

CLIMATE CHANGE AND EXTREME WEATHER EVENTS: SCIENCE AND THE LAW

DI JOSEPH F. C. DIMENTO *PhD, JD University of California Irvine* jdimento@law.uci.edu

The recent extraordinary rains in California caused massive damage and injury. Many observers link this and other extreme weather with climate change. The scientific community is assessing causation with increased confidence. In an often precautionary way, the law reflects this approach. To what extent is additional law at the international, regional, and domestic level needed? Or, as in many areas of evaluation of the effectiveness of law, should the emphasis be on compliance and implementation of the already copious corpus of rules?

Le recenti piogge in California di straordinaria intensità hanno provocato enormi danni al territorio e alle persone. Molti osservatori collegano questo anomalo evento con il cambiamento climatico. Gli scienziati individuano le cause di questi eventi con crescente certezza. Le leggi riflettono spesso queste conclusioni in applicazione del principio di precauzione. Sono necessari ulteriori interventi legislativi a livello internazionale, regionale o nazionale? Oppure, come si verifica in molte aree nelle quali si valuta l'efficacia delle norme esistenti, deve privilegiarsi l'adozione di meccanismi per l'attuazione delle norme?

Introduction

The recent late January and early February weather events in the State of California were extraordinary. Places that normally get 10 inches of rain in a year received those volumes in less than two days. The Hollywood Hills became an area of rivers and mudslides; in many places Long Beach was underwater; snow in California dropped to very low levels; several people died and many more were stranded or injured; there were structural fires and dozens of mud and debris flows, and over a hundred flooding incidents. The rainfall totals in some cases qualified as a 1-in-1,000-year event. [Total annual average precipitation in Los Angeles is 14.25 inches.] February 4th and 5th were the third-wettest two days in recorded history.

In this note, we ask first whether or not this “event” can be linked in a meaningful way to climate change as the scientific community understands that phenomena: we summarize some of the most recent evolving scientific analysis on whether individual extreme weather can be linked to the overall phenomenon. Then we move to a summary of the law and its adequacy to address the flooding and other implications of the phenomenon.

We note first however that, despite its drought stained dystopian reputation to some non-Californians, the state is not a foreigner to great rains. “California is ...subject to episodic pluvials that substantially exceed any in the meteorological instrumental era Observed extreme precipitation and severe

subregional flood events during the 20th century—including those in 1969, 1986, and 1997—hint at this latent potential, but none have rivaled ... the...“Great Flood of 1861–1862” ... transforming the interior Sacramento and San Joaquin valleys into a temporary but vast inland sea nearly 300 miles in length....and inundating much of the now densely populated coastal plain in present-day Los Angeles and Orange counties...” [https://www.science.org/doi/10.1126/sciadv.abq0995]

Climate Change as Causal

The historical record thus also raises the question of the extent to which climate is a significant causal factor. This connection is a leading research topic. In addition to the empirical information, science addresses the dynamics that explain those links.

“Much of the precipitation in California and the West comes from major storms called atmospheric rivers that sweep in from the Pacific. Scientists have projected that atmospheric rivers will grow more potent as temperatures continue to rise, and will become an even more dominant driver of California’s water supplies and flooding. Based onprinciples of thermodynamics..... when the atmosphere grows 1 degree warmer, the air’s water-holding capacity increases by up to 3.9%. And with the increase in global average temperatures now more than 2 degrees over preindustrial times, research has shown that the increase in water vapor is leading to more extreme downpours in many parts of the world.

As the climate warms, the atmospheric rivers that churn toward California over warmer ocean waters are projected to carry more water vapor, leading to more intense precipitation.....
<https://www.latimes.com/environment/story/2024-02-08/climate-change-california-flooding-storms>

“We expect less frequent but more intense precipitation,” said Alexander Gershunov, a research meteorologist at the Scripps Institution of Oceanography at UC San Diego. “Climate models clearly project an intensification of rain, especially from atmospheric rivers, in the future. ... And that’s a very high confidence expectation for a warmer future. However, we have not observed that trend yet...”

“Changes in amount and type of precipitation have been predicted for decades. A number of studies address the links in California and elsewhere. One 2022 study found that atmospheric rivers that hit California in 2017 were up to 15% wetter due to human-caused climate change. Other recent studies have found similar conclusions and point to future atmospheric river events being even more prolific producers of precipitation.” <https://www.axios.com/2024/02/01/dangerous-atmospheric-river-southern-california>

“We can conclude with confidence that climate change is making the event occurring in California right now worse than it would be without climate change,” said climate scientist Andrew Dessler. The recent California rains came after some of the hottest years on record and 2023 was the hottest year on record.

Others have found that climate change has “doubled the likelihood of an event capable of producing catastrophic flooding.”

<https://www.science.org/doi/10.1126/sciadv.abq0995>

Other scientists however conclude that this dynamic remains theoretical and California has not seen these results yet. What’s more, tempering conclusions related to climate change is a phenomenon that is now implicated with climate change: that is El Niño, a climate pattern that generally brings warm, wet conditions in Southern California; it has been influential starting in June through the early winter. “A strong El Niño event tilts the odds toward wetter-than-average conditions in Central and Southern California in particular,” said Daniel Swain, a climate scientist with UCLA.”

..... “We can’t say that El Niño caused..[this]... storm, but a strong El Niño event like this one definitely makes it easier for the atmosphere to produce the kind of pattern conducive for this sort of system.”

The Effects of the Changes

What we witness as damage is a function however of factors other than the atmospheric science. It is in part a result of available infrastructure: drains, dams, channels, aqueducts, highways. Some of this hardscape in California [and elsewhere] is dated and undersized. Some of it was built to meet goals, designed by engineers and implemented by government agencies, that would not be primary or at least singular now. Historically, moving water out of California faster has been done to control local flooding, so rivers were channelized in cement limiting percolation into the ground where aquifers could store the excess.

The Law

What does this scientific record and theory mean for the Law? Among goals [in addition to mitigation which historically has been the preferred approach to addressing climate change and is not addressed in this brief article] are: a. to protect people and property from harm and damage and b. to promote infrastructure development to capture water to avoid the double negative impact of disastrous flooding followed by drought.

Law makers have not been unaware of these objectives. Domestically and internationally efforts have been considerable, although not fully effective. Law has focused on planning for these events, adapting to them, and requiring funding, financial and technical assistance and technology transfer. On this challenge, surprisingly to some legal scholars, a focus on cooperation among jurisdictions and agencies is a matter of crucial importance.

International Law

This is an area of international in which the precautionary principle has played an important role. Even before science had moved to its present generally accepted position, the law was moving in the direction of a focus on planning, prevention and adaptation. A considerable part of the activity is perhaps best characterized as soft law. However, hard law commitments to addressing the challenges of extreme weather outcomes have verbally been made. A number of international environmental agreements speak to the need: international environmental research cooperation is promoted; funds are promised for adaptation and recently are now promised for loss and damage [in 2022 a new global fund on loss and damage was launched at COP 27 to assist vulnerable countries in responding to climate change damage]; and ongoing international meetings and commitments are mandated.

As in many areas of international environmental law, gaps in meeting these commitments at a high enough level remain real and as, throughout the history of climate change law, are common to a lawmaking. Commitments come in a world wherein a mid night breakthrough at an international venue is announced far away from lawmakers and agency officials who need to undertake the actions of implementation. Furthermore, the delegates and other political actors and agencies who are committing are not always those whose behaviors need to be changed on the ground: the federal, state, and provincial water and transportation agencies, and local government planners. In many cases, these are not ill motivated nor science-denying functionaries whose self interests are threatened by the changes; they are simply people and entities whose daily activities have not been informed or structured to make the changes.

Relevant law is found in several places. The law of international watercourses generally promotes state cooperation over flood-related matters. There are also regional treaties and those on a geographic basis that provide more specific provisions related to floods such as the Europe Floods Directive and the Model Provisions of the U.N. Economic Commission for Europe, Helsinki Convention.

[<https://digitalrepository.unm.edu/cgi/viewcontent.cgi?article=1195&context=nrj#:~:text=At%20pr>]

esent%2C%20the%20law%20of,regional%20and%20basin%2Dspecific%20treaties.] and <https://unece.org/environment-policy/publications/model-provisions-transboundary-groundwaters.>]

The International Flood Initiative (IFI) is a joint effort involving collaboration among many international organizations. It promotes focuses on research, information networking, education and training, empowering community and technical assistance and guidance. [<https://en.unesco.org/themes/water-security/hydrology/programmes/floods>]

The Platform on Water Resilience and Disasters, one of its main activities, promotes “platforms on water resilience and disasters” worldwide: national frameworks in which relevant government organizations [flood control, and meteorology, and disaster management] collaborate for common purposes. The “Water Cycle Integrator (WCI)” WCI aims, inter alia, to integrate knowledge of water cycle, climate, agriculture, and energy. Here WCI aims to establish “cross-sectoral frameworks at local, national, regional, and global levels to link cutting-edge science beyond disciplines with on-site decision-making and action using an “end-to-end approach.” [<http://www.ifi-home.info--again> --an element of the overall international effort that seems much easier to conceptualize than evaluate.

There are other initiatives. The United Nations developed guidelines “for the political decision maker, such as a mayor or minister, who wants to take positive steps to reduce flood losses but does not know how to proceed.” Guidance is offered on identifying and mapping “areas prone to land/mud slide and flooding, preventing development in such hazard prone areas, enforcing controls on land use, and in implementing flood forecasting and warnings and emergency response programmed” [https://www.un.org/esa/sustdev/publications/flood_guidelines.pdf]

The European Union. Among EU actions is the Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks). All EU countries are required to:

- “assess all areas where significant floods could take place
- map the flood extent and assets and humans at risk in these areas
- take adequate and coordinated measures to reduce this flood risk.”

The Directive also provides public to access to information and involvement in the planning process.

[<https://www.eea.europa.eu/themes/water/interactive/by-category/floods/directive#:~:text=seas%20and%20coasts,Water%20data%20centre,heritage%20in%20the%20European%20Union.>]

Domestic Law

California and other states and provinces have built climate change mitigation and adaptation into their state law including with a concern for extreme weather events. Comprehensive plans may mandate creation of climate change elements. More specifically, the law in response to sea level rise is relevant. Some jurisdictions address sea level rise by utilizing land use controls. Tools include environmental impact assessment requirements, more specific requirements such as comprehensive plan elements dedicated to water rise, and development standards for building and related activities near the coast¹. Development codes in some states specifically address floodplain protection prohibiting encroachments including new construction within the floodways. Others direct local governments to move to pervious “spongy” public area development including landscaping.

¹ See for example Collier County, Florida, Land Development Code, Section 3.02.00. In general see Selmi, DiMento et al. *Land Use and Development Control Law*. Aspen. 5th ed.

Looking forward:

This brief and partial survey of the law suggests that there is no dearth of legal requirements regarding extreme events like flooding and the preparation for and adaptation to them. The law has been rather impressive in its aspirations, at least in light of a science that is evolving.

What more should the law direct? In both domestic and international law perhaps planners and lawmakers should focus now on enforcement and compliance including by the agencies that are already required to undertake many actions through conventions, codes, regulations, directives, and statutes. In fact, this emphasis on actually performing what is promised is recognized by some international and domestic mandates which call for reporting and monitoring and also seek funding to assist in implementation. As is often the case in international environmental law, one adds to the potential for institutional paralysis with requirements creating new obligations while not focusing on compliance with the already existing corpus of international, regional, and domestic law.