Table 7.7 Major Findings on the Interactions between Land Tenure and Climate Change

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Landscape or natural resource system	State of understanding of land tenure, land policy and sustainable development	Implications of land tenure for vulnerability and adaptation to climate change	Implications of land tenure for mitigation of climate change	Impacts of climate change and climate action on land tenure	Implications of climate change and climate action for land policy
Smallholder cropland	In South Asia and Latin America the poor suffer from limited access including insecure tenancies, though this has been partially alleviated by land reform.[1] In Africa informal/customary systems may provide considerable land tenure security and enable long-term investment in land management, but are increasingly weakened by demographic pressures on available land resources increase. While however, creation of freehold rights through conventional land titling is not a necessary condition for tenure security and may be cost-ineffective or counter-productive.[2,3,4,5] Alternative approaches utilising low-cost technologies and participatory methods are available.[6] Secure and defendable land tenure, including modified customary tenure, has been positively correlated with food production increases.[7,8,9]	Insecure land rights are one factor deterring adaptation and accentuating vulnerability.[10,11] Specific dimensions of inequity in customary systems may act as constraints on adaptation in different contexts.[12] LSLAs may be associated with monoculture and other unsustainable land use practices, have negative consequences for soil degradation[13] and disincentivise more sustainable forms of agriculture.[14]	Secure land rights, including through customary systems, can incentivise farmers to adopt long-term climate-smart practices,[15] e.g., planting trees in mixed cropland/forest systems.[16]	Increased frequency and intensity of extreme weather can lead to displacement and effective loss of land rights.[17] REDD+ programmes tend slightly to increase land tenure insecurity on agricultural forest frontier lands, - but not in forests.[18]	Landscape governance and resource tenure reforms at farm and community levels can facilitate and incentivise planning for landscape management and enable the integration of adaptation and mitigation strategies.[11]
Rangelands	Communal management of rangelands in pastoral systems is a rational and internally sustainable response to climate variability and the need for mobility. Policies favouring individual or small group land-tenure may have negative impacts on both ecosystems and livelihoods.[19,20,21]	Many pastoralists in lands at risk from desertification do not have secure land tenure, and erosion of traditional communal rangeland tenure has been identified as a determinant of increasing vulnerability to drought and climate change and as a driver of dryland degradation.[22,23,24,25,26]	Where pastoralists' traditional land use does not have legal recognition, or where pastoralists are unable to exclude others from land use, this presents significant challenges for carbon sequestration initiatives.[27,28]	Increasing conflict on rangelands is a possible result of climate change and environmental pressures, but depends on local institutions.[29] Where land use rights for pastoralists are absent or unenforced, demonstrated potential for carbon sequestration may assist advocacy.[28]	Carbon sequestration initiatives on rangelands may require clarification and maintenance of land rights.[27,28]
Forests	Poor management of state and open-access forests has been combatted in recent years by a move towards forest decentralisation and community co-management.[30,31,32,33,34,35] Land tenure systems have complex interactions with deforestation processes.	Land tenure security can lead to improved adaptation outcomes[40, 41,42,43] but land tenure policy for forests that focuses narrowly on cultivation has limited ability to reduce ecological	Land tenure insecurity has been identified as a key driver of deforestation and land degradation leading to loss of sinks and creating sources of GHGs[45,46,47,48,49]	Findings on both direction of change in tenure security and extent to which this has been influenced by REDD+ are very diverse.[m] The implications of land-based mitigation (e.g., BECCS) on land	Forest tenure policies under climate change need to accommodate and enable evolving and shifting boundaries linked to changing forest livelihoods.[10] REDD+ programmes need to be integrated

	Land tenure security is generally associated with less deforestation, regardless of whether the tenure form is private, customary or communal.[33,36,37,38] Historical injustices towards forest dwellers can be ameliorated with appropriate policy, e.g., 2006 Forest Rights Act in India.[39]	vulnerability or enhance adaptation.[39] Secure rights to land and forest resources can facilitate efforts to stabilise shifting cultivation and promote more sustainable resource use if appropriate technical and market support are available.[44]	(Clover and Eriksen 2009; Damnyag et al. 2012; Finley-Brook 2007; Robinson et al. 2014; Stickler et al. 2017). While land tenure systems interact with land-based mitigation actions in complex ways,[36] forest decentralisation and community co-management has shown considerable success in slowing forest loss and contributing to carbon mitigation.[30,31,32,33,34,35] Communal tenure systems may lower transaction costs for REDD+ schemes, though with risk of elite capture of payments.[16]	tenure systems is currently understudied, but evidence from biofuels expansion shows negative impacts on local livelihoods and loss of forest sinks where LSLAs override local land tenure.[50,51]	with national-level forest tenure reform.[18]
Poor and informal urban settlements	Residents of poor and informal urban settlements enjoy varying degrees of tenure security from different forms of tenure. Security will be increased by building on de facto rights rather than through abrupt changes in tenure systems.[52]	Public land on the outskirts of urban areas can be used to adapt to increasing flood risks by protecting natural assets.[53] Secure land titles in hazardous locations may make occupants reluctant to move and raise the costs of compensation and resettlement.[17]	Urban land use strategies such as tree planting, establishing public parks, can save energy usage by moderating urban temperature and protect human settlement from natural disaster such as flooding or heatwaves.[54]	Without proper planning, climate hazards can undermine efforts to recognise and strengthen informal tenure rights.[55,56]	Climate risks increase the requirements for land use planning and settlement that increases tenure security, with direct involvement of residents, improved use of public land, and innovative collaboration with private and traditional landowners.[56,57]
Riverscapes and riparian fringes	Well-defined but spatially flexible community tenure can support regulated and sustainable artisanal capture fisheries and biodiversity.[58,59,60,61,62,63,64]	Unequal land rights and absence of land management arrangements in floodplains increases vulnerability and constrains adaptation.[65] Marginalised or landless fisherfolk will be empowered by tenurial rights and associated identity to respond more effectively to ecological changes in riverscapes including riparian zones.[66,67,68,69]	Mitigation measures such as protection of riparian forests and grasslands can potentially play a major role, provided rights to land and trees are sufficiently clear.[70,71]		Secured but spatially flexible tenure will enable climate change mitigation in riverscapes to be synergised with local livelihoods and ecological security.[67,72]

Sources: 1) Binswanger et al., 1995 2) Schlager and Ostrom, 1992 3) Toulmin and Quan, 2000 4) Bruce and Migot-Adholla, 1994 5) Easterly, 2008 6) McCall and Dunn, 2012 7) Maxwell and Wiebe, 1999 8) Holden and Ghebru, 2016 9) Corsi et al., 2017 10) Quan et al,. 2017 11) Harvey et al,. 2014 12) Antwi-Agyei et al., 2015 13) Balehegn, 2015 14) Friis & Nielsen, 2016 15) Scherr et al., 2012 16) Barbier and Tesfaw, 2012 17) Mitchell, 2010 18) Sunderlin et al., 2018 19) Behnke, 1994 20) Lane and Moorehead, 1995 21) Davies et al., 2015 22) Morton, 2007 23) López-i-Gelats et al., 2016 24) Oba, 1994 25) Fraser et al,. 2011 26) Dougill et al., 2011 27) Roncoli et al., 2007. 28) Tennigkeit and Wilkes, 2008 29) Adano et al., 2012 30) Agrawal et al., 2008 31) Chhatre & Agrawal, 2009 32 Gabay & Alam, 2017 33) Holland et al., 2017 34) Larson & Pulhin, 2012 35) Pagdee, Kim, & Daugherty, 2006) 36) Robinson et al., 2014 37) Blackman et al., 2017 38) Nelson et al., 2001; 38) Ramnath, 2008 40) Suzuki, 2012 41) Balooni et al., 2008 42) Ceddia et al., 2015 43) Pacheco et al., 2012) 44) Garnett et al., 2013 45) Clover & Eriksen, 2009 46) Damnyag et al., 2012 47) Finley-Brook, 2007 48) Robinson et al. 2014 49) Stickler et al., 2017 50) Romijn, 2011 51) Aha & Ayitey, 2017 52) Payne, 2001 53) Barbedo et al., 2015 54) Zhao et al., 2018 55) Satterthwaite et al., 2018 56) Mitchell et al., 2015 57) Satterthwaite, 2007 58) Thomas, 1996 59) Welcomme et al., 2010 60) Silvano and Valbo-Jørgensen, 2008 61) Biermann et al., 2012 62) Abbott et al., 2007 63) Béné et al., 2011 64) McGrath et al., 1993 65) Barkat et al., 2001 66) FAO, 2015 67) Hall et al., 2013 68) Berkes, 2001 69) ISO, 2017 70) Rocheleau and Edmunds, 1997 71) Baird and Dearden, 2003 72) Béné et al., 2010.