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Weaponization of climate and environment crises: Risks, realities, and consequences

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ABSTRACT

The importance of addressing the existential threat to humanity, climate change, has grown remarkedly in recent years while conflicting views and interests in societies exist. Therefore, climate change agendas have been weaponized to varying degrees, ranging from the international level between countries to the domestic level among political parties. In such contexts, climate change agendas are predominantly driven by political or economic ambitions, sometimes unconnected to concerns for environmental sustainability. Consequently, it can result in an environment that fosters antagonism and disputes over power and position and increases the risk of prolonged confrontations, hindering the collective global efforts to mitigate and adapt to climate change. Through the current discourse, we aim to provide a preliminary definition of the weaponization of climate change and environmental sustainability and examine its risks and consequences on international relations, political dynamics, public perception, and the comprehensive integrity of climate action. We also recommend embracing a globally coordinated, scientifically substantiated approach to circumvent climate change by building an eco-surplus cultural value system.

> "It is difficult to have a grasp of philosophy in life. Well, because everyone knows only bits here and there. And generalization would likely end up false. Such bad philosophizing in the bird village has brought harm to numerous birds.
>
> […]
>
> Commonly, those with some authority in life would like to spew philosophy. Older guys have loud mouths and often force others to listen to them."
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> —In "The Philosopher Bird"; Wild Wise Weird (2024)

1. The weaponization of climate change

The imperative to address climate change has recently intensified, evolving from a purely environmental concern to a multifaceted socio-political issue. Scholars have posited that the impact of global climate change on international security may be unprecedented, potentially surpassing historical global challenges, such as nuclear weapons proliferation, the Great Depression, and terrorism (Claussen and Peace, 2007). Due to its significance and interdependence, climate change agendas can be easily weaponized to achieve geopolitical, political, and economic goals other than climate change mitigation and adaptation. The process of "weaponizing" can create an environment that fosters antagonism disputes over power and position and potentially carries the risk of protracted confrontations, damaging the efforts to mitigate losses and existential threats to the planetary ecosystems.

Considering humanity's and society's crucial reliance on the natural environment and resources, ecological issues have historically catalyzed global conflicts. Social scientists have consistently noted a broad and persistent correlation between the scarcity of essential resources and both national and international conflicts (Homer-Dixon, 2010); Marcus D (King and Burnell, 2017). Historically, freshwater scarcity has frequently been weaponized in conflicts for strategic, resource, or mental advantages, particularly in regions like the Middle East and Africa. As climate change intensifies these scarcities, the frequency, severity, and scale of conflicts are expected to increase, potentially on a global level. For example, escalating water tensions due to climate

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change, especially in arid and semi-arid areas, are anticipated to engender numerous water-related disputes and conflicts involving water availability, quality, and accessibility (Dai, 2013); (UN, and States, L. o. A. (2015).

Collective global efforts are imperative to prevent and mitigate crises and conflicts related to natural resource scarcity exacerbated by climate change. Although there is a broad consensus within the scientific community about the significant consequences of climate change and its primarily human-caused origins (Cook et al., 2013; Cook et al., 2016; Earth Science Communications Team. (2023)., the response strategies of nations and political entities to the climate crisis are markedly diverse. These disparities emanate from the fact that many people in society either remain skeptical or outright deny the reality of climate change (Dunlap and Jacques, 2013; Dunlap and McCright, 2010). Climate change deniers typically challenge scientific evidence or express doubts about scientific conclusions, especially when the underlying rationale or data appear insufficiently robust. Some, while acknowledging the existence of climate change, dispute its predominant anthropogenic contribution, thereby opposing measures aimed at curtailing its detrimental effects. The disparities are further exacerbated by the climate misinformation and obstruction actions consistently funded by climate change counter-movement entities that are largely unidentified (Brulle, 2021; Brulle et al., 2021; Brulle et al., 2024).

The intricate and risk-laden landscape of climate change necessitates an investigation of the weaponization of the climate change agenda—its occurrences, risks, and consequences. This paper seeks to provide a preliminary definition of climate change and environmental sustainability agenda weaponization, explore its various forms, and underscore the inherent risks and far-reaching consequences of such a strategy.

The paper is organized into five sections. The first section introduces the significance of climate change weaponization, the paper's objectives, and its structure. The second section refers to existing definitions relevant to climate change weaponization in the literature and provides a definition of climate change and environmental sustainability agenda weaponization. The next section concerns some notable ways through which climate change is weaponized internationally and domestically. The fourth section unravels the complexity of climate change weaponization and examines its risks and consequences on international relations, political dynamics, public perception, and the legitimacy of climate action. In the final section, the paper emphasizes the necessity of upholding a globally coordinated, scientifically substantiated approach to one of the most formidable challenges of our time: climate change. Notably, it highlights the critical need for a novel cultural value system capable of forging agendas and initiatives to generate eco-surplus and sustainable values.

2. Elucidation of climate change and environmental sustainability agenda weaponization

Before delving into the occurrences, risks, and consequences of climate change weaponization, it is necessary to define the term. Climate change is often considered "a threat multiplier," which triggers, accelerates, and intensifies the existing instabilities, especially in regions with water insecurity and political instability (De Châtel, 2019). Thus, scholars tend to regard climate change as a catalyst for the growing weaponization of critical resources (e.g., water) but not a "weapon" itself.

For instance, one of the most commonly used definitions of water weaponization is of Marcus DuBois King (King, 2016). He considers a weapon as "a means of gaining advantage or defending oneself in a conflict or contest," so it can take many forms (e.g., items, actions, capabilities, mechanisms) depending on how the wielding individual or group identifies and capitalizes on it. Water weaponization is, thus, the use of tangible resources and infrastructures to gain advantages or defend the wielder politically and militarily (King, 2016). Given the multifaceted impacts of climate change on the Earth's ecosystem and human socio-economic systems, the definition of water weaponization, which is limited in the scope of water resources and lacks consideration of economic factors, cannot elucidate the scope of climate change weaponization sufficiently.

Unlike water weaponization, climate change weaponization is a relatively new term and has been rarely mentioned in the literature. The works of Thomas and Warner (Thomas and Warner, 2019) and Bigger and Neimark (Bigger and Neimark, 2017) are some of the few documents most relevant to the weaponization of climate change. In particular, as climate change threats can be redistributed through adaptation, Thomas and Warner (Thomas and Warner, 2019) develop a five-mode framework to explain how people can become or be made more vulnerable as a result of climate change adaptation. Among the five modes, weaponizing vulnerability is considered the most severe, as it involves using people's vulnerabilities to exclude them from much-needed assistance while diverting resources to strengthen the well-being of those already well-positioned to respond to climate threats (e.g., framing climate refugees as threats to sovereignty). In other words, the study of Thomas and Warner (Thomas and Warner, 2019) focuses on how people's vulnerability induced by climate change adaptation measures is weaponized for political agendas but not the climate change itself.

Meanwhile, Bigger and Neimark (Bigger and Neimark, 2017) examine the U.S. Navy's biofuel program and its discursive use of climate change to weaponize nature. They suggest there are two ways that the Navy weaponizes nature. First, the future induced by climate change is selectively interpreted to identify emerging threats that require military-style responses, which then gives rise to the second way of weaponization. The identified threats will be used as justifications for the increased support for developing the domestic biofuels industry, moving away from current fossil fuel infrastructures, and reconfiguring its spatial arrangements. In other words, climate change information is used as geostrategic discourse to reduce its reliance on fossil energy, reconfigure its energy sources, and increase its spaces of military interventions. The weaponization of nature in the study of Bigger can be understood as the weaponization of climate change because the Navy employs climate change information to push its own economic, political, and geopolitical agenda. However, the authors do not provide an explicit definition of climate change weaponization, and their description of the nature of weaponization is not general enough to be applied to other groups of weapon wielders (e.g., countries, political parties, religious organizations, and institutions).

In general, most of the existing definitions of weaponization in the literature are not directly related to the weaponization of climate change (e.g., water weaponization and weaponization of vulnerability to climate change). The study of Bigger and Neimark (Bigger and Neimark, 2017) demonstrates a typical scenario in which climate change is weaponized for geopolitical, economic, and political agendas, but it does not provide an explicit definition of climate change weaponization. Moreover, climate change is a global problem that requires global consensus and collaboration to address (e.g., consider problems caused by the rising sea temperature, mass mortalities of aquatic animals, and sea ice melting). A definition of climate change weaponization needs to reflect its contradicting nature with the global collaborative endeavors to adapt and mitigate climate change. Notable definitions of weaponization in the literature lack this vital attribute.

Thus, incorporating the weaponization definition of Marcus DuBois King (King, 2016) and insights provided in the study of Marcus DuBois King (King, 2016), we propose a definition for climate change weaponization as follows:

"The weaponization of the climate change and environmental sustainability agenda encompasses a suite of directions and actions, including propaganda, wherein climate strategies are employed to procure political, economic, or geopolitical benefits. This advantage predominantly resides with the entity wielding the authority to implement such an agenda. This dynamic potentially diverges substantially from the ideal paradigm of globally

coordinated, scientifically grounded cooperative action to address a universal climate threat to humanity."

The definition provided will be used to refer to the weaponization of climate change throughout the remainder of the paper.

3. The realities of the "Weaponization" process

In reality, a careful examination of various government bodies reveals that the climate change agenda has been weaponized to varying degrees, ranging from the international level between countries to the domestic level among political parties, religious organizations, and other entities (Ajibade and McBean, 2014; Thomas and Warner, 2019; UN. (2021).). Weaponization has been utilized for achieving a wide range of goals, ranging from geopolitical agendas, economic benefits, and political objectives to information warfare and maintaining the "monopoly" of speech.

Accusations have emerged against certain nations for ostensibly leveraging the battle against climate change as a façade for geopolitical dominance. These allegations, often lacking robust empirical foundation, are speculative and imposing in nature. For instance, in 2019, China faced allegations of using climate change as a pretext to augment its military presence in the Arctic (Mooney et al., 2023). The United States Department of Defense's 2019 report, "Military and Security Developments Involving the People's Republic of China 2019," suggested that "civilian research could support a strengthened Chinese military presence in the Arctic Ocean, which could include deploying submarines to the region as a deterrent against nuclear attacks" (Koh, 2020). Additionally, the accusers may weaponize their progress in environmental initiatives as a means to assert moral or technological leadership, exerting influence on other nations and securing advantages in global forums.

Pursuing climate change mitigation objectives is occasionally a guise for economic benefits, as seen through stringent environmental regulations that serve as trade barriers or mechanisms disadvantaging global market competitors. In a notable instance in 2021, the European Union (EU) released the Carbon Border Adjustment Mechanism (CBAM), an innovative and contentious tool in the climate policy arsenal. CBAM, a variant of the carbon border tax concept, enables the EU to impose additional levies on trade partners to incentivize compliance with its environmental regulations and energy transition commitments. Although some endorse this initiative as necessary, it has incited opposition and legal challenges, with critics claiming the EU is transforming the climate agenda into an economic weapon. Belgian Prime Minister Alexander De Croo, at the 2021 COP26, remarked that the EU's advanced carbon reduction strategies could potentially be employed "almost as a trade weapon" (FORESIGHT Climate and Energy. (2023).).

Climate change is also used as an election agenda, leading to polarization in climate change issues among political parties in many countries (Stokes, 2015). Pew Research Center's studies in major global economies reveal pronounced disparities in climate change attitudes among leading political parties. In nations like Canada, Germany, and the UK, individuals affiliated with conservative parties exhibit less concern about the adverse impacts of climate change than their liberal or green party counterparts. In countries like Canada and Australia, conservative party supporters are less inclined to believe that wealthier nations should take more responsibility in addressing climate change than developing countries. In contrast, in Germany, Green Party affiliates advocate for greater involvement from wealthier nations in climate change initiatives compared to members of the right-leaning Christian Democratic Union/Christian Social Union and the left-leaning Social Democratic Party (Stokes et al., 2015).

The United States (U.S.) epitomizes the profound impact of such partisan divides on international efforts to mitigate global warming. The disparity between the Democratic and Republican parties' stances on climate change is stark, with a 48 percentage point gap in concern levels—68 % of Democrats expressing greater concern compared to only 20 % of Republicans. Furthermore, a significant majority of Democrats (82 %) support governmental efforts to reduce CO2 emissions, in contrast to only 50 % of Republicans, marking a 32 percentage point gap in support for these initiatives (Stokes, 2015).

This perceptual gap among political parties regarding climate change facilitates its politicization (Kamarck, 2019). Political figures may weaponize climate change issues to garner support, employing them as tools to solidify their base or critique opponents, often devoid of a genuine commitment to environmental issues. While the Democratic Party frequently integrates climate change into its electoral campaigns to attract voters, the Republican Party often critiques related policies, emphasizing economic development and bolstering the competitiveness of U.S. enterprises (Basseches et al., 2022).

In addition to these outlined "weaponization" strategies, other approaches exist for exploiting climate change issues. For instance, a country might engage in information warfare to spread misinformation about climate change or create discord among nations working together to address the problem, especially as natural resources become increasingly scarce, unstable, and unpredictable due to climate change. Even within the scientific community, where unity and a shared mission to protect the Earth's ecosystem are presumed unequivocal, the "monopoly" of speech and national interests in shaping the agenda remains a widespread and concerning reality (Vuong, 2021b).

4. Risks and consequences of weaponizing the climate change agendas

The strategic weaponization of climate change transcends simple political disagreements about environmental policy. It entails the deliberate use of climate change as a strategic resource or bargaining advantage in international relations, trade negotiations, or domestic political confrontations. In this context, climate change policies are not primarily driven by concerns for environmental sustainability but rather are used to serve other political or economic agendas, often unrelated. While weaponizing the climate change agenda may serve some immediate political or economic interests, it can lead to a range of risks and adverse consequences for sustainable development. These risks and consequences extend beyond environmental policy and can impact global security governance, economic stability, and social equity. Such weaponization mainly creates opposition rather than fostering cooperation and consensus, eroding mutual and public trust.

4.1. Undermining the legitimacy of climate change agendas and exacerbating the divisions

In the process of weaponizing climate change, the line between genuine environmental concern and other strategic maneuvering becomes obscured. This obscurity elicits critical questions about the authenticity and legitimacy of measures purportedly undertaken to mitigate and adapt to climate change. It also poses challenges in distinguishing pure environmental endeavors from those driven by other motives hidden under environmental rhetoric (Thomas and Warner, 2019). This ambiguity may provoke defensive, antagonistic, or retaliatory responses from oppositional nations or political parties. The scenario is comparable to the development of novel weaponry (e.g., missiles). When a new missile is detected, and its risks and threats are perceived, the opposing side will attempt to develop a weapon capable of counteracting or even advocating a "preemptive strike" (following the philosophy of "the best defense is a good offense"). A similar thinking also applies to using climate change as a strategic weapon. Instead of encouraging multi-partner collaborations in adaptation to and combating climate change, these weapons create unwanted resistance, such as climate change denial.

For instance, the idea of a Carbon Border Adjustment Mechanism (CBAM) has incited divergent responses from governments worldwide, with some initiating their regulatory frameworks to circumvent climate

anti-dumping measures, whereas others have threatened to lodge complaints at the highest level (FORESIGHT Climate and Energy. (2023) ; Krukowska and Ainger, 2022). China, the largest emitter of greenhouse gases globally, perceives CBAM as a trade impediment despite also planning to expand its emissions trading system (Yermolenko, 2022). Russia, a major steel exporter to the European Union, anticipates this mechanism might inflate the costs of crucial commodities such as rolled steel and aluminum, noting that its exports to the EU have already dwindled due to the Ukraine conflict. Even the U.S. government has been skeptical of this idea.

Concurrently, European nations, led by France, have critiqued the foundation of Washington's green program—a package of subsidies for green investments, which, according to EU officials, might violate WTO competition rules. European leaders have expressed concerns that President Biden's Inflation Reduction Act (IRA) potentially discriminates against companies exporting to the U.S., posing risks of job losses and shutdowns in their vital green technology sectors and creating EU's dependence on green technology imports while those innovations originated within the EU (Krukowska and Ainger, 2022).

The strategic maneuvering by certain developed nations to exploit the climate change agenda as an economic instrument, coercing compliance from others, has deepened the divide among nations in addressing climate change. In his speech at the United Nations General Assembly in New York in September 2023, centered on inequality and the climate crisis, Brazilian President Luiz Inacio Lula da Silva expressed his discontent with how the international community has "numbed" to its responsibility to care for the world's poor (Shortell, 2021). This has long been warned by the scientific community (Dabelko et al., 2013; Gemenne et al., 2014): "Mitigation and adaptation policies [to climate change], done poorly, exacerbate power asymmetries and dispossess vulnerable communities in ways that amplify various kinds of insecurities."

4.2. Inconsistent climate change mitigation and adaptation directions and actions

The "weaponization" of the environmental agenda in partisan disputes makes political consensus on environmental policies challenging. As a result, an agenda of utmost importance lacks consistency and stability and is seen as less credible by the international community, or "ephemeral," if you like it.

In the U.S., the profound politicization of the climate change issue leads to inconsistencies in climate change mitigation and adaptation directions and actions, substantially impeding the domestic climate change agendas and global efforts (Byrne et al., 2022). When the Democratic Party incorporates climate change legislation into its electoral agenda, using it to counter Republican policies, the climate change agenda has been positioned as a target for the Republicans to counterattack. Consequently, the Republican Party often tries to deny and radicalize climate change denial views, arguing that fighting climate change will negatively impact the U.S. economy. Since the Democratic Party cannot hold power indefinitely, environmental policies face the risk of being repealed or invalidated in part or in whole when the Republican Party returns to power. In such a state of extreme policy conflict, finding common ground becomes increasingly difficult.

Notable instances of such extreme polarization are evident. One of President Joe Biden's first actions upon taking office was to shut down the Keystone XL oil pipeline from Canada and restrict oil extraction in the U.S. This decision was hailed by environmentalists as an important step towards limiting greenhouse gas emissions related to the extraction and processing of oil from tar sands (CNBC, 2021). In stark contrast, under the recent Republican dominance in the House, Speaker Mike Johnson endorsed a plan to slash approximately 40 % of the Environmental Protection Agency (EPA) funding (Frazin and Folley, 2023). Alongside cutting the EPA's budget, Republican bills also proposed removing some climate change-related regulations previously passed by the Democrats in healthcare and tax reforms last year (Frazin and Folley, 2023). Speaker Mike Johnson, known for his skepticism regarding climate change science, opposition to clean energy initiatives, and substantial backing from the oil industry, exemplifies the stark ideological divide on climate issues (Friedman, 2023). Meanwhile, former President Trump plans to overhaul the U.S.'s climate and energy policy to cut spending on clean energy programs, specifically President Biden's Inflation Reduction Act, and repeal fossil fuel restrictions if elected for the second term (Smyth and William, 2023).

Internationally, on June 1, 2017, former President Donald Trump declared that the U.S. would withdraw from the 2015 Paris Agreement on climate change mitigation, claiming the agreement would "undermine" the U.S. economy and place it at a "permanent disadvantage" (Chakraborty, 2017). This decision included the cessation of a $3 billion commitment to the Green Climate Fund, a pledge made by former Democratic President Barack Obama in 2016. In 2021, under President Biden's administration, the U.S. rejoined the Paris Agreement. However, this move faced opposition from some Republican members of Congress who challenged the administration's approach to implementing the Agreement (Sobczyk, 2021). Due to the inconsistency and unreliability of the U.S.'s climate commitments, weaponized for political purposes, global efforts and cooperation to address climate change issues have been significantly weakened (Sridharan and Shetty, 2021).

Not only are the U.S. climate change agendas weaponized and attacked by opposition parties when they come back to power, but the Netherlands and Argentina also face the same risks. On November 24, 2023, the far-right Party for Freedom (PVV), led by politician Geert Wilders, won 37 seats and will be the largest party in the House of Representatives. Environmentalists fear that this victory of PVV can mean "four years of climate change denial" in the Netherlands, as the PVV manifesto denies the primary role of anthropogenic activities in driving climate change and the possibility that the Dutch society can save the climate. The manifesto of PVV even calls for more North Sea oil and gas exploitation and the continued operation of coal and gas power plants (Smith, 2023). In Argentina, support for climate change agendas has been of great concern since far-right politician Javier Milei was elected president. The politician and other members in his La Libertad Avanza (Liberty Advances) Party have pledged to cut government expenditures in many ways, including shutting down or privatizing the country's main science agency, the National Scientific and Technical Research Council (CONICET), as well as the ministries of health, science, and the environment. If the reduction plan is enacted, climate change science will likely be one of the main targets. Politician Milei seems to contradict the former president of Argentina – politician Alberto Fernández, who pledged to tackle climate change – and possesses a climate change denialism viewpoint as he has called climate change a "socialist hoax" (Ambrosio and Koop, 2023; Orfila, 2023).

4.3. Short-sighted decision-making and policy-making

When climate change is weaponized for political objectives, it tends to lead to short-sighted decision-making and policy-making without careful consideration of practical efficacy, thus intensifying social inequality and conflict. In 2023, Florida Governor Ron DeSantis, a Republican politician, attempted to appear more extreme than former President Donald Trump by rejecting all significant investments and funding that would acknowledge the existence of human-induced climate change. He declined a $5 million federal grant aimed at supporting residents wishing to equip their homes with energy-efficient appliances to mitigate climate change impacts. This refusal also precluded Florida's access to $341 million in funding allocated to state residents under the Inflation Reduction Act (IRA). Additionally, DeSantis rebuffed $3 million in IRA funding for pollution control and the "Solar for All" program, which would have facilitated the provision of solar panels to low-income individuals. This program was a cornerstone of President Biden's climate crisis mitigation strategy. DeSantis's

extreme stance left Florida facing the devastating effects of Hurricane Idalia 2023, a climatic event directly linked to climate change, without federal support (DeBerry, 2023; Otten, 2023).

Thomas and Warner have highlighted that solutions ostensibly addressing climate change exacerbate the vulnerability of disadvantaged groups and those directly affected by these changes. Concurrently, these "ostensible" solutions divert climate change resources to reinforce the welfare of those already relatively secure to confront climate threats, specifically wealthy and politically connected groups in both the Global North and the Global South (Thomas and Warner, 2019). Moreover, exploiting resource scarcity or population displacement due to climate change for territorial or market dominance might escalate to armed conflict risks (Pazzanese, 2021). A 2019 study indicates that increasing climate change could amplify the risk of armed conflict and violence among nations, estimating that climate change has contributed to 3–20 % of the risk of armed conflict over the past century. The study further suggests that unabated global emission rates could raise the risk of climate-induced violence fivefold (Hubbard, 2021).

Currently, although the weaponization of climate change is primarily on the fronts of ideas, politics, and psychology (Mann, 2021), it can set dangerous precedents, potentially leading to armed conflict and future global security risks, even when countries and political parties have reached a consensus on combating climate change. As the ramifications of climate change become more evident and undeniable, nations and political entities will more acutely recognize the existential imperative of climate change solutions. This acknowledgment heightens reliance on climate technologies and clean energy resources, including emission reduction and solar geoengineering methods, for survival and sustainable growth. The current trajectory of climate change weaponization will likely motivate nations or political parties to persist in utilizing climate technologies and clean energy resources as strategic weapons against adversaries. Thus, it will not only significantly diminish the effectiveness of climate change countermeasures but also raise the prospect of exacerbating tensions, potentially culminating in actual armed conflicts (Sovacool et al., 2023). The recent initiative by the U.S. Navy, leveraging geopolitical discourse to weaponize nature through producing advanced biofuels, exemplifies this trend (Bigger and Neimark, 2017). These advanced fuels aim to reduce greenhouse gas emissions and allow the U.S. Navy's operations to adapt to changing climatic and geopolitical conditions.

4.4. Inadvertent weaponization of science and declining public trust

Because of the instability and unreliability of U.S. climate commitments, scientists who understand the dire consequences of unabated climate change have been drawn into the whirlpool of political disputes. This involvement has raised concerns about the erosion of science's political impartiality and objectivity. Specifically, during the 2020 presidential race between President Joe Biden and former President Donald Trump, eminent scientific journals *Nature* and *Science* publicly endorsed President Joe Biden (Editorial, 2020; Malakoff, 2020). This endorsement seemingly transformed part of the scientific community's influence and credibility, with climate science at the core, into "weapons" for political dispute. As a result, this inadvertently portrayed science as part of a political interest group benefiting from the political status of a governing party. However, as mentioned earlier, the Democratic Party will not always hold power. The scientific community may face challenges in maintaining its status and resources under different political administrations, as exemplified by the recent decision by the U. S. House Speaker to reduce the Environmental Protection Agency (EPA) funding by nearly 40 %, eliciting significant concern within the scientific community (Frazin and Folley, 2023). During Trump's presidency, he even requested the EPA to remove its climate change website, which contained links to scientific research on global warming and detailed data on emissions (Volcovici, 2017). Therefore, the tendency of Western politicians to attack science for partisan gains can also be seen as a consequence of the "weaponization" of science in political conflicts (Vuong, 2018).

The scientific community has also confronted a marked decline in public trust. Zhang's recent research (Zhang, 2023) indicated that the loss of neutrality and objectivity due to partisan interests had led to a significant erosion of trust among many voters, particularly among supporters of former President Trump. This decline in trust extends beyond specific scientific journals like *Nature* to encompass the broader scientific community. A recent Pew Research Center survey revealed a sharp decrease in public confidence in the positive societal impact of science and scientists in the U.S. (Kennedy and Tyson, 2023). Compared to 2016, the number of people believing that science has a positive impact on society dropped by 10 %, from 67 % to 57 %, while those thinking science has a negative impact doubled from 4 % to 8 %. Over a quarter of respondents stated they had little or no trust in scientists acting in the public's best interests, up from 12 % in April 2020. This decline in public trust occurred among both parties but was most severe among Republicans, with nearly 40 % having little or no trust in scientists acting in the public's best interests. With such a severe decline, it is challenging for scientists to expect public response and unity in the fight against climate change based on scientific information.

Science's improvidence in endorsing a political party and causing part of science to be weaponized for political interest may stem from an overestimation by the scientific "elites" (including prestigious journals) of their societal influence. These "elites" of academia permitted themselves to deviate from neutrality and openly endorse a political party. However, they seem to have somewhat realized the mistake of "weaponizing" science. Right after the publication of Zhang's findings on the erosion of trust in science (Zhang, 2023), *Nature* promptly released an article attempting to rationalize their endorsement of President Biden (Editorial, 2023). Nevertheless, the impact of such justifications may be limited relative to the damage that has been incurred. Scientific journals should have been more humble and cautious in using their information power and authority of speech to avoid becoming a weapon in the weapon system for political disputes (Vuong, 2020), akin to the age-old adage: "With great power comes great responsibility." An environmental healing and climate change agenda for the survival of Earth and humanity will be more convincing and beneficial to all than aiding the Democratic Party's victory over the Republicans.

5. Urgent need for a global, multilateral, and cooperative paradigm

In the current context, the climate change agenda is increasingly being appropriated as an instrument of strategy, interwoven with political, economic, and geopolitical maneuvers by various nations and political factions. The cases and instances discussed underscore that climate policies can be employed as a tool for an array of objectives, occasionally diverging from the primary aim of environmental preservation. This phenomenon raises serious concerns about the effectiveness and integrity of global climate change mitigation and adaptation efforts.

Climate change is a global issue because greenhouse gas emissions and their impacts are not confined to national borders. Emissions from one country affect the entire planet, leading to rising global temperatures, sea levels, and more frequent extreme weather events. Not to mention, the current global socio-economic structure is highly interconnected, with international trade, global collaboration and migration, digital connections, supply chains, investment flows, and so on. Climate change can disrupt these systems, affecting food security, water availability, and socio-economic stability. As such, unilateral actions by individual countries or parties are insufficient to address the problem. Suppose the weaponization of the climate change agenda continues and intensifies. In that case, achieving common consensus and cooperation to combat climate change will become increasingly difficult as disagreements and ideological conflicts increase, followed by a decline of public trust in science.

Consequently, an essential takeaway from this discussion is the need for a balanced, multifaceted approach that focuses on the main objective: mitigating and adapting to climate change, based on scientific substantiation and global cooperation. At the same time, recognizing and addressing the complexity of how climate policy intersects with other areas is essential to ensure that these efforts are not counterproductive.

To achieve this, we need to build a different cultural value system: the eco-surplus culture (Nguyen and Jones, 2022; Nguyen and Vuong, 2021; Vuong, 2021). A cultural value system that sees environmental protection and restoration as a prerequisite for ensuring economic, political, social, and geopolitical benefits, rather than viewing the environment as an isolated entity and using it to "barter" with other interests. The informational entropy-based notion of value, grounded in the granular worldview and main features of quantum mechanics (Hertog, 2023; Rovelli, 2018), Shannon's information theory (Shannon, 1948), and the mindsponge theory (Vuong, 2023), helps explain why such a cultural value system is essential.

Following the informational entropy-based notion of value (Vuong and Nguyen, 2024a; Vuong and Nguyen, 2024), we can consider that humanity possesses a set of core values that guide its actions and decisions. Since humanity is made up of diverse countries, parties, and institutions, this set of core values encompasses a wide range of different values. The greater the number of distinct values, the more chaotic and disordered humanity's set of core values becomes. Shannon's formula effectively captures this aspect (Shannon, 1948):

$$H(X) = -\sum_{i=1}^{n} P(x_i)\log_2 P(x_i)$$

$H(X)$ is the informational entropy (uncertainty or unpredictability) of a random variable X with possible outcomes $\{x_1, x_2, \ldots, x_n\}$ and corresponding probabilities $\{P(x_1), P(x_2), \ldots, P(x_n)\}$. $P(x_i)$ is the probability of the outcome x_i. Each probability $P(x_i)$ represents how likely each outcome x_i is to occur. In this context, the variable X can be seen as representing humanity's set of core values at a given time, with i number of values. Each value has a probability $P(x_i)$ of driving the directions and actions of humanity. According to the entropy formula, if the number of values increases without clear differentiation or prioritization, informational entropy will rise, reaching its maximum when all values are equally important, specifically when $P(x_i) = \frac{1}{n}$. Therefore, if eco-surplus cultural values are given equal importance (or probability) as other competing values, this will lead to a high-entropy scenario. In such a scenario, humanity will need to invest significant energy (e.g., resources, labor, and capital) to maintain order in the socio-economic and political systems and achieve its objectives. The polarization between Democratic and Republican parties in the U.S. is a prime example of this dynamic. As a result, achieving global consensus and collaboration on climate change agendas necessitates prioritizing values that support environmental sustainability over others.

Building an eco-surplus culture requires significant investment, not only in material resources like machinery and technological innovations but also in information, policies, and the opportunity costs associated with seeking effective solutions (Vuong and Nguyen, 2024a). While this process may initially hinder or even jeopardize short-term socio-economic development and its associated benefits, the long-term value of establishing an eco-surplus culture justifies the tradeoff. The transition will take years, requiring persistent effort to overcome resistance from entrenched cultural values and to ensure consistency and stability within the new value system. This stability is crucial, as it aligns societies, countries, parties, and businesses with sustainable directions and practices. However, it is important to recognize that the cultural transition process is inherently imperfect and should not be rushed. The process must be guided by scientific information, evidence, verification, and collaboration. Additionally, greater attention to social sciences and humanities research—particularly in areas related to climate change denialism, climate action obstruction, anthropocentrism, and the human-nature relationship—will facilitate this cultural shift (Abson et al., 2017; Roberts et al., 2024; Vuong and Nguyen, 2023).

Furthermore, the economic valuation of ecosystem functions should be applied with great caution in decision-making and policy-making processes (Vuong and Nguyen, 2024a). Although the projected economic losses seem tremendous, expert analysts have stipulated that these projections of economic devastation are still short-sighted estimates, far from reflecting the full extent of the catastrophe that the Earth has to experience (Beuret, 2021). Reports from the professional body for the United Kingdom's actuaries, The Institute and Faculty of Actuaries, and Carbon Tracker indicate that conventional economic models have consistently underestimated the economic damages inflicted by climate change. This underestimation results from neglecting ecological tipping points, precipitation variability (that influences extreme weather events like floods and droughts), and relying on "strikingly invalid assumption" (e.g., presuming that indoor works will not be affected by climate change). Economist Steve Keen from University College London critiques this approach, suggesting it arises from a tendency of mainstream economics that endorses "shoddy standards" that align with established economic orthodoxy and "confirm what economists wish to believe" (Lo, 2023). This approach to economic valuation effectively serves as a communicative weapon, trivializing the irreversible loss of life by equating it with the manipulable money supply of central banks. In fact, Franta (2022) and Brulle (2023) studies reveal that the industry coalitions have financed biased economic analyses to obstruct climate policy, underscoring the urgent need to scrutinize the influence of economists, as well as economic paradigms, doctrines, and models, in delaying climate action (Vuong and Nguyen, 2024a).

Achieving global consensus and collaboration requires a foundation of trust among countries, parties, and institutions (Vuong et al., 2021). However, ongoing wars and conflicts not only lead to long-lasting environmental degradation and the depletion of vital resources needed to address environmental crises but also breed further hatred and distrust. Therefore, global cooperation in conflict resolution and the reduction of military activities are not merely moral imperatives; they are essential to preventing the weaponization of nature and ensuring the survival and well-being of our planet (Vuong et al., 2024). Exploring the link between environmental sustainability and humanistic and moral values is thus a critical area of focus, demanding greater attention for advancing peace resolution and effective climate change mitigation and adaptation (Nguyen, 2024; Vuong and Nguyen, 2024).

However, is it plausible to build such an eco-surplus cultural value system? We think it is because a sustainable environment is the foundation for the normal functioning of society, as well as economic, political, and cultural activities. If the current balance of Earth's ecosystem is disrupted, the foundation for human societal functioning will be severely affected, critically fractured, and even collapse (Diamond, 2011). Abundant evidence suggests that the world is approaching the point of passing the climate tipping points and planetary boundaries, which threatens the existence of countries and parties (Armstrong McKay et al., 2022; Lenton et al., 2019; Richardson et al., 2023). Therefore, despite the differences in cultural values among nations, organizations, groups, and individuals, consensus can still emerge in the face of existential threats. This is why 193 countries in the United Nations General Assembly have reached a consensus on the Sustainable Development Goals (SDGs).

Curbing the weaponization of the climate agenda also means enhancing opportunities for consensus and uniformity predicated on the credibility of scientific information, respecting diverse viewpoints among parties, and fortifying peace and the ethical values of our era. This approach lays the groundwork for sustainable advancements under human stewardship. The climate and environmental crises have reached a very serious and urgent stage. There is little time left for humanity to unite and take decisive action to save the Earth, ecosystems, and living environment. The desirable (ideal) situation is that while striving to

reach a decisive agreement and effortlessly take protective actions in unison against climate and environmental crises, the climate-crisis mitigation program is not forced to be a "reluctant" weapon for one interest group to attack another in whatever way. Climate and ecosystems have only one role: to nurture and preserve the life of the Earth (Readfearn, 2023).

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No data was used for the research described in the article.

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