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Understanding Urban Vulnerability: Exploring the Interplay of Social and Biological Factors in Heat-Related Human Rights Violations

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Norwegian University of Life Sciences

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Executive summary

Heat waves increase with global warming and pose a threat to people's health, livelihoods, well-being, and labor productivity. Higher temperatures put pressure on urban infrastructures that are essential for providing services to uphold Human Rights. Defining and locating vulnerable groups is important to evaluate which policy measures should be employed to target these groups, reduce the fatal effects of heat waves, and protect people's Human Rights. In this report, we assess how social and biological factors make people in urban areas vulnerable to heat-related Human Rights violations, aiming to evaluate different policies that can be applied and different actors' responsibilities and possibilities to protect vulnerable groups. We conducted a literature review to define four vulnerable groups and to find information about different ways the infrastructure in urban areas can help reduce the effects of heatwaves. We also conducted an interview with KlimaSeniorinnen to understand the ways in which civil society can push their government to protect their rights. Governments should implement policies that arise from their Human Rights obligations to safely and adequately adapt to the impacts of climate change and extreme heat. The policies should especially target vulnerable groups by ensuring access to cooling centers and systems, which will also be beneficial for all of us. However, it is crucial to have sufficient and strict policies to reduce emissions, which can result in fewer cases of heat waves and less extreme heat over time. Our findings can help policymakers target vulnerable groups in their development policies in response to heat waves and global warming, and motivate civil society to stand up for their Human Rights.

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List of Acronyms:

ECHR - European Court of Human Rights

NIM- Norwegian Institute for Human Rights

NGO – Non-governmental organization

UN – United Nations

UNHR- United Nations Human Rights

UNFCCC - United Nations Framework Convention on Climate Change

UNICEF – United Nations Children's Fund

WBT – Wet bulb temperature

OHCHR- The Office of the High Commissioner for Human Rights

1.0 Introduction

Heat waves and extreme heat have become an increasing problem globally, and it is essential to address them in order to create solutions and prevent extreme heat events in the future. Heat waves are stated to be the deadliest weather-related hazard globally in most places where reliable data are available (Puley, 2022). Extreme heat threatens several Human Rights, including the right to life, health, and socioeconomic and cultural rights. It has detrimental consequences, including deadly health effects, wildfires, dried-out water reservoirs, unbearable temperature conditions, and amplified inequalities. The consequences are especially challenging for vulnerable groups and their Human Rights, which the state is obliged to fulfill and protect (OHCHR, 1998). People in vulnerable groups lack the means to reduce their exposure, and they face greater risk during heat waves.

In this paper, our aim is to explore the impact of social and biological factors on the vulnerability of urban populations to heat-related Human Rights violations. Vulnerable groups consist of people facing increased risk of heat waves due to social factors and biological factors. There are different ways of defining social factors, but in this research report, we view social factors as how people are positioned in society in relation to others and the circumstances that affect well-being and lifestyle, such as income level, living and working conditions. By biological factors, we mean physical traits such as age and sex. We will mostly focus on the effects of heat waves in urban areas in this paper, as structures and materials found in cities absorb and radiate heat more than natural landscapes (Puley, 2022). Additionally, over half of the world's population lives in urban areas today, and it is estimated to increase in the future, which is why we chose to focus on vulnerable groups in urban areas (Ritchie & Roser, 2019). By urban areas, we are referring to cities, towns, or surrounding areas where there is a high population density. Although heat waves are a global phenomenon, there is no commonly agreed definition of heat waves since countries define heat thresholds individually according to different climate conditions. Heat waves can be defined as periods of abnormally and uncomfortably high temperatures that have detrimental effects on people’s health and lifestyle (Robinson, 2001). Extreme heat is defined as an abnormally warm temperature for the season and for the place of measurement, not dependent

on the timeframe (Øvrebø, 2022). We will use both definitions interlinked for the purpose of our study.

With a focus on advocating for the integration of Human Rights into national laws and providing development policy recommendations, our emphasis lies on identifying and supporting vulnerable groups. This involves assessing which policy interventions are necessary to safeguard them from the severe impacts of heatwaves. Furthermore, our aim is to raise awareness among individuals about their rights during extreme heat events and urge them to hold their governments accountable for insufficient action on climate change. This report draws on secondary data analysis, literature reviews, and interviews, including insights from 'KlimaSeniorinnen', a group of senior women from Switzerland engaged in legal action against their government for violating their rights. The analysis begins with a historical perspective on heatwaves, followed by an examination of their relationship with climate change and urbanization. It then delves into the health consequences of heat and identifies four vulnerable demographics: low-income individuals, outdoor workers, children, and the elderly, illustrated through the case of KlimaSeniorinnen. Subsequently, it explores instances of Human Rights infringements linked to heatwaves, assesses the roles and responsibilities of various stakeholders, and proposes solutions and recommendations for both civil society and governmental actors to prevent such violations.

2.0 Historical overview

A research carried out by Cohen (2020) shows there have been several heat waves throughout history, some dating back to the 1800s. In 1896, there was a ten-day-long heatwave rolling over New York, causing an estimated 1300 citizens to die. The police force, led by Theodore Roosevelt at the time, was able to reduce the effects of the heat wave by providing healthcare services to sick people while also distributing free ice. Continuing in 1995, another heat wave caused Chicago’s urban infrastructure to struggle, as so many people used cooling systems that overpowered the electric grid. The healthcare system was also overwhelmed by cases of heat-related emergencies and deaths. Since 1950, the length and the intensity of heat waves have increased, which we have seen in the past decades (Perkins-Kirkpatrick & Lewis, 2020 cited by Øvrebø, 2022).

The European heatwave of 2003 caused around 70,000 deaths, which led France to make a national plan to tackle future heat waves (Øvrebø, 2022). Among the measures, they strengthened the infrastructure of the healthcare system and identified vulnerable groups. This is similar to the type of environmental governance dominating the 60s-70s, with central national governments implementing strategies and institutions, as transboundary environmental problems were seen as too difficult to handle at a local level (Benson & Jordan, 2017). Recently, there has been a shift in environmental governance due to the rise of capitalism and globalization (Benson & Jordan, 2017). 2011-2020 is the hottest decade recorded, and governments nowadays are struggling to deliver sustainable development on their own (UN, 2022). NGOs and civil society are left to fill the vacuum of environmental governance in situations such as extreme heat and other transboundary environmental problems caused by climate change (Benson & Jordan, 2017).

3.0 Heatwaves and climate change

Climate change is defined as long-term shifts in temperatures and weather patterns. Human activities, primarily burning fossil fuels, create greenhouse gasses which warm the planet faster than at any time in the past two thousand years (UN, 2022). When human activities cause the earth to get warmer, it changes ecosystems and their services, including climate- and temperature-regulating mechanisms in arctic areas where the ice is melting fast, reducing the albedo effect (Norsk polarinstitutt, n.d.). The ice reflects sunlight due to its light color, and as it melts, the dark surface of the ocean increases, resulting in low albedo, which creates a positive feedback loop that can further increase the risks of extreme weather events (Norsk polarinstitutt, n.d.). Heatwaves are now more frequent, more extreme, and occurring in global regions and at times of the year previously unthinkable (Puley, 2022). They will continue to increase in rapidity and fatality over time. Compared to a climate without human influence, an extreme heat event that would previously arise once in 50 years is now nearly five times as probable. Hypothetically, reaching a mean temperature of 2°C, an extreme-heat event is projected to be approximately 14 times more likely, and at far more dangerous levels (Puley, 2022).

3.1 Heat in urban areas

3.1.1 Urban heat island effect

The albedo effect is also present in urban areas as buildings, roads, darker colors, asphalt, and concrete absorb and radiate heat. Additionally, pollution and heat-generating activities like transport tend to concentrate in cities, creating warmer temperatures. This effect is called an 'urban heat island,' which is an area that is warmer than its rural surroundings. Particularly if these types of structures and materials are largely concentrated, and greenery like trees, parks, and water bodies are limited, the temperatures increase significantly (Puley, 2022). Cities are densely populated, and humans are always emitting heat. In cities with skyscrapers, waste heat is created, which means heat that has nowhere to go and just lingers between buildings. The structure and material in urban areas block heat coming from the ground from rising into the air, which causes nighttime temperatures to remain high. The urban heat island effect additionally increases the demand for energy in the form of air-conditioning and fans. This can strain energy resources and cause power outages, or "rolling blackouts," as happened in Chicago in 1995. It is estimated that in a city with 1 million people, the average annual temperature is one to three degrees warmer than its surroundings (Boudreau et al., 2022). Because of the urban heat island effect, cities need infrastructures that can cool them down and be equipped to mitigate extreme heat.

3.1.2 Infrastructure in cities

With increasing urbanization in combination with the urban heat effect, cities are more vulnerable to extreme heat. Good infrastructure for managing water, energy supply, healthcare, and cooling systems is important for mitigating the urban heat island effect and the effects of water scarcity. In this paper, we have chosen to focus mostly on the physical aspect of infrastructures. In Barcelona, for example, it can be above 40 degrees Celsius several days during the summer, a temperature where people need water to cool down and to stay hydrated. Unfortunately, this is difficult as their water reservoirs Sau and La Baells are shrinking in size. While drought happens because of low precipitation, it is often linked with high temperatures, as the heat makes the soil dry out (Øvrebø, 2022). Around six million people in and around Barcelona are dependent on these reservoirs from the north (Elster, 2023). Water is also crucial to control wildfires, another

detrimental consequence of extreme heat, which is increasingly necessary as 2022 had the most wildfires in a year in Spanish history (Elster, 2023).

With extreme heat, there will be a rising need for cooling systems requiring energy. Unfortunately, some energy sources such as hydroelectricity, nuclear power plants, coal, and gas get affected by the heat negatively. Back in 2003, France had to close several of their nuclear power plants due to a lack of water for the cooling systems (Øvrebø, 2022). There are also studies showing that extreme heat indirectly affects a person's sleeping quality and working life (Øvrebø, 2022). With higher temperatures, it gets more difficult to work, and productivity falls. Extreme heat is especially problematic for healthcare workers who are responsible for the high numbers of people in need, putting further external pressure on the healthcare system. Moreover, extreme heat creates this multi-crisis for cities to tackle; decreasing freshwater resources, low working productivity, fewer energy sources to rely on, a pressured healthcare system, and more people needing medical assistance due to heat-related illnesses and dehydration.

3.2 Health effects

Increased mortality rates are reported throughout the world during heat waves, as extreme heat directly affects human health (IPCC, 2022). Heat-related deaths are caused by an overburden on the respiratory and cardiovascular systems. The combination of high temperatures and humidity can be deadly under longer exposure because the body loses its ability to lower its internal temperature by sweating. This would result in a steadily rising body temperature, ultimately leading to organ failure and death (Raymond et al., 2020). There exists an upper limit for the combined effect of heat and humidity on the body, known as the wet-bulb temperature (WBT). Once the WBT surpasses this threshold, a healthy individual can only survive for a few hours. The WBT limit is 35°C, which corresponds to a relative humidity of 75% with an air temperature of 40°C. However, this limit assumes perfect physiological and behavioral circumstances, such as good health, inactivity, complete shade, lack of clothing, and unlimited access to drinking water. These conditions are rarely met, and therefore even lower WBT values can result in severe morbidity and mortality impacts. For instance, during the fatal heatwaves in Europe in 2003 and in Russia in 2010, the WBT limit was as low as 28°C (Raymond et al., 2020). The health effects

of extreme heat and heat waves can be detrimental, especially for people who are more vulnerable to heat.

4.0 Vulnerable groups

4.1 Low-income Individuals

Being considered low income can depend on satisfying at least one of three criteria: being below the poverty line, experiencing serious material deprivation, or having low working intensity in a person's household (Kolokotsa & Santamouris, 2015). Urban neighborhoods characterized by having a low-income population can be more exposed to heat compared to wealthier neighborhoods. This disparity is observed in many developing and developed cities worldwide (Chakraborty et al., 2019). A study conducted in the U.S., focusing on Southwestern urban regions mainly consisting of dryland cities, found that low-income neighborhoods on average are 2.2 °C warmer than wealthier neighborhoods (Dialesandro et al., 2021). It is crucial to ensure that low-income neighborhoods become less vulnerable to climate and health risks by improving air quality and lowering local temperatures. This can be achieved by increasing green spaces and adding more vegetation to these neighborhoods.

Greenspace appears to be one of the central factors contributing to the unequal temperature and exposure observed in urban areas among different neighborhoods (Dialesandro et al., 2021). According to an international multi-city study, green vegetation reduces the urban heat island effect (Chakraborty et al., 2019). However, there is significantly more greenspace in high-income neighborhoods than in low-income neighborhoods (Harlan et al., 2019 cited by Dialesandro et al., 2021). In Santos city, Brazil, areas with more valuable land tend to have greater urban environments, attracting the high-income population and households (Pereira et al., 2021).

Being low income can also impact people's ability to cope with extreme heat and heat waves. According to an Australian scientific article, houses of lower-income individuals are often of poorer quality and may contain inefficient electrical appliances that are cheaper upfront but cost much more to use (ACOSS, 2013 cited by Zografos et al., 2016). In Cabramatta, Sydney, Australia, many people with lower incomes tend to seek cooling in places other than their homes, such as shopping centers and the local library, during very high temperatures (Zografos et al., 2016).

Housing and neighborhoods are therefore central factors impacting inequality in relation to extreme heat and heat waves. Housing conditions also impact the health and vulnerability of people with low incomes. Poor housing conditions can reduce thermal comfort and increase ill-health (Conti et al., 2006; Haines et al., 2006 cited by Sakka et al., 2012). Moreover, health services tend to be less accessible for poorer people, often due to the cost of services (Shonkoff et al., 2011, cited by Bezgrebelna et al., 2021), further exacerbating inequality between low- and high-income populations. People with low incomes may also struggle to afford the increasing costs associated with cooling, leading to utility shut-offs, evictions, and homelessness (Jessel, 2019 cited by Bezgrebelna et al., 2021). Homeless individuals are also more vulnerable to extreme heat due to poorly controlled underlying diseases and increased exposure (Ramin & Svoboda, 2009). This exposes them to health risks associated with extreme heat and violates their rights to life, adequate living standards, and well-being (UN, 1948).

4.2 Workers

Almost half of the world's population, and more than 1 billion workers, are exposed to episodes of very high temperatures. One third of all workers who are exposed to high heat episodes experience adverse health consequences (Ebi et al., 2021). Outdoor workers and those with jobs that require more physical effort are more vulnerable to heat stress. Outdoor workers are at higher risk of heat stress because there are no accessible cooling systems, and they are exposed to the sun. Indoor workers can also be at risk if temperatures inside buildings are not regulated. Workers using physical power are especially vulnerable to high temperatures because they generate internal heat when their muscles work. Even working in an office and performing basic low-intensity tasks is challenging at high temperatures due to physiological and cognitive fatigue (Global Heat Health Information Network, n.d.-b).

According to the Global Heat Health Information Network (n.d.-b), workers' productivity is reduced at temperatures above 24-26°C, while at temperatures above 33-34°C, they lose 50% of their labor capacity. A report by Saeed et al. (2022) found that labor loss due to heat causes significant poverty impacts in West African countries. Moreover, they found that poverty rates will increase with temperature, between 2.3% and 9.2%. In this report, the authors did not take potential increases in mortality and morbidity rates into account, but there are dire health effects

of heat. The Universal Declaration of Human Rights (1948) states that everyone has the right to favorable working conditions. A solution can be to reduce working hours, avoid working during peak temperatures during the day, and have a nearby cooling center for breaks and cooling down. Working conditions under extreme heat do not uphold this standard, indicating a breach of human rights (United Nations, 1948).

4.3 Children

Children face high risks during heat waves. According to the UN and Red Cross (2022), children's bodies adjust to changes in environmental temperature at a slower rate. Dehydration caused by heat can lead to severe illness or death for children, particularly when aggravated by other health factors like diarrhea. Another reason why children are a vulnerable group is their limited ability to adjust their own behaviors or change their environment (Puley, 2022). For example, they might not have the ability to recognize that they are too warm or know how to take measures to cool down (Global Heat Health Information Network, n.d.-a). Pregnant and breastfeeding women are also a vulnerable group. This is a vicious cycle, as children often are entirely dependent on adults to make decisions or take care of their well-being, especially their breastfeeding mothers. Additionally, heat can affect education. Learning can be impossible during extreme temperatures in schools; for instance, in India, many schools must have reduced teaching hours (Puley, 2022). According to estimates from UNICEF, 820 million children are currently highly exposed to heat waves (UNICEF, 2021 cited by Puley, 2022). As seen in the examples, there are many health-related human rights at risk in extreme high temperatures, and for children, these hot conditions also affect their right to education and social protection.

4.4 Elderly

The increase in heatwaves leads to more health problems, and the elderly are especially vulnerable to this extreme heat. We define ‘elderly’ as people above 65 years old. The increased frequency, intensity, and duration of heat waves resulted in a 53.7% increase in heat-related mortality among individuals older than 65 years in the past 20 years (Watts et al., 2020 cited by Patel et al., 2022). Especially those working in the agriculture industry are most at risk (Romanello et al., 2021 cited by Patel et al., 2022). The nocturnal warming caused by climate change is

particularly hazardous to health since it does not allow the body to recuperate from a hot day (Patel et al., 2022). Kenny et al. (2010) state that with age, the ability to physiologically maintain body core temperature during heat stress deteriorates, and this loss in thermoregulatory ability can be linked to a variety of reasons, including changes in perspiration, blood flow, and cardiovascular function. They conclude that the problem may be aggravated by the aging-related reduction in general physical fitness and increase in body adiposity. As people get older, their cardiovascular responses to passive heating vary (Minson et al., 1998; Pandolf 1997; Sawka et al., 2011 cited by van Steen et al., 2019). Individual risk factors, such as low aerobic fitness and chronic health conditions that can limit the ability to cope with extreme heat, are also frequent in the older population (Minson et al., 1998; Pandolf 1997; Sawka et al., 2011 cited by van Steen et al., 2019). These variables make it more difficult for the elderly to survive heat waves.

Van Steen et al. (2019) analyzed various reports assessing heat-related deaths in both men and women, and found that women appear to be more affected by heat waves than men. They confirm that differences in vulnerability to extremely high temperatures between men and women may be attributable to physiological differences or other variables such as age or social structure. They also mentioned that some studies examined the social risk factor that older women often live alone because their partner has died. Moreover, in the United States, social and physical isolation is noticed to be highly associated with heat-related death (Klinenberg, 2015 cited by van Steen et al., 2019; Naughton et al., 2002). However, studies in England, Wales, and France showed that the effect of living alone was not found to be significant (Bouchama et al., 2007, cited by van Steen et al., 2019; Hajat et al., 2007). Van Steen et al. (2019) brings up that the traditional role of the woman as the main childcare provider and the man as the wage earner may also influence vulnerability to death during a heatwave later in life. When comparing personal incomes, they found that widows are financially disadvantaged compared to men and unmarried women. Further, a vulnerable financial situation may be one explanation for the increased mortality rate among older women compared to men, partly because low socioeconomic status has been associated with poorer housing quality and lack of air conditioning (Bouchama et al., 2007 cited by van Steen et al., 2019; Koppe et al., 2004). Older age and other social and economic factors, such as financial situation, marital status, problems regulating body temperature and thus less ability to sweat, and generally poorer health, make it more difficult for older people to survive heat waves. In order for

the elderly to efficiently cope with rising temperatures, there needs to be a change in how governments deal with heat waves to ensure the rights of health and life for older people (UN, 1948).

5.0 KlimaSeniorinnen

There are activists who want to force the state to act. They want the state to adhere to the Paris Agreement and take other climate protection measures because timely action could possibly prevent even more extreme heatwaves in the future.

The association 'KlimaSeniorinnen' was founded in August 2016 by a group of elderly women in Switzerland with concerns over health consequences arising from extreme heat and climate change. They are currently in the process of suing Switzerland at the European Court of Human Rights to force them to protect their citizens and act on the climate crisis (R. Wydler-Wälti, Personal Communication, April 20, 2023). The group has previously filed a number of cases against their own government due to their failings in protecting their populations against climate change. Unfortunately, the cases have been rejected. After exhausting all measures at a national level, the group has decided to take their government to the European Court of Human Rights (ECHR) (Klimaseniorinnen, 2020)[1]. The case was submitted with three main complaints:

Firstly, the Swiss government has implemented inadequate climate mitigation efforts leading to a violation of the women's right to life and health under Articles 2 and 8 of the ECHR.

Secondly, the Swiss Federal Supreme court rejected the group's original case on unreasonable and arbitrary grounds, violating their right to a fair trial under Article 6.

Thirdly, the content of their complaints was not dealt with by the Swiss authorities, in violation of their right to an effective remedy in Article 13 (Klimaseniorinnen, 2020).

[1] On April 9, 2024, the Grand Chamber of the European Court of Human Rights (ECHR) ruled that Switzerland had violated the human rights of older women by failing to take sufficient action against the effects of climate change. This landmark decision marks the first climate case victory in the ECHR, setting a significant precedent for future climate litigation. The ruling underscores the obligation of states to protect the human rights of vulnerable populations, including older women, from the impacts of climate change. It also highlights the recognition of environmental degradation as a human rights issue, potentially paving the way for more robust climate action across Europe and beyond (ECHR, 2024).

While gathering information and researching for our report, we had the opportunity to interview Rosmarie Wydler-Walti, co-founder of the KlimaSeniorinnen. This helped us forge a deeper insight into the case brought by the group to the ECHR while also understanding the depths of struggles and consequences being faced by a lack of initiative from the Swiss government. It is important to note that this is the first case in the world where older women, generally older people over 65, are suing a state with this background and dimensions (R. Wydler-Wälti, Personal Communication, April 20, 2023). They have claimed that Swiss politicians do too little to ensure that their health is not at risk (R. Wydler-Wälti, Personal Communication, April 20, 2023). "Our health is at risk, [...] and we actually want the health care, virtually, the climate protection, to be recognized as a human right" - Rosmarie Wydler- Wälti, co-president of the KlimaSeniorinnen (April 20, 2023, translated from German).

It is especially problematic that politicians are not taking cases like these seriously enough although they have a responsibility towards their citizens. By not acting they are violating Article 25.1 under the Universal Declaration of Human Rights (1948), which states that:

"Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, medical care, and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood due to circumstances beyond his control".

However, there is some hope because the court case of the 'KlimaSeniorinnen' is evaluated with two other court cases, and if they win, this can have a big impact on the restrictions and climate policy in Europe (R. Wydler-Wälti, Personal Communication, April 20, 2023). This illustrates how NGOs and civil society are forced to act upon environmental problems due to the lack of environmental governance by states. If this lawsuit is successful, it could become a precedent, and the hope of the 'KlimaSeniorinnen' is that other organizations and individuals can then adopt their lawsuit (R. Wydler-Wälti, Personal Communication, April 20, 2023). Especially third countries in the 'global South' suffer from the emissions of the 'global North'; therefore, stricter climate protection laws can contribute to more climate justice, meaning that actors, who are mostly responsible for climate change, must change their strategy and contribute to climate action.

6.0 Human Rights

Heat waves pose threats to both environmental systems and human communities. The increasing frequency of heat waves has raised concerns as it interferes with the realization of many Human Rights. However, since global warming is perceived to be anthropogenic in nature, there has been significant debate on how to address the complexities of environmental protection and Human Rights (Lewis, 2018).

Universal rights, conventions, covenants, and treaties offer insight into the mutual interaction between environmental protection and Human Rights. For example, the 1972 Stockholm Declaration in the Our Common Future report stated that "all human beings have the fundamental right to freedom, equality, and adequate conditions of life in an environment that permits a life of dignity and wellbeing" (UN, 1972, p.3). This legal principle recognizes the importance of protecting fundamental Human Rights and the environment. Additionally, regional groups such as the European Committee of Human Rights provide clauses for Human Rights protection in environmental extremes. This is evident in their 2nd and 8th articles, which state that states should provide "protection against generalized risks in environmental matters" (NIM, 2021, Chapter 3.1). Furthermore, Article 11 notes that states should "protect the intrinsic value of nature" (NIM, 2021, Chapter 3.1). Since human beings are part of nature, it could be argued that their value needs to be protected as well.

6.1 Right to life

Looking into global statistics and heat wave reports, it's evident that heat waves directly impact human health and general wellbeing. The heightened mortality rates exacerbated by extreme heat have been alarming in recent times, posing a threat to the right to life, health, and adequate shelter, fundamental rights outlined in the universal declaration (Levy & Patz, 2015). During prolonged heat waves, essential rights for human life such as access to water, food, and shelter are often undermined, disproportionately affecting vulnerable groups in society (Levy & Patz, 2015). As mentioned earlier, children, for instance, are more sensitive to heat waves due to their biological and behavioral characteristics, underscoring the need to address their right to life more critically.

One contributing factor to high heat-related mortality rates is the inaccessibility of healthcare services for low-income individuals due to insufficient medical insurance. Additionally, limitations in mobility among vulnerable groups such as the elderly, persons with disabilities, and young children make them more prone to heat-related mortalities (Rosenthal et al., 2014). With projections indicating that global warming will intensify, the severity of heat-related mortalities is expected to increase. Therefore, governments need to prioritize and protect essential rights to life and fundamental entities such as food, water, and shelter.

6.2 Social, Economic and Cultural Rights

In the broad spectrum, heat waves affect social, economic, and cultural rights among low-income and vulnerable populations. The International Covenant on Economic, Social, and Cultural Rights (1976) states in Article 7 that parties must recognize "the right of everyone to enjoy just and favorable conditions of work by ensuring safe and healthy working conditions" (UNHR, 1976). Heat waves impede the enjoyment of these rights, particularly among individuals working in open fields, such as those in the agricultural sector. Since many of these workers struggle to make ends meet, accessing other social services becomes challenging.

Furthermore, underlying social inequalities increase vulnerability for people living in unsafe conditions, particularly in urban areas. During heat waves, these individuals suffer as they cannot access adequate infrastructure (Levy & Patz, 2015). A study conducted in New York City found a high correlation between heat-related mortality rates and people living in low-income neighborhoods, attributed to disparities in access to residential air-conditioning, dilapidated buildings, and low green land cover (Rosenthal et al., 2014).

Additionally, the right to education is impacted. According to the Convention on the Rights of the Child (UN, 1989), children have the right to engage in leisure and recreational activities and have a right to education. Heat waves can make learning difficult, thus affecting these specific rights. It is crucial to guarantee social, economic, and cultural rights to protect the rights of workers, low-income individuals, and young students.

7.0 Actors' role

Climate litigation efforts are becoming increasingly popular in recent years, as seen through the KlimaSeniorinnen case, with more and more individuals bringing their governments and leaders to court in response to their passivity to climate change mitigation. Collective and international action is required to lessen the consequences of climate events like heat waves, and protect current and future generations (Dewaele, 2019). However, some ambiguity is present when understanding the roles and obligations of states (duty bearers), governments, organizations, and individuals in climate change mitigation efforts. Climate change has a great influence on the livelihoods and well-being of people and therefore also on the protection of their Human Rights.

With regards to state responsibility, many authors claim that rules for duty bearers are not compatible with Human Rights conventions, as seen in the International Law Commission's articles for the 'Responsibility of States for International Wrongful Acts'. Although there is much ambiguity surrounding duty bearers' obligations to protect citizens against the effects of extreme heat, international laws can be interpreted to recognize states' obligations for protecting their citizens (Legal Response International, 2014). Climate adaptations should take place in a multi-actor setting, with public and private sectors and more importantly between international, national, regional, and private scales. The issue of extreme heat and climate change is spread across multiple levels and jurisdictions which demand a constant interplay between actors (Driessen & van Rijswick, 2011).

The primary source for states obligations in combating and mitigating climate change are the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and those that can be taken from general international and Human Rights laws. However, these frameworks do not give direction on how to use Human Rights when developing or managing their responses to climate change (Driessen & van Rijswick, 2011). The extent to which Human Rights are protected and how this is enforced will depend on a multitude of factors and national circumstances. Significantly, this will also depend on which Human Rights instruments a given country has ratified. As international law obligations originate from treaties, the duties of states therefore will depend on which treaties they have chosen to ratify. The UNFCCC and the Kyoto

Protocol are the most universally ratified and thus are the most important sources for states obligations on climate change (Driessen & van Rijswick, 2011).

Moreover, according to international law, states have an obligation to ensure that any actions taking place within their territory or control do not cause any damage to the environment of other states beyond their borders. States are only duty-bound to respect the Human Rights of citizens within their borders, however, the UN Human Rights Committee of Uruguay (1981) stated that "it would be unconscionable (…) to permit a State party to perpetrate violations of the Covenant on the territory of another State, which violations it could not perpetrate on its own territory" . In some instances, this means that states could be held responsible for any transboundary pollution and environmental harm that originates within their own jurisdictions (Dewaele, 2019).

As citizens across the world are becoming more aware of the dangers and effects of climate change, climate litigation is on the rise with citizens holding their governments accountable for the lack of preparedness and efficiency of action against environmental degradation and global warming (Dewaele, 2019). We have seen that it is possible to hold governments accountable for their lack of initiative in responding to or in attempting to mitigate climate change based on Human Rights, including in the Netherlands, Pakistan and the case of the KlimaSeniorinnen in Switzerland (Dewaele, 2019). These cases claim that states are disregarding their obligations to Human Rights. These cases can create massive impacts and domino effects for other countries and their citizens' demand for action regarding climate change, even if it is merely symbolic. Further, it is obvious from our research that climate change can and does have a huge impact on extreme heat occurrences. States have a responsibility to protect citizens and fulfill Human Rights in the context of climate change, including extreme heat, under international Human Rights law. While certain obligations may differ between states, depending on which frameworks have been ratified, states must protect against current and future threats related to climate change.

In cases of extreme heat, there are a number of Human Rights obligations that states must consider while aiming to protect their populations and help them adapt to the impacts of extreme heat. This includes assessing the current and future impacts of extreme heat, particularly for vulnerable groups and those more at risk, while also introducing sufficient plans to mitigate future

harm. It is further imperative that governments swiftly reduce the volumes of greenhouse gas emissions and avoid destructive climate outcomes.

Most of the strategies we recommended in the section on solutions must be implemented by either the city administration or the government, but some can be carried out by civil society. Inhabitants of urban areas can, for instance, reduce energy use by avoiding excessive usage of air-conditioning (Loughnan et al., 2015 cited by Hintz et al., 2018) and spend time by the sea where the air is of better quality as much as practically possible (Czarnecka & Nidzcorska-Lencewicz, 2014 cited by Hintz et al., 2018). The general public can also spread the word on adaptive and mitigating action to their peers and friends, or to the wider community by joining an organization that is working on this issue. Working on influencing politicians on the governmental and city-administration level by advocating for the executions of actions that support the three strategies, 'behavior of inhabitants', 'gray infrastructure', and 'green and blue infrastructure', that we will discuss in the next section, is crucial. These preventive adaptive approaches are applicable to the wider society at large and to vulnerable groups. Furthermore, advocating for mitigating action against heat waves is necessary within the international community, as climate change presents a global challenge that requires both global and local solutions.

8.0 Possible solutions and recommendations

Based on our literature review, we have identified numerous correlations between climate change and Human Rights. Promoting environmental rights will inherently promote Human Rights, as humans are an integral part of nature and vice versa. The effects of climate change necessitate holistic interventions, and integrating Human Rights-based approaches will not only promote healthy livelihoods but also benefit nature (NIM, 2021). The UN Human Rights office has highlighted in their framework principles that "states should respect, protect, and fulfill Human Rights to ensure a safe, clean, healthy, and sustainable environment" (UN, 2018, principle 2). To achieve this, states have an obligation to consider the concept of Human Rights in their policies.

When addressing the issue of heat waves, Human Rights-based approaches can be integrated into mitigation and adaptation measures. Preventing or decreasing the prevalence and

extent of heat waves can be achieved through a global reduction in greenhouse gas emissions (National Wildlife Federation, 2009 cited by Hintz et al., 2018). This requires global climate cooperation with a key consideration of the intrinsic nature of Human Rights. Many treaties, such as the Paris Agreement, acknowledge the integral role of Human Rights in actions to reduce greenhouse gas emissions. Paragraph 11 of the Paris Agreement highlights that "states should consider their obligations under Human Rights and intergenerational equity when tackling greenhouse gas emissions" (NIM, 2021, Chapter 3.2.1).

However, with the global increase in heat wave frequency, particularly in urban areas, there is a strong need for effective adaptation strategies. Adaptation strategies are crucial for reducing vulnerabilities in systems such as entire towns or cities and for assisting individual groups affected by the issue (Bicknell et al., 2009 cited by Hintz et al., 2018).

The actions we recommend are divided into three general strategies: "behavior of inhabitants," "gray infrastructure," and "green and blue infrastructure." The former two strategies focus on vulnerability reduction, emphasizing recovery and adaptation methods for urban settlements vulnerable to, facing, or having faced heatwaves (Hintz et al., 2018). Meanwhile, "green and blue infrastructure" contributes to adaptation and assists in mitigating climate change (Gill et al., 2007 cited by Hintz et al., 2018). The following section discusses the suitability of potential policies and developmental actions recommended by our non-governmental organization in response to heatwaves in urban areas worldwide.

8.1 Green and blue infrastructure

‘Green and blue infrastructure’ implementations include using bodily waters to increase urban cooling (Heusinkveld et al., 2014 in Hintz et al., 2018) and facilitate public cooling islands such as incrementation of green areas and shade in cities (Alavipanah, 2015 cited by Hintz et al., 2018). Another advantage of urban greenery is the positive impact it has on public health (McMahon, 2000 cited by Hintz et al., 2018), which is emphasized in the UDHR as something we all are fundamentally entitled to at an adequate standard of living (United Nations, 1948). The infrastructure enactments can be executed in a variety of different ways, and on different spatial scales, such as in parks, on rooftops or as street greenery. This makes the implementation of this infrastructure more generally applicable to a variety of urban areas (Ahern, 2007 cited by Hintz et

al., 2018) ‘Green and blue infrastructure’ also have social and economic benefits, which is something ‘grey infrastructure’ has as well (Svendsen et al., 2012 cited by Hintz et al., 2018).

8.2 Grey infrastructure

'Grey infrastructure' is cheaper than the aforementioned infrastructures (Jones et al., 2012 cited by Hintz et al., 2018), but is at a disadvantage when it comes to feasibility across all urban areas, as some cities and towns in Africa lack adequately developed infrastructure to start with (Dodman et al., 2009 cited by Hintz et al., 2018). This infrastructure refers to implementations such as cooling roofs that prompt a reduction in the near-surface temperature and high-albedo material that improves the albedo of roofs, pavements, and other surfaces (Li et al., 2014 cited by Hintz et al., 2018). Implementations that can ensure thermal comfort and energy saving in buildings are also effective for adaptation (Barbosa et al., 2015 cited by Hintz et al., 2018). As noted earlier, choosing materials with high albedo connects back to the example of ice melting in the Arctic zones. Implementing infrastructure with such materials is a good adaptation method because energy and heat from the sun are being reflected and not absorbed.

8.3 Behavior of inhabitants

The 'behavior of inhabitants' strategy is the most effective in preparing for heat waves and for recovery afterward (Hintz et al., 2018). This approach concerns itself with what inhabitants on individual and group levels can do in the event of heat waves. Examples of 'behavior of inhabitants' actions include facilitating the general community and social workers to take an active role in reducing and preventing heat exposure by educating them about heat and national or regional heat plans (Zaidi & Pelling, 2013 cited by Hintz et al., 2018). Another action we recommend is the implementation of cataloging vulnerable groups by developing a heat vulnerability index to ensure effective adaptation for especially affected groups in a community (Bélanger et al., 2014 cited by Hintz et al., 2018; Weber et al., 2015). All three strategies are ones we recommend since they can yield developmental progress when executed effectively.

9.0 Conclusion

Heat waves and extreme heat directly affect human health, and in the worst cases, heat can cause organ failure and death. The elderly, children, women, outdoor workers, people living in urban areas, and people with lower incomes are especially vulnerable to heat. As extreme temperatures are increasing, governments across the globe must take action to protect their populations from any current and future harms fueled by climate change. Moving forward, a holistic approach should be applied, and development policies should stem from the governments' Human Rights obligations, allowing all members of their populations to safely and adequately adapt to the impacts of climate change and/or extreme heat. The policies should especially target the vulnerable groups. However, applying adaptation methods in urban areas, such as cooling systems and green infrastructure, will be beneficial for all of us. Still, the underlying issue is global warming. Therefore, reducing greenhouse gas emissions is essential to protect people from heat waves and should be the long-term goal in ensuring Human Rights. Nowadays, governments are failing to adopt sufficient policies to reduce emissions and protect their population from the fatal risks of heatwaves. NGOs and civil society are left to tackle problems, such as extreme heat and other transboundary environmental problems caused by climate change. There are more and more cases where people and organizations are taking governments to court due to their insufficient action. We must continue to push the governments and international organizations to respond by ratifying the international conventions into their policies to protect livelihoods and Human Rights. It is imperative that increased recognition is given to Human Rights obligations while further understanding and halting any rights violations currently in operation.

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