Chapter 12
Extreme Weather Linked to Climate Change:
Risk, Vulnerability, and Exposure

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ABSTRACT

Climate change has made extreme weather events happen more often, more severely, and with less warning all around the planet. Heatwaves, floods, cyclones, droughts, and wildfires are all getting worse and are bad for ecosystems, economies, and people's health. This chapter looks at extreme weather events from the points of view of risk, susceptibility, and exposure. It looks at the scientific reasons why climate change is linked to extreme occurrences, the social, economic, and environmental aspects that make people more vulnerable, and the patterns of exposure across different areas and groups of people. The chapter goes on to talk about evaluation frameworks, real-world case studies, adaptation and mitigation techniques, and policy responses that are meant to lessen the effects of disasters. To make societies that can survive climate change and move forward with sustainable development in a climate that is changing quickly, it is important to understand these characteristics.

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1. INTRODUCTION

An important problem that humans face is the anthropogenic climate crisis. Changes in many extreme weather and climate events have been observed since about 1950 and human influence on the climate system is clear were the main conclusions drawn from the AR5. Adaptation to a changing climate is becoming an increasingly pressing concern for societies worldwide. Combining adaptation to certain inevitable hazards with climate change mitigation through reduction of greenhouse gas emissions might help reduce such risks, which necessitates considering susceptibility and exposure to climate-related hazards. The process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence is one definition of attribution, which is used to describe climate change. Since many climate change hazards are linked to the incidence of severe weather or climate events, attrition is an essential part of comprehending these risks. Separate episodes of extreme weather or unusual climate conditions, often associated with detrimental impacts on society or natural systems, defined using some metric to characterise either the meteorological characteristics of the event or the consequent impacts. is one way to describe these occurrences (Stott et al., 2023). Timescales for events can range from minutes to seasons or even longer, and spatial ranges from a few kilometres to the size of continents are equally flexible. To that end, attribution can be used for extremes that could be categorised as either weather-related (such as an exceptionally high daily rainfall total) or climate-related (such as an exceptionally high yearly mean temperature). A fundamental assumption is that certain extremes will see different occurrences as a result of climate change. In regions where average temperatures rise, scorching heat waves are likely to become more often. Changing the distribution can either amplify or counteract this trend, but a change in the mean alone is enough. As an example, when soils dry out, they no longer offer evaporative cooling to moderate temperatures, which can lead to an increase in temperature extremes and a wider dispersion of summer maximum daily temperatures in the interiors of continental regions (Çelik, 2026). Extreme rainfall events may become more common as a result of atmospheric warming, which enhances the atmosphere's moisture-holding capacity. The observed record shows these trends in temperature and rainfall extremes predicted by thermodynamic considerations, and climate models indicate that human-caused forcings are responsible for the increased occurrence of such occurrences globally (D. G. Huber & Gulledge, 2021).