variables potentially leads to excess information that eventually become an impediment for academics and policymakers alike [79–81]. Compounding the issues of complexity, the development and diffusion of scientific findings do not function linearly. More accurately, academic research and policymaking is an outcome of the diffusion of multiple models and feedback loops [80,82]. These process of integrating diverse knowledge creates greater complexity that may result in an inability to draw consensus. Relatedly, we posit that this presents an opportunity for interdisciplinary collaboration to play the role as an organizer and moderator for a vibrant discourse.
2. Interdisciplinary collaborations can act as brokers and intermediaries within the web of scientific discourse. As seen in Figure 1, brokers have greater access to novel information, which shapes ideas and implementation as they engage with heterogeneous groups [83–85]. Some evidence suggests that access to novel information can increase and strengthen insights because of greater access to diverse perspectives, ideas, and information [84,86,87].

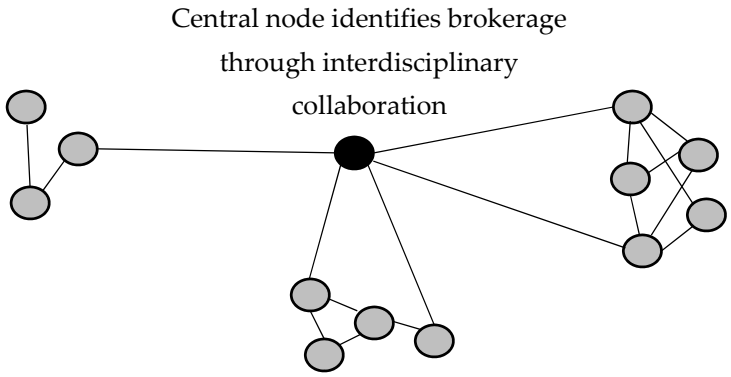

Figure 1. A Simple Illustration of Brokerage within a Network Structure.

Assuming that collaborative ties continue to repeat, ties will strengthen and provide relevant support and validation, wherein feedback will be more likely to be accepted and perceived as constructive [88,89]. Capacity to absorb and integrate different information will be enhanced once collaborations build an entrenched network of scientific discourse across a variety of disciplines. Building this capacity could potentially negate the problem of processing excessive information. Hence, we propose that ideas, diffusion of knowledge, and systems of integration could enhance scientific understanding and policy implementation alongside the growth of interdisciplinary collaboration. This interdisciplinary collaboration is of critical need to understand and address the complex problem of climate change.

Taken as whole, the complex problem of climate change cannot be understood and addressed without uncovering its deep nexus with the socio-political issues in our societies. Herein lies the critical and crucial contributions of sociology and other social science disciplines. Table 2 adumbrates some of the central issues of climate change captured by sociology and other social science disciplines.

Table 2. Sociological and social science contribution to climate change research.

No.	Sociological Issues Related to Climate Change	Examples of Sociological and/or Social Science Contributions
1.	Anthropogenic forces of climate change	[4,6,9,76,90]
2.	Markets and organizations related to climate change	[17,91–93]
3.	Consumption patterns and global climate change	[24,94,95]
4.	Global inequality and climate justice	[9,15,30,36–38,45]
5.	Adaptation, mitigation, response, and resilience to climate change	[25,42,43,95,96]
6.	Global climate politics and the role of civil society and social movements	[9,13,46,97]
7.	Public opinion on climate change	[58,96,98]
8.	Climate change denial counter-movements	[71,99]
9.	Social theories and methodological approaches to climate change	[7,16,72,92,100]
10.	Bridging social and natural sciences in understanding and addressing climate change	[2,3,71]

3. Conclusions

This review has laid out a broad range of issues related to the social aspects and consequences of climate change and the discipline's sensitivities to the social obstacles related to effective climate change policies. In general, sociological researchers have championed the essential need to examine issues that go beyond direct mitigation and adaptive policies. Although the physical and natural sciences have attained an array of understanding about climate change, the social sciences must do more to complement the issues examined. An interdisciplinary approach that considers the social dimensions of climate change can have a great impact on and wider relevance for policy formulation and mitigation/adaptation strategies, especially when the causal influence of climate change is anthropogenic in nature.

Social science disciplines, especially sociology, can improve the state of climate adaptation policies and their corresponding practices by examining the underlying issues related to social vulnerabilities, inequities, and tensions between and within nations. *Climate Change and Society: Sociological Perspectives* explained that economic priorities, governance, values, and power differentials are all factors that have contributed to climate change and have also had a critical influence on the attempts to address it. Research on social classes and diversity has created understanding of risk perception, social vulnerability, and the adaptive capacities of various groups within society. Sociological theories, together with research on social movements and collective actions, have been vital to understanding the origins, dynamics, and impacts that have promoted or resisted adaptation to and mitigation of climate change.

By emphasizing that a diversity of approaches can strengthen our current understanding of climate change, no particular theoretical or methodological approach has been favored [71]. A better integration of sociological research with other research programs can be invaluable to providing insight. In doing so, more attention to the wider field of social science can provide alternative viewpoints, which will expand the scope of policies and the implementation of programs that are sensitive to the intricacies of social dynamism and political conflicts. The assemblage of powerful sociological insights not only sets the stage for sociological input to understand and address climate change, but also should make ground-breaking contributions across disciplines for years to come.

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