

Sector Interactions, Multiple Stressors, and Complex Systems

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Key Message 18.1

Human–Nature Interconnections Create Unexpected Climate Risks and Opportunities

Human–natural systems are dynamic and complex. Interconnected networks of people, infrastructure, commodities, goods, and services influence changing climate risks and are increasingly vulnerable to their impacts (*high confidence*). The vulnerabilities in these networks, and their effects on human–natural systems, strongly depend on human responses and other compounding stressors (*high confidence*). Decision-makers seeking to reduce climate change risks have to navigate diverse and sometimes competing objectives and perspectives across many actors, institutions, and geographic scales while reconciling deep uncertainties and limits to predictability (*high confidence*).

Key Message 18.2

Complex Climate Impacts and Responses Further Burden Frontline Communities

Compounding and cascading interactions among sectors, hazards, and geographies magnify the impact of climate change and societal responses for already-overburdened groups (*high confidence*). However, social vulnerability assessments tend to evaluate risks and impacts by sector, hazard, or jurisdiction, and most complex-systems models do not yet account for social and political dynamics (*high confidence*). Data about how complex systems affect frontline communities under climate change are severely lacking, especially for hard-to-reach populations, and this can lead to disproportionate risks and impacts for these groups (*high confidence*).

Key Message 18.3

Collaborations Among Diverse Knowledge Holders Improve Responses to Complex Climate Challenges

Responding effectively to complex climate challenges benefits from integrated frameworks and modeling approaches that incorporate diverse types of knowledges suited to specific contexts and needs (*high confidence*). Participatory and collaborative approaches and tools bring together diverse knowledge holders and improve the generation and use of actionable knowledge for complex-systems decision-making (*medium confidence*). These collaborative approaches help navigate complex challenges, such as competing perspectives and knowledge uncertainties, thereby improving climate responses (*low confidence*).

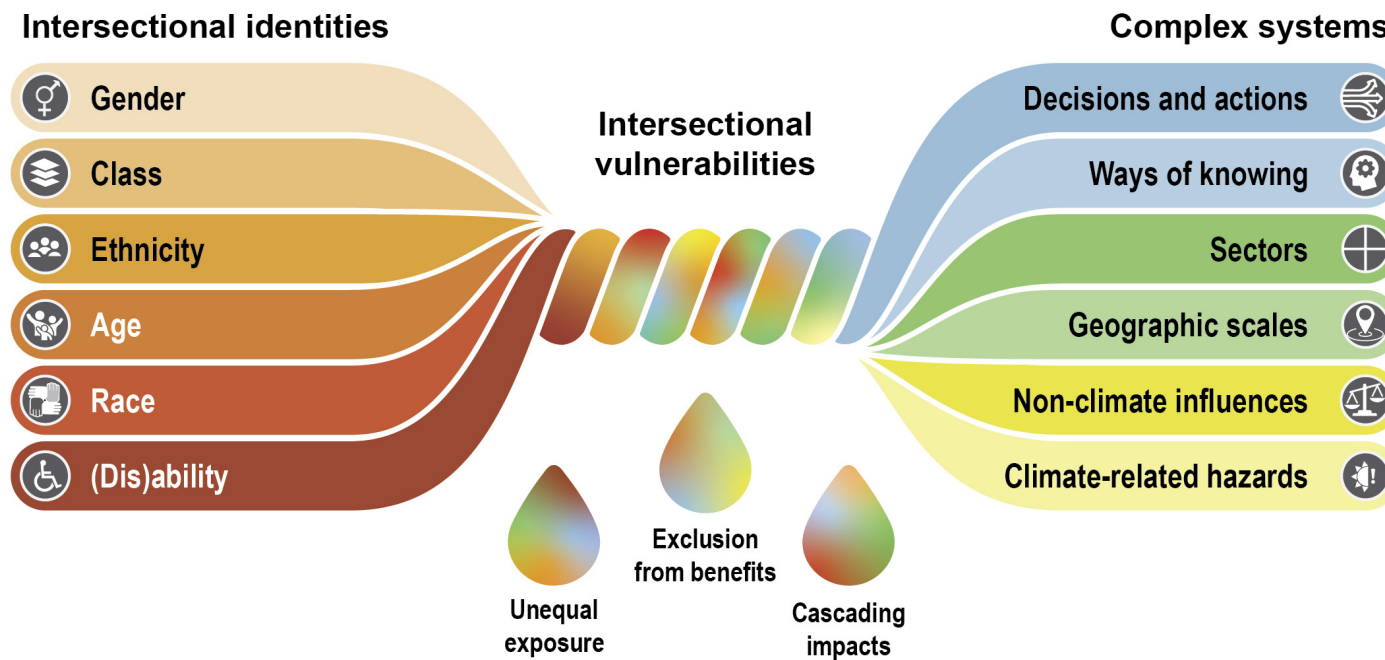
Key Messages 18.4

New Governance Approaches Are Emerging, but Gaps in Practice and Evidence Persist

Climate change presents challenges for managing risks and responses across different levels of government, the private sector, and civil society. Current governance entities and their existing jurisdictional authorities are often unable to resolve conflicts posed by the wide-ranging and unprecedented interactions and complexities of climate risks and more localized compounding stressors (*high confidence*). Local and regional governments have experimented with alternative institutional arrangements, funding mechanisms, and decision coordination (*medium confidence*). Thus far, however, there is only preliminary evidence of their effectiveness (*low confidence*). These pilots and other innovations developed for climate mitigation and adaptation may well present opportunities for replication and broader successes in other locations and different local contexts (*medium confidence*).



Intersectional Vulnerabilities



Intersecting social and environmental factors privilege some people's ability to respond to climate change.

Figure 18.2. Climate impacts and societal responses exacerbate intersectional vulnerabilities. People's gender, class, ethnicity, age, race, and ability form their intersectional identity (left). Intersectional vulnerabilities emerge when intersectional identities interact with inequities in complex systems, as outlined in Figure 18.1 (right). In the face of climate risks and responses, these intersectional vulnerabilities can result in unequal exposure, exclusion from benefits, and cascading impacts that further impact already-overburdened groups. Societal responses to climate change—including uneven existing resources across municipalities, decisions about where to allocate investments, and noninclusive ways of knowing—can exacerbate existing harms and generate new ones. Adapted with permission from Box TS.4, Figure 1 of Field et al. 2014 (see full chapter for detailed citation).

Recommended Citation

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