GOVERNANCE STRATEGIES FOR COOLING CITIES:

Cases of Athens and İstanbul

GEF Cities as Place of Hope Project Working Paper

Begüm Aydın & Cem İskender Aydın

GREEN EUROPEAN FOUNDATION

yeşil düşünce derneği

December 2020

Design: Güneş Akçay, Green Thought Association

GEF Proje Koordinatörü: Adrián Tóth, Green European Foundation

Green European Foundation

Rue du Fossé – 1536 Luxembourg

Brussels Office: Mundo Madou

Avenue des Arts 7-8, 1210

Tel: +32 2 329 00 50

info@gef.eu

www.gef.eu

Green Thought Association

Türkali Mahallesi

Şehit Nuri Sokak

No:18, Beşiktaş / İstanbul

Tel: +90 543 807 72 25

info@yesildusunce.org

www.yesildusunce.org

Published by the Green European Foundation with the support of national partner Green Thought Association.

The Green European Foundation (GEF) is a European-level political foundation whose mission is to contribute to a lively European sphere of debate and to foster greater involvement by citizens in European politics. GEF strives to mainstream discussions on European policies and politics both within and beyond the Green political family. The foundation acts as a laboratory for new ideas, offers cross-border political education and a platform for cooperation and exchange at the European level.

Established in 2008 in Istanbul, Turkey with the mission to proliferate green thought and green policies, the Green Thought Association works on national and international projects and campaigns. The Green Thought Association works on ecology and sustainability, democracy and media, climate change and energy, green economics.

This publication has been realised with the financial support of the European Parliament. The European Parliament is not responsible for the content of this project.

This article was produced as part of the Cities as Places of Hope Project to present research findings on good practices in cities. The project aims to increase the visibility of actors who work on urbanisation policies and to enhance cooperation among different actors by highlighting inspiring examples from different cities shown by project partners.

The Cities as Places of Hope Project is carried out by the Green European Foundation with the support of green organizations in the following countries: Spain (Transición Verde), Catalonia (Nous Horitzons), Croatia (The Institute for Political Ecology-IPE), Belgium (Oikos), North Macedonia (Sunrise), and Turkey (Green Thought Association). The Cities as Places of Hope Project started in 2019 with a focus on progressive city networks that appear as key factors in the creation of a positive narrative about the future of Europe. Project activities that were carried out in 2020 aimed to bring together progressive and transformative trans-local city networks, to connect them and to facilitate exchange between them, ultimately contributing to the development of a positive narrative about the future of Europe.

Governance Strategies for Cooling Cities: Cases of Athens and İstanbul

Begüm Aydın[1], Cem İskender Aydın[2]

This article was produced as part of the Cities as Places of Hope Project to present research findings on good practices in cities. The project aims to increase the visibility of actors who work on urbanisation policies and to enhance cooperation among different actors by highlighting inspiring examples from different cities shown by project partners.

The Cities as Places of Hope Project is carried out by the Green European Foundation with the support of green organizations in the following countries: Spain (Transición Verde), Catalonia (Nous Horitzons), Croatia (The Institute for Political Ecology-IPE), Belgium (Oikos), North Macedonia (Sunrise), and Turkey (Green Thought Association). The Cities as Places of Hope Project started in 2019 with a focus on progressive city networks that appear as key factors in the creation of a positive narrative about the future of Europe. Project activities that were carried out in 2020 aimed to bring together progressive and transformative trans-local city networks, to connect them and to facilitate exchange between them, ultimately contributing to the development of a positive narrative about the future of Europe.

1. INTRODUCTION

With the failure of global collective action to mitigate greenhouse gas emissions fast enough and the shrinking of the carbon budget accounted to keep the global average temperature increase below 1.5 degree Celsius, adaptation measures become exceptionally important in the struggle against climate change. As cities have the local agency to develop and implement adaptation measures (on

1 Institute of Environmental Sciences, Boğaziçi University, Istanbul, Corresponding Author, begum.aydin1@boun.edu.tr.

2 Institute of Environmental Sciences, Boğaziçi University, Istanbul, cem.aydin@boun.edu.tr

top of their mitigation potential), they acquire an increasing role in combating climate change. While adaptation to the changing climate has many different aspects, this research focuses specifically on improving the understanding of the capabilities and needs that cities have for an effective adaptation to heatwaves, which are expected to become more frequent with the increasing average global temperature. To this end, after laying a short account of the relation between cities, climate change, and heatwaves, we will first try to assess the efforts of cooling Athens, conducted within the "100 Resilient Cities" initiative between 2014-2019. Then, drawing from the experience in Athens, we will explore the potential policies and measures relevant to the case in Istanbul and conduct a discussion on effective governance for the effective implementation of these policies.

2. HEATWAVES AND CITIES

Heatwaves are pervasive natural hazards that are lately acknowledged as a major threat to society and the environment (WMO and WHO, 2015) with adverse effects on human health, workplace productivity, agriculture, frequency and intensity of wildfires, and infrastructure (Perkins-Kirkpatrick, 2020). Although there is no universally accepted definition of a heatwave, exceptionally hot weather conditions that last for several days and that deviate from the local climatic conditions are often referred to as heatwaves. They may vary in character and impact even in the same location. The World Meteorological Organization (WMO) (2018, p. 2) defines a heatwave as a period of "marked unusual hot weather (maximum, minimum and daily average temperature) over a region persisting at least three consecutive days during the warm period of the year based on local (station-based) climatological conditions, with thermal conditions recorded above-given thresholds". This description is impact-independent and tries to adopt a standard approach to the international exchange of information on heatwaves. However, heatwave thresholds vary greatly from one place to another. Even though heatwaves are meteorological events that are relative to a location's climate, they should also be assessed in terms of their impacts on humans. A city's geographical, meteorological, and social parameters as well as the impact of heat on health should be taken into account in determining action-threshold points. Therefore, the act of determining action-threshold points requires not only climatological methods but also epidemiological methods showing the health effects of heatwaves (Sahin, 2019).

An emerging public health problem, heatwaves are regarded as a silent meteorological killer (Mora et al., 2017). Several major heatwave events have occurred over the past decade, some of which have had devastating effects, such as the heatwave in Europe which caused more than 70,000 deaths in 2003 (Robine et al., 2008), and the one in the Russian Federation that resulted in more than 50,000 deaths in 2010 (Coumou & Rahmstorf, 2012). Mora et al. (2017) conducted a global analysis of documented lethal heat events by reviewing papers published between 1980 and 2014, and discovered

that 783 cases of excess human mortality[3] were associated with heat in 164 cities from 36 countries. According to the WMO report on The Global Climate, heatwaves were the deadliest meteorological hazard in the period between 2015-2019, affecting all continents and resulting in numerous new temperature records (WMO, 2019). The proportion of people who are at risk of lethal heat conditions is around 30% globally (Mora et al., 2017). The strong upward trend in heatwave exposure will continue to risk public health.

Box 1: Notable heatwaves in the recent past (WMO, 2019)

May and June 2015; India, Pakistan – Heatwave

2248 deaths were reported due to heat in India, and 1229 in Pakistan.

Summer 2015/16; South Africa – Heatwaves

There were numerous heat waves in South Africa during the 2015/16 summer. Pretoria broke its previous record high temperature on three separate occasions.

Summer 2015 and 2018, Europe – Heatwaves

In France 3275 and 1500 excess deaths were attributed to the heat in 2015 and 2018, respectively.

Summer 2018-2019, Australia – Heatwave

Hottest summer on record for Australia. There were also significant heatwaves in the 2016/17 and 2017/18 summers, especially in New South Wales.

June – July 2019, Europe – Heatwave

Two major long and extended heatwaves were recorded in Europe in June-July 2019 with national records broken in many countries. In southern France, a national record for any month of 46°C was observed. The heat dome spread northwards through Scandinavia towards Greenland where it accelerated the already above-average rate of ice melt.

With increasing global average temperatures, the frequency, intensity, and duration of heatwaves are also increasing (Can et al., 2019). According to WMO (2019), almost every study of a significant heat wave since 2015 has found the hallmark of anthropogenic climate change. According to the study conducted by Imada et al. (2019), the heatwave that affected Japan in July 2018 which caused serious damage to human lives would have been impossible without anthropogenic global warming. Heatwaves are considered extreme weather events and by definition, they are rare events. With climate change, even if the statistical distribution of such events remains the same, as shown in Figure 1, a relatively small increase in average temperature creates a large change in our extreme temperatures. What was once considered a rare and exceptionally hot day is now becoming more common. Heatwaves are getting hotter and longer, and record high temperatures are outpacing record low

3 Excess human mortality is a term used in epidemiology and public health that refers to the number of deaths from all causes during a crisis, beyond what we expect to see under 'normal' conditions." Source: Turkish Medical Association, https://www.ttb.org.tr/kollar/COVID19/haber_goster.php?Guid=6f221b3e-190a-11eb-904e-d1ba31c64d30 (t.n.)

temperatures.

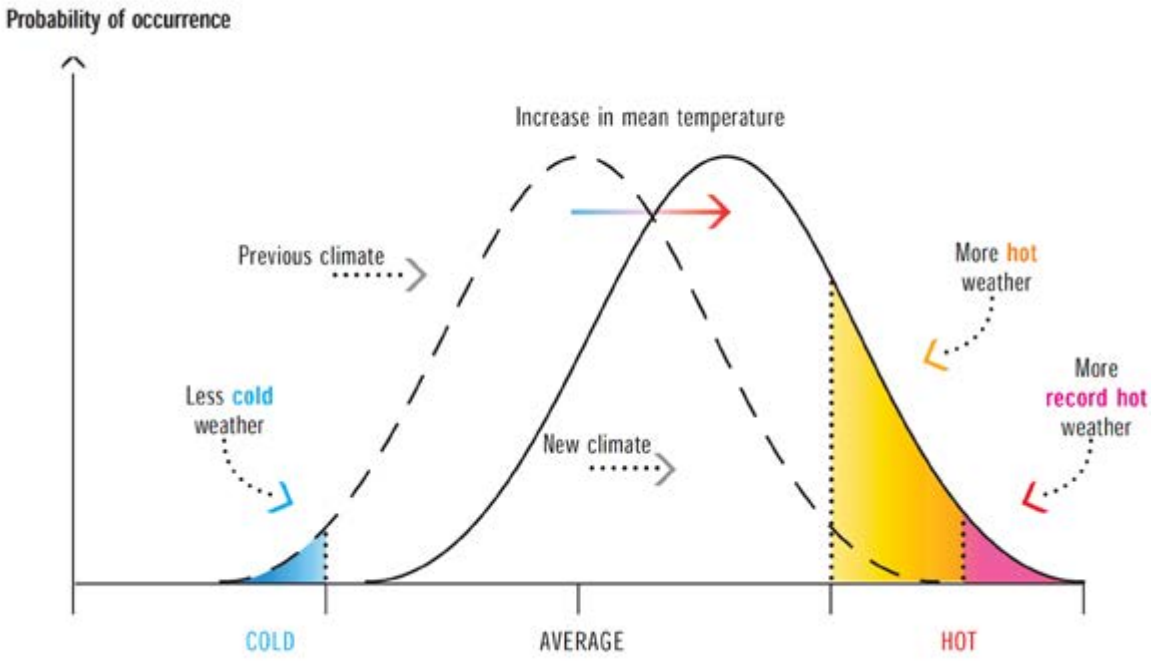

Figure 1: Changes in the probability of extreme weather events with a shift in mean temperature (Source: Houghton et al. (2001))

As seen in the above examples in Box 1, cities are already vulnerable to heat waves, and their vulnerability is expected to increase mainly due to population density and the potential additive effect generated by the urban heat island (UHI) (Khan, 2019). The latter results from the large amount of heat-absorbing materials, the characteristics of buildings, and the emissions of anthropogenic heat from air conditioning units and vehicles (Handmer, 2012). The urban climate is modified by human activities through rapid urban development that transforms the natural surface and turns it into man-made structures and built landscapes with different heat absorption capacities. Recent studies point to synergies between heatwaves and urban heat islands, leading to strong increases in thermal risk in cities and the vulnerability of urban populations (Founda, 2017).

Effective adaptation to the increasing and more frequent heatwaves first involves a thorough understanding of who is the most vulnerable (Gronlund, 2014). An assessment of someone's vulnerability involves assessing both their exposure level and their ability to adapt (Benzie, et al. 2011). Similar to the other adverse impacts of climate change, the effects of heatwaves are disproportionately distributed among different demographic groups, making this issue also a matter of climate justice. It is well-established that the elderly, children, and those with chronic diseases are more vulnerable to the adverse impacts of heatwaves (WHO, 2008; WMO and WHO, 2015, Can et al., 2019). It is also clearly

shown that minorities and low-income groups who live in densely populated areas and poorly constructed homes are more prone to the urban heat island effect. Having restricted access to cooling technologies, they are also at greater risk (Gronlund, 2014; Sanchez & Reames, 2019).

In that regard, local action against heatwaves should involve precise vulnerability assessments and detailed heat-health action plans which include long-term prevention measures, medium-term preparation, and short-term emergency measures (WMO and WHO, 2015). Fortunately, cities are becoming more aware of this problem and trying to devise effective strategies to increase their resilience to the impacts of climate change, including heatwaves. The next section will focus on the efforts shown by the citizens of Athens to cool down their cities and reduce vulnerabilities through the #CoolAthens campaign.

3. COOLING ATHENS: ASSESSING THE #COOLATHENS CAMPAIGN

#CoolAthens is a public health protection, public information, and awareness campaign conducted as part of the supporting actions for the Climate Change Adaptation Action Plan of Athens Resilience Strategy, developed with the support of 100 Resilient Cities (100RC) pioneered by the Rockefeller Foundation. Heatwaves in Athens are prioritized as one of the most important shocks in this strategy document because the average summer temperatures are projected to increase by 2°C between 2021 and 2050, and the increase is projected to go up to 4°C between 2071 and 2100. Intensified by the rising heat, urban heat islands exhibit severe temperature differences reaching even 10°C between the city centre and its suburbs.

Athens joined the 100 Resilient Cities (100RC) network in 2014 through a competitive selection process in the second round as one of the 35 cities. In 2015, the Agenda Setting Workshop initiated the resilience building process with 130 Athenians. In 2016, the Chief Resilience Officer (CRO) was appointed, and the Office for Resilience and Sustainability (ORS) was established to act as a facilitator to the whole system. The ORS gained official status as a part of the Mayor's Office later in 2016. Based on the three tools (perceptions tool, assets & risks tool, and actions tool) used for identifying the city's critical assets, shocks, stresses, and vulnerabilities, the Preliminary Resilience Assessment (PRA) was also released in 2016, shaping the vision for a resilient Athens—a city that is open, green, proactive, and vibrant. In 2017, the Athens Resilience Strategy was created through a collaboration involving a wide range of actors including experts, representatives from the local, regional and, central government, city district leaders and other civil society and community ambassadors, platform partners, and strategic partners. The One Year Action Plan supporting the implementation of the Strategy was launched in May 2018 and the municipality of Athens conducted an assessment of the 3 years of the ORS in order to monitor the course of its implementation.

The Resilience Strategy is framed by four pillars: open city, green city, proactive city, and vibrant city. #CoolAthens campaign takes place in the Resilience Strategy as a part of Climate Change Adaptation Action Plan under the goal of integration of natural systems into the urban fabric to become a green city. The Athens Climate Change Adaptation and Mitigation Action plan was produced through a unique collaboration between C40[4] and 100RC. For public health protection, the municipality (its relevant departments and the ORS) is responsible for making available data and services contributing to the protection and the reduction of the health risks related to high temperatures. Expanding the "cool centres" network, establishing public water fountains, establishing regulatory measures for traffic are necessary actions for public health protection.

As a public information and awareness campaign, #CoolAthens includes actions such as promoting publicly available personalized information linking high temperatures to health risks; preparing guides through the Treasure Phone and Web Application (NOA) as well as NFC tags to orient high-risk populations to an enhanced network of municipal "Cool Centers"; linking all heat-related data sources; establishing information and awareness-raising campaigns and activities, and engaging the private sector in the activities. The action owners, partners, funding sources, and time frame are clearly defined for the implementation of these actions (Municipality of Athens, 2017).

4. HEATWAVES AND ISTANBUL: POLICY RECOMMENDATION FOR EFFECTIVE COOLING

Istanbul, as the most populated city in Turkey with 15 million inhabitants, has experienced a high-speed urban growth with natural areas transforming into built-up spaces in the last century. Due to the dense development, the temperature differences between urban and rural areas are expected to increase with the UHI effect (Zaeemdar & Baycan, 2017). Furthermore, both the severity and the frequency of extreme climatic events including the heatwaves are expected to increase and trigger health problems, especially for vulnerable groups. Can et al. (2019), the only epidemiological study on the impacts of heatwaves on public health in Turkey, examine the excess mortality in Istanbul attributable to extreme heat wave episodes between 2013 and 2017 and show that the extreme heatwaves in 2015, 2016, and 2017 caused 419 additional deaths, demonstrating that heatwaves have already become an important problem for local and national authorities. The Climate Change Action Plan (2011-2023) of the Ministry of Environment and Urbanization determine some actions on monitoring and evaluating the present and future effects of extreme weather events on public health. Also, Istanbul's Climate Action Plan identifies heatwaves as one of the major risks for many sectors, especially public health. However, it does not specify a detailed heat-health action plan. Drawing from the Athens Resilience Strategy report, we identify potential action areas in Table 1.

4 C40 Cities is a network of metropolitan cities that come together to address the issue of climate change. Source: http://www.yereldiplomasi.gov.tr/aglar/c40-kentleri/ (Accessed on January 16) (e.n.)

Table 1: Potential action areas against heatwaves for Istanbul Metropolitan Municipality and examples of actions (Source: Prepared using the Athens Resilience Strategy for 2030 (Municipality of Athens, 2017) and the Istanbul City Council's opinion and suggestions on heatwaves (Istanbul City Council, 2020).

	Description of Action	Stakeholders and Partners
Green Infrastructure	Investing in green infrastructure (maintaining the existing ones and creating new ones) could improve the city's microclimate and limit the urban heat island effects. Some of the actions that can be implemented in the short and medium-term are: • Parks and other green spaces should be arranged to allow taking shelter during the heatwaves, and incorrect pruning should be avoided to prevent reducing shades. • Plants that require less water should be used in park landscapes and other green areas, and irrigation should be done at times that will create less moisture. • Open areas such as marketplaces, bazaars, and other spaces on the streets should be covered using native plants that require less water (such as ivy and shrubs), to allow for shade and cool transition areas. • Vertical gardening practices can have a cooling effect in residential areas with high population density where it is not possible to create green areas. Therefore, it should be used in appropriate places to reduce the effect of urban heat islands, provided that they are low-cost and use native plant species that require less water. • In addition to water savings, practices such as rain harvesting may be developed to prevent water shortages in extreme temperatures.	• Ministry of Environment and Urbanisation, • Universities • NGOs • Private Sector • C40 and other international city networks
Built Environment	A large part of Istanbul is very densely built, with an aging building stock that requires high energy to keep warm and cool. A long-term strategy of renewing the building stock with energy-efficient and sustainable materials is required. Furthermore, future zoning plans should be prepared to reduce heat islands and create wind corridors. In the meantime, the following short and medium-term actions can be implemented: • The metrobus stops and other major stops in main squares should be redesigned in a way to allow pedestrian thermal comfort in hot weather. • Cool shelter centres equipped with air conditioning, permanent health care professionals, and other facilities (such as water, toilet, entertainment services) should be established. Ground or basement floors of large public buildings can be adapted for this purpose. • Reflective colours and surface coating materials with low albedo can be used on the exteriors of public buildings.	• Ministry of Environment and Urbanisation • Ministry of Health • Universities • NGOs • Private Sectorr

Public Health	Municipalities can have an important role in information dissemination and coordination during the heatwaves; they can implement effective prevention and protection measures for both the general population and vulnerable populations, including homeless people. Coordination with the Ministry of Health and other relevant authorities is especially important. Some of the short-term measures that can be implemented are: • Cool shelter centres should be established so that citizens can protect themselves from heat in high temperatures. • Temporary accommodation spaces with air conditioning should be provided for the homeless, and tents with cold water and sun umbrellas should be established in the main squares. • Reminders should be published to ensure that neighbours, relatives, and the social services of the municipality regularly check on the elderly and other vulnerable people living alone.	• Ministry of Health • Private hospitals • Universities • NGOs • Private Sector
Public Information and Awareness	Informing the citizens and other professionals in the abovementioned actions are crucial for their participation in these actions and hence the success of the action plans. First and foremost, the heatwave action plan and the location of the cool shelter centres should be publicly available. Some other short-term actions are: • Heatwave early warning systems should be established in cooperation with the General Directorate of Meteorology. • Citizens should be warned against the expected heatwaves through mainstream and alternative media and communication channels (such as social media). • Billboards and information screens in public transportation should provide awareness-raising messages about heatwaves. Precautions that should be taken by vulnerable populations and risk groups should be directly communicated to them via text message.	• NGOs • TVs and newspapers • Universities • Private sector

While identifying the set of potential actions is a necessary step towards a heatwave action plan, it is not sufficient without an effective governance mechanism. As also identified in Table 1, many actions require collaboration and coordination between different stakeholders, in addition to the need for fair implementation that respects fundamental environmental justice principles – fair distribution, procedural justice, and recognition (Schlosberg, 2007). Box 2 identifies some key elements for effective governance.

Box 2: Key elements for an effective and fair governance mechanism (Source: Prepared using the Athens Resilience Strategy for 2030 (Municipality of Athens, 2017) and World Health Organization's Technical Summary of EuroHEAT project (World Health Organization, 2008).

Lead organization: A lead organization should be identified to coordinate the collaborative mechanism between institutions and direct responses in emergency cases.

Participatory decision-making processes based upon cross-sectoral approach: Participatory and cross-sectoral decision-making processes including a wide range of stakeholders should be established. The engagement process of the stakeholders should be described in detail.

Participatory and continuous monitoring/process evaluation: An assessment of heat-health action plans highlighting the progress should be carried out every year. The Istanbul City Council can take part in the participatory monitoring and evaluation process. The Council may strengthen ownership and increase trust in local government policy.

Special care for risk groups and vulnerable populations: Risk groups and vulnerable populations (i.e. the homeless, migrants and mobile populations, the disabled, workers doing heavy outdoor labour) should be identified for special care according to procedural, distributive, and recognition justice. Suggestions on how institutions could address these needs should also be shared.

Open data platforms: Open data platforms may create public awareness by comprehensive dissemination of relevant information and are necessary for the transparency of the governance.

City networks: International city networks may act as a mechanism for scaling and sharing good examples from the actions taken by cities.

Multi-level governance: As the historical, cultural, and economic centre of the country, Istanbul requires a heatwave action plan that involves special coordination between the national government and the metropolitan municipality.

While these key elements seem straightforward, their implementation is not without challenges. First of all, the current centralized administration system together with the silo approach to urban policies pose obstacles to achieving desirable outcomes. Other challenges such as working without a defined target population, lack of communication between the actors, and the generally time-consuming nature of participatory processes also need to be overcome. Lastly, effective governance is not a static process but a dynamic one; hence, a continuously updated and fine-tuned strategy is needed.

5. CONCLUSION

Increasing the resilience of cities against climate change and reducing heatwaves together with the potential negative impacts of climate change is only possible with an effective urbanisation policy. This, in turn, requires a multi-disciplinary and multi-actor process, where action plans are designed in a participatory manner. Active participation and collaboration between different stakeholders are essential for effective governance because i) the (natural and social) complexity of climate change requires a multi-actor collective mind, and ii) participation in the process ensures actors' and stakeholders' ownership of the action plans (which is quite important for effective implementation) (Peker and Aydın, 2019). The term collaboration here refers to both the collaboration of actors within the city and collaboration among cities worldwide. While each city is unique in its needs to fight the negative impacts of climate change and there is no one-size-fits-all policy, the key elements are the same. Therefore, an immense opportunity exists for co-learning and co-creation through global city networks.

REFERENCES

Benzie, M., Harvey, A., Burningham, K., Hodgson, N., & Siddiqi, A. (2011). Vulnerability to heatwaves and drought: adaptation to climate change. York, UK: The Joseph Rowntree Foundation.

Can, G., Şahin, Ü., Sayılı, U., Dubé, M., Kara, B., Acar, H. C., ... & Küçükali, H. (2019). Excess mortality in Istanbul during extreme heat waves between 2013 and 2017. International journal of environmental research and public health, 16(22), 4348.

Coumou, D., & Rahmstorf, S. (2012). A decade of weather extremes. Nature climate change, 2(7), 491-496.

Founda, D., & Santamouris, M. (2017). Synergies between Urban Heat Island and Heat Waves in Athens (Greece), during an extremely hot summer (2012). Scientific reports, 7(1), 1-11.

Gronlund, C. J. (2014). Racial and socioeconomic disparities in heat-related health effects and their mechanisms: a review. Current epidemiology reports, 1(3), 165-173.

Handmer, J., Y. Honda, Z.W. Kundzewicz, N. Arnell, G. Benito, J. Hatfield, I.F. Mohamed, P. Peduzzi, S. Wu, B. Sherstyukov, K. Takahashi, and Z. Yan, 2012: Changes in impacts of climate extremes: human systems and ecosystems. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 231-290.

Houghton JT et al., eds. (2001). Climate change 2001: the scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press.

Imada, Y., Watanabe, M., Kawase, H., Shiogama, H., & Arai, M. (2019). The July 2018 high temperature event in Japan could not have happened without human-induced global warming. SOLA, 15A-002.

Istanbul City Council (Istanbul Kent Konseyi) (2020) Sıcak dalgaları konusunda görüş ve öneriler – Bilgi notu, Accessed: 08.12.2020 on https://istanbulkentkonseyi.org.tr/wp-content/uploads/2020/06/iKK-iKcG-Sicak-Dalgalari-Konusunda-Gorus-ve-oneriler-BiLGi-NOTU-30.06.2020-v2.pdf

Khan, H. S., Paolini, R., Santamouris, M., & Caccetta, P. (2020). Exploring the Synergies between Urban Overheating and Heatwaves (HWs) in Western Sydney. Energies, 13(2), 470.

Mora, C., Dousset, B., Caldwell, I. et al. Global risk of deadly heat. Nature Clim Change 7, 501–506 (2017). https://doi.org/10.1038/nclimate3322

Municipality of Athens (2017) Athens Resilience Strategy 2030: Redefining the city 100 Resilient Cities Accessed: 08.12.2020 on https://resilientathens.files.wordpress.com/2017/07/athens_resilience_strategy_-_reduced_pdf-compressed.pdf

Peker, E., & Aydın, C. İ. (2019). Değişen İklimde Kentler: Yerel Yönetimler için Azaltım ve Uyum Politikaları. Istanbul Politikalar Merkezi Politika Notu, İstanbul.

Perkins-Kirkpatrick, S. E., & Lewis, S. C. (2020). Increasing trends in regional heatwaves. Nature communications, 11(1), 1-8.

Robine, J. M., Cheung, S. L. K., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J. P., & Herrmann, F. R. (2008). Death toll exceeded 70,000 in Europe during the summer of 2003. Comptes rendus biologies, 331(2), 171-178.

Şahin, Ü. (2019). Sıcak Dalgaları: İklim Değişikliğiyle Artan Tehdit ve Sıcak- Sağlık Eylem Planları, İstanbul Politikalar Merkezi Politika Notu, İstanbul.

Sanchez, L., & Reames, T. G. (2019). Cooling Detroit: A socio-spatial analysis of equity in green roofs as an urban heat island mitigation strategy. Urban Forestry & Urban Greening, 44, 126331.

Schlosberg, D. (2007). Defining Environmental Justice: Theories, Movements and Nature. New York: Oxford University Press.

World Health Organization. (2008). Improving public health responses to extreme weather (No. EUR/07/5067942). Copenhagen: WHO Regional Office for Europe.

World Meteorological Organization (2018). WMO Commission for Climatology Task Team on The Definition of Extreme Weather and Climate Events. Guidelines on The Definition and Monitoring of Extreme Weather and Climate Events.

World Meteorological Organization (2019). The Global Climate in 2015–2019, Geneve (2019)

World Meteorological Organization and World Health Organization (2015). Heatwaves and Health: Guidance on Warning-System Development; McGregor, G.R., Bessemoulin, P., Ebi, K., Menne, B., Eds.; WMO: Geneva, Switzerland, 2015; p. 96.

Zaeemdar, S., & Baycan, T. (2017). Analysis of the relationship between Urban Heat Island and land cover in Istanbul through Landsat 8 OLI. Journal of Earth Science & Climatic Change, 8(11).

Contact us :

GREEN EUROPEAN FOUNDATION

GREEN EUROPEAN FOUNDATION
Rue du Fossé 3, L-1536 Luxembourg
Brussels Office: Mundo Madou,
Avenue des Arts 7-8, 1210 Brussels
t: +32 2 329 00 50
e: info@gef.eu

Connect with us :

Visit our website to find out more about us

gef.eu

Follow our social media to stay informed about our latest activities and events taking place all over Europe

GEF_Europe

GreenEuropeanFoundation

GEF_Europe