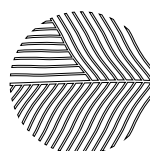
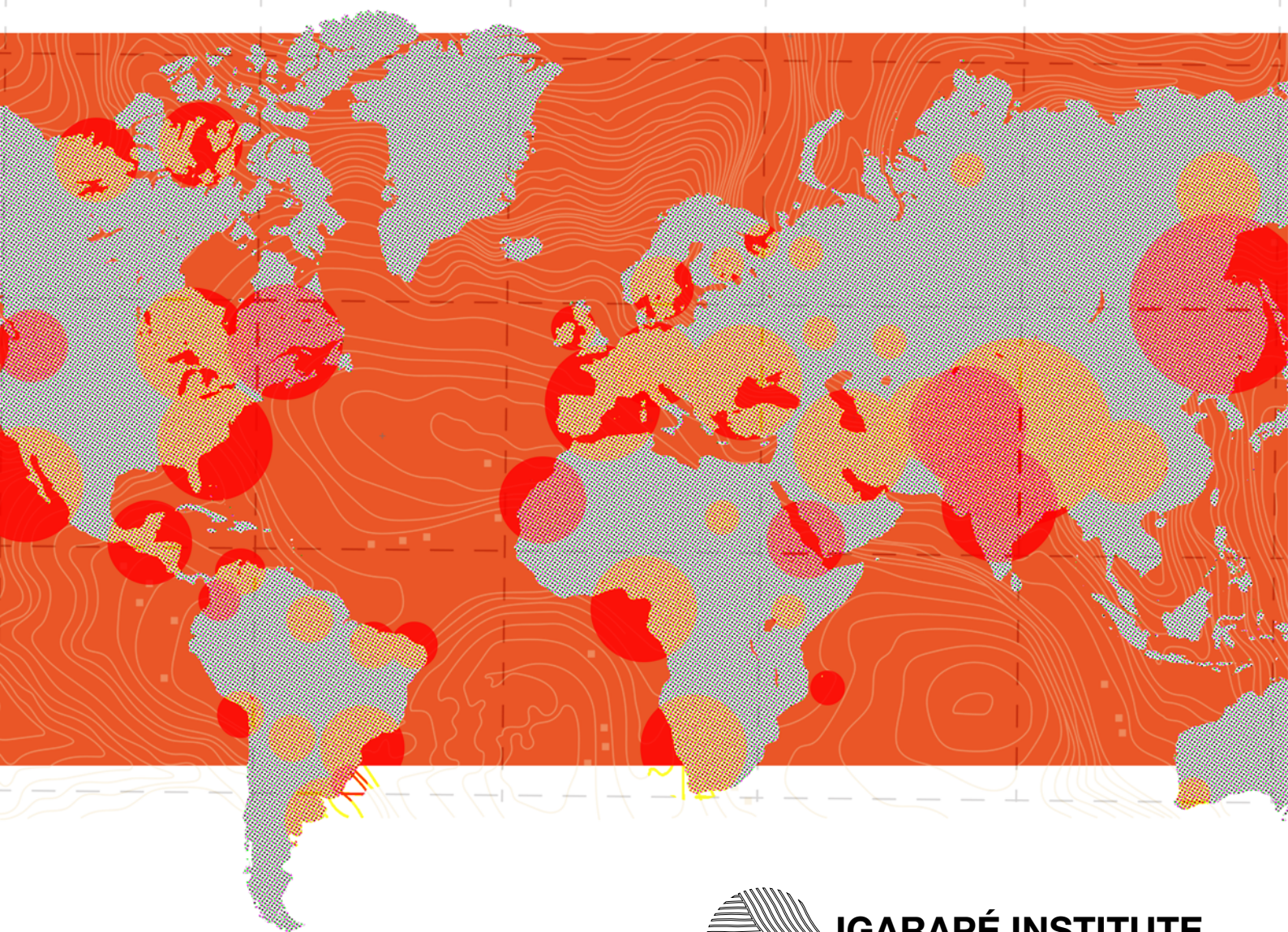


CLIMATE CHANGE AND CRIME IN CITIES



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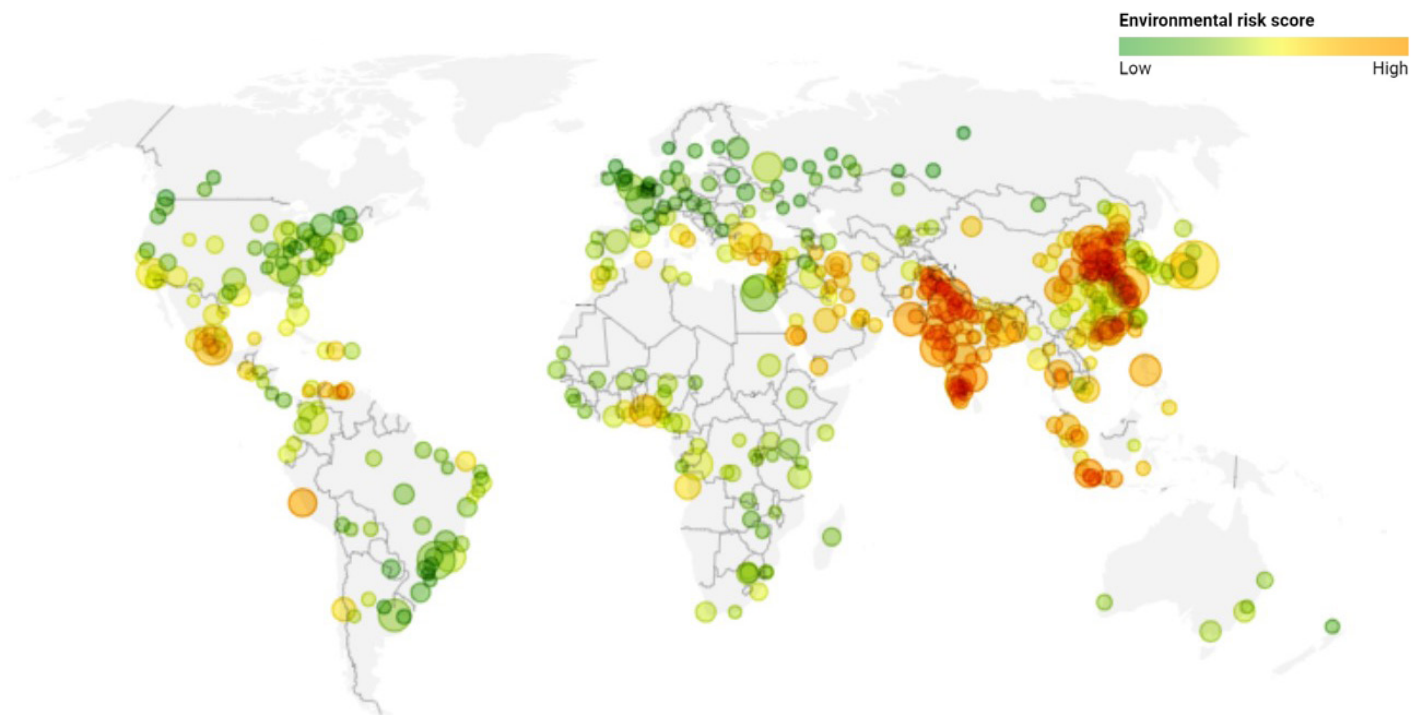
CLIMATE CHANGE AND CRIME IN CITIES

Robert Muggah

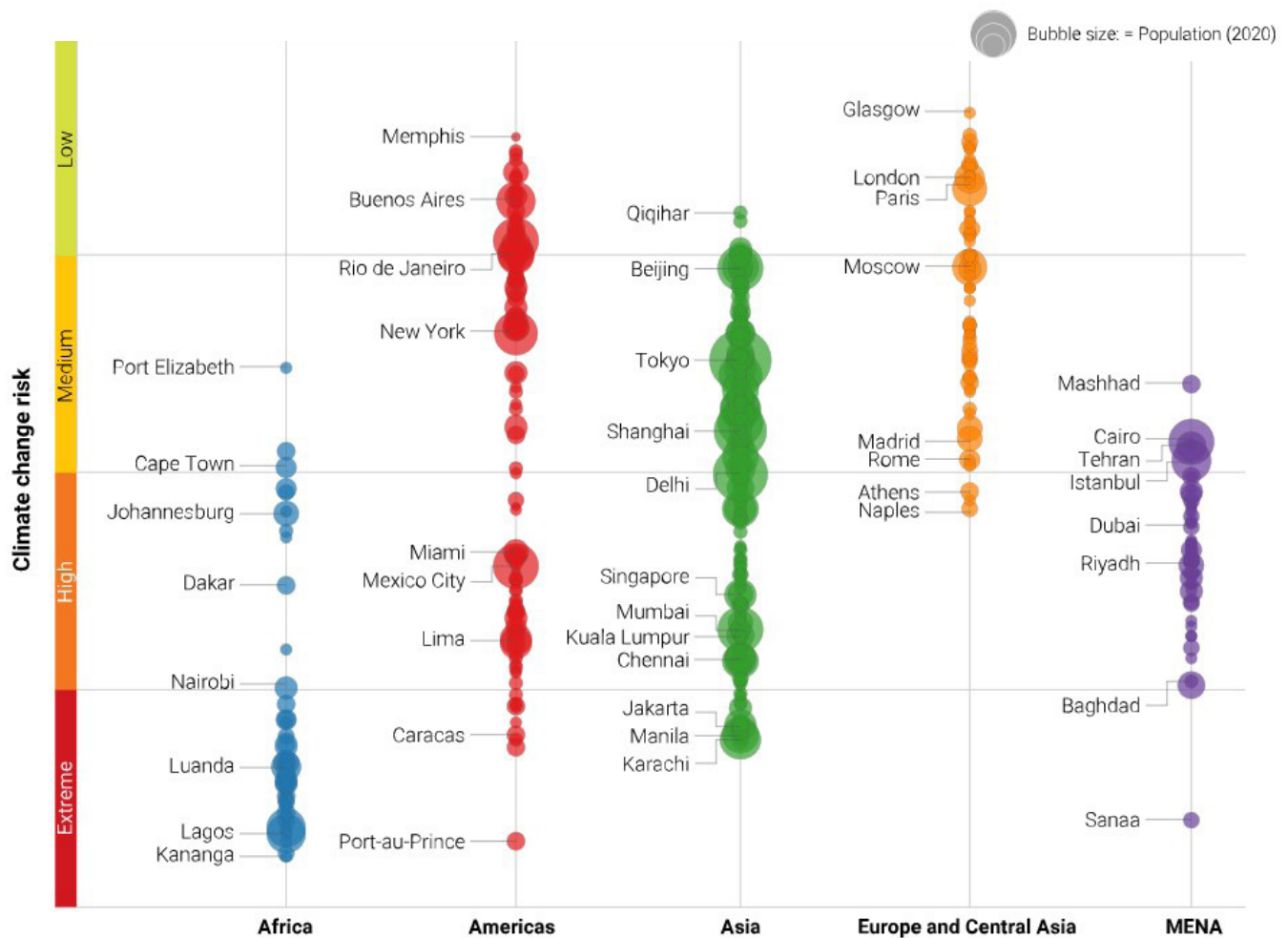
Climate change is already [disrupting cities](#) around the world. Continued greenhouse gas emissions and warming are intensifying heat islands, contributing to water shortages, rising seas, increasing flood-related risks and worsening pollution. With [over two thirds](#) of the population expected to live in cities by 2030, the effects are consequential. [Large and fast-growing cities](#) in Asia, Africa and the Americas are likely to be hit hardest by more frequent and intense disasters. Coastal cities across North America and Western Europe are likewise on the front-line.

Climate change is influencing all aspects of city life, from labor markets and food security to migration patterns and economic productivity. One critical, if under-examined, way climate change is affecting cities is in relation to crime and victimization. To be sure, the [debate about the relationships between climate and security](#) - and in particular the influence of global warming on conflict onset, duration and intensity - has heated-up over the past decade, there is less attention devoted to how climate change stands to influence criminal violence in cities around the world.

Climate change risks facing cities (2021)



Source: [Verisk Maplecroft](#)



Source: [Maplecroft \(2021\)](#)

Conceptualizing the climate-crime link

When examining the climate change-crime nexus, it is important to clarify the variables under consideration. With respect to climate change, one can distinguish between *short-term shocks* such as cyclones, tornadoes, forest fires and floods and *long-term stressors* including droughts and sea level rise.

Meanwhile, crime can be disaggregated into *violent* and *non-violent* categories ranging from homicides and assaults to robberies and burglaries. The relationships between shocks and stresses and violent and non-violent crime are not necessarily straight-forward or linear.

Conceptualizing the climate-crime connection

	Short-term	Medium-term	Longer-term
Shocks: Flood/storm surges; tornadoes; cyclones; forest fires	Loss of life/injuries - especially vulnerable groups; Stress on health and medical facilities; Evacuations and displacement; Disruption of power grids/ services; Rising non-violent property crime	Disease outbreaks - especially among vulnerable groups; Disruption of basic services; Rising prices for goods and services; Food insecurity and livelihood stress; Supply chain fragmentation; Intimate partner and domestic violence; social unrest	Mortality/morbidity due to divested care; Diversion of expenditures from public services; Declining tax revenue and investment; Degraded social and physical infrastructure; Deepening grievances and mistrust; Increasing crime associated behavioral changes; rising violent crime
Stressors: droughts; water scarcity; heat islands; air pollution (GHGs); pest infestations	Increasing mortality/ morbidity for at risk groups; grievances and competition over services; Evacuations and relocations; Disruption to energy grid and drain on basic services; Intimate partner and domestic violence	Disruption to food security; rising prices for services and essentials; increased resort to violent and non-violent criminality to substitute for lost livelihoods; increased risk of social unrest and demonstrations	Mortality and morbidity associated with cardiovascular diseases; Heightened risk of violent aggression among at-risk/ exposed populations

There is a general scientific consensus that climate change is accelerating the incidence of shocks. Specifically, increases in global surface temperatures are contributing to [more frequent and severe disaster events](#). The combination of increased water vapor evaporation and hotter atmosphere and oceans is increasing the intensity of storms and wind speeds. As a result, there are not only more disaster events, there are more of them [occurring in quick succession](#) which in turn undermines the ability of societies to cope and recover.

Meanwhile, stressors such as water scarcity, heat islands, pollution and pest infestation are also increasing in severity. Simultaneous heat waves and prolonged drought are [becoming more common](#) in many parts of the world, with damaging environmental and human consequences. In 2021 over [half of the US](#) experienced a drought and these conditions are likely to worsen owing to erratic precipitation. Large parts of North and South America experienced soil moisture levels that are only expected to occur once every 50 years, increasing the risks of forest fires.

The relationships between climate change and violent and non-violent crime have short, medium and longer-term dimensions. Specific criminogenic effects are associated with the particular shock or stress. Moreover, the type and severity of crime can change over time. One implication of this is that an array of mitigation, adaptation and prevention strategies are required to minimize the risks of crime. Another is that there are opportunities to enhance protective factors to bolster city resilience and avoid downstream shocks, stresses and crime-related outcomes.

Explaining the relationships

Geographers, sociologists, criminologists and economists have debated the relationships between changes in climate and crime for over a century. One of the underlying assumptions across disciplines is that changes in different aspects of the weather can influence the rational calculations of would-be perpetrators about whether or not to commit a crime. Drawing from routine activity and social interaction theory, the basic idea is that changes in the environment can influence the cost-benefit calculus of a potential offender, would-be victim and the presence of a guardian. Put simply, mild weather encourages people to go outdoors while milder weather does the opposite. An abundance of prospective victims and unguarded homes changes the likelihood of criminal activity.

Another set of more recent theories about the relationships between climate and crime come from behavioral science and neurology. Drawing on experimental research, the central claim is that overt and subtle alterations in weather or exposure to pollutants can affect individual judgement and control. The key idea is that when people are exposed to changes in their environment - such as by increased heat or exposure to specific pollutants - their underlying behavior may change. There is growing evidence, for example, that ambient temperatures can influence [mental stress](#) disorders, aggressive behavior and the disposition to commit crime (or not).

Meanwhile, another cohort of social scientists explain the climate-crime connection through the lens of social disorganization theory. In their view, when a disaster strikes, it can undermine the social cohesion and social efficacy that is critical to fostering social sanctions and restraints at the community-level. Depending on their severity, disasters can corrode or short-circuit binding and bridging capital, thus

giving rise to a higher likelihood of delinquency and criminal activity. There is some [research](#) suggesting that disasters can also reduce the number of people and households that are left unguarded, thus lowering the cost of committing non-violent crime.

It should be noted, however, that there is a fundamentally contrary [thesis](#) that massive trauma - including large-scale disasters - can promote solidarity and potentially reduce crime (as opposed to breaking down social bonds and increasing criminal activity). What is more, some researchers contend that the so-called [institutionalization of altruism](#) can be engineered and bolstered by public sector intervention as well as mutual aid among residents. The explanation for this is that major disruptions supposedly generate opportunities for acts of altruism, motivate self-help, and strengthen community networks and bonds. While an appealing idea, the evidence for this view is thin.

Ultimately, there is fairly extensive research indicating a moderate to [strong causal relationship](#) between various climate-related shocks and stresses and both violent and non-violent crime. While the extent of these connections varies, the available [evidence](#) suggests that dramatic climate change will generate a substantial increase in crime in many cities - and especially more vulnerable neighborhoods and households that are already registering deep inequities and concentrated disadvantage.

There are especially robust relationships between rising temperatures and greater exposure to pollution with higher violent and non-violent crime. There is also evidence that natural and human-made [disasters](#) are typically followed by longer-term increases in crime rates relative to the baseline. Studies of floods, [earthquakes](#), and other shocks also reveal a range of shorter and longer-term crime effects, the most common being upward shifts in property crime as well as the intensification of domestic and intimate partner abuse.

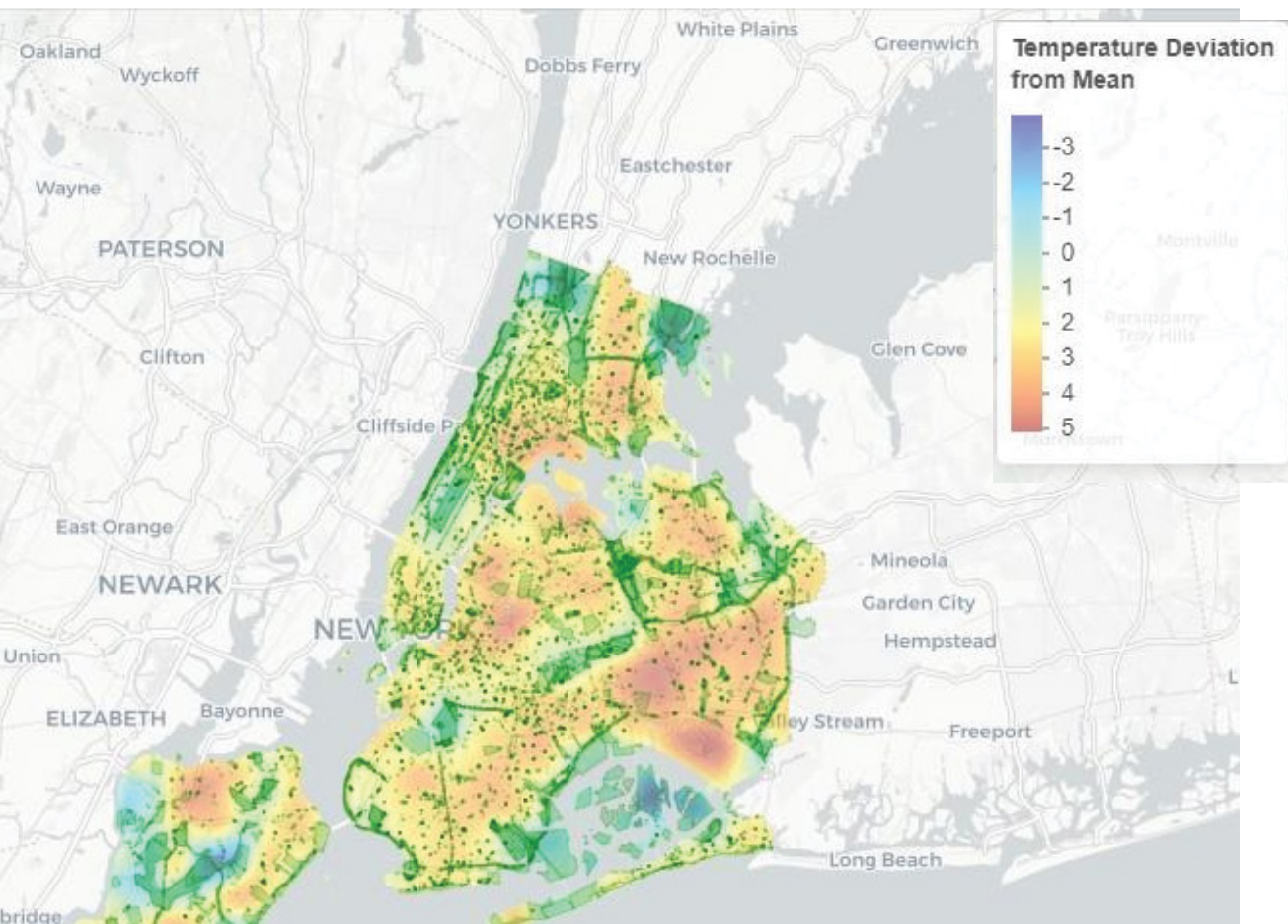
The heat-crime hypothesis

The study of weather and crime has been a hot topic of criminology and sociology since the mid-1800s. The first major studies exploring the connection were conducted in 1904 by [Dexter](#) and later, by [Falk](#), in 1952. Since then, scholars have examined how changes in air pressure, humidity and temperature affect changes in patterns of violent crime. These early studies laid the ground for the so-called “heat hypothesis”: the idea that people experiencing heat stress are more likely to read social interactions as aggressive and shift toward violent responses.

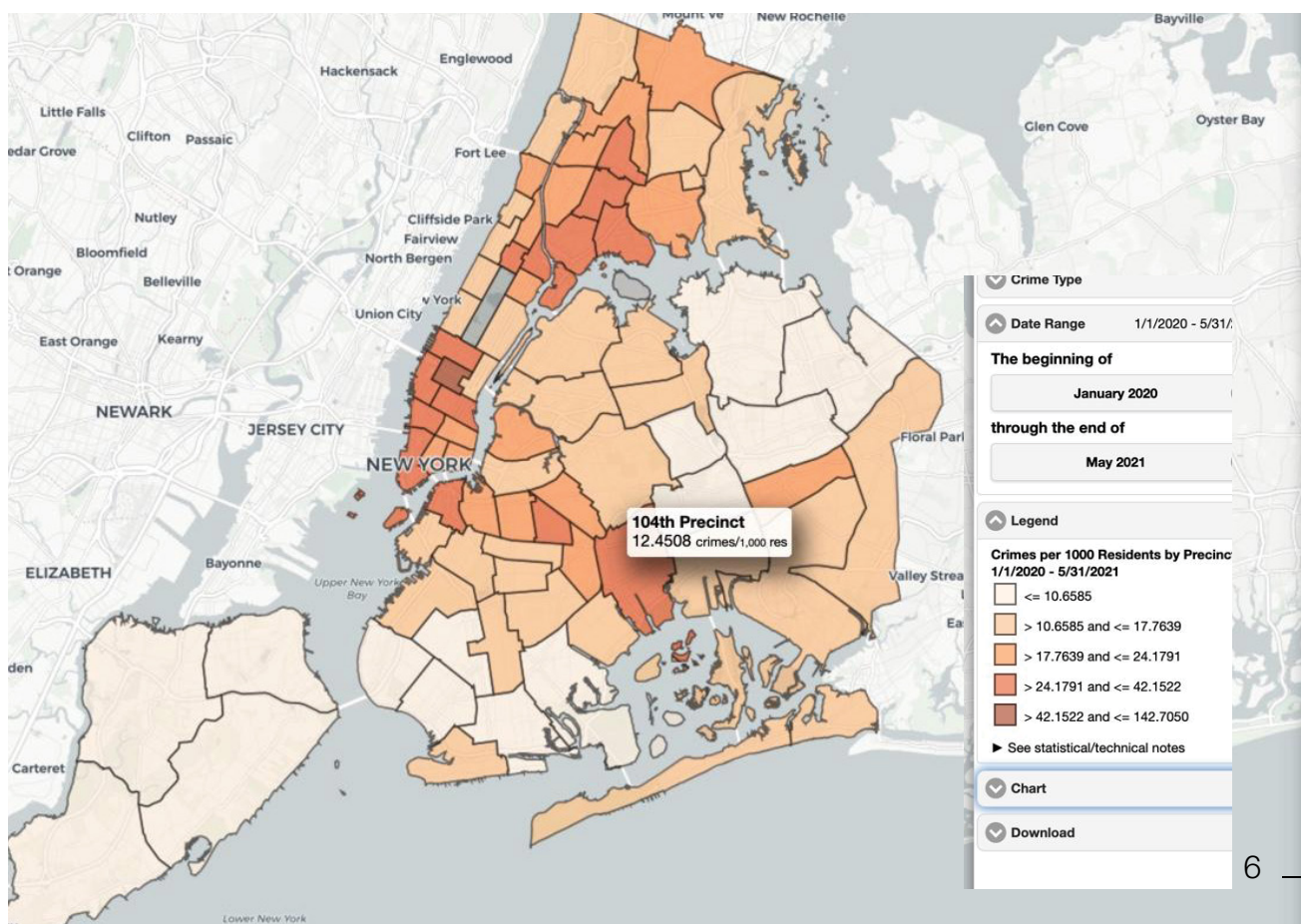
The heat hypothesis has been extended to a host of other shocks and stressors - from floods, hurricanes and blackouts to droughts, sea level rise and food shortages. The central contention is that the imposition of major strains on communities, households and individuals can reduce inhibitions, self-control and lower constraints against retaliatory violence. There is [experimental research](#) that shows, for example, how athletes can become more aggressive when exposed to rising heat. Likewise, road-rage appears to be [moderately influenced](#) by hot weather.

“Evidence suggests that dramatic climate change will generate a substantial increase in crime in many cities - and especially more vulnerable neighborhoods.”

Comparing urban heat islands and crime hot spots in NYC (2020/2021)



Source: [USG \(2020\)](#) and [NYC \(2021\)](#)



Another reading of the heat hypothesis is that it affects the opportunity for crime. As noted above, more agreeable weather generally increases the rate of social interactions and, consequently, opportunities for crime. More people on the street or out of their homes, the higher the likelihood of interpersonal altercations and property crimes. A wave of studies in US cities throughout the 1980s and 1990s explored the relationship in more detail. One early assessment by [Anderson in 1984](#) in the US detected a strong linear relationship between ambient temperature and crime.

An ambitious study of over 50 US metropolitan areas by [Anderson, Bushman and Groom in 1997](#) examined changes in weather and crime between 1950 to 1995 and determined that hotter years generated higher rates of deadly assaults when controlled for age, year and socioeconomic status. Research by [Rotton in 2003](#) and [Rotton and Cohen in 2004](#) came to similar conclusions, albeit with some new insights. They noted strong seasonal and regional variations: higher temperatures were associated with more property crimes in the northern US and violent crime in the southern states. They also discerned an inverted U-shape association between temperature anomalies (deviations from the monthly average) and crime.

A number of scholars have projected climate change and crime trends into the future. Recent studies, including by [Ranson in 2012](#), are forecasting a bleak scenario. A review of over 3,000 US counties predicts a dramatic spike in crime by 2100, with an estimated 35,000 more murders, 216,000 more cases of rape, 1.6 million aggravated assaults, 409,000 robberies, and 3.1 million burglaries per year. Another 2020 assessment by [Harp and Karnauskas in 2020](#) tested out 42 global climate models in over 16,000 cities in the US anticipated between 2.3-3.2 million more violent crimes by the end of the century. More optimistically, an earlier [assessment](#) in 2014 drawing on data from 1960-2009, observed that cooler temperatures potentially reduce the incidence of several crime categories.

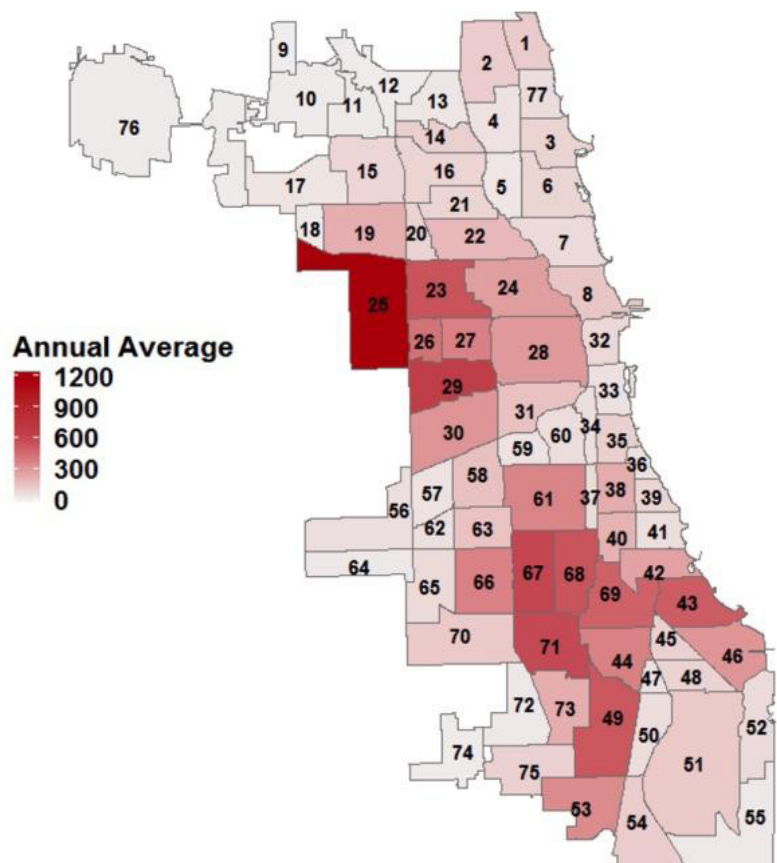
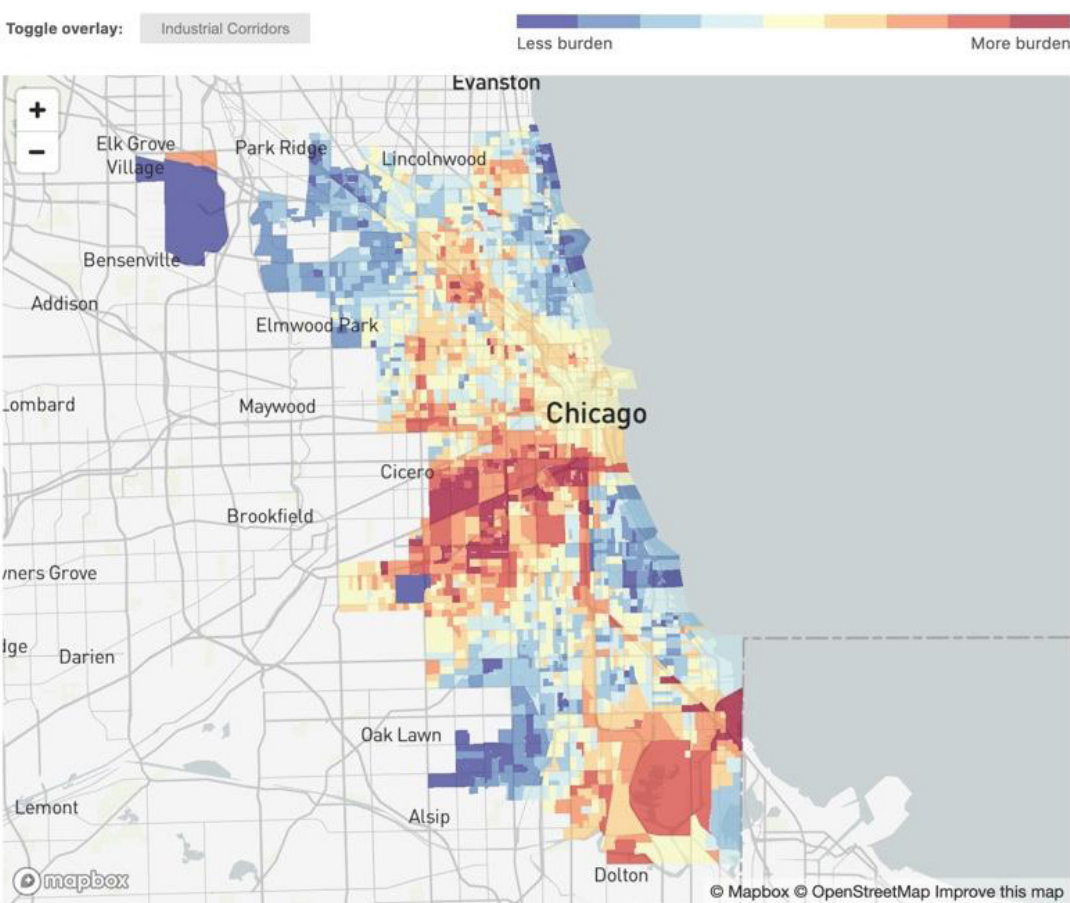
The climate change-crime relationship is not restricted to the US. A [2016 study by Mares and Moffett](#) examined the effects of annual temperature changes and homicide across 57 countries between 1995 and 2012. They found that a one degree Celsius increase in global temperature is associated with a six percent increase in the prevalence of homicidal violence. Across geographic settings, then, the [higher the temperature increases](#), the greater the number of additional violent crimes. A [follow-up study in 2019](#) found not only a positive relationship between climate change and crime but also significant monthly variation in this association.

The pollution-crime thesis

Social and natural scientists are also heavily invested in studying the linkages between pollution and crime. There is considerable [evidence](#) indicating that short-term exposure to certain air pollutants can influence the predisposition toward aggressive behavior and ultimately the likelihood of crime perpetration. Even so, the underlying neurological and physiological factors that potentially explain the relationships between pollutants and criminal behavior are still being carefully investigated.

One of the most widely known is the [lead hypothesis](#). Its proponents claim that surges in crime across the US between the 1960s and 1990s were a result of young people breathing exhaust from cars running on lead gasoline. The core assumption was that increased exposure to lead triggered [personal conduct problems](#) - including increased impulsiveness and aggression - as well as decreased IQ. The hypothesis gathered steam after unleaded gas started replacing leaded petrol in the 1980s, and crime halved by the end of the 1990s.

Comparing pollution threats and gun crime hot spots in Chicago (2018-2021)



Source: [BGA \(2020\)](#) and [CIP \(2019\)](#)

There is also [evidence](#) that exposure to pollutants such as sulphur dioxide is associated with higher incidence of mental disorders. Likewise, there is partial evidence suggesting that particulate matter, or PM2, is potentially connected to [delinquent behavior among youth](#) in urban settings. The key contention is that certain types of pollution can lead to the inflammation of the brain and cellular oxidative stress. This in turn negatively affects neural networks and influences behavior including impulsive crimes among younger people.

A [review of air pollution and crime](#) in over 9,360 US cities detected increased anxiety, which in turn apparently lead to a rise in criminal behavior. Cities exhibiting higher levels of pollution registered higher levels of crime. Likewise, a [study](#) of London's air quality index found that a 10 point rise in AQI increased overall crime rates by 0.9 percent. In other words, crime was more prevalent on polluted days, irrespective of social and economic factors.

Scholars such as [Burkhardt, Bayham and Wilson](#) have examined the relationship between pollutants such as ozone and PM2.5 and certain types of criminal activity - mostly domestic and intimate partner violence - between 2006-2013. After examining 400 US counties covering 28 percent of the population they confirmed a robust positive effect of increased air pollution and violent crime, in particular assaults, and to a lesser degree, property crimes.

Disrupting the climate-crime link

Although awareness of the climate-crime relationship is slowly coming into sharper focus, national, subnational and municipal policy responses are lagging. At a minimum, city authorities should map out the vulnerability of specific population groups to the differentiated effects of climate-related shocks and stresses. To be sure, it is commonly poorer, minority and under-served communities that are facing the most severe risks and egregious consequences. This is often a result of deeper social, economic, racial and indeed, environmental inequalities and injustices connected to affordable housing, access to basic services, and participation in formal markets.

Public authorities and civic leaders should initiate a conversation about the types of climate change and crime-related outcomes that are likely at the neighborhood scale. There is a very real risk of resorting to narrow policing responses which can potentially exacerbate existing inequities and insecurities. For example, the deployment of law enforcement and hardening of penalties can result in repressive responses with damaging consequences on poorer, minority and excluded groups. Comprehensive and integrated measures will be required that account for the needs of vulnerable communities, while strengthening mitigation, adaptation and ultimately, resilience.

“Certain types of pollution affects neural networks and influences behavior including impulsive crimes among younger people.”

Very practically, if disasters are associated with rising property crimes and intimate partner and domestic violence, preparedness plans and targeted services need to anticipate these dynamics. Likewise, if rising heat and pollution are correlated with parallel increases in specific types of violent and non-violent crime, appropriate planning is essential to ensure preventive measures are in place. These short-term measures must also be complemented with a broader appraisal of the structural risks - in the built environment and socio-economic conditions - that may give rise to rising crime.

There are multiple co-benefits to be had from investing in green nature-based investments in urban areas, especially vulnerable settings. Specifically, strategies to reduce heat island effects, introduce green roofs, increase park space and forested areas and reduce pavement and concrete can all have crime reduction dividends by lowering temperatures and reducing pollution such as CO₂, NO₂ and PM_{2.5}. Likewise, strategies to reduce air pollution are highly cost effective when it comes not just to improving health, but preventing crime. Tightening environmental policies, including emissions standards and congestion pricing may likewise make cities safer.

“Strategies to reduce heat island effects, introduce green roofs, increase park space and forested areas and reduce pavement and concrete can all have crime reduction dividends .”



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