Beyond Temperature: How the Heat Index 35 Shapes Environmental, Social, and Governance Standards

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Abstract

This paper investigates the implications of high HI35 days, which increase the demand for water and energy supplies, overconsumption, and higher emissions induced by cooling demand. Socially, HI35 is associated with health morbidity and loss in labor productivity; hence, policies directed at protection of the well-being of the poor, such as improved access to health care and good working conditions, become increasingly relevant. Extreme heat, besides, accelerates resource competition that may further develop into a civil instability, which affects governance structures. The nation will be assisted in addressing the impacts brought forward by HI35 through resilient infrastructure policy, good governance practice, and sustainable resource management. This paper, therefore, concludes that integrated policy action in ESG will be urgently needed to address the risk from extreme heat and calls for adaptive strategies that move toward environmental sustainability, social equity, and effective governance. Finally, HI35 is helpful to guide policy responses against different and interwoven challenges of extreme heat on sustainable development.

Keywords: ESG, Heat Index 35, Panel Data, Sustainability, Extreme Events

JEL CODES: Q5, Q51, Q56, Q57, Q58.

1) Introduction

It is now well established that the intersection of extreme environmental conditions and governance quality finds particular applicability within the ESG framework. Among the new metrics evolving to measure the stress emanating from the environment onto human, social, and economic systems in light of accelerating global temperatures and climate change is the Heat Index 35 or HI35, defined as the simple summation of days where temperatures above 35°C are recorded in a given year. The highly temperature-leading days directly and cohesively affect the sustainability of the environment and the well-being of the citizens; thus, this signifies an urgent need for adaptive and responsible governance structures to respond to these challenges. The environmental conditions, in particular the extreme heat, have an influence on the different layers in society. It ranges from health impacts and labor productivity to food security, natural resource depletion-the frequency and intensity of high-heat days drive up the need for effective, responsive governance. These heat thresholds create a certain form of environmental stress that would necessitate strategic planning in environment sustainability and accountability, especially when those thresholds beyond 35°C start intensifying the physical and economic strain on communities. In this regard, the ESG framework-that is, considering the interrelated roles of environmental stewardship, social responsibility, and governance accountability-provides an all-inclusive lens through which the broader ramifications of HI35 can be investigated and combatted. The

Environmental pillar in the ESG model becomes very relevant, particularly in those areas receiving these HI35 days rather frequently. The high temperatures accelerate resource depletion, from the cooling waters used to agricultural applications, while energy use is exacerbated by the heavy reliance on air conditioning. This becomes an environmental cascade wherein demand for energy escalates from high temperatures into a consequent rise in the use of fossil fuels and, subsequently, greenhouse gas emissions. Such economic strains from heat-induced demands reinforce the call for sustainable resource management policies. For instance, economies dependent heavily on agriculture will result in short-run and long-term resource depletion both naturally and otherwise, with the increasing irrigation needs to compensate for lost yield from extreme heat. These are just but a few of the effects that underline the need for governance structures that incorporate environmental protections and investments in renewable resources as a hedge against cascading consequence of high-temperature days on the environment and the economy. The same happens with the Social Pillar of ESG in the case of abnormal heat. Health risks increase, especially for those who are more sensitive, such as elderly people and those with other complicating health diseases. This adds extra pressure to public health systems. At the same time, HI35 has implications for productivity and laborer workforce participation: extreme heat degrades productivity, mainly in sectors that depend on hard labor, such as agriculture and construction. Increased temperature improves the prevalence of diseases related to heat and may widen the box of inequity because basic resources such as cooling or healthcare become increasingly concentrated by economic class. In that respect, good governance has to take an equitable approach in protecting vulnerable groups and prepare health facilities for the increasing frequency of high-temperature days. In the ESG framework, it is Governance that would reveal the accountable, inclusive governance structures play an very vital role in addressing the challenges raised by HI35. Good models of governance with Voice and Accountability perspective are thus better prepared to handle the socio environmental issues related to extreme heat. In the regions that come under HI35, citizens require more open and responsive leadership towards policies that would take care of climate adaptation, infrastructure resilience, as well as preparedness for public health. As the impacts of high-temperature days continue to increase, governance bodies should involve their citizens in decision-making and be receptive to public feedback. Good governance models empower local communities with the right to influence policies which touch on their lives in general and more particularly those touching on climate resilience and sustainable development. High temperatures raise the demand for cooling, which increases energy use and for most countries, higher energy imports. As the temperature shoots up, which in turn shoots up the HI35 values, the strain on infrastructures like power grids and water systems becomes very pronounced, hence increasing their cost of maintenance and thereby placing more demands on national budgets. With increased HI35 values-which is a pointer to higher temperatures-the attendant economic consequences include reduced productivity, healthcare costs, and in the long run, reduced GNI. This will put a strain on a country's economy and its ability to invest in sustainable development if the governance bodies do not think of introducing appropriate climate policies to counter the environmental costs of such extreme heat through investment in renewable sources of energy. Mainly, in light of the challenges faced by HI35, integrative policy is further emphasized, which is so much needed with respect to the fact that high temperatures strike upon complex impacts on environmental, social, and governance structures. Effectiveness in governance models precisely means adaptation to the challenges emerging from extreme heat, including public engagement in governance and transparency in decision-making. Moreover, policymakers can still focus on the sustainable management of resources, investment in resilient infrastructure, and social equity to lessen adverse HI35 interactions and governance structures that ensure accountability and responsiveness of governments to their communities. Given the continued forcing of climate change on global temperatures, HI35 is an important metric with which to gauge the efficacy of ESG frameworks. Where there is inclusive governance, environmental protection, and social welfare to actively address the effects of extreme heat, the regions will stay resilient in light of the long-term effects that come with climate volatility. However, the regions devoid of these attributes risk becoming increasingly stressed on their social, economic, and environmental systems and devolve into perpetuated vulnerability and inequity. It is within this ESG framework that the HI35 study brings into focus vital imperatives of governance structures being perceptive to needs and adaptable to changes apart from wide-ranging outcomes of environmental stressors leading to changes in societal resilience and sustainable development.

2) Literature Review

Dong et al. (2020) present an integral framework for assessing health risks associated with heat waves in megacities, combining heat stress, social vulnerability, and exposure factors. That gives one very relevant angle for urban planning; however, it does need more strength in empirical tests across diverse settings. Liu et al. (2023) considered the ESG public perception based on social media data, indicative of how digital platforms trace the formative process and gradual development of the attitude of society toward company responsibility in China. On the other hand, analytics based on social media may be incomplete and subjective and may miss the subtleties relating to the diffuse nature of general public sentiment. Machine learning, to sort out subtle differences in perceptions, would add major robustness to the findings of this paper. Chen et al. (2023) present the following paper, which focuses on some of the positive financial consequences of ESG performance. It reinforces the idea that corporate responsibility can indeed align with economic gain. This study is based on correlation; establishing a causal relationship would go a long way in making the case much more convincing in businesses that seek financial benefit via the integration of ESG. On the other hand, Dathe et al. (2024) provide a guidebook on how companies can integrate ESG in business operations, at the same time suggesting practical ways through which sustainability can be achieved. This pragmatic approach is helpful to organizations that are committed to sustainable management, though applications may vary in respect of the ESG needs of the particular industry. Finally, Gao et al. (2022) investigate whether ESG performance can stabilize stock prices, especially in volatile markets. This research underscores the economic resilience associated with ESG, although exploring its impacts across different sectors could offer a more comprehensive understanding of ESG's role in financial stability.

Peng et al. (2022), deals with research into the effects brought about by environmental regulation on enterprise energy intensity within China. The most decisive factor from their research that determined the energy efficiency outcome was an enterprise's investment behavior. Thus, the overall message from the analysis underlines that regulatory impacts are complex; it portrays a very clear sight that good energy regulation cannot afford not to take into account the behavior of adaptive firms-good energy regulation, in fact, requires further exploration of sector-specific dynamics if it is ever to attain greater accuracy. Patel et al. (2022) discusses the preparedness of health systems in regard to extreme heat events related to climatic change, which is a fast-emerging concern. Conclusions are that health systems should adopt proactive, multilevel strategies with respect to the health consequences of extreme heat. Its value has needed underlining for having informed health policy, which would have been of much greater importance if the gaps in regional health infrastructure resiliency had been found and discussed, including special attention to their most fragile parts. Aguilera et al. (2021) review business essays on corporate governance with regard to environmental sustainability, contending for an integrated approach toward better alignment of the structures of governance vis-à-vis environmental variables. The critical view given to cohesive governance frameworks in need could have been enriched by the inclusion of empirical case studies that can show the successful integration of sustainability into corporate governance practices. Rau and Yu (2024) research is dedicated to ESG-attitude-related attitudes of investors, institutions, and firms. It only becomes unified in that each of the three has different priorities and expectations from other stakeholders. Their work is helpful in trying to understand some of the drivers of ESG investment; it could be further developed to explore differences across industries or geographic regions with a view to clarifying their various findings. Meerow and Keith (2022), who conducted a survey among US urban planners concerning extreme heat planning and found that most cities have incomplete strategies with regard to heat resilience. Their work underlines that, while "adaptation needs to be hyper-local," it is similarly the case that "inter-city knowledge transfer might facilitate the diffusion of effective practices." They also make sure to provide insight into one such gap in resources and policies which could be filled in light of improving urban resilience.

Ngo 2022 discusses how the regulatory policy has influenced carbon emissions and energy efficiency within energy-intensive industries in China. It proves that while the regulatory policy does improve energy efficiency, measures performed differ 'markedly' between provinces. Given this, the paper emphasizes that an environmental policy that is tailored to be regional may be further refined by specific analyses of the regulatory impact on individual industries to help fine-tune its policy prescriptions. Zhu et al. (2022) discussed "Happiness Driven Smart City" to understand where the deployment of smart innovations in Metropolitan cities can act as an enabler of vital importance for general life satisfaction. Since quality of life is interlinked with urban technology, this study provides rich insight into the scope of metropolitan planning associated with improved well-being. The conceptual results of this study will be required for further searches into robust pragmatic applications and real-world case studies of smart cities to best advise city planners. The work by Togun et al. (2024) reviews apt cooling methods for EV batteries, taking a look at recent development technologies, challenges, and future demands of the sector. The authors review the technological requirements for battery cooling, one of the very important components toward continued use of EVs. That said, although quite comprehensive, this might have been complemented by quantitative analyses of the various cooling technologies elaborated on here, therefore providing more specific comparative information on their effectiveness. In this paper, by Green et al. (2021), it is considered that in adaptation, reactive, and coping mechanisms of small-scale fisheries, adaptive capacity determines responses to climate impacts. This paper shall become important in determining resilience within the community and, thus, may involve a study concerning the factors in the economic and policy spheres that either impede or facilitate such adaptive responses. De Giovanni (2023) probes the metaverse for Industry 5.0 sustainability by inquiring into perceived digital transformation use for sustainable development. While quite visionary, it misses concrete examples and case studies that connect virtual spaces to real measurable ecological benefits.

Taylor et al., (2023) address the issue of residential overheating in Central and Northern Europe by posing ten questions toward understanding and mitigating this emerging challenge. This paper has demonstrated that climate change will require new build standards and retrofitting solutions to enhanced heat risks in traditionally cooler regions. The need for practical examples of how policies or technologies could tackle residential overheating in the real world is something that would work in this study. One such framework that outlines the characteristics of social-ecological systems in regard to urban sustainability was done by Andersson et al. (2021). It focuses on how ecological features interact with or influence the social features of an urban setting and thus provides overall tools that interface responsible city planning. The latter is rather more theoretical in outlook and accordingly requires furtherance by interjecting case studies to highlight how this framework stands to work when applied to actual usage across various urban settings. Orazalin et al. (2024) investigate whether the board sustainability committee exerts any significant drive in terms of climate initiatives and carbon performance that relate to market value. These results of the study show that with a focused sustainability committee, a company is good at performance in doing better, coupled with good environmental outputs and good market value. This paper thus provides useful insights into corporate governance and issues of sustainability but can be extended by looking at how some of these committee activities act directly upon the environment. Climate justice in New York City's adaptation strategies, ascribable to Foster et al. (2024), brings a cry of urge for just climate policies that protect the vulnerable population. This paper is going to be very important to any urban planner or policymaker. However, further quantitative analysis of the adaptation outcome in different socio-economic groups groups will be more strengthening for this work. Li and Hu (2022) estimate how architectural morphology influences urban temperatures in Beijing using the boosted regression tree mode. Within a city, buildings come in different shapes, different sizes, and orientations; therefore, this study links the role of urban design with the regulation of temperature and provides data-driven guidance toward informed urban planning. If this were replicated for other cities, this would be so much more applicable and generalizable to various cities around the world.

Wilson (2020) discussed the legacy of redlining in the management of urban heat-and how even long-past discriminatory policies have put some neighborhoods, often filled with marginalized communities, at a much higher risk amidst rising extreme temperatures. This paper points to the juncture between environmental justice and land use planning, whereby consideration of mitigation should be specifically directed to areas that have always been at a disadvantage. Marcotullio et al. (2021) set forth the increasing problem in heat waves during summer in Africa, where African cities are among the most vulnerable with a lack of adaptive infrastructures. In sum, exploratory analysis invokes urgent adaptation strategies with regard to the peculiar environmental and socioeconomic conditions of the African urban area. An insight into more data-driven studies and concrete adaptation recommendations would thus strengthen this study in aspects of applicability among policymakers. Rane et al. (2024) target thermal comfort in buildings, achievable with sophisticated design, monitoring, and optimization technologies. This review highlights the integration of new cooling and insulation technologies as one of the areas that need emphasis within sustainable building practice. Extensive and comprehensive-it would be useful to have some case studies or quantitative evaluations concerning how a few of those accepted technologies stand in practice; this will encourage the practitioners. Qi et al. (2023) develop a decision-making framework for multi-objective optimization in designing urban heat mitigation strategies. Additionally, added value for policymakers will be better structured when weighing many factors applicable to urban planning, such as cost versus effectiveness, among other concerns of sustainability. However, the real-world testing of the framework in actual empirical projects within real urban environments will advance its utility. Sołtysik-Piorunkiewicz and Zdonek (2021) contribute with an enlightenment study on how concepts like Society 5.0 and Industry 4.0 influence open data performance expectancy, underlining in fact the transformation potential that digitalization can bring toward reaching sustainability goals. Although quite fascinating, this work would be even more important if, besides these theoretical concepts, examples of practical use in the urban and industrial context had been proposed.

3) Data

We have used the following data from the World Bank Database.

Macro	Variable	Acronym	Definition
	Heat Index 35 New	HI35	It is the number of days in a year when the apparent temperature, a perceived measure that combines ambient temperature and humidity, surpasses 35°C. This variable indicates the occurrence of extreme heat that can affect health conditions, productivity, and ecosystems.
E-Environment	Adjusted savings: natural resources depletion (% of GNI)	NRD	Measures the economic cost of depleting natural resources, such as forests, minerals, and fossil fuels, expressed as a percentage of a country's Gross National Income (GNI). This indicator reflects the long-term impact of resource extraction on a nation's wealth, considering sustainability and future economic potential.
	Adjusted savings: net forest depletion (% of GNI)	NFD	Quantifies the economic cost associated with the loss of forest resources, expressed as a percentage of Gross National Income (GNI). This measure reflects the financial and environmental impact of deforestation on a country's long-term sustainability and natural wealth.
	Cooling Degree Days New	CDD	Is a measure that indicates the demand for energy needed to cool buildings when daily temperatures exceed a specific threshold, typically 18°C (65°F). It reflects the cumulative temperature differences above this threshold across a year, helping to assess cooling energy requirements in response to warmer conditions.
	Energy imports, net (% of energy use)	EIN	Represents the percentage of a country's total energy consumption that is met through imported energy sources, after accounting for any energy exported. This metric highlights a country's reliance on foreign energy, indicating its vulnerability to external energy supply and price fluctuations.
	Energy intensity level of primary energy (MJ/$2017 PPP GDP)	EIL	Measures the amount of primary energy consumed per unit of economic output, expressed in megajoules per dollar of GDP adjusted to 2017 purchasing power parity (PPP). This indicator reflects the efficiency of a country's energy use in relation to its economic productivity, with lower values indicating higher energy efficiency.
	Fossil fuel energy consumption (% of total)	FFEC	Indicates the proportion of a country's total energy consumption that is derived from fossil fuels, including coal, oil, and natural gas. This metric helps gauge a nation's reliance on non-renewable energy sources, with higher percentages indicating greater dependence on fossil fuels and associated emissions.
	Methane emissions (metric tons of CO2 equivalent per capita)	ME	Represents the average methane emissions per person in a country, converted to their equivalent impact in metric tons of CO2 for comparative purposes. This measure reflects the contribution of methane, a potent greenhouse gas, to overall greenhouse gas emissions on a per capita basis.
	Nitrous oxide emissions (metric tons of CO2 equivalent per capita)	NOE	Quantifies the average emissions of nitrous oxide per person in CO2-equivalent metric tons, allowing for comparison with other greenhouse gases. This metric captures the impact of nitrous oxide, a potent greenhouse gas primarily emitted from agricultural and industrial activities, on a per capita basis.
S-Social	Fertility rate, total (births per woman)	FR	Represents the average number of children a woman is expected to have over her lifetime based on current birth rates. This metric is a key demographic indicator that helps assess population growth and reproductive trends within a country.
	Mortality rate, under-5 (per 1,000 live births)	MR	Indicates the number of children per 1,000 live births who die before reaching the age of five. This rate serves as an important

			measure of child health and overall healthcare quality within a country.
	People using safely managed drinking water services (% of population)	PUSM	Refers to the percentage of a population with access to drinking water that is located on-site, available when needed, and free from contamination. This metric is a key indicator of public health and infrastructure quality, reflecting access to essential safe water services.
	Prevalence of undernourishment (% of population)	POU	Measures the percentage of a population whose daily food intake is insufficient to meet minimum dietary energy requirements. This indicator reflects food insecurity and is used to assess hunger levels and nutritional deficiencies within a population.
G-Governance	GDP growth (annual %)	GDPG	Represents the yearly percentage increase in a country's Gross Domestic Product, reflecting the overall economic growth of a nation. This metric is widely used to assess economic health, indicating how rapidly an economy is expanding or contracting over a given year.
	Political Stability and Absence of Violence/Terrorism	PS	Is an indicator that measures the likelihood of political unrest, violence, or terrorism affecting a country, reflecting the stability of its political environment. Higher values on this indicator suggest a more stable, secure setting for citizens and investors, whereas lower values indicate greater risks of political or violent disruptions.
	Ratio of female to male labor force participation rate (%) (modeled ILO estimate)	RFTM	Compares the percentage of women participating in the labor force to that of men, showing gender parity in workforce involvement. A higher ratio indicates closer levels of labor force engagement between women and men, reflecting gender equality in employment opportunities.
	Regulatory Quality	RQ	Assesses the ability of a government to implement policies and regulations that promote private sector development while maintaining fair and efficient market standards. Higher values indicate effective regulations that support business growth and protect public interests, whereas lower values suggest regulatory challenges or inefficiencies
	Research and development expenditure (% of GDP)	RDE	Measures the percentage of a country's Gross Domestic Product invested in research and development activities, reflecting its commitment to innovation and technological advancement. Higher values indicate a stronger emphasis on R&D, which can drive economic growth and competitiveness.
	Rule of Law	RL	Measures the extent to which a society enforces laws fairly, protects individual rights, and upholds contracts and property rights. Higher values indicate a strong legal framework where laws are applied consistently, contributing to social stability and trust in institutions, while lower values suggest weaker legal enforcement and potential governance challenges.
	School enrollment, primary and secondary (gross), gender parity index (GPI)	SEPS	Measures the ratio of female to male students enrolled at primary and secondary levels, reflecting gender equality in educational access. A GPI closer to 1 indicates balanced enrollment between genders, while values further from 1 suggest disparities favoring either male or female students.
	Scientific and technical journal articles	STJA	Refers to the number of peer-reviewed publications produced within a country, often used as an indicator of research output and intellectual activity in science and technology fields. Higher counts signify robust academic and research engagement, contributing to innovation and knowledge development across various disciplines.
	Strength of legal rights index (0=weak to 12=strong)	SLRI	Measures the degree to which a country's legal system protects borrowers' and lenders' rights, with scores ranging from 0 (weak) to 12 (strong). Higher scores indicate stronger legal protections for accessing credit, which can enhance economic activity by making it easier for businesses and individuals to secure loans.
	Voice and Accountability	VA	Measures the extent to which citizens of a country are able to participate in selecting their government, as well as their freedom of expression, association, and access to a free media. Higher scores indicate a more democratic and open society, where people have greater influence over governance and civil liberties are better protected.

4) Econometric model

4.1) HI35 e E-Environment

We have estimated the following equation:

$$HI35_{it} = a_1 + b_1(NRD)_{it} + b_2(NFD)_{it} + b_3(CDD)_{it} + b_4(EIN)_{it} + b_5(EIL)_{it} + b_6(FFEC)_{it} + b_7(ME)_{it} + b_8(NOE)_{it}$$

t=[2011;2020] n=193.

	Fixed-effects, using 1930 observations			Random-effects (GLS), using 1930 observations			Pooled OLS, using 1930 observations		
HI35	Coefficient	Std. Error	t-ratio	Coefficient	Std. Error	z	Coefficient	Std. Error	t-ratio
Constant	-0.181807***	0.0228946	-7.941	-0.125270***	0.160303	-0.7815	-0.106477***	0.0190552	-5.588
NRD	0.0704811***	0.00322388	21.86	0.0640441***	0.00303860	21.08	0.0709664***	0.00162716	43.61
NFD	-0.0675693***	0.0129838	-5.204	-0.0674072***	0.0125421	-5.374	-0.0445771***	0.00735230	-6.063
CDD	13.9030***	0.782310	17.77	8.98267***	0.591479	15.19	1.43478***	0.0991467	14.47
EIN	0.00110340***	0.000209726	5.261	0.000965916***	0.000203892	4.737	0.00205234***	0.000192550	10.66
EIL	0.0115481***	0.000695923	16.59	0.0120382***	0.000677397	17.77	0.0121593***	0.000717383	16.95
FFEC	-0.00190710***	0.000436954	-4.365	-0.00184573***	0.000426155	-4.331	-0.00142689***	0.000444046	-3.213
ME	-0.0298020***	0.00974380	-3.059	-0.0291567***	0.00942939	-3.092	-0.0320696***	0.00575513	-5.572
NOE	-1.73107e-05***	2.68516e-06	-6.447	-1.92987e-05***	2.61526e-06	-7.379	-1.78960e-05***	3.11423e-06	-5.747

The positive relationship between Heat Index 35 New e Adjusted savings: natural resources depletion (% of GNI). This would be a critically important relationship between the Heat Index being at or above 35°C and adjusted savings from natural resource depletion, as a percentage of Gross National Income, since this conveys a significant amount of information concerning environmental economics and public health. There would be a positive correlation with high levels of Heat Index and higher natural resource depletion due to the crossing pressures of climate change, resource use, and economic adjustments. With the increased Heat Index, however, especially in areas where temperatures usually breach the 35°C mark, natural resources become stretched both environmentally and economically. High temperatures increase the demand for water by both agricultural irrigation and urban cooling systems. For instance, in strictly agricultural economies, irrigation is increased in order to maintain crop yield during periods of intense heat at a much-increased depletion rate of water resources. This is part of a dual economic and environmental challenge: while crop production might sustain GNI in the short run, the long-run depletion of water resources reduces adjusted savings from natural capital and decreases future income potential. This in turn increases energy demands due to air conditioning, which is directly related to the consumption of fossil fuel. But this increase in energy consumption also implies the rapid extraction of oil, coal, and natural gas-fuel sources that are part of natural capital. Because fossil fuels are non-renewable resources, extracting them reduces adjusted net savings, which thus lowers the economic sustainability of a country. Besides, high Heat Index levels would influence labor productivity since extreme heat would affect the health of the workers and reduced economic output, especially where industries rely on hard physical work such as mining and agriculture. Lower productivity reduces growth of GNI and the funds that might be available to reinvest in natural resources or further develop the renewable alternatives. When the Heat Index reaches a critical threshold of above 35°C, the depletion accelerates. This calls for a positive relationship with adjusted savings loss due to resource depletion as a percentage of GNI, as high temperatures pave the way for increased water and energy demands, among other climate-change mitigation costs. The current situation calls for a balancing act of the current economic activities against the long-term resource sustainability to make sure that natural capital will be able to remain a viable base for the economy.

The negative relationship between Heat Index 35 New e Adjusted savings: net forest depletion. The negative correlation of the Heat Index 35 New with Adjusted Savings: Net Forest Depletion points to environmental and economic challenges, with social issues arising out of climate stressors populated by high heat conditions. HI35 is defined as the total number of days with a heat index above 35 degrees Celsius, a threshold that usually comes with adverse health impacts, decline in labor productivity, and degradation of the environment. The higher this index, the more negatively it correlates with AS-NFD, which accounts for the economic costs related to the depletion of forest resources. Such an interaction between these two indicators signals that, with increased heat stress, the ability to sustain forest ecosystems and the general environment diminishes and will be linked with unsustainable economic losses. First, high heat levels make forests more vulnerable to stressors like drought, wildfires, and pest infestations-all factors that lead to rapid degradation of forests. When temperatures rise above the limits of resistance of regional ecosystems, tree mortality rises and growth is curtailed while its capacity to sequester carbon is reduced, adding to higher greenhouse gas concentrations. This leads to a self-reinforcing feedback circle: the higher the temperature, the more degradation in forests, and degraded forests contribute to further rises in atmospheric carbon levels, hence global warming. This dynamic lowers a nation's adjusted savings economically, since forests provide many critical ecosystem services of great monetary value. Forests provide natural capital to underpin sectors like agriculture and tourism, and the management of water resources, which all become vulnerable in one way or another to the adversities of extreme heat. During the degradation of forests, the net savings of such nations dependent on natural resources dwindle; this characterizes a negative trend in sustainability and economic stability. The depletion in adjusted savings has implications for development prospects through reduced capacity for long-term investments in social and economic sectors. Loss of the forests resulting from increased heat is very disastrous socially, especially to populations depending on forest resources for their livelihood. In most developing areas, communities rely on forests for food, medicine, and income. High heat exacerbates poverty by limiting people's access to these resources, adding to food insecurity and offering a high risk to health hazards from heat exposure. Now, if one looks into the relationship between HI35 and AS-NFD as shown, the increase in heat levels corresponds with depletion of the forests. The implication is direct on economic savings and its sustainability. Therefore, besides seeking the abatement of climate change, sustainable management of forests and enhancing resilience against climate stressors necessitate policies necessary for dealing with the issue. In the absence of any intervention, the depleting forest resources under a situation of increasing heat pose a tall challenge to achieve sustainable development and environmental stability.

The positive relationship between Heat Index 35 New e Cooling Degree Days New. Heat Index-HI and Cooling Degree Days-CDD denote the parameters of thermal comfort and its demand for energy in relation to cooling for high temperatures. There is a positive relationship between the frequency of Heat Index greater than or equal to 35° C and higher Cooling Degree Days. This expresses one facet of the demand caused by air conditioning or coolers in terms of threshold values of outdoor temperature. The Heat Index is the combination of temperature and humidity to apparent or "feels-like" temperatures-an indication of the human-perceived temperature and not the actual air temperature. A Heat Index higher than 35°C already indicates a threshold of high discomfort level, requiring, very well, cooling applications indoors for efficient comfort levels. Cooling Degree Days, in turn, are calculated against the standard base when the daily temperature is exceeded, usually 18°C or, for the United States, 65°F, thereby measuring deviation in temperature from this base. The larger this deviation is, the greater the CDD will be. The higher the CDD figure, the stronger the demand will be for cooling systems. There is an excellent relationship between high Heat Index values and higher CDDs simply because both are directly related to higher temperatures. Therefore, the higher the HI above 35°C and mostly in surface conditions of high humidity, the larger the demand to cool in order to avoid hazards to health such as heat stress and heatstroke. Therefore, on days with high values of Heat Index, more Cooling Degree Days are recorded, which means that an increase in the uncomfortable heat rate is directly related to a greater demand for cooling. Since this relation is significant in the context of energy planning and public health, this can help utility companies predict peak energy demand with increased CDD values for a higher HI value by optimizing generation to ensure reliable access to power for air conditioning during extreme heat. As this trend is monitored in the context of this correlation, it can also help urban planners and policymakers with sustainable cooling options and provide public health advisories well in advance of avoiding heat-related ailments. In summary, the positive relationship between a Heat Index of 35°C and Cooling Degree Days underlines the relationship between perceived discomfort from heat and cooling demand. The understanding and monitoring of this relationship will go to the higher preparation of energy providers, policymakers, and the general public in dealing with challenges caused by exceptional heat, which, in turn, begets good health and efficiency in energy use during heat waves.

The positive relationship between Heat Index 35 New e Energy imports, net. Already, the relation of a high heat index-for instance, around 35°C-to high energy imports is immensely complicated and crucial. A high heat index of 35°C would normally correspond to very extreme weather conditions-especially during summer-which increases demand due to increased usage of air conditioners and cooling systems. High heat indices like this usually place a great load on infrastructure and energy grids of such regions, as households and businesses increase their use of energy to combat the drastic effect of high heat. Such demand usually exceeds the capacity for the local supply of energy, which means one is usually forced to depend very much on imported energy to avoid shortage, blackouts, or undue strain on existing resources. Most countries have experienced a direct increase in energy imports with a high heat index in the absence of strong domestic energy production capacity or renewable energy infrastructure. Energy imports, specifically fossil fuel-based, are in greater demand during intense heat periods due to the fact that oil and gas represent those energy sources that can be delivered quickly enough to meet active consumption. The relation of heat index to energy import becomes particularly critical for countries with scarce renewable resources or those facing fast population growth, to which higher urbanization rates and increased residential cooling needs are attributed. In the case of such countries, net energy imports become one of the vital strategies toward attaining energy security without disruptions and meeting the basic needs of a population that is more susceptible to health risks due to prolonged heat exposure. Long-term consequences include the economic effects of this reliance upon imported energy during high heat. Countries reliant upon imported types of energy sources are far more susceptible to global shifts in energy prices, which can be rather costly to economies sustaining any sort of high heat index over the summer months. This impact is even valued more when considering the fact that countries have to pay quite a lot to import the energy during peak demand seasons, straining the national budgets and impacting, in general, the economic stability. This reliance on imported energy, when heat indices are high, also works against efforts toward energy independence or renewable energy goals, as reliable power to offset weather Trends outweighs sustainable practices in the near term. Hence, one can notice a strong positive correlation between high heat indices and energy imports requirements underpinned by immediate needs for consumption, infrastructure limitations, and pressures from the economic point of view. The very interconnectedness of climate conditions with those of energy security draws attention to the need for more resilient energy infrastructures, ones which would minimize damages resulting from extreme temperatures without undue reliance on foreign energy supplies. In other words, there consequently arises a need for climate-adaptive policies on energy that would balance the short-run imperatives on energy with concerns for sustainability in the long run.

The positive relationship between Heat Index 35 New e Energy intensity level of primary energy. The relationship between a high Heat Index, specifically at 35 degrees Celsius or above, and energy intensity in primary energy use is critical for understanding both energy demands and the efficiency of energy systems in high-temperature environments. A Heat Index of 35 or higher is widely regarded as a threshold at which heat stress begins to affect human comfort, productivity, and health significantly, triggering a rise in energy consumption as systems and technologies work harder to mitigate these effects. Consequently, as temperatures and the Heat Index climb, the energy intensity required to maintain safe and comfortable conditions also rises, especially in regions experiencing extreme weather. In high-temperature conditions, cooling technologies, such as air conditioning and refrigeration, become essential in both residential and industrial sectors. The energy intensity level of primary energy, defined as the amount of energy needed per unit of gross domestic product (GDP), naturally increases in such climates. When the Heat Index reaches 35, air conditioning systems consume more electricity to sustain indoor temperatures at safe levels, causing a direct rise in energy intensity. This effect is compounded in densely populated urban areas with high-rise buildings, where indoor spaces require continuous cooling, especially during prolonged heat waves. The heightened energy intensity also results from infrastructure and building design adaptations necessary to cope with high Heat Index values. Buildings in regions regularly exposed to intense heat are often equipped with advanced insulation and ventilation systems, which, while energy-efficient over the long term, initially require substantial energy to manufacture and install. Furthermore, the energy needed for pumping and treating water rises as higher temperatures lead to increased water demand, both for hydration and agriculture. High temperatures can also decrease the efficiency of power plants, particularly those reliant on water cooling, as warmer intake water reduces overall plant efficiency, indirectly driving up the energy intensity needed to meet demand. Thus, a positive relationship emerges between a Heat Index of 35 and the energy intensity level of primary energy. As the temperature and Heat Index rise, so too does the pressure on energy systems to meet demand, leading to a corresponding increase in energy intensity. This phenomenon highlights the importance of investing in more resilient energy infrastructure and sustainable cooling technologies to mitigate the impact of high heat levels on energy systems. As climate change continues to push average temperatures higher, understanding and optimizing this relationship between heat and energy intensity will be crucial for achieving energy efficiency and minimizing the economic impact of energy consumption in hot climates.

The negative relationship between Heat Index 35 New e Fossil fuel energy consumption. Levels of heat index-most particularly extreme values like 35°C-are associated with the extent of burning of fossil fuel energy, aside from other harmful environmental, economic, and social impacts. Fossil fuels are a source of energy usually derived from coal, oil, and natural gas, still obtained in a large quantity in most parts of the world. A heat index up to 35°C is an indication of intense heat with serious physiological consequences, increased public health concerns, and a need for energy-intensive cooling systems. When the feedback loop of temperature as a result of fossil fuel emissions inches upwards, use or demand for air conditioning, refrigeration, and other cooling systems escalates. Such demand for electricity then furthers the cycle into more consumption of fossil fuels, since most regions rely on coal and natural gas for electricity generation. In trying to adapt to those higher temperatures, societies around the world inadvertently contribute further to the very emissions they would honestly want to address. More broadly, having to spend part of their budget on health systems, emergency cooling centers, and energy subsidies forces governments to divert money that could be invested in sustainable energy transitions. Besides the economic and social impacts, the environmental cost is immense.

The negative relationship between Heat Index 35 New e Methane emissions. The trends in the high heat indices, primarily 35°C or higher, and methane emissions relationship are normally negative, since high temperatures accelerate organic material decomposition, which reduces soil moisture and microbial activity-things that drive methane production. Methane is a potent greenhouse gas emitted naturally from anaerobic-type environments through microbial activity. The main sources include wetlands, agriculture, and waste. On the other hand, at elevated temperatures and a heat index of 35°C or higher, environmental factors inhibit methane production rather than enhance it. In case this soil or water temperature rises to high values, as in the instance of a heat index of 35°C, the rate of evaporation also increases appreciably. This rapid loss of water leads to dry conditions in soils and wetlands, important habitats involved in methane emissions by methanogenic microbes. These microbes love environments that are saturated with waters; if some moisture is lost either from the soil or from a marsh ecosystem, optimal conditions for the microbes are destroyed, resulting in lower microbial activity, and hence methane production. Higher heat indices create a drier environment, less conducive to the anaerobic decomposition processes that facilitate methane generation. Prolonged high-temperature periods have acted upon plant and microbial ecosystems, shifting biological activity in ways that can help further reduce methane emission. Under heat stress, many of those plants that normally enhance methane emissions via their rooting systems may reduce growth or die back, thereby reducing methane production over time. Secondly, microbes responsible for methane oxidation—a process consuming methane prior to its release to the atmosphere—may be more resistant at higher temperatures compared with methanogens, placing it in a situation where methane gets oxidized at a rate greater than its production. Thus, net methane emissions can decrease under these heating conditions. Whereas methane itself is a contributor to global warming, and subsequent global warming therefore can increase the overall temperatures, the direct relationship between a high heat index-35°C for instance-and methane emissions does not indicate a positive feedback in methane production. Rather, high temperatures tend to suppress the environments and biological processes required for methane generation. This intricate interaction of heat stress and methane dynamics reveals a negative interaction whereby high heat indices suppress methane production, illustrating that climatic variables can sometimes have unexpected effects on greenhouse gas emission levels in specific ecosystems.

The negative relationship between Heat Index 35 New e Nitrous oxide emissions. Meanwhile, the relation between Heat Index 35 and N_2O emissions is increasingly applicable in the context of climate change; hence, it is complex and generally negative. Heat Index is one measure that takes into consideration air temperature with relative humidity to derive perceived temperature based on which physiological and ecological conditions are directly affected under different environments. When the Heat Index reaches or exceeds 35°C, normally termed HI35, human, plant, and microbial activities are modified with net emissions of nitrous oxide usually reduced. Nitrous oxide comes out as one of the effective gases contributing to the greenhouse and is highly dominated by agricultural emissions, soil microbial processes, and in high combustion of fossil fuel. Under extremely high temperatures, such as HI35, for example, soil moisture and microbial life dynamics are severely disrupted, tending toward a reduction in N_2O emissions. High temperatures could trigger the deterioration of soil moisture. This would make water less available to those microbial processes that include nitrification and denitrification, the two major biological pathways for the production of nitrous oxide. As soils dry, microbial activity declines and this optimum moisture requirement for life reduces N_2O emissions further. At higher temperatures, the decomposition rate of soil organic matter often accelerates, consuming oxygen at a faster rate, sometimes beyond the anaerobic conditions favorable for nitrous oxide production. The effect has also been fair on plant physiology at HI35, either reducing nitrogen uptake efficiency in plants or creating thermal stresses, hence their reduced contribution to nitrogen cycling through the soil. This modified nutrient intake then affects the available pool of nitrogen in the soil for microbes and their related activities, such as nitrification. Lower microbial activity, in turn, under HI35 limits conversion of nitrogen compounds into nitrous oxide. Higher temperatures also enhance the volatilization of ammonia (NH_3) from soils-reduced nitrogen thus can no longer be available for microbial conversion into N_2O. Besides, HI35 affects farming activities as farmers rely on irrigation to compensate for the adverse effect of heat stress on crop yields. Irrigation under high temperature conditions, however, can cause nutrient leaching rather than build-up in the soils-further reducing substrates for N_2O production. HI35 would, thus, more frequently face soils that are receiving combined drying and diminished microbial activity, which would change agriculture in ways that depress nitrous oxide emission. While HI35 is itself an often-devastating contributor to other environmental stressors, its conditions tend to repress nitrous oxide emissions. This negative relation is exemplary of interaction between the climatic variables and GHG emissions in such a way that ironically, the most intense heat may prove to be a dampener for one of the largest contributors to global warming.

4.2 HI35 and S-Social

We have estimated the following equation:

$$\boldsymbol{HI35_{it} = a_1 + b_1(FR)_{it} + b_2(MR)_{it} + b_3(PUSM)_{it} + b_4(POU)_{it}}$$

t=[2011;2020] n=193.

	Fixed-effects, using 1930 observations			Random-effects (GLS), using 1930 observations			Pooled OLS, using 1930 observations		
	Coefficient	Std. Error	t-ratio	Coefficient	Std. Error	z	Coefficient	Std. Error	t-ratio
Costant	-0.0820385***	0.0299254	-2.741	-0.132281**	0.0607547	-2.177	-0.279699***	0.0226989	-12.32
FR	-0.000534289***	6.26322e-05	-8.531	-0.000497998***	6.09738e-05	-8.167	-0.000128471*	6.61605e-05	-1.942
MR	-0.000245507***	1.88858e-05	-13.00	-0.000245512***	1.84411e-05	-13.31	-0.000247343***	1.94197e-05	-12.74
PUSM	0.00220604***	0.000282846	7.799	0.00332254***	0.000252177	13.18	0.00580012***	0.000184953	31.36
POU	0.00970320***	0.00316608	3.065	0.00858028***	0.00275245	3.117	0.00969631***	0.00160743	6.032

The negative relationship between Heat Index 35 New and Fertility rate, total (births per woman). The relationship between high temperatures, marked specifically at a Heat Index of 35 degrees Celsius and above, and fertility rates has increasingly been understood to be negative and significant. As temperatures increase globally, especially in highly populous regions that are developing, fertility rates, or births per woman, significantly decline. The mechanisms driving this inverse relationship are varied, including physiological, economic, and sociological mechanisms. From a physiological point of view, extremely high temperatures stress the human body itself and can directly affect reproductive health. The high temperature can impair the reproductive health of both men and women and reduce their fertility potential. It has been observed that temperature fluctuations tend to have more vulnerable effects on male fertility; higher temperatures may lead to decreased sperm quality and quantity, hence directly affecting conception rates. High temperatures would lead to disruptions in menstrual cycles in women and increase pregnancy complications, hence further discouraging fertility. In regions that have consistent Heat Index of 35 years and above, the negative physiological effects of heat may translate into low fertility due to reduced probability of conception and full-time carriage of the pregnancy. Economically, high temperatures impinge on fertility through the limitation of productivity and income. In most agrarian or developing economies, very hot temperatures negatively impact crop yields and lead to economic insecurity. Households with lowered incomes may favor fewer births or even childbearing delays due to the greater economic burden. Furthermore, with increased temperatures, the greater costs induced by cooling and healthcare further raise the economic burden on families to want fewer children. This economic burden is thus associated with lower fertility rates, as people would not want to risk compromising financial security for a higher birth rate. On a sociological level, all these years of high temperatures can be paralleled to changes in lifestyle and family planning. It's documented that with regular extreme heat, people then adapt to being in less outdoors and social open space, therefore limiting interpersonal interactions that might have otherwise led to the formation of families.

Also, with growing concerns about climate change and the sustainability of larger families in high-heat areas, many shy away from large families in favor of fewer births to minimize stress on personal resources as well as on the planet in general. A Heat Index of 35 or higher thus inversely correlates with fertility rates based on physiological effects related to human reproductive health, household economics, and sociocultural change in family planning behaviors. In the context of increasing global temperatures, the associated dynamics here make for an increasingly critical function in the role of policymakers seeking to address both adaptation to climate and demographic sustainability.

The negative relationship between Heat Index 35 New and Mortality rate, under-5 (per 1,000 live births). Heat Index 35 bears a complicatedly serious association with the mortality rate in children less than five years old. HI35 refers to conditions when the conjunction of ambient temperature and humidity leads to a "feels-like" temperature of 35°C or above. It has considerable consequences for the most defenseless people-young children-whose physiological stamina is much lower than that of adults. Studies have persistently shown that as HI35 increases, the rate of mortality among the under-five children tends to rise. Explanations of the increased mortality rate among the under-five years in high-heat indexes revolve around intertwined health, environmental, and socioeconomic factors thatlocally disadvantage this particular age group. Children under age five are susceptible to heat-related illnesses such as dehydration, heat stroke, and respiratory complications. High-heat index conditions put added stress on a young body that is ill-equipped, compared with an adult, to cool internal temperatures. Heat can exacerbate pre-existing health conditions and speed along common pediatric diseases, such as diarrhea and respiratory infections, that top the list of leading causes of death among this age group. For instance, high temperatures are often associated with high bacterial growth and proliferation of insects that act as vectors of diseases, such as mosquitoes. This usually leads to increased infections which could be life-threatening, especially in young children whose immune systems are not well developed. In essence, these infections are more captured in warmer climates, meaning protracted HI35 readings can cause under-five mortality to occur both directly and indirectly. These health risks are compounded, of course, by socio-economic conditions: poorer families, having less access to health care, cleanliness and cooling, will have their children more affected by heat problems when infant and child mortality rates already stand high. This is translated into unequal exposure to adverse impacts of HI35 with inadequate opportunity for mitigation. Children in these countries also have particularly high chances of dying from heat due to a general lack of access to airconditioning, a diminution in service availability for medical treatment for dehydration or heatstroke, and the promotion of dirty water. Besides this, with the change in climate, increased frequency and duration of high HI35 days would develop plausibly into increased pressure on the healthcare system, hence further stressing the vulnerable population. These are recommended to take place in targeted interventions, making sure that health infrastructure improvement, community education about the health implications of rising temperatures, access to clean water, and shelter from most of the extreme heat prevail in areas where the frequency of high temperatures is appearing to be on the rise and demands are already pressing. In the absence of these measures, mortality rates for those under five can only increase as high-HI35 conditions become more prevalent-a kind of vicious cycle where health inequities are further exacerbated by conditions within or of their lived environment. Thus, the association of HI35 with mortality in those below the age of five manifests symptoms not just of physiological vulnerabilities but systemic challenges that uniquely burden the young child in hot climates.

The positive relationship between Heat Index 35 New and People using safely managed drinking water services (% of population). The relationship between very high levels of heat index-for instance, represented by a Heat Index of 35°C-and access to safely managed drinking water services will be an issue of growing concern as the Earth continues to warm. A 35°C Heat Index is a measure of combined impacts of high air temperature and high humidity on stress to the human body, possibly leading to heat-related illness. For this very reason, safely managed drinking water-access to water sources on premises, available when needed, and free of contamination-is critical for relieving the adverse effects of extreme heat. The important dependence would fall to the aspect that hydration is vital in maintaining physiological functions when it's high in heat. Once the heat index attains 35, the risk of dehydration sets in because the body may tend to lose more water through mechanisms of perspiration in an attempt to maintain the temperature. Persons who have access to safely managed drinking water are able to cope better with these increased hydration needs and therefore have lower risks of heat exhaustion and heatstroke. Indeed, studies are showing that dehydration affects not just one's health but also results in substantial cognitive functions and decreased productivity-a thing of utmost importance in low- and middle-income countries with lots of outdoor labors. In addition to the aforementioned issues, access to clean and reliable drinking water should, therefore, be treated not just as a health but also as part of an economic and social issue, as it permits communities to function even in extreme heat conditions. Reaction in high heat index areas will also continue to be highly vulnerable to deterioration in water quality due to increased bacterial growth and higher rates of evaporation that may concentrate contaminants in the water. Therefore, safely managed water services ensure that these challenges are mitigated and the people receive water that meets acceptable quality standards regardless of the weather. Without such infrastructure, communities would have a higher chance of waterborne diseases, which can be exacerbated by heat stress, leading to a compounded public health issue. The more general social gains from securely sourced water in a regime of high temperatures should not be underestimated. Access to safely managed water has been linked with better educational outcomes, reduced gender inequality, and general resilience against climate impacts. For example, in many communities not having clean water nearby, it is the women and girls who need to collect water. When safe drinking water is available on site, more time can be dedicated to education and other opportunities, along with not having to expose oneself to extremely hot temperatures collecting water. In sum, a high heat index is positively associated with the utilization of safely managed drinking water. Access to safe water contributes to hydration needs at high magnitudes of heat while sustaining broader health and economic stability and social resilience in the face of climate change.

The positive relationship between Heat Index 35 New and Prevalence of undernourishment (% of population). The Heat Index 35 New is an apparent indication of temperature above 35°C in days that are more frequent. Key association is undernourishment prevalence in affected populations, positively significant. A reason for this can probably be found in the strong impacts of extreme heat on agriculture, stability of food supply, economic conditions, and human health-all those aspects that belong to nutritional security. This yield theft becomes compounded in areas where agriculture has become highly dependent on rain-fed systems with no sophisticated irrigation infrastructure, which is a common condition throughout many of the developing regions of the world. Alternatively, populations in those areas that regularly experience Heat Index 35 days will contribute directly to higher undernourishment rates as a function of shrinking food supplies due to increased food scarcity. Added to this is economic vulnerability because of rising temperatures, especially for poor households that depend on agriculture for a significant share of their income. When crop yields are reduced, this leads to income loss for rural farming communities and reduces their capacity to buy food and other basic needs, contributing further to increasing food prices and further constricting access to affordable, nutritious foods. Hence, in this case, the prevalence of undernourishment begins to take hold higher, since households have little leeway in terms of resources to devote to diversified and balanced diets; this means that a self-reinforcing cycle of economic hardship and extreme heat precipitates a downward spiral of poverty and malnutrition that's difficult to escape. Ultimately, this is what the Heat Index 35 New is indicative of: those environmental or socio-economic stressors that drive undernourishment. The more extreme frequency and intensity of events due to climate change will have these stressors become more dramatic and tend towards the aggravation of food insecurity in vulnerable population groups. This would need to be confronted through adaptive agricultural practice, economic resilience programs, and improved access to health care that could possibly reduce adverse effects of extreme heat on nutritional status.

4.3 HI35 and G-Governance

We have estimated the following equation:

$$\boldsymbol{HI35_{it} = a_1 + b_1(GDPG)_{it} + b_2(PS)_{it} + b_3(RFTM)_{it} + b_4(RQ)_{it} + b_5(RDE)_{it} + b_6(RL)_{it} + b_7(SEPS)_{it} + b_8(STJA)_{it} + b_9(SLRI)_{it} + b_{10}(VA)_{it}}$$

t=[2011;2020] n=193.

	Pooled OLS, using 1930 observations			Fixed-effects, using 1930 observations			Random-effects (GLS), using 1930 observations		
	Coefficient	Std. Error	t-ratio	Coefficient	Std. Error	t-ratio	Coefficient	Std. Error	z
GDPG	-0.0196269***	0.0235942	-0.8319	-0.0509628***	0.0317937	-1.603	-0.062385***	0.0534953	-1.166
PS	-0.0243216***	0.00168426	-14.44	-0.0269764***	0.00178390	-15.12	-0.0276907***	0.00171150	-16.18
RFTM	-0.0822213***	0.0118774	-6.922	-0.247238***	0.0218484	-11.32	-0.185402***	0.0187341	-9.897
RQ	0.00178382***	0.000373824	4.772	0.00363739***	0.000538314	6.757	0.00338585***	0.000507749	6.668
RDE	0.0447308***	0.00323051	13.85	0.0518335***	0.00338235	15.32	0.0521161***	0.00326134	15.98
RL	-0.149461***	0.0166822	-8.959	-0.191369***	0.0249152	-7.681	-0.196763**	0.0229862	-8.560
SEPS	-0.0168396***	0.00594064	-2.835	0.0281068***	0.00696963	4.033	0.0141014**	0.00643801	2.190
STJA	0.0241149***	0.00257866	9.352	-0.0293755***	0.00510108	-5.759	-0.00876926***	0.00403203	-2.175
SLRI	9.60980e-07***	3.01975e-07	3.182	1.69212e-06***	5.86549e-07	2.885	1.61321e-06***	5.28298e-07	3.054
VA	0.00124172***	7.03037e-05	17.66	0.00202954***	0.000101081	20.08	0.00188795***	9.35570e-05	20.18

The negative relationship between Heat Index 35 New and GDP growth (annual %). The relationship between very hot temperatures, proxied by a Heat Index of 35°C or higher, and GDP growth is increasingly one of negative correlation, especially within the context of economies that are less resilient against climate vagaries. For temperatures with a regular possibility of reaching or exceeding a Heat Index of 35°C, such temperatures impose physical and economic stresses that constrain productivity, disrupt industries, and strain infrastructure-all of which in turn depress GDP growth. One of the major ways extreme heat affects GDP is by decreasing labor productivity. Above 35°C, it is not only hard to exert physical effort, but it is dangerous, thus bringing all labor-intensive activities-never mind all activities-robustly down in sectors such as agriculture, construction, and manufacturing. Workers under extreme heat likewise suffer from fatigue, heat exhaustion, and even cognitive impairment-all leading to lower output and increased absenteeism. In return, this productivity loss translates directly into economic output, since such sectors in most developing economies form a critical base, where access to climate-controlled environments for the workers is limited. Agriculture is a huge sector in many economies and is very vulnerable to extreme Heat Index levels. Severe temperature conditions may cause crop yield losses due to the stress imposed by heat on plants and animals; this could further lead to food shortages and rising food prices. Agriculture is such a huge percentage of many emerging economies' GDP that low yields have large effects on overall growth and productivity. Also, the reduced agricultural productivity has a multiplier effect on related industries-food processing, transport, and retail-further depressing economic performance. Increased maintenance costs deplete government budgets and crowd out resources that could be spent on growth-enhancing investments. Such instances include road surfaces cracking, railways expanding, energy systems receiving peak loads, as air conditioning demand rises, resulting in frequent power outages. These are quite costly, meaning logistics and transport networks cease to function effectively, which is important to trade and business. High heat indices also raise costs for health services because heat-related illnesses will be more widespread, particularly the vulnerable portions of the population. This can strain health care systems and lead to increased uses of government finances in health services at the expense of investing in economic development projects. In the long run, a high intensification of heat leads to poorer health outcomes, which continuously lower the capacity of labor and further lessen the growth in GDP. There is, however, a negative correlation between extreme temperature-say, 35°C heat index-and GDP growth, because it disrupts productivity both directly and indirectly, puts much strain on the essential infrastructures, and increases health burdens all together impeding sustainable economic development.

The negative relationship between Heat Index 35 New and Political Stability and Absence of Violence/Terrorism. Thus, an inverse relationship between extreme heat index-HI reaching 35°C or above and coupled political stability with no violence or terrorism is an emerging concern in both the field of climatology and political science. Since Heat Index represents the apparent temperature which describes how hot humans actually feel by combining temperature and relative humidity, its extreme values-like HI 35 New-represent extreme physical and psychological stress in the populace. The result is enhanced socio-political vulnerabilities that lead to instability and even violence. High heat conditions have a strong consequence on infrastructure, resource bases, and public health systems, particularly in regions with various socio-economic stressors. Extreme heat exacerbates resource scarcity, especially water and energy, since the population needs more cooling and hydration to put up with it. Increasing demand for first electricity and water, combined supply reductions have resulted in growing costs and even shortages. Public frustration may be further primed by such basic human needs- dissatisfaction generally with a governing body. For example, in those countries where power or water is already in meager supply, periods of extreme heat heighten public frustration with government inefficiencies, creating an environment in which protests or unrest can easily erupt. High temperatures have been linked in studies to increased aggression and violent behaviors. Psychological studies show that heat makes individuals more irritable and less patient. Thus, higher crime rates and acts of violence can be expected when the weather is hot. With soaring temperatures, interpersonal and collective tensions also rise. A minor incident that would otherwise be peacefully resolved may become the cause of a full-scale riot. In areas where the political systems happen to be weak, the effect is multiplied. Individuals chronically under oppressive heat may transfer their anger to authorities, whom they may perceive to be in charge of failures in infrastructural provisions or lame climate policies. Moreover, the link between extreme heat and the likelihood of terrorism is becoming clearer. Indeed, most insurgent-prone areas face agricultural productivity and livelihoods disrupted due to climatic stressors, which are a truly fertile recruitment ground for extremist groups. In agriculture-based communities, crop failures or water scarcity due to heat can foster a descent into economic desperation and engender motives of affiliation to violent groups who may offer subsistence money or ideological interpretation of their situation. These groups take advantage of feelings of marginalization that are associated with natural calamity and further redefine it as not having effective political leadership or even part of a greater existential danger, which they seek to exploit to foster political turbulence. In sum, high Heat Index-where the temperature is greater than 35°C-is indicative of much more than an unhealthy environment. It enhances resource competition, promotes misery that leads to civil instability, increases the propensity for person-to-person violence, and builds an environment where recruitment for extremist activities is easier. These events cumulatively threaten political stability through increased potential for violence and terrorism and, therefore, constitute a severe call for policies addressing the issue of climate stress and political vulnerability.

The positive relationship between Heat Index 35 New and Ratio of female to male labor force participation rate (%) (modeled ILO estimate). This can be an association that is explained through the differential impacts of extreme heat on labor sectors dominated by each gender and the resiliency strategies that may be employed by women in developing economies. In very hot regions, classic male-dominated jobs, like those in agriculture, construction, and heavy industry, are extremely physically challenging because of the rising temperatures. Prolonged exposure to heat reduces productivity, creates health hazards, and increases absenteeism, making these sectors less viable under peak heat conditions. Indirectly, in the economies suffering from intense heat stress, there may be a slight restructuring of labor demand toward sectors that are relatively less vulnerable to high outdoor temperatures-incidently, these are female-dominated: healthcare, education, and service industries. This can inadvertently breed a relative increase in female participation. In addition, women might use a more flexible work strategy in developing countries to reduce heat-related risks. Flexibility in this context may mean home-based, flexible, or informal work, enabling women to balance domestic responsibilities with those required for labor market participation. In fact, the motivation for flexibility could be from necessity rather than choice, because the household economic pressures mount under extreme climatic conditions, making women contribute more to the family income. In such cases, the labor force participation of women compared to men may increase as they enter or re-enter the workforce under adaptable conditions that are suited for handling environmental stressors. This positive correlation may also partly reflect policies and labor reforms aimed at increasing female workforce participation in the wake of climate change. The government may encourage women's employment in climate-resilient sectors through targeted initiatives or incentivize the offering of protection against serious working conditions for businesses. Such policies, emanating from urgency to counter adverse impacts of climate change on economic productivity, could inadvertently bolster female participation ratios relative to males. In short, this correlation of the Heat Index 35 New and female-to-male labor force participation ratio is a very intricate interplay of environmental challenges, sectoral labor shifts, and adaptive economic behaviors. This correlation, accordingly, underlines how climate resilience strategies interact with gendered occupational shifts and responsive labor policies in a manner that can change traditional gender dynamics at work. This makes climate adaptability an important aspect in shaping future labor market trends.

The positive relationship between Heat Index 35 New Regulatory Quality. Owing to the rise in temperatures globally because of climate change, the Heat Index, particularly values meeting or surpassing 35°C, has received greater attention from a regulatory perspective. In fact, regulatory quality concerning heat index thresholds, for instance, 35°C, is representative of the increased awareness with respect to the way extreme heat tendencies affect public health, labor productivity, and the environment. A positive relationship exists because the 35°C Heat Index will establish a threshold from which policies, from protection of public health and safety, can be drawn and developed by managing regulations of labor appropriately and encouraging adaptations in infrastructure. However, the Heat Index 35°C is proving to be a threshold for regulatory action since it is beyond that limit when heat exposure poses a hazard to human health. High values of heat index have been associated with heat exhaustion, heat stroke, and cardiovascular strain, especially among the most vulnerable groups of the population, such as the elderly, children, and outdoors workers. Because of these risks, a Heat Index threshold of 35°C aids in the development and enforcement of a variety of different public health interventions by policymakers, such as the issuance of heat advisories, setup of cooling centers, and encouragement of hydration practices. By codifying these protections at 35°C, regulations can serve as preventive measures, protecting not only the citizens but also saving health costs due to heat-related illnesses. Besides public health protection, Heat Index 35°C plays an important role in the labour regulatory frameworks. Regulations fitted specifically to heat exposure among workers outdoors or in areas without air conditioning serve to alleviate the burdens of heat stress in the economic costs related to low productivity, absenteeism, and workplace accidents. Identifying a threshold Heat Index of 35°C will thus enable regulatory agencies to institute understandable and implementable regulations concerning work-rest cycles, break times, hydration accessibility, and personal protective equipment. This regulatory clarity helps employers and employees alike, since it sets the record straight concerning what constitutes safe working conditions, thus protecting labor rights and minimizing company liability. Besides, embedding the Heat Index 35°C in infrastructure planning and environmental regulations will add to further resilience. Urban planning guidelines based on such temperature threshold levels can make green spaces, building materials that reflect heat, or even shaded areas a requirement as a mean of mitigating the urban heat island effect. Besides, the environmental quality regulations that consider the heat threshold can enhance the sustainable energy policy processes further, as there is a peak demand on energy for cooling during an extreme heat event. By tying a regulatory quality to the 35°C threshold, policymakers can spur infrastructure investments in their climate resilience goals to future-proof cities and communities from the scaling-up impacts of climate change. In sum, Heat Index 35°C is more than a simple meteorological measure; it serves as an efficient yardstick to raise the level of regulatory quality. This prompts proactive public health policy, creates equal conditions at work, and informs resilient infrastructure planning. Mediated through this multi-dimension, well-being and stability increase in society due to rising global temperatures.

The negative relationship between Heat Index 35 and Research and development expenditure (% of GDP). High temperatures challenge economic productivity and social well-being-a factor that eventually influences financial commitments to R&D sectors, most especially in developing regions where actual cases of extreme heat are more frequent and funds more scarce. In fact, at a threshold heat index of about 35°C, working conditions become increasingly unbearable; thus, this results in lowered productivity because of the physiological strain that workers will reduce work efficiency and cognitive performance altogether. The immediate effect is a remarkable fall in productivity, which has real economic implications: while the workforce efficiencies go down, businesses and economies face reduced output that might even affect the GDP. Lower growth in the latter may restrict the resources that governments and private sectors allocate toward R&D. In this case, high-heat environments indirectly reduce the potential funds for innovation, as the latter usually represents a discretionary or secondary investment from the perspective of economies where there are more immediate needs. Besides, extreme heat amplifies the costs in other vital sectors of the economy, such as health care, energy, and infrastructure. Higher temperatures increase the occurrence of heat-related illnesses, thus putting pressure on healthcare systems and diverting public funds to emergency responses and health services. Similarly, energy demands are increasing since air conditioners and cooling become indispensable; hence, this increases the cost of electricity and many times requires subsidies by the government. Besides, infrastructures under extreme heat are bound to deteriorate more frequently and thus require more frequent repairs and upgrades, adding burdens to both public and private spheres. These pooled stresses essentially force the government, especially under tighter budgets of the low-income countries, to focus on short-term needs rather than sacrifice in areas of R&D spendings. This potential deficit in innovation is more extreme in those countries highly subjected to heat. Fewer investments in R&D mean fewer technological breakthroughs that could help counter the effects of extreme heat through preheat-resistant infrastructure or advanced cooling technologies. This is thus a feedback loop wherein high heat indexes suppress economic productivity and capacity for innovation, entrenching socioeconomic vulnerabilities in these regions. The inverse correlation of a heat index at or above 35°C with R&D expenditure as a share of GDP is part of a more general trend whereby very hot weather depresses economic growth and also reduces the rate at which essential technological and scientific progress may otherwise be made to meet some of these challenges.

The negative relationship between Heat Index 35 and Rule of Law. This negative correlation between the heat index reaching 35 degrees Celsius and the rule of law may be bettered understood in the context of how extreme heat destabilizes society, public health, and individual behavior-all factors that, cumulatively, tax the systems upholding the rule of law. The latter is epitomized by notions of accountability, transparency, and the equal application of justice against the background of a stable social structure with efficacious governance. On the other hand, extremely hot temperatures, according to scientists, particularly when the heat index is 35°C or higher, is associated with shooting and stabbing, was attributed to increased aggression, decreased productivity, and scarcity of resources. Social harmony breaks down, which does not help the problems of maintaining legal order. Prolonged extreme heat tends to stress human physiology and is associated with rising levels of stress and increased aggression. Psychological studies prove that high temperatures raise irritability and aggression, increasing violent incidents and crimes. This automatically puts more workload on law enforcement agencies and various judicial systems at times when intense heat increases the crime rates. In addition, public resources are usually directed at addressing heat-related health crises, from dehydration to heat strokes, particularly among the most vulnerable segments of the population. The use of resources in coping with the public health crisis during periods of extreme temperature could weaken law enforcement's potential for keeping order and therefore is likely to contribute to less obedience to the rule of law. Another avenue through which the rule of law is adversely affected is via economic and productivity impacts associated with high heat. It has also been proven that extremely hot conditions undermine productivity in outdoor or physically demanding industries. When the heat index reaches 35, laborers can become fatigued and have lower output, sometimes even developing heat-related illnesses, which put economic burdens on individuals and the community as a whole. This economic stress has, in recent times, been increasing social inequalities within communities since low-income populations tend to be more affected by very hot conditions because of the lack of cooling infrastructure. Increasing inequality fuels social tensions within communities and is, thus, potentially fertile ground for civil unrest and instability. It disrupts social cohesion-so important for upholding the rule of law-and serves to undermine trust and confidence among citizens and between citizens and state institutions. The high heat index, besides affecting public behavior and resource allocation, further causes large-scale disruptions to socio-economic stability and treads on the very pillars of the rule of law.

The positive relationship between Heat Index 35 and School enrollment, primary and secondary (gross), gender parity index (GPI). The interaction between high temperatures-the Heat Index at 35°C-and school enrollment rates, through the prism of the gender parity index in primary and secondary education, presents an interesting crossroads of environmental and educational studies. Intuitively, one might think that such intense heat would act to discourage educational engagement, but sociocultural and economic factors buffer and, at times, may even capitalize on this environmental condition to lay a foundation to improve educational attendance and equity. First, in areas where the Temperature Index of 35°C is a common phenomenon, the societies have already adapted to the infrastructure, schedule, and general community activities. For instance, facilities for cooling are better in some schools, with shaded areas or adjusted class schedules for comfort during the hottest time of the day. Such adjustments may "normalize" school attendance even in high temperature cases, hence maintaining the enrollment rate. Schools also tend to provide a point of central activity and learning in which parents can easily center their children's attendance because oppressive heat may restrain community activities outside of school hours. Thus, schools are usually the safer and more comfortable spaces; hence, schools factor into increasing enrollment rates across genders. Perhaps most important, the Gender Parity Index further teases out the nuanced impact of climate on educational equity. The division may reduce, in general, for areas with higher temperatures, when the temperature becomes extreme-for instance, girls helping out with household chores or farming. At the same time, this shift can support a rise in female enrollment, helping bring parity between genders in educational access. In this case, when heating becomes a prolonged environmental factor, families are more likely to support the education of girls out of pragmatism, rather than intensive outdoor activities, and thus improve the metrics on GPI. Besides, a combination of economic conditions with warm climates influences this relationship. Many agrarian societies, in which children might otherwise be expected to work outdoors, often find that exceptionally hot weather reduces such activities, allowing families to support rather than discourage school attendance. This is a substitution effect: children, girls included, are more regularly enrolled in schools during peak heat periods, thereby sustaining or growing overall GPI figures. In turn, the routine presence of a Heat Index of 35°C, rather than decreasing access to education, can paradoxically support higher school enrollment and gender parity. This is because households and schools in such an environment typically make specific adaptive strategies with the use of educational access as a response to the environmental constraint of extreme heat. Therefore, a positive relationship arises in which a challenging environmental factor creates an indirect contribution to equity in education and higher enrollment rates.

The positive relationship between Heat Index 35 and Scientific and technical journal articles. The concept of a "Heat Index" reaching or surpassing 35°C is, therefore, increasingly critical in any discussion centered on climate change, for such a threshold indeed shows that the environmental condition has become bad for human health and productivity. Scientific and technical journals are very important in advancing our understanding of this threshold, especially by providing research that deals in-depth with the effects caused by heat extremes and innovation needed to minimize these effects. The high heat indices and the growth of scientific literature must have gone hand in hand: with more occurrences of high heat index, the requirements for research increase, and with more research, societies are better poised in responding and adapting to such climate challenges. The researchers are studying further how extreme heat affects infrastructure: power grids, water supplies, and transportation systems. Each publication develops new insight into the many ways in which heat affects human societies and ecosystems, often leading to specific policy recommendations related to heat management, urban planning, and emergency preparedness. The interdisciplinary research it encourages due to emergency seating created by high heat indices is the reason it has coupled huge publication output of environmental science with technological innovation. These are studies, for instance, testing usage of new materials in construction to keep buildings cool or green infrastructure solutions such as increased urban tree cover and reflective roofing. Scientific journals document these findings and thus often give a foundation for governments, businesses, and individuals who will make informed choices from the information received with regard to adaptation to high heat. Therefore, in response to global trends on the warming of the earth, with continuous publication of articles on high heat indices such as 35°C, technological advancement in predictive modeling and remote sensing is encouraged, allowing for more precise monitoring of heat waves and more effective forecasting.

The positive relationship between Heat Index 35 and Strength of legal rights index (0=weak to 12=strong). On the other hand, the high Heat Index, at the level of 35°C, relates to the Strength of Legal Rights Index based on the interaction between climate resilience and a strong legal infrastructure. As the temperatures rise, societies also become increasingly vulnerable to environmental and economic stresses, which include heat-related health hazards, loss of productivity, and stress on infrastructure. Large legal frameworks become critical to effective dealing with such issues in areas where the constant Heat Index reaches 35°C or higher. A good indicator of the ability of a given society to adapt to such environmental stressors would be the Strength of Legal Rights Index, which measures the robustness of legal protections for businesses, consumers, and the vulnerable. High-temperature regions are often faced with growing demands for adaptation measures that contribute to safeguarding public health while being economically resilient and maintaining social welfare. A good score in Strength of Legal Rights Index means that a jurisdiction is able to enforce property rights, regulate labor conditions, and facilitate financing to businesses-all factors that build resilience. Examples include how powerful legal rights are enacted through labor protections, such as safe working conditions in extremely hot environments, forced breaks, and proper hydration for individuals in the workforce, especially of outdoor or high-exposure industries like construction and agriculture. This handling ability, by strong legal rights, diminishes the adverse effects of high temperatures and lets economic activities that are persistent in a sustainable way toward the extremes in weather. In addition, the strong legal frameworks ensure investment in climate-resilient infrastructure on account of securing property rights and access to credit. This will mean that when property and legal rights are well-protected, investors have more reason to finance those upgrades in infrastructure that enable higher temperatures to be withstood, such as enhanced cooling systems, green energy solutions, and climate-resilient public spaces. The strength of the law allows governments, businesses, and individuals to proactively address much of the impact that could be expected from frequent extremes of heat. The resiliency built by high levels of legal rights protect health and productivity along with enabling communities to invest in sustainable growth, as a function of how well-functioning legal regimes are adaptive in the presence of climate stressors such as high heat. In that sense, a high Strength of Legal Rights Index is part of what it takes to thrive in very challenging thermal climates.

The positive relationship between Heat Index 35 and Voice and Accountability. With a Heat Index of about 35°C, it is observed that people feel acutely ill at ease physically, get easily irritated, and their energy level is flaccid. Though such a threshold of heat is apparently a health matter, indirectly it affects structures in society pertaining to governance, representation, and public responsiveness. As it crosses the uncomfortable threshold in temperature Heat Index, responsive governance becomes all the more important for peoples experiencing heat waves and climate volatility. This brings an aspect that is an essential measure of governance: Voice and Accountability captures perceptions of citizens' ability to participate in selecting their government, freedom of expression, and association under such conditions. Such frequent and widespread impacts of extreme heat are bound to create a bottom-up demand from the citizenry for increased accountability at both the local and national levels concerning statements on climate adaptation policy, health systems, and robust infrastructure. It is this rise in demanding accountability that underlines a very important interlink: the more environmental stressors increase, the more expectations go up for responsiveness and openness within government regarding crisis management. Apart from that, extreme weather events have a grouptech effect. Such conditions of high Heat Index disproportionately affect the already marginalized communities, who are usually more vulnerable due to lesser or no access to air conditioning, healthcare, and safe housing. For this reason, there is an emerging need in these communities regarding forums to voice their concerns in order to influence policies related to climate adaptation and resilience. In this context, Voice and Accountability mechanisms become cardinal. Opening channels for feedback from citizens, public consultations, and nondiscriminatory representation allows policies to take into consideration the needs of vulnerable groups and therefore enhances responsiveness toward more inclusive governance. Where Voice and Accountability are strong, it tends that the citizenry has more access to information on environmental hazards and various ways of making their leaders accountable for taking insufficient action against climate change. This is a correlation that underlines the importance of a governance framework that would actively involve citizens' contribution to environmental discourse and policymaking, amidst a worsening heat challenge. In essence, a higher Heat Index around 35°C would be speaking indirectly to the principle underlying Voice and Accountability for more responsiveness in governance by increasing people's awareness and desire for it and thus show how deeply environmental conditions can affect societal expectations and standards of governance.

6. Policy Implications

The findings of the implications of the policy addressing HI35 in view of Environmental, Social, and Governance pillars have indicated that a range of urgent priorities now pertaining to extreme heat policymaking need to be considered by policymakers to build resilience. Connotations on environmental policy brought about by HI35 in this respect, call for policies related to proper resource use and conservation effective forthwith. Higher temperatures increase the need for water in agriculture and urban areas while simultaneously pulling up the consumption of energy for cooling. High-temperature demand increases the use of water in agriculture and cities, together with increasing energy use for cooling. That would involve multi-dimension water-energy management policies by the policymakers, which would not lead to greater scarcity of either resource; for example, water-saving agricultural practices should be encouraged, drought-resistant varieties of crops subsidized, and renewable sources of energy developed. Moreover, high temperatures relate to increased demand for cooling systems, most of which depend on fossil fuels most of the time and could continue to build up gases in the atmosphere. Therefore, incentives towards energy efficiency, clean energy investments, and improved grid resilience will ensure that pressure on national energy systems is reduced amidst increased demand. Of course, such policies tend to point towards a way of ensuring environmental sustainability while extreme heat events increase in frequency and severity. Social policy, too, is obliged to address the broad health concern and wide concerns of equity issuing from manifestations of heat stress due to HI35. The most vulnerable populations include children, the elderly, and economically disadvantaged groups that cannot afford access to cooling measures and health care. Thus, the heat health infrastructure reflecting better policies to deal with increased incidence of heat-related diseases, especially in those areas which tend to show high HI35 days. Concretely, this involves policy measures regarding the creation and provision of public health facilities, including cooling stations, free water points, and an early warning system against heat waves. The change in labor policy to high temperature will further implant heat-protective work regulations in outdoor high-exposure industries, which are among the most vulnerable to heat stress. Such interventions will additionally and importantly help in improving productivity and reducing health hazards among various socioeconomic groups, especially those dependent upon labor-intensive sectors such as agriculture and construction. These inclusive and equity policies form the very foundation of reduced disparate impacts of extreme heat along demographic and economic lines. Governance implications of HI35 emphasize adaptive, accountable institutions.

In this view, resilience might be derived from appropriate governance structures that turn their attention to adapting to complex and interconnected impacts of extreme heat. In other words, policy frameworks more supportive of public involvement in the decision-making process will thus bring about more responsive and inclusive climate adaptation policies in return. Where frequent HI35 days are perceived, governments ensure transparency and accountability in policy execution related to climate resilience through infrastructure upgrades and public health measures. In addition, extreme heat events can also push political stability to a breaking point-competition for water and energy resources which could heighten the dissatisfaction of the populace and result in unrest in under-resourced regions. Thus, equitable distribution and wise resource management would inspire a model of governance that reduces such risks while improving social cohesion. While policies ensure openness and participatory governance, they are in a better position to address the various challenges related to climate change and provide avenues of stability even under negative environmental conditions. The latter refers to the economic consequences associated with HI35, suggesting that policy should be directed toward resilience in economic sectors susceptible to heat stress. This might include very high temperature industrial adaptation and climate-resilient infrastructure investments, along with facilitating innovations within heat-tolerant agricultural technology. Equally important will be investment by governments in R&D that yields technologies capable of mitigating the impact of extreme heat: energy-efficient cooling systems, climate-adaptive urban designs, efficient water use technologies. In setting a premium on R&D, policy makers can permit the economies to adapt with sustainability into a climate in change, protect the long-run productivity, and the economic growth within heat-stressed sectors. Above all, policy implications of HI35 bring out multi-dimensionality of environmental sustainability, social equity, good governance, and economic resilience. These four pillars should underpin the closing adaptive and proactive policies pursued by policymakers in response to extreme heat systemic consequences, over-exploitation of resources, and the path towards sustainable development in a warming climate.

7. Conclusions

The conclusions that could be derived from this paper bring into sharp focus the pressing need for adaptive policy interventions at all levels across the domains of ESG in reducing the impacts of extreme heat. High HI35 days create increased demands on limited resources in both water and energy supply. Such kind of pressures require supportive policies that can work hand in hand with natural resource management for sustainability, especially in water-scarce regions, and scale up renewable energy to meet raised cooling conditions without adding to greenhouse gas emissions. Policymakers therefore will have to address transitioning into more sustainable systems and give incentives for technologies that minimize resource depletions, including energy-efficient cooling technology and water-conserving agriculture. From the social perspective, HI35 days reflects health risks, decreased healthy labor productivity, and enlarged inequalities. Heat stress affects the low-income population those who perform labor outdoors. As a result of this fact, more public health programs are needed in addition to labor protection. First and foremost, one must ensure access to cooling centers with heat-protective work regulation and health care within reach. These are all vital public health measures as well as productivity-enhancing ones. Equitable social policies must be laid down to safeguard the most helpless of all citizens from the misfortune brought about by intense heat. Governance structures are also playing a role in addressing these different challenges due to HI35: It wants transparency, accountability, and adaptive governance frameworks to meet resource competition, public dissatisfaction, and even civil unrest from extreme heat events. Effective governance should target the involvement of civil society in decision-making on policymaking, in providing incentives in adapting to climate change, and in enhancing resilience through judicious investment in infrastructure. Inclusive governance may enhance social cohesion and, by so doing, enable the capacity of the community to stand firm against the ravages of extreme temperatures. The economic dimension brings in an important case: the building of resilience in temperature-sensitive sectors. The government can reduce the economic risks from HI35 by investing in climate-resilient agriculture, energy-reducing industry, and infrastructure innovations. Investing long-term in research and development related to adaptation technologies of climate change runs against short-term economics. In all ends, HI35 is well worth an indicator toward integrated policy responses along environmental, social, and governance lines. In turn, this paper calls for holistic climate adaptation, resource management, equity in social arenas, and responsive governance to match the rising complexities of issues brought about by extreme heat.

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