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Urban–Rural Interactions – Context for Climate Change Vulnerability, Impacts, and Adaptation

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Rural areas and urban areas have always been interconnected and interdependent, but recent decades have seen new forms of these interconnections: a tendency for rural–urban boundaries to become less well defined, and new types of land use and economic activity on those boundaries. These conditions have important implications for understanding climate change impacts, vulnerabilities, and opportunities for adaptation. This box examines three critical implications of these interactions:

1) Climate extremes in rural areas resulting in urban impacts— teleconnections of resources and migration streams mean that climate extremes in non-urban locations with associated shifts in water supply, rural agricultural potential, and the habitability of rural areas will have downstream impacts in cities.
2) Events specific to the rural–urban interface— given the highly integrated nature of rural–urban interface areas and overarching demand to accommodate both rural and urban demands in these settings, there is a set of impacts, vulnerabilities, and opportunities for adaptation specific to these locations. These impacts include loss of local agricultural production, economic marginalization resulting from being neither rural or urban, and stress on human health.
3) Integrated infrastructure and service disruption—as urban demands often take preference, interdependent rural and urban resource systems place nearby rural areas at risk, because during conditions of climate stress, rural areas more often suffer resource shortages or other disruptions to sustain resources to cities. For example, under conditions of resource stress associated with climate risk (e.g., droughts) urban areas are at an advantage because of political, social, and economic requirements to maintain service supply to cities to the detriment of relatively marginal rural sites and settlements.

Urban areas historically have been dependent on the lands just beyond their boundaries for most of their critical resources including water, food, and energy. Although in many contexts, the connections between urban settlements and surrounding rural areas are still present, long distance, teleconnected, large-scale supply chains have been developed particularly with respect to energy resources and food supply (Güneralp et al., 2013). Extreme event disruptions in distant resource areas or to the supply chain and relevant infrastructure can negatively impact the urban areas dependent on these materials (Wilbanks et al., 2012). During the summer of 2012, for instance, an extended drought period in the central United States led to significantly reduced river levels on the Mississippi River that led to interruptions of barge traffic and delay of commodity flows to cities throughout the country. Urban water supply is also vulnerable to droughts in predominantly rural areas. In the case of Bulawayo, Zimbabwe, periodic urban water shortages over the last few decades have been triggered by rural droughts (Mkandla et al., 2005).

A further teleconnection between rural and urban areas is rural–urban migration. There have been cases where migration and urbanization patterns have been to attributed to climate change or its proxies such as in parts of Africa (Morton, 1989; Barrios et al., 2006). However, as recognized by Black et al. (2011), life in rural areas across the world typically involves complex patterns of rural–urban and rural–rural migration, subject to economic, political, social, and demographic drivers, patterns that are modified or exacerbated by climate events and trends rather than solely caused by them.

Globally, an increased blending of urban and rural qualities has occurred. Simon et al. (2006, p. 4) assert that the simple dichotomy between "rural" and "urban" has "long ceased to have much meaning in practice or for policy-making purposes in many parts of the global South." One approach to reconciling this is through the increasing application of the concept of "peri-urban areas" (Simon et al., 2006; Simon, 2008). These areas can be seen as rural locations that have "become more urban in character" (Webster, 2002, p. 5); as sites where households pursue a wider range of income-generating activities while still residing in what appear to be "largely rural landscapes" (Learner and Eakin, 2010, p. 1); or as locations in which rural and urban land uses coexist, whether in contiguous or fragmented units (Bowyer-Bower, 2006). The inhabitants of "core" urban areas within cities have also increasingly turned to agriculture, with production of staple foods, higher value crops and livestock (Bryld, 2003; Devendra et al., 2005; Lerner and Eakin, 2010; Lerner et al., 2013). Bryld (2003) sees this as driven by rural–urban migration and by structural adjustment (e.g., withdrawal of food price controls and food subsidies). Lerner and Eakin (2011; also Lerner et al., 2013) explored reasons why people produce food in urban environments, despite high opportunity costs of land and labor: buffering of risk from insecure urban labor markets; response to consumer demand; and the meeting of cultural needs.

Livelihoods and areas on the rural–urban interface suffer highly specific forms of vulnerability to disasters, including climate-related disasters. These may be summarized as specifically combining urban vulnerabilities of population concentration, dependence on infrastructure, and social diversity limiting social support with rural traits of distance, isolation, and invisibility to policymakers (Pelling and Mustafa, 2010). Increased connectivity can also encourage land expropriation to enable commercial land development (Pelling and Mustafa, 2010). Vulnerability may arise from the coexistence of rural and urban perspectives, which may give rise to conflicts between different social/interest groups and economic activities (Masuda and Garvin, 2008; Solona-Solona 2010; Darly and Torre, 2013).

Additional vulnerability of peri-urban areas is on account of the re-constituted institutional arrangements and their structural constraints (Iaquinta and Drescher, 2000). Rapid declines in traditional informal institutions and forms of collective action, and their imperfect replacement with formal state and market institutions, may also increase vulnerability (Pelling and Mustafa, 2010).

Peri-urban areas and livelihoods have low visibility to policymakers at both local and national levels, and may suffer from a lack of necessary services and inappropriate and uncoordinated policies. In Tanzania and Malawi, national policies of agricultural extension to farmer groups, for example, do not reach peri-urban farmers (Liwenga et al., 2012). In peri-urban areas around Mexico City (Eakin et al., 2013), management of the substantial risk of flooding is led *de facto* by agricultural and water agencies, in the absence of capacity within peri-urban municipalities and despite clear evidence that urban encroachment is a key driver of flood risk. In developed country contexts, suburban–exurban fringe areas often are overlooked in the policy arena that traditionally focuses on rural development and agricultural production, or urban growth and services (Hanlon et al., 2010). The environmental function of urban agriculture, in particular, in protection against flooding, will increase in the context of climate change (Aubry et al., 2012).

However, peri-urban areas and mixed livelihoods more generally on rural–urban interfaces, also exhibit specific factors that increase their resilience to climate shocks (Pelling and Mustafa, 2010). Increased transport connectivity in peri-urban areas can reduce disaster risk by providing a greater diversity of livelihood options and improving access to education. The expansion of local labor markets and wage labor in these areas can strengthen adaptive capacity through providing new livelihood opportunities (Pelling and Mustafa, 2010). Maintaining mixed portfolios of agricultural and non-agricultural livelihoods also spreads risk (Lerner et al., 2013).

In high-income countries, practices attempting to enhance the ecosystem services and localized agriculture more typically associated with lower density areas have been encouraged. In many situations these practices are focused increasingly on climate adaptation and mitigating the impacts of climate extremes such as those associated with heating and the urban heat island effect, or wetland restoration efforts to limit the impact of storm surge wave action (Verburg et al., 2012).

The dramatic growth of urban areas also implies that rural areas and communities are increasingly politically and economically marginalized within national contexts, resulting in potential infrastructure and service disruptions for such sites. Existing rural–urban conflicts for the management of natural resources (Castro and Nielsen, 2003) such as water (Celio et al., 2011) or land use conversion in rural areas, for example, wind farms in rural Catalonia (Zografos and Martínez-Alier, 2009); industrial coastal areas in Sweden (Stepanova and Bruckmeier, 2013); or conversion of rice land into industrial, residential, and recreational uses in the Philippines (Kelly, 1998) have been documented, and it is expected that stress from climate change impacts on land and natural resources will exacerbate these tensions. For instance, climate-induced reductions in water availability may be more of a concern than population growth or increased per capita use for securing continued supplies of water to large cities (Jenerette and Larsen, 2006), which requires an innovative approach to address such conflicts (Pearson et al., 2010).

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This cross-chapter box should be cited as:

Morton, J.F., W. Solecki, P. Dasgupta, D. Dodman, and M.G. Rivera-Ferre, 2014: Cross-chapter box on urban–rural interactions—context for climate change vulnerability, impacts, and adaptation. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 153-155.