

ENVIRONMENTAL JUSTICE AND FLOOD HAZARDS

A conceptual framework applied to emerging
findings and future research needs

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Introduction

In recent decades, distributive justice issues have become centrally important in risk assessment of environmental risks and hazards. Recognition of social inequalities in the spatial distribution of toxic pollution hazards and risks – first in the United States and then globally – has spawned a vibrant social movement, policy debates, and a large body of research. Under the rubric of environmental justice (EJ) analysis, numerous quantitative spatial studies have focused on examining whether toxic risk burdens are distributed evenly across people and places, or the extent to which racial/ethnic minority, lower class, or other oppressed communities are disproportionately exposed to toxic pollution hazards (see Chapters 25 and 26). Various statistical and spatial analytic techniques (see Chapters 15, 16, 17) have been employed in a variety of locational contexts worldwide. The majority of studies indicate that racial/ethnic minorities, people of low socioeconomic status and other socially marginalized groups experience disproportionate residential exposure to hazards such as air pollution, chemical releases from industrial facilities, and residual risks from inactive hazardous waste sites (Chakraborty et al. 2011; Walker 2012). The impacts of Hurricane Katrina in 2005 and subsequent state response failures catalysed academic inquiry and activism to address social injustices associated with events such as hurricanes and floods. More specifically, concerns regarding the uneven impacts of Katrina on African-American, elderly and low-income residents of New Orleans led to an expansion of empirical EJ research to include the unjust implications of flooding (Bullard and Wright 2009; Colten 2007; Ueland and Warf 2006; Walker and Burningham 2011).

A premise of this chapter is that, while distributive EJ research has produced important knowledge regarding injustices associated with toxic pollution hazards, this body of work is bound by limitations that constrain empirical and normative understandings of EJ implications of flood hazards, despite recent focus in the EJ literature. From an EJ perspective, this chapter first highlights the complex and sometimes counterintuitive findings emerging from relatively recent studies of flood hazards. Next, it highlights some key limitations of conventional distributive EJ research before introducing a conceptual framework with corresponding

propositions for enhancing understanding of the complex distributive dimensions of environmental injustices associated with flood hazards.

Environmental justice, social vulnerability and flood hazards: empirical findings

EJ-related studies of floods have yielded ambiguous findings regarding relationships between indicators of social vulnerability/marginality and flood risks. Divergent relationships between indicators of social vulnerability and risks associated with flood hazards have been found for studies focused on disproportionality in pre-flood hazard exposure, versus those focused on disproportionality associated with actual flood events.

One approach to examining EJ implications of flooding is to clarify which people live at greatest risk of flooding or the social characteristics of those residing in locations within or proximate to floodable zones. Such distributive EJ-type studies have not consistently found associations between indicators of social vulnerability/marginality and pre-flood hazard exposure. More than a few quantitative spatial analyses have found, counterintuitively (from a conventional distributive EJ perspective which assumes that socially disadvantaged populations will be exposed to greater risks), that socially advantaged people (i.e. those of low social vulnerability) experience the highest pre-event exposure to flood hazards in particular contexts (Chakraborty et al. 2014; Fielding and Burningham 2005; Grineski et al. 2013; Montgomery and Chakraborty 2013; Ueland and Warf 2006). Of the pre-flood exposure studies focused in the US, we found only one reporting a consistent pattern of areas characterized by high social vulnerability experiencing disproportionately high pre-flood hazard exposure (Burton and Cutter 2008). Notably, this study is based on a measure of spatial flood risks associated with failure-susceptible levees, a variable that integrates (a lack of) flood hazard mitigation (Burton and Cutter 2008), and which points toward issues of process/procedural injustice in the context of flooding (Johnson et al. 2007). Results from other US-based studies have not revealed clear patterns of disproportionate exposure for socially marginal groups (e.g. Mantaay and Maroko 2009), including one focused on spatial associations between neighbourhood socioeconomic composition and flood exposure in Hurricane Katrina (Masozera et al. 2007). In the UK, research reveals that flood risks in inland areas are not inequitably distributed, but that coastal flood risks are borne disproportionately within lower social class areas subject to economic decline via port-based deindustrialization (Fielding 2007; Walker and Burningham 2011; Walker 2012).

On the other hand, far more numerous and methodologically broader ranging studies of flood impacts, response and post-event recovery have typically documented disproportionate impacts for traditional EJ communities. Most such work has not been conducted under the rubric of EJ research, but rather has been conducted using a social vulnerability to hazards/disasters lens (Rufat et al. 2015). The last three decades have marked the emergence of a social vulnerability perspective on hazards and disasters, which emphasizes the influence of social inequalities on differential risks (Cutter 1996; Wisner et al. 2004). Studies of disaster events associated with flood hazards, as well as a range of hazard types, reveal that disadvantaged social groups are at increased risk of experiencing debilitating damage, uncompensated loss, and long-term suffering. Key characteristics explaining variations in natural disaster impacts are context-dependent, but often include social class, race, ethnicity, gender, age, disability and health status, and immigration and citizenship status – some of the axes of social inequality that EJ research focuses on (Cutter et al. 2003; Wisner et al. 2004).

Vulnerability studies reveal that socially marginalized people have reduced capacities for self-protection in terms of mitigating flood hazards at home sites pre-event; evacuating in

response to flooding; returning home or to employment following flood-induced livelihood disruption; and accessing social protection resources to reduce the impacts of flooding such as flood insurance, pre-flood hazard mitigation infrastructure, emergency response information, and post-disaster assistance (Collins 2009, 2010; Elliott and Pais 2006; Maldonado et al. 2016; Mustafa 2005; Pelling 1999). Additionally, such studies indicate that socially vulnerable groups experience the more adverse consequences of flood disasters in terms of morbidity and mortality (Collins et al. 2013; Jimenez et al. 2013; Zahran et al. 2008), which may reflect both their increased exposure to flooding during actual flood events and their reduced access to protective resources.

To summarize, in contrast to the focus of pre-flood studies on the *distributive* dimension of (in)justice in terms of the spatial correspondence between traditional EJ communities and flood hazards, studies of social vulnerability to floods typically emphasize the role of *process-based* inequalities in shaping disproportionate risks for socially marginal groups of people. Thus, from an EJ perspective, the anomalous and divergent findings from distributive and process-based studies of flood hazards are difficult to reconcile. To better integrate these findings within an EJ perspective, the next sections identify limitations of the distributive EJ approach and propose a conceptual framework with specific considerations that analysts should make when examining the EJ implications of flood hazards via future studies.

Two considerations for expanding understanding of the environmental justice implications of flooding

To expand knowledge of the EJ implications of flooding, we must begin from the premise that research on the EJ dimensions of flooding (and the broader quantitative distributive EJ literature) suffers from several limitations. We focus on two limitations here, since they are most relevant to conceptualizing EJ in the context of flood hazards. The distributive EJ literature is founded on 1) an incomplete conception of risk as hazard exposure, which neglects people's capacities to reduce risks; and 2) an underlying assumption that people primarily aim to avoid hazards, which neglects other factors influencing residential decision-making such as locational benefits (see also Chapter 5).

With reference to limitation (1), in order to broaden the EJ conception of risk, it is useful to engage concepts from studies of social vulnerability to hazards/disasters. The social vulnerability to hazards/disasters and EJ research fields are topically related, yet conceptually distinct. A theoretical premise of vulnerability studies is that *risk* is determined partly by human exposure to a *hazard* and partly by people's *social vulnerability*. While there is debate about the meaning and measurement of social vulnerability, the following definition is useful: "*the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard*" (Wisner et al. 2004: 11). The recognition that risk is shaped in part by social vulnerability factors that condition people's capacities to mitigate risks is an important advance upon the conception of *risk as hazard exposure* reflected in the distributive EJ literature (Collins 2010). The environmental equity conception of risk supports the expectation that the least powerful groups in society inhabit the most hazardous environments. While findings from most environmental equity studies of *technological* hazards validate that expectation, results from spatial analyses of social patterns of *natural* hazard exposure most often do not (Kates and Haarmann 1992; Maantay and Maroko 2009; Masozera et al. 2007). We argue that the vulnerability studies conception of risk facilitates understanding of complex socio-spatial patterns of exposure to various hazard types – patterns that would be viewed as anomalous from an environmental equity perspective

(e.g. the residence of socially elite people in high hazard zones) – because it illuminates capacities that enable people to mitigate risks associated with living in hazardous environments. A strength of the vulnerability perspective is the acknowledgement that people have varying capacities to deploy resources (e.g. from their own reserves or through access to social protections), to enhance security and reduce risks, even under conditions of high hazard exposure.

With regard to limitation (2), distributive EJ research has been limited by its one-dimensional treatment of the environment as hazard. EJ scholars have focused their attention primarily on negative environmental attributes. The EJ expectation that vulnerable people inhabit the most hazardous locations, for example, is rooted in the assumption that environments present only hazards and not benefits to people (Collins 2008, 2009, 2010). Although a bevy of more recent EJ studies have examined distributional injustices associated with positive environmental attributes, e.g. amenities such as tree cover, parks, and green space (Landry and Chakraborty 2009; Wolch et al. 2005), this research has also treated the environment in a one-dimensional manner. Few distributive EJ or social vulnerability analysts, however, have examined the role of locational benefits in the distribution of risks across social groups. A handful of EJ studies suggest that employment opportunities – a type of locational benefit that stems from residence near industrial zones – may influence residential patterns of air pollution exposures (Boone 2002; Oakes et al. 1996). For example, in Baltimore (Maryland, USA), Boone (2002) found that whites historically lived closer to factories than African Americans, which was counterintuitive from an EJ perspective; it turns out that housing proximate to factories was reserved for white workers, while African Americans lived further away, without access to gainful employment. Similarly, a few vulnerability analysts have described how exposure to hazards is influenced by associated locational benefits such as production and livelihood opportunities, accessibility, and amenities (e.g. Pelling 1999; Wisner et al. 2004). However, the influence of locational benefits on exposure to risks has also been a tangential emphasis of the literature on social vulnerability to hazards.

Locational benefits associated with hazards have been a more central focus of scholarship emanating from the disciplines of psychology and economics than they have from the fields most central to EJ scholarship (sociology, geography, public health). The psychology-based risk perception literature reveals that, in the process of making decisions about a place to live, people are influenced by multiple interacting factors, with an important one being the trade-off between the perceived risks and benefits of a location (Slovic 2000). Hazards to which people knowingly expose themselves (assuming they have some agency) are associated with benefits; otherwise, people would generally avoid risky locations. To the extent that the benefits are perceived as exceeding the risks of hazard exposure, people may choose to remain at risk (technically speaking). Technical risk assessments generally find a positive correlation between benefits and hazards; i.e. people tend to accept higher levels of hazard exposure in locations where the associated benefits are high (Slovic et al. 1980). Scenic views and a sense of social exclusivity, for example, entice people to live on highly combustible and geologically unstable slopes in Malibu (California, USA) (Davis 1998). In contrast to technical risk assessments, people's perceptions of benefits and hazards tend to be negatively correlated; residents typically underestimate hazards in environments where associated benefits are perceived to be great, which may lead them, even those with relatively low social vulnerability, to accept higher levels of hazard exposure (Alhakami and Slovic 1994; Siegrist and Cvetkovich 2000; Slovic 1987).

Additionally, economists have explored spatial relationships between hazard exposure, environmental benefits, and land values. Along the coastline, flood risk is often associated

with environmental amenities such as ocean views and proximity to beaches. Research shows that proximity to shoreline in the US is highly desirable in residential land markets (Earnhart 2001). Bin and Kruse (2006) found that properties located within the 100-year flood zone (with a one per cent or greater chance of flooding per year) had significantly higher cash values than comparable properties outside of the 100-year flood zone. They hypothesized that this counter-intuitive result may relate to the close relationship between risk and amenity value in coastal settings. In a subsequent study, Bin et al. (2008) statistically isolated the effects of amenity value and flood risk on property values, providing support for that hypothesis.

In sum, analytical consideration of risk mitigation and locational benefits is needed in order to expand understanding of the EJ implications of flood hazards. Next, extending from the literatures on EJ and social vulnerability to hazards/disasters, we present what we see as key elements that should be integrated in a conceptual framework designed to address these two limitations and advance knowledge of socio-spatial influences on exposure to flood hazards, which may be applicable to other types of hazards as well.

Conceptualizing environmental justice implications of flooding

Divisibility refers to the ability to separate (geographically speaking) the risks and benefits associated with a hazard (Kates 1971). Theoretically, divisibility plays a pivotal role in spatial relationships between social vulnerability and hazard exposure. In particular, fundamental differences in *divisibility* may generate divergent social distributions of exposure to flood vs. air pollution hazards. However, divisibility has not been conceptually well integrated in either EJ or vulnerability studies. This relates to the aforementioned lack of consideration of both negative and positive environmental attributes in these two fields. Theoretically, differences exist in divisibility between “natural” (e.g. flood) and “technological” (e.g. sources of toxic air pollution) hazards (see Chapter 26). The benefits associated with many natural hazards must be consumed in place (i.e. they are not geographically separable), whereas the risks/benefits associated with technological hazards are separable by design. Thus, risks/benefits may typically be less divisible for many types of natural hazards and more divisible for many types of technological hazards.

To conceptualize how divisibility plays a pivotal role in distributive aspects of EJ, it is useful to draw a comparison between air pollution – the most studied type of hazard in the EJ literature – and flooding. Figure 28.1 depicts the traditional EJ conceptual model of the relationship between social vulnerability and residential hazard exposure, in which there is assumed to be a positive relationship between social vulnerability and hazard exposure. This model does not account for the divisibility of risks/benefits associated with hazards or people’s (differential) capacities to mitigate hazards, and is based largely on EJ scholars’ empirical analyses of distributive injustices associated with residential exposure to air pollution and other toxic pollution hazards.

Figure 28.2 depicts our conceptual model of the relationship between social vulnerability and residential exposure to air pollution from major stationary sources of hazardous air pollutants (such as factories), where commodities are produced and distributed for profit and pollution is released into surrounding areas. Nearby residents may be at risk and not benefiting from their proximity to polluting factories, especially when the factories do not provide them with employment. This is an example of how stationary sources of air pollution are characterized by a high degree of divisibility. With respect to environmental hazards in which risks/benefits are highly divisible, proximate locations tend to be less desirable for residential uses and have relatively low land values, which may influence the in-migration of socially

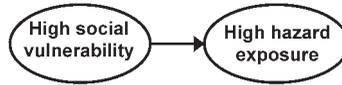


Figure 28.1 Traditional EJ conceptual model of relationship between social vulnerability and residential hazard exposure

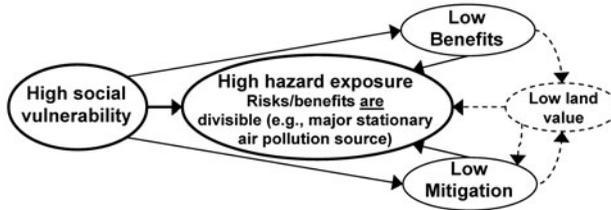


Figure 28.2 Conceptual model of relationship between social vulnerability and residential air pollution exposure

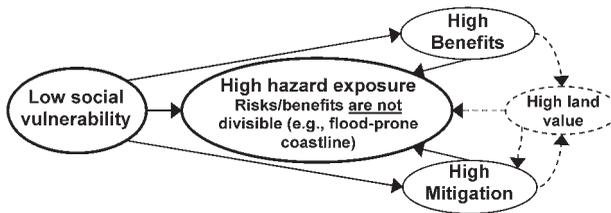


Figure 28.3 Conceptual model of relationship between social vulnerability and residential flood risk

vulnerable residents due to the relatively low cost of housing (Been 1994; Oakes et al. 1996; Hernandez et al. 2015). At the same time, socially vulnerable residents typically lack political power and have reduced capacities to mitigate risks of hazard exposure and, through time, lower value lands near their homes may be continually targeted for development by industries that emit toxic air pollution (Bolin et al. 2005; Cole and Foster 2001; Pulido 2000).

Figure 28.3 depicts our conceptual model of the relationship between social vulnerability and residential flood risk. In contrast to our conceptual model for air pollution, and as our previous points about coastal amenities suggest, risks and benefits are largely indivisible in the case of coastal flood hazards. With respect to hazard types in which risks and benefits are highly indivisible, socioeconomic factors may influence hazard exposure indirectly through the capitalization of amenities in land markets. Socially powerful groups may reside in locations characterized by high levels of hazard exposure as they are able to garner/implement structural and nonstructural forms of mitigation to minimize risks and protect values (Collins 2008, 2009, 2010; Davis 1998).

Recent collaborative work focused on the Miami, Florida metro area illustrates the applicability of our conceptual framework for understanding environmental injustice in the context of flood risk. Metro Miami's population of 6 million is ethnically diverse, with non-Hispanic White residents accounting for only 35 per cent of the total population, and Hispanics and non-Hispanic Blacks, respectively, accounting for 42 per cent and 21 per cent of the population. Miami is also highly residentially segregated along ethnic lines and characterized by some of

the highest levels of income inequality in the US. In terms of flood risks, metro Miami is one of the most hurricane-prone urban areas in the world. A study of coastal flood risk ranked Miami as first in asset exposure and fourth in population exposure for cities worldwide (Nicholls et al. 2008). The three counties of metro Miami (Broward, Miami-Dade, and Palm Beach) have been ranked first, second, and third, respectively, for flood-induced property damage in Florida (Brody et al. 2007). Miami is thus a particularly suitable location for analysing the EJ implications of flood hazards.

In alignment with the models presented above, recent studies of metro Miami reveal that distributive relationships between social vulnerability indicators (e.g. lower socioeconomic status, racial/ethnic minority status) and flood risk tend to be opposite from the relationships between social vulnerability indicators and air toxics. That is, greater social vulnerability is typically negatively associated with residential exposure to flooding (Chakraborty et al. 2014; Grineski et al. 2015), while it is generally positively associated with exposure to air pollution risk (Chakraborty et al. 2016; Collins et al. 2015; Grineski et al. 2013, 2015). Evidence suggests that the divergence in social profiles of risk for residential exposure to flooding vis-à-vis air pollution is due in part to the low divisibility of locational benefits within coastal landscapes from the risks of residential flood exposures (as opposed to the relatively higher divisibility of benefits from risks in the case of air pollution). In Miami, floodable landscapes along the coast are amenity rich. Indeed, Miami's urban structure is largely shaped by the value of coastal access. In Miami, indicators of coastal amenity value (e.g. housing cash value, prevalence of seasonal/recreation homes, proximity to public beach access) exhibit robust positive relationships with coastal flood risk (Chakraborty et al. 2014; Montgomery and Chakraborty 2015), and a pattern of environmental injustice exists whereby socially vulnerable groups experience constrained access to coastal amenities (e.g. public beaches) (Montgomery et al. 2015). When high risk flood zones in Miami are disaggregated based on inland or coastal zonation, social vulnerability indicators are generally positively associated with inland flood zones and negatively associated with coastal flood zones (Chakraborty et al. 2014). This provides further evidence that the counterintuitive social patterning of exposure to coastal flood risk in Miami is partly contingent upon the indivisibility of amenity values from those high risk landscapes. In contrast, inland flood zones – which typically lack the water-based amenities of coastal zones – are characterized by a risk pattern that aligns with traditional EJ expectations.

To fully comprehend the EJ implications of those distributive patterns, we must apply a process-based perspective. While metro Miami is generally at very high risk of flooding, the fact that the most socially powerful residents are concentrated in areas at the greatest risk of coastal flooding suggests that amenity values must outweigh the costs of flood risks. In this context, socially privileged residents (e.g. highly affluent non-Hispanic Whites) are able to externalize risks of coastal living to all US taxpayers through insurance coverage offered by the National Flood Insurance Program (NFIP), which provides highly subsidized premiums to residents in high risk coastal flood zones (US Congressional Budget Office 2007). Socially privileged residents of metro Miami typically choose to live in or near coastal locations because coastal flood risks are mitigated through a variety of public investments (e.g. flood insurance, engineered flood control structures, “beach nourishment” programmes, etc.). Thus, the risks of dwelling within coastal zones are offset by institutionally mediated access to mitigation resources, including flood insurance policies with premiums well below the actuarial costs of flood risks. Indeed, Chakraborty et al.'s (2014) results align with our conceptual model, in that they suggest that flood insurance subsidization through the NFIP in particular may inflate property values and facilitate residential risk-taking, particularly for socially privileged households, because it enables them to externalize risks in their pursuit of coastal amenities.

Recent efforts in the US Congress to systematically increase flood insurance premiums to match actuarial rates has generated resistance from representatives of flood-prone coastal districts as well as home construction and real estate industry groups, who argue that planned rate increases will depress real estate markets in areas where flood insurance is currently heavily subsidized by the NFIP. Although increases in flood insurance premiums would probably affect real estate markets in such locations, this reality underscores the fact that NFIP subsidization has indeed facilitated land speculation, housing development, and residential risk-taking in flood-prone coastal locations.

Some socially vulnerable residents of metro Miami also experience high exposure to flood risks (especially within inland flood zones), which is of particular concern owing to their generally reduced capacities to prepare for, respond to, and recover from flood events (Chakraborty et al. 2014). Miami is one of the most economically unequal metropolitan areas of the US and also perhaps the most flood-prone. Flood exposure similar to that experienced in New Orleans during Hurricane Katrina would generate highly disparate adverse impacts based on prevailing racial/ethnic and economic inequalities. The presence of socially vulnerable groups at risk of inland flooding in greater Miami creates the potential for a disaster of a magnitude unprecedented in US history. Beyond the NFIP, which targets the recovery needs of property owners in particular, protective resources for socially vulnerable groups at risk of flooding in metro Miami are minimally available, and some highly vulnerable groups (e.g. undocumented immigrant renter-occupants) are fortunate if they are able to access any resources to partially meet their recovery needs (Maldonado et al. 2016). Without the implementation of genuine need-based programmes to ameliorate vulnerability among socially marginal residents of flood-prone areas, the risks of a flood disaster of monumental proportions in metro Miami will remain alarmingly high. In sum, environmental injustices in metro Miami appear to be (re)produced as socially privileged groups seek to monopolize access to coastal amenities while the added costs of flood risk mitigation are treated as an externality conveyed to the broader public; in the process, socially vulnerable residents are relegated to areas with air toxics and/or inland flood risks, where they are less able to access protective resources or enjoy coastal amenities.

Conclusion: propositions for deepening understanding

We conclude with three propositions for future research on the EJ implications of flood hazards. First, to improve understanding, a process-based EJ perspective focused on unequal power relations and differential capacities to mitigate risks should be integrated within distributive EJ analysis, which has traditionally been pattern-based and focused on quantifying disproportionate exposure to hazards. To better analyse process-pattern linkages and shed new light on the formation of environmental injustice in the context of flood hazards, distributive EJ analysts should consider the differential capacities of individuals and social groups to mitigate flood risks by deploying or appropriating resources (e.g. from their own reserves or through access to social protections made available through institutions), in order to enhance their security and reduce the threat of loss, even while living amid flood-prone environments. Here, we conceive of mitigation broadly as any structural and nonstructural strategy used to minimize loss and enable recovery from the impacts of hazard exposure (NRC 2006). In the context of flood hazards, risks of damaging exposures can be mitigated through a variety of means. Alterations to the built environment (“structural” mitigation strategies) can reduce physical exposure to flood hazards and “nonstructural” strategies can reduce social vulnerability to flooding. The built environment can be modified through

structural mitigation strategies to protect human settlement and reduce exposure to floods in myriad ways, for example through the construction of flood protection structures, through alterations in building design and land cover, and through the designation, restoration, and maintenance of undeveloped public floodways/coastal zones in cities (Alexander 1993). Specific nonstructural strategies to reduce vulnerability to floods include: land-use controls to restrict development in hazardous zones, weather forecasting to predict flood events, emergency response plans to mitigate flood impacts, flood insurance to compensate losses, and post-event aid to enable recovery (Alexander 1993). More broadly, nonstructural strategies to reduce vulnerability include labour laws and access to safe housing, health care, education, and social services. Such entitlements increase people's livelihood security, physical safety, and capacity to cope with flood hazards. Reliance on these mitigation strategies may have dramatic effects upon the actual societal distribution of flood risk as well as the measurement of distributive environmental (in)justice in the context of residential flood risks.

Second, the reality that flood-prone environments typically reflect both positive and negative attributes necessitates that scholars examine the EJ implications of both flood hazards and water-based benefits, when making inferences regarding distributive (in)justices. Expanding upon the conceptual model introduced above (Figure 28.3), from an EJ perspective, we must acknowledge the fact that floodable landscapes are often simultaneously environmentally attractive and biophysically dynamic, and, furthermore, the risk instantiates an obstacle to accumulation for elite social groups (i.e. those of the lowest social vulnerability). Maximizing values over the long term (i.e. increasing the exchange value of private property and consuming the use values of coastal environments while averting flood risks) necessitates the enlistment of state and market institutions to redirect appropriated social surplus toward mitigating flood risks. Thus, analysts of the EJ implications of flood risks should direct their attention to the multidimensional character of flood-prone environments (which is necessary since sources of risk and reward are typically not easily separable), with recognition that counterintuitive social patterns of exposure to flood hazards may result from processes founded on highly uneven power relations.

Consider the findings from Collins' (2010) study of a flood disaster at the US–Mexican border. While elite residents on the US side voluntarily exposed themselves to flood hazards in their pursuit of environmental amenities (e.g. scenic arroyo views), they were able to externalize risks by harnessing a disproportionate share of the flood mitigation resources that were redistributed by state and market institutions to support flood preparedness, response, recovery and reconstruction before, during and after the event. It would be erroneous to infer that those social elites suffered environmental injustices even though some experienced acute flood impacts. The case study, in fact, supports precisely the opposite interpretation, i.e. social elites living in scenic, flood-prone environments had continually benefited through environmentally unjust processes (Collins 2010). Such findings highlight limitations to the one-dimensional conception of the *environment as hazard* (or, alternatively, as *amenity*), which is employed (often tacitly) in EJ research.

Third, analysts should integrate distributive and procedural approaches with a focus on pattern–process linkages in order to more fully comprehend environmental injustices in the context of flood hazards, as well as other unevenly distributed environmental risks and resources of EJ concern. The fact that seemingly contradictory social patterns of exposure to hazards can flow from environmentally unjust processes provides support for the point that pattern–process linkages merit closer attention in EJ research. Multiscalar, mixed methods, and comparative research approaches should be integrated in studies of distributive and procedural EJ implications of flooding. In addition to quantitative analyses of aggregated socio-demographic data for census-designated areal units, there is a need to focus on people's

decision-making regarding costs and benefits associated with flood-prone residential locations, including their subjectivities and differential material constraints, in order to characterize the environmental injustices they experience (see Chapters 19 and 21). Such micro-scale research demands the inclusion of qualitative methods, which are best suited to uncovering complex, situational and subjective factors that influence experiences of injustice in the context of flood hazards.

Micro-level compositional qualitative research focused on distributional injustices has been underutilized (Hernandez et al. 2015). It holds the potential to more fully explain patterns that quantitative distributive EJ studies have found and, perhaps, to reveal important EJ implications of flooding that have been overlooked. Analysts must also recognize that contemporary patterns of risk exposure across social groups articulate with macro-scale historical-geographical processes (see Chapter 18 on historical approaches). An explicitly multiscale perspective on environmental injustice, originally advanced in the field of urban political ecology (Swyngedouw and Heynen 2003; Collins 2010), has not been widely adopted by EJ scholars. Given the complex EJ implications of flooding, we believe there is a need for EJ scholars to embrace a multiscale perspective, since it fosters insights into how distributional injustices are actively (re)produced through the articulation of constraining and enabling forces.

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