Page 5590 - 5608 **DOI:** *https://doij.org/10.10000/IJLMH.111151*

INTERNATIONAL JOURNAL OF LAW MANAGEMENT & HUMANITIES

[ISSN 2581-5369]

Volume 4 | Issue 3

2021

Effects of Climate Change on Human Rights of Labor

ANUBHAV CHAUDHRY[1]

ABSTRACT

Although there is broad empirical understanding on the need for action to avoid global warming and potential ecological calamity, it would undoubtedly prove more intricate than it expected to be to establish and enforce global warming policies. Emerging economies face as much as 10 per cent losses in working hours because of deteriorating thermal conditions in the workplace due to climate change, according to a new report. The reasons are the complexity of the danger and the extreme conflict between the danger and the types of issue which democratic governments usually face. The greenhouse effect in particular presents significant challenges for the mechanisms for creating a community and for having developed industrial economies able to compromise. This article explores facets of global warming policy at international level and discusses some of the main environmental, political, and social dimensions of industrial democracies' reaction to the challenge of global warming to date. Overall, I try to make it clear with this article and make it clear that climate change leads to heat stress in the world of work must be tackled, above all, by promoting occupational safety and health, social dialogue, and structural transformation in agriculture, and by encouraging the development of responsible and sustainable, or "green", businesses. An integrated approach was also taken in 2019 by the Global Commission on the Future of Work, which highlighted the need for a universal labor guarantee that includes health and safety standards in all places of work.

Keywords- *Climate Change, Human Rights, Labor, Green, Workplace.*

I. KEY POINTS

- Excessive workplace heat is a well-known occupational health and productivity danger: high body temperature or dehydration causes heat exhaustion, heat stroke and in extreme cases, death. A worker's natural protection is to slow down work or limit working hours, which reduces productivity, economic output, pay and family income.
- A range of key international and national labour standards informed by decades of ergonomic and occupational health and safety research are designed to protect workers from

[1] Author is a student at Amity Law School, Noida, India.

 [ISSN 2581-5369]

adverse thermal conditions (high heat levels).

- Levels of heat in many tropical locations are already very high with respect to thermal tolerances even for acclimatised populations. Hot days and hot hours affect virtually all workers operating outdoors or in non-climate-controlled conditions across several world regions. The continued changes to the climate with growing heat worsen the situation.
- Highly exposed zones, with effects experienced on a macro-scale, include the Southern United States, Central America and the Caribbean, Northern South America, North and West Africa, South and South East Asia.
- By the mid-1990s, heavily exposed countries, such as Bangladesh, have been estimated to have lost approximately 1 to 3% of the entirety of available daylight work hours due to heat extremes, underscoring the current nature of the problem with workers and employers needing protection now.
- Future climate change will increase losses. Even if the current commitments of the world governments to combat climate change are realized, losses by the end of this century to most vulnerable economies of all available daylight work hours will double or triple.
- The IPCC's 5th Assessment Report confirmed that labour productivity impacts could result in output reductions in affected sectors exceeding 20% during the second half of the century–the global economic cost of reduced productivity may be more than 2 trillion USD by 2030.
- The lowest income-bracket work – heavy labour and low-skill agricultural and manufacturing jobs – are among the most susceptible to climate change.
- Through this and other challenges altered thermal conditions also undermine development and present multi-faceted hurdles for the achievement of the Sustainable Development Goals (SDGs) related to poverty (SDG1) and hunger (2), health (3), education (4), gender (5) and income inequalities (10), good jobs and growth (8), and sustainable cities and communities (11), as well as climate change (13).
- Heat extremes also affect the very habitability of regions, especially in the long term, and may already constitute an important driver of migration internally and internationally.
- Since November 2015, the ILO adopted Guidelines for governments and other labour organizations to address the health and safety ramifications of climate change. But no international organization has established a programme to assist countries vulnerable to the challenges of climate change for the workplace.

 [ISSN 2581-5369]

- Limiting warming to 1.5 Celsius degrees as enshrined in the UNFCCC Paris Agreement would still result in a substantial escalation of risks but increases the viability of adaptation measures and contains the worst impacts in health, economic and social terms.
- Actions are needed to protect workers and employers now and, in the future, including low-cost measures such as assured access to drinking water in workplaces, frequent rest breaks, and management of output targets, carried out with protection of income and other conditions of Decent Work.

II. INTRODUCTION

For more than two decades, governments around the world have been addressing the problem of global warming. Human actions – especially the burning of methane, oil and other fossil fuels – contributing to carbon dioxide and other dangerous "greenhouse gasses" (GHGs) pollution accelerate the warming of the Earth's atmosphere. Global climate change in effect results in rising Heat Stress, Sea Levels, Droughts and Floods, crop destruction and disruption to natural ecosystems and biodiversity. Global warming creates change. As the extremely harmful impacts of climate change have become more evident and better understood, government efforts and gradually non-governmental organizations to reduce and respond to these consequences have evolved.

Signing the UN (UN) Climate Change Framework Convention (FCCC) at the United Nations 1992 Environment and Development Conference (The Earth Summit) represented a landmark in this endeavour. There were difficulties and disagreements among countries in further international negotiations, including those relating to the Kyoto Protocol to the FCCC of 1997 – which provided for a small number of mandatory reductions in GHG emissions by developed countries – and further discussions on how it should be applied. Such debates were intensively active in the countries of East Asia (i.e., China, Northeast Asia and South East Asia). In addition, they are essential to international climate change efforts. Including the second largest issuer of GHGs in the world – China – and other major contributors among developing countries with rising pollution. East Asia also comprises one of the largest economic forces worldwide and one of the largest environmental aid contributors to the developing world, particularly in the region: Japan. Yet Eastern Asia is home to many developed countries with large populations most affected by climate change. China and Japan, two of the most important East-Asian countries in the field of global warming and explores the position of other East- and Southeast-Asian countries, such as Indonesia and the Philippines, in resolving the issue. The goal of this series is to further intensify this phenomenon by publishing books that explore the

 [ISSN 2581-5369]

existence and centrality of environmental policy in the context of politics per se. The series involves wide knowledge of politics, and books would concentrate on current topics like government and modern social movements as well as developing fields such as cultural culture and political economy. The show would examine current democratic processes as regards the climate and/or discuss possible directions in which contemporary politics might be 'greening.' The show will not only attract scholars and environmental students but would also need a more general reading.

The impact of heat stress on labour productivity is likely to be among the most serious economic consequences of climate change. Economic losses are expected to occur at various levels, affecting individual workers, their families, businesses and entire communities. In the case of heavily exposed economies, the effects could be so strong as to undermine national economic output, which in turn would have implications for the global outlook. The economic, social and health effects of heat stress would make it harder to tackle poverty and promote human development, and, consequently, also to attain most of the United Nations Sustainable Development Goals (SDGs), including those related to poverty, food security, health, decent work and economic growth, inequality and cities. [2]

If no efforts are undertaken to improve the adaptive capacities of workplaces across all countries, rising temperatures are likely to jeopardize progress towards the environmental, social and economic sustainability objectives laid down in the SDGs.

It is clear that preventive measures must be taken proactively to deal with heat stress. Together with governments, both employers and workers should be involved in the design and implementation of mitigation and adaptation policies. As indicated in the ILO's 2015 *Guidelines for a just transition towards environmentally sustainable economies and societies for all* (hereinafter referred to as the ILO *Guidelines for a just transition*), workers and employers are best placed to implement adaptation measures and to take action at the workplace, such as ensuring compliance with health and safety standards and finding practical solutions to enable workers to cope with high temperatures and continue to do their jobs.

This report looks at the impact of rising temperatures, and of the increasing frequency and intensity of heatwaves, on decent work and labour productivity. Drawing on climate and employment data, it presents estimates of the current and projected productivity losses resulting

1. [2]Jagers, S.C.; Stripple, J. (2003). "Climate Governance beyond the State". Global Governance. **9** (3): 385–400. doi:10.1163/19426720-00903009.

2. Thecvf.org. 2021. <http://www.thecvf.org/wp-content/uploads/2016/04/Climate-Change-and-Labour-Impacts-Of-Heat-In-The-Workplace.pdf> [Accessed 5 February 2021].

 [ISSN 2581-5369]

from heat stress at the national, regional and global levels. Our analysis takes into account the fact that temperature, humidity, wind speed, physical intensity and other factors affect the way in which rising temperatures impact on the physical work capacity of workers. Productivity loss is measured in terms of reduced work capacity and translated into an equivalent number of working hours lost. The effects of heat stress on workers are reported for four sectors, to each of which we have assigned one of three levels of physical work intensity. Higher physical work intensity is assumed for workers in agriculture and construction (these workers are also assumed to work outdoors), moderate intensity for industrial workers, and lower intensity for service workers. The report continues with a discussion of relevant adaptation and mitigation policies. In the short run, proactive employment policies and appropriate climate change adaptation measures are required to enable workers, businesses and vulnerable households to adapt to rising temperatures. In the long term, climate change mitigation is indispensable if occupational heat stress is to be prevented and the future labour force protected from heat-related risks.

For a number of reasons, the case study in this is significant. In East Asia, many of the root causes and future solutions to the problems of global warming and climate change are deeply cotton. Since the world needs the US and the other developed countries to reduce their substantial GHG emissions, it must also include the East Asian countries which contribute significantly to the problem by emissions themselves if this problem is addressed with the requisite vigour (at the time this is published, the prospect of this occurring is rather dreadful sometime soon). Just like the larger communities of East Asia are particularly vulnerable to climate change, as is significant from a human well-being viewpoint. Their physical circumstances and their sometimes-extreme deprivation have significant repercussions, typically in painful ways, and these results are difficult to overcome. Therefore, we have to consider seriously and understand the role performed by East Asia countries if we concern ourselves with the problem of climate change and if we worry about the human suffering that it creates.

To this end, this puts several significant domestic and international development and political economy research and thought on climate change in East Asia together into a single volume. This type of research, although much of the reasoning contained here is original, is present elsewhere in the specific book chapters and journal articles. In doing so, we have consciously tried to combine the analysis and experiences of Western academics with those of local citizens. This is crucial, we agree, because there will be various people in the region who recognize what problems are relevant, what steps need to be done to tackle this problem and exactly what

 [ISSN 2581-5369]

powers and players take part in the policies of the East Asian countries.

(A) Climate change and the rising incidence of heat stress

This section discusses global heat levels and presents an overall picture of the countries and regions that are at risk. In order to estimate the incidence of heat stress, one of the most common heat stress indices in occupational health is used, namely the wet bulb globe temperature (WBGT), measured in degrees Celsius. The WBGT index was specifically designed for work activity assessments and is calculated on the basis of temperature, humidity, air movement (wind speed) and radiated heat (sun or shade) (Parsons, 2014). For the purposes of our analysis we have calculated the maximum WBGT value for the hottest month in small geographical areas (grid cells), following the same method that was used to identify heat threats to occupational health in the latest IPCC Assessment Report (IPCC, 2014a).

The heat levels and trends presented in this section cover two periods of 30 years each. Thirty-year averages are used because the climate science community regards 30 years as the minimum time period over which a long-term climate trend, as opposed to weather or extreme events, can be demonstrated (WMO, 2018). The values presented for climate variables are therefore "snapshots" of the 30-year mean of these two 30-year periods. For example, figure 2.1 covers the years 1981–2010 and offers a snapshot of the climate in 1995, while figure 2.2 covers the years 2071–20991 and offers a snapshot of the projected climate in 2085.

Fig 2.1

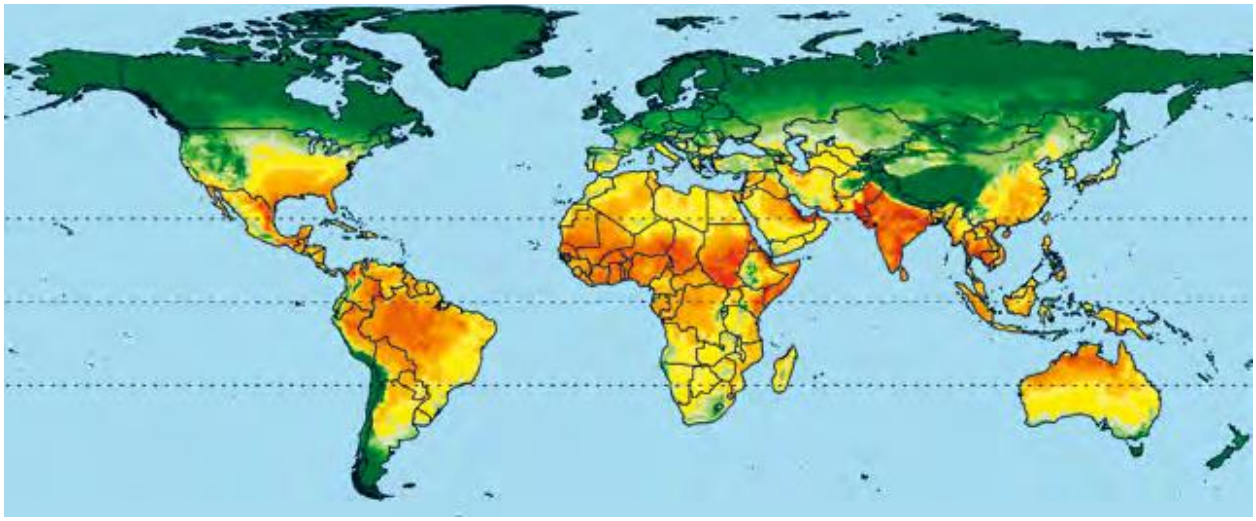
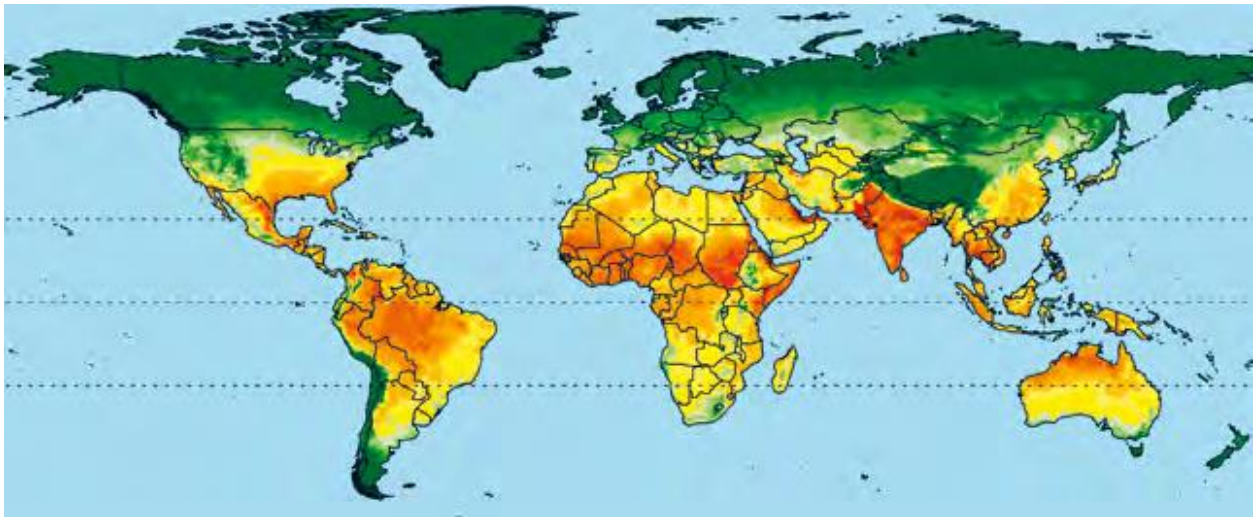


Fig 2.2



The distribution of heat stress in the world is not uniform. As can be seen in figure 2.1, the tropical and subtropical areas are the hottest overall. The month that is actually the hottest in each of these areas depends on several variables, such as wind patterns and monsoons. It is worth noting that the WBGT values shown in this figure are based on temperatures measured in the shade; in full afternoon sun conditions they would be around 2–3°C higher.2

To help workers in hot areas cope with the heat, certain adjustments need to be made, such as scheduling work appropriately and allowing for rest periods to reduce heat strain on their bodies. This is an example of an existing climate-related impact on labour productivity. The only cool areas in the tropical and subtropical latitudes are to be found at high altitudes, including parts of Mexico and South America (the Andes), Eastern Africa (Ethiopia and Kenya) and Asia (Tibet and the Himalayas). Consequently, workforce output in tropical and subtropical regions is already lower than that in cooler regions (Gallup, Sachs and Mellinger, 1999).

Figure 2.2 shows, using the same colour scheme, the projected incidence of heat stress in 2085 under a scenario in which the global mean temperature increases by 2.7°C above pre-industrial levels by the end of the century in accordance with Representative Concentration Pathway 6.0 (RCP6.0). The latter is one of the four scenarios for the evolution of atmospheric concentrations of greenhouse gases (GHGs) adopted by the IPCC (2014b), which correspond to four different climate futures. As can be seen from comparison with figure 2.1, the greatest increases in heat stress in populated areas are expected to occur in sub-Saharan Africa, southern India, northern Australia and South-East Asia.

 [ISSN 2581-5369]

III. CLIMATE CHANGE AND EAST ASIA: DOMESTIC POLITICS, FOREIGN POLICY, AND INTERNATIONAL RELATIONS

Given East Asia's significance in combating global warming and climate change, what general lessons should we derive from the study of countries within the region in this book? Most countries and their foreign affairs outside their boundaries are rather wide and applicable; others are rather regional, sometimes unique, but have an effect on international relations in the area and beyond. We will consider the environmental mechanisms and consequences themselves from a broad perspective (as we might see them as structural forces), including the global warming, the impact of climate changes on the countries and the citizens of East Asia. The effects of climate change are essential to us. This ensures that climate change influences all the other factors that control climate change policies in East Asia both domestically and internationally. In fact, views of how climate change impacts national interests such as economic development and well-being are policy factors. This illustrates science's important role as an opportunity for political negotiations, government reactions, and the more general value of knowledge and expertise in influencing domestic and international policies (such as awareness of the economic effects of climate change and possible answers). Thus, the most climate-affected countries in East Asia (e.g., the Philippines and Indonesia) that take great interest, at least at an initial level of analysis, in international talks and mitigation steps.

However, other specific powers control political discussions and political processes. These include the rich inequalities between nations, the structural gaps in the accountability for current levels of GHG atmospheric and foreign (in)justice and (in)equity considerations.

This is a very important matter for the East Asian countries, and in politicizing the international policy cycle, they will distract attention from the real and alleged impact of climate change. International justice and equality problems underline the important role of international aid amongst wealthy and poorer countries. international assistance. China, for example, has demonstrated that practical measures can be taken to tackle emissions of GHGs; according to new studies, its emissions in recent years, given its strong economic development, have not risen dramatically. Even if it’s real emissions are rising, they do not increase at a pace similar to the growth rate. Certainly, China's attempts to move to less polluting energy will justify this in large part for factors beyond the fight against climate change. Yet China needs a lot of support from rich countries to move for more productive and sustainable energy usage and wants developing countries to provide a precedent before taking any further steps in particular to tackle climate change-related air pollution. Similar views prevail in other developed

 [ISSN 2581-5369]

countries in the region.

Many of the financial assistance for creation in East Asia is given from inside the area and is less disruptive to the global environment. Japan has supported its neighbor's significant development help. But Japan's impetus for support is certainly not always, or even sometimes, explicitly connected to global warming and climate change and at least the legal system for climate change. Rather, Japan's initiatives are also more strongly related to the bureaucrats' views of national and corporate interests; or funding for environmental growth is regarded as a way of improving Japan's foreign image. This, apart from demonstrating some of the complexities related to climate change North-South assistance, shows that climate change motives are not as straightforward and unambiguous as cursory analysis would expect. Therefore, specific factors – often entirely unrelated – in relation to climate change impact national policies.

Further insights may be obtained when getting closely at particular events. What function does the wish for international recognition and leadership amongst countries, for example, play? Some nations, for example, China and Japan, want to and are international leaders in various areas of concern. But there are limits on their desire to lead. China, for example, continues to lead the developing world, refusing the demands of the developed countries to agree strongly to lowering their emissions of GHG and rejecting multilateral attempts to influence their pollution policies. Nevertheless, it has been successful in voluntarily curbing its pollution and, in its mutual efforts to push its economic growth course in an environmentally friendly direction, it willingly supports other countries (especially Japan). That is so it can more effectively monitor these activities, using the international climate change funding and more efficiently advance its unique national interests. Japan needs to rule, too, and its reputation is obviously of concern worldwide. However, its diplomacy on climate change may not be inspired by the climate change problem itself, which helps explain why it wants to lead in part in shaping Japan and Japanese foreign policy views of its global neighbours.

The accompanying case studies provide other examples. In East Asia international cooperation and policy making, history and environmental expertise are sometimes important. For example, experience of conflict and conquest, maybe unexpectedly, has had an immense effect on climate change politics in East and South-East Asia. (The effects are not, of course, fresh, and have not been addressed in current literature that discuss environmental diplomacy and sustainable development in the region.) As a result of China's Western domination, China remained wary of external influences and threats in particular in the 19th century. Which affects their ability to be bound by international organizations' environmental norms, even though they

 [ISSN 2581-5369]

are interested in influencing them, and much more limits their readiness to enable other parties to control and manage projects related to climate change. Moreover, the wars and massacres of Japan in the last century have been recalled by China and the Eastern Asian countries. As a result, they decided that in the form of development assistance to tackle emissions leading to global warming they should offer help as a retaliation, and Japan accepted to do so frequently (among others, with greater self-interest, fair support for that help). Also significant is environmental history. Japan's history in the area of horrible air emissions has contributed to valuable insights, and this has influenced both domestic and foreign climate change policies.[3]Thus, it has been effective in resolving its environmental challenges, but it has been also discouraged from taking a constructive approach in solving global environmental concerns while resolving domestic issues. China still has chronic natural problems in emissions, if not worse, because of the vast number of adversely impacted. Chinese citizens endure almost appallingly. Such recent trends and their current changes are forcing China to take even greater steps to counter global warming emissions, tackling some of the worst regional environmental problems in the world.

(A) Occupational health impacts of climate change other than direct heat effects

This Issue is focused on the effects of changing thermal conditions in workplaces and the related economic, health and social repercussions. However, climate change is also responsible for a range of other occupational health and productivity threats. Climate change entails, for instance, more extreme weather events and these create injury risks for affected populations as well as for the emergency workers trying to help the other victims. Violent storms, floods and resulting landslides, as well as forest fires due to drought, are all creating occupational health and safety hazards for outdoor and indoor workers, as well as for the relief workers. There are mental health effects including suicides among farmers whose harvests fail due to climate change. Secondly, in assessments of climate change health impacts, the changing patterns of vector-borne diseases are routinely highlighted. One aspect of such health risks that is likely to be a health hazard for workers, particularly agricultural workers is the probability that daily work has to be shifted to cooler dawn and dusk periods as the middle of the day is too hot to work. Disease spreading vectors such as mosquitoes are more likely to bite people during these cooler hours, and so the risk of malaria and other diseases may increase. Another indirect effect

3. Bernstein, S., Betsill, M., Hoffmann, M. & Paterson, M. (2010). "A tale of two Copenhagens: Carbon markets and climate governance". Millennium-Journal of International Studies. **39** (1): 161–173. doi:10.1177/0305829810372480.

4. Bulkeley, H.; Newell, P. (2009). Governing climate change. New York: Routledge.

5. Jean-Philippe Therien (2009). "Beyond the North-South divide: The two tales of world poverty". Third World Quarterly. **20** (4): 723–742. doi:10.1080/01436599913523.

 [ISSN 2581-5369]

of increasing heat is a likely increase of exposures to hazardous chemicals. At higher temperatures chemicals in workplaces evaporate more quickly and the chemical amounts that the workers inhale from the workplace air will increase creating an increased risk of poisoning.

(B) Reduced labour productivity due to heat.

It should be pointed out that in South-East Asia, for example, the heat stress level is approximately 2-3oC (WBGT) higher in the sun during the afternoon than it is in full shade or in indoor workplaces without cooling systems. This is why it is essential for the interpretation of workplace heat stress issues to consider whether outdoor workers are protected by shade, workplace cooling systems, special clothing, or other parameters. Analyses of the annual losses of daylight work hours due to excessive heat exposure show substantial losses in many regions of the world. The losses in the 1980-2009 period are already up to 5-7% for several regions. Estimates for 2030 showed that the worst affected regions would be South Asia and West Africa, and ten regions in Asia, Africa and Latin America have more than 2% of work hours lost by this date. The underlying physiological and agronomical science for these calculations of health risks and productivity loss are very robust and well established. The key question is whether to focus on the increased clinical health effect risks as workers keep their work activity going at usual speeds, or on the labour productivity loss risks as workers slow down to avoid health effects. Many health professionals and scientists appear to consider the productivity loss as a "non-health effect" and therefore not worth including in health impact analysis. But this oversight undermines efforts to achieve Decent Work, which includes both health protection and fair income protection. [4]

(C) Extent of current climate threats to labour

It is now well recognized and established in science that the global climate is already changing towards higher temperatures. Much of the analysis by climatologists and in public debate focus on the average global temperature change, which increased by 0.74o C per century (or 0.074o C per decade) in the period 1906-2005. More recently, the World Meteorological Organization (WMO) announced the likelihood that the planet has already warmed by 1o C since the pre-industrial era (WMO, 2015). The bulk of that warming occurred in recent decades in an

6. [4] Boyd, W. (2010). "Ways of seeing in environmental law: how deforestation became an object of climate governance". Ecology Law Quarterly. **37**: 843–857.

7. Hammer, M.; Peet, J.; Vincken, M. (2009): Coping with uncertainty. Accountability challenges in global climate governance, One World Trust Briefing paper number 123, December 2009

8. Power, G., Maury, M. & Maury, S. (2002). "Operationalising bottom-up learning in international NGOs: Barriers and alternatives". Development in Practice. **12** (3): 272–284. doi:10.1080/0961450220149663.

9. Roper, L.; J. Pettit (2002). "Development and the Learning Organisation: An Introduction". Development in Practice. **12** (3/4): 258–271. CiteSeerX 10.1.1.525.9449. doi:10.1080/0961450220149654.

accelerating trend whereby all but one of the ten hottest years since records began have occurred since the year 2000, the warmest yet being 2015 (WMO, 2015).

These changes are not the same everywhere in the world and according to routine recordings at weather stations in Asia and Africa, the increase of annual mean temperature from 1980 to 2012 is often 0.2-0.8o C per decade (and even > 1o C per decade), much faster than the global average from 1906 to 2005. Using existing climate data for 67,000 geographic sections over land around the world analysis can show the levels of different heat stress indexes.

The future modelling of climate change impacts is based on the analysis carried out for IPCC by a large number of scientists (Collins et al., 2013). This Issue Paper uses two well tested models. Estimates can therefore be considered robust and can be used as indications of how climate change will affect labour conditions and productivity. This report does not include the details of methods used, which are available in published references.

IV. INTERNATIONAL CLIMATE CHANGE REGULATION

The governments' decisions and behaviour against each other and the challenges posed by them are influenced by several variables. Indeed, the factors are far more nuanced, diverse and disputable with regard to global warming and the effects of climate change than in other fields of economic and foreign policy. Many of these factors in East Asia are discussed through case studies in this novel.

According to **Paul G. Harris (2009)**, Presents a first with the following case studies.

He looks at two specific concerns that permeate the discussions on climate and policy: (1) the ecological and, more importantly, socio-economic impacts for the countries of the area and, of course, precede and influence most of the subsequent agreements, discourse, and activities of each country and of the international community to a large extent. Such two specific topics are essential factors for climate change strategies and are crucial for helping us to recognize why and how countries react at state, global and international level to climate change. There are concerns about the impacts of climate change across countries, but not just significantly. Requests for redress influence the ability of countries to participate and to adopt the FCCC and its corresponding international instruments and also dictates the potential of other countries for concrete action to curb global change and to resolve its harmful impacts. The FCCC and related international instruments are addressed.

Harris discusses some of the evidence on climate change and its potential effects in East Asia and its related studies. As the reports indicate, the area faces big, most of them unexpected

challenges. He then quickly discusses some overarching legal issues in regard to climate change justice before summarizing how it is part of a broader international climate change agenda. (Later chapters look in more depth at effects in countries in particular.) He believes that the climate change effects are not necessarily important to Eastern Asian countries. Of necessity, an increased perception of the potential impacts of climate change has raised knowledge and concern. Strong questions regarding justice however (not to mention certain problems posed in the following chapters) may be hindrances.

(A) Current Legal Challenges in Climate Change Justice

The international community has experienced a fractured and dispersed system in relation to climate change justice over the last 20 years given the substantial growth and numerous achievements of foreign environmental legislation. This heterogeneity is attributed over part to a wide number of related areas of foreign judicial action, but also to the size and scope of international development. Many aspects of international law are applicable to the issues posed by climate justice, but the new regulation has not been developed for and is not necessarily well tailored to addressing the issue of climate change.

- Human rights law,
- Foreign law affecting such adaptation steps, and
- State accountability, and issues depending on the application of each or all such mechanisms on alleviate sources of pollution disruption,
- The current structures under foreign and, where appropriate, global and domestics in human protection law.

(B) Possible heat protection measures

- **Direct:** engineering solutions, such as cooling and air conditioning, building insulation, shade and worker rehydration stations, and protective clothing; administrative controls, education and awareness campaigns and worker practice and monitoring programs (e.g. rest, scheduling and acclimatization regimes, bio-physical monitoring and other related measures); strengthening labour institutions, guidelines, regulations, protection programs, and policies.
- **Indirect:** fiscal and regulatory intervention to speed structural shifts of economies towards industries involving non-outdoor work (especially in the service and industrial sectors); compensating for productivity losses via other means, such as expanding the use of information and communications technologies or modernized agricultural technologies.

 [ISSN 2581-5369]

Creating cooler work environments with air conditioning consumes energy and costs money. It is often not possible to use this solution in small workshops and in outdoor work. In addition, the provision of sustainable energy sources need to be considered. For instance, solar panel driven air conditioning systems are already available and should be assessed as a part of national policies. [5]

However, it is important to consider mitigation as the key feature of labour protection, and energy policies and programs that broaden the use particularly of renewable energy for electricity production is of high priority. This is because effectively adapting to climate change that is already expected to occur will require a significant increase in air conditioning in hot regions of the world. Under the current energy mix for such regions, those measures – vital for protecting workers from heat extremes – would generate significant additional emissions, counteracting efforts to cap further warming in a vicious cycle.

V. CONCLUSION

This paper has examined the extent to which heat stress affects labour productivity, measured in terms of working hours, in virtually every country in the world. Globally, an estimated 1.4 per cent of total working hours were lost in 1995 owing to heat stress, representing around 35 million full-time jobs worldwide. As a result of the temperature increases caused by climate change, it is projected that the percentage of total working hours lost will rise to 2.2 per cent in 2030 – a productivity loss equivalent to 80 million full-time jobs. Of the 20 subregions analysed, four are particularly vulnerable and are expected to suffer losses close to or above 3 per cent in 2030: Southern Asia, Western Africa, South-East Asia and Central Africa. By contrast, North America and all the subregions of Europe are not significantly affected by heat stress. The difference in productivity losses between the subregions most affected by heat stress and those affected to a lesser extent is even greater if one considers in-sun temperatures. Action taken today to limit global warming by the end of the century to 1.5°C or at least to 2.7°C, will determine the extent of future labour productivity losses. The sectoral composition of employment – in particular, the shares of agriculture and construction in total employment – also has a strong influence on the extent of productivity losses due to heat stress. The diversity of legal changes in relation to climate change, which is discussed amply in this report, indicates

10. [5] Roper, L.; J. Pettit (2002). "Development and the Learning Organisation: An Introduction". Development in Practice. **12** (3/4): 258–271. CiteSeerX 10.1.1.525.9449. doi:10.1080/0961450220149654.

11. UNFCCC. "The Kyoto Protocol". United Nations Framework Convention on Climate Change.

12. Biermann, F., Pattberg, P. & Zelli, F. (2010). Global climate governance beyond 2012: architecture, agency and adaptation. Cambridge Univ Pr.

13. Sandbag. "Sandbag ETS S.O.S: Why the flagship 'EU Emissions Trading Policy' needs rescuing" (PDF). Retrieved 15 May 2011.

that a new legal specialty, that of climate change legislation, has emerged in recent years. This is a new legal framework that is designed to respond to the "diabolistic" problem of climate change mitigation and adaptation. As such, much of it stems from the new legislation adopted since the turn of the century, which attempts, either through emission controls or through less pollution-intensive forms of energy production, specifically to decrease the rate of GHG emissions. However, the law on climate change fills the gaps between global governmental initiatives to traffic in carbon and the production of renewable energy. New elements of the legal framework have been added to the task of providing a specific legal response to the effects of climate change, such as climate change lawsuits, contingency plans and corporate responsibility for GHG pollution. In fact, in order to innovative this case law — which had been determined in the absence of a formal climate change regulatory system — it gives a motivating indicator of a law's ability to evolve and adjust to deal with the new environmental problem. While climate change shares several features with other environmental "new generation" problems, the threats to current policy and regulatory systems are greater than those previously experienced. It is also a problem that needs the concerted attention of policymakers at a regional and national level, preferably through environmental industries, including waste control, water management and restoration, not only that it has an important international aspect, but also that of the countries. In turn, understanding a wide range of interests in and reactions to climate change is crucial in a governance system that is targeted at being inclusive and participative, despite the fact that this may contribute to conflicting views on the correct aspects of regulatory measures. Finally, environmental policy research gradually shows the need for comprehensive regulatory regimes requiring more than one type of legal framework for complicated environmental problems such as climate change. Efforts to limit global warming can help significantly to prevent further increases in heat stress levels. Since projected temperature increases up to 2030 depend largely on the accumulation of past GHG emissions, the world of work is already having to adapt to heat stress. The challenges identified in this report point to the urgent need to understand better how such adaptation might be achieved. In particular, focusing on vulnerable groups of workers and on the countries most affected by heat stress would help to identify specific priority actions that should be undertaken by governments and by employers' and workers' organizations. Domestic concerns gradually see a variety of legal issues such as policy, business, financing, tax and carbon law infiltration of climate change considerations. Whilst it is important that the central goals of climate change legislation are not excessively evasive, considering the extreme risks involved with global warming, from the viewpoint of integrating climate change issues in the wider legislative / regulatory context,

 [ISSN 2581-5369]

the full scope of this practice is still encouraged. The policy on climate change is thus more than just "a guiding theory whose time has come." Its introduction also suggests that foreign agencies, domestic policymakers and the broader Population are sincerely dedicated to implementing the complex improvements in action required to avert serious global warming.

VI. POLICY RECOMMENDATIONS

- When it is too hot, people work less effectively out-of-doors, in factories, the office or on the move due to diminished ability for physical exertion and for completing mental tasks.
- Heat extremes also increase accident risk and expose people to serious heat-related health risks including heat stroke, severe dehydration and exhaustion, while a body temperature above 40.6o Celsius is life-threatening.
- That is why governments and international organizations have long put in place standards on thermal conditions in the workplace. But climate change has already altered thermal conditions in the work place, and additional warming is a serious challenge for any worker or employer reliant on outdoor or non-air conditioned work.
- The challenge is that workers are required to work longer hours to achieve a targeted output, or more workers are needed for the job; this creates costs due to a lower hourly productivity of labour.
- The world's warmest regions – tropics and sub-tropics – are worst affected due to pre-existing heat extremes and because of high concentrations of exposed sectors (agriculture and manufacturing).
- More than one billion workers already grapple with dozens of additional extremely hot days in a year due to climate change alone. While every decade brings a similar amount of additional hot days for exposed regions with warming set to continue for decades no matter what degree of emissions control is realized.
- Unmanaged, the impact of climate change results in lost work hours that can be substantial at a macro-economic level, with losses for most vulnerable countries already exceeding 2% of all available work time.
- Rising heat in the workplace will undermine progress towards the Sustainable Development Goals (SDGs), the UNFCCC's Global Adaptation Goal, and makes Decent Work and respecting international Labour standards on thermal environments of workers a serious challenge.
- An emerging concern, most national climate or employment policies do not address the impact of climate change on health and productivity in the workplace, but new ILO

 [ISSN 2581-5369]

Guidelines address occupational health and safety and social protection linked to climate change and provide a starting point for a more substantial response.

- Workers and employers need protection now and measures to manage risks to health, income and output do exist, but often entail costs and may compound challenges as in the case of air conditioning, a costly and energy and emissions intensive response.
- Risks become increasingly less manageable and costly to deal with at higher levels of warming as even 1.5C of warming entails substantial increased heat and workplace impacts that is a strong incentive for ambitious action to reduce emissions and limit warming in-line with the new UN Paris Agreement on climate change.
- More detailed research and analysis of this issue is urgently required.

*****

 [ISSN 2581-5369]

VII. REFERENCES

1. Jagers, S.C.; Stripple, J. (2003). "Climate Governance beyond the State". Global Governance. **9** (3): 385–400. doi:10.1163/19426720-00903009.
2. Thecvf.org. 2021. <http://www.thecvf.org/wp-content/uploads/2016/04/Climate-Change-and-Labour-Impacts-Of-Heat-In-The-Workplace.pdf> [Accessed 5 February 2021].
3. Bulkeley, H. (2010). "Climate Policy and Governance: an editorial essay". Wiley Interdisciplinary Reviews: Climate Change. **1** (3): 311–313. doi:10.1002/wcc.1.
4. Bulkeley, H., Newell, P. (2009). Governing Climate Change. New York: Routledge.
5. Andonova, L. B., Betsill, M. M. & Bulkeley, H (2009). "Transnational climate governance". Global Environmental Politics. **9** (2): 52–73. doi:10.1162/glep.2009.9.2.52.
6. Bäckstrand, K. & Lövbrand, E. in Pettenger, M. E. (ed.) (2007). Climate governance beyond 2012: Competing discourses of green governmentality, ecological modernization and civic environmentalism in 'The Social Construction of Climate Change. Power, Knowledge, Norms, Discourses'. Aldershot: Ashgate Publishing. pp. 123–149.
7. Farah, Paolo Davide, Global Energy Governance, International Environmental Law and Regional Dimension (November 30, 2015). Paolo Davide FARAH & Piercarlo ROSSI, ENERGY: POLICY, LEGAL AND SOCIAL-ECONOMIC ISSUES UNDER THE DIMENSIONS OF SUSTAINABILITY AND SECURITY, World Scientific Reference on Globalisation in Eurasia and the Pacific Rim, Imperial College Press (London, UK) & World Scientific Publishing, Nov. 2015. . Available at SSRN: http://ssrn.com/abstract=2701031
8. Bulkeley, H.; Newell, P. (2009). Governing climate change. New York: Routledge. p. 22.
9. ICLEI 'Local Governments for Sustainability'. "AboutICLEI". Archived from the original on 2009-08-13. Retrieved 15 May. Check date values in: |accessdate=(help)
10. Bernstein, S., Betsill, M., Hoffmann, M. & Paterson, M. (2010). "A tale of two Copenhagens: Carbon markets and climate governance". Millennium-Journal of International Studies. **39** (1): 161–173. doi:10.1177/0305829810372480.
11. Bulkeley, H.; Newell, P. (2009). Governing climate change. New York: Routledge.
12. Jean-Philippe Therien (2009). "Beyond the North-South divide: The two tales of world poverty". Third World Quarterly. **20** (4): 723–742. doi:10.1080/01436599913523.
13. Boyd, W. (2010). "Ways of seeing in environmental law: how deforestation became an object of climate governance". Ecology Law Quarterly. **37**: 843–857.

14. Hammer, M.; Peet, J.; Vincken, M. (2009): Coping with uncertainty. Accountability challenges in global climate governance, One World Trust Briefing paper number 123, December 2009

15. Power, G., Maury, M. & Maury, S. (2002). "Operationalising bottom-up learning in international NGOs: Barriers and alternatives". Development in Practice. **12** (3): 272–284. doi:10.1080/0961450220149663.

16. Roper, L.; J. Pettit (2002). "Development and the Learning Organisation: An Introduction". Development in Practice. **12** (3/4): 258–271. CiteSeerX 10.1.1.525.9449. doi:10.1080/0961450220149654.

17. UNFCCC. "The Kyoto Protocol". United Nations Framework Convention on Climate Change.

18. Biermann, F., Pattberg, P. & Zelli, F. (2010). Global climate governance beyond 2012: architecture, agency and adaptation. Cambridge Univ Pr.

19. Sandbag. "Sandbag ETS S.O.S: Why the flagship 'EU Emissions Trading Policy' needs rescuing" (PDF). Retrieved 15 May 2011.

*****

 [ISSN 2581-5369]