Land and climate
science-policy interface

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Context

Productive land is a finite and increasingly vulnerable resource under climate change

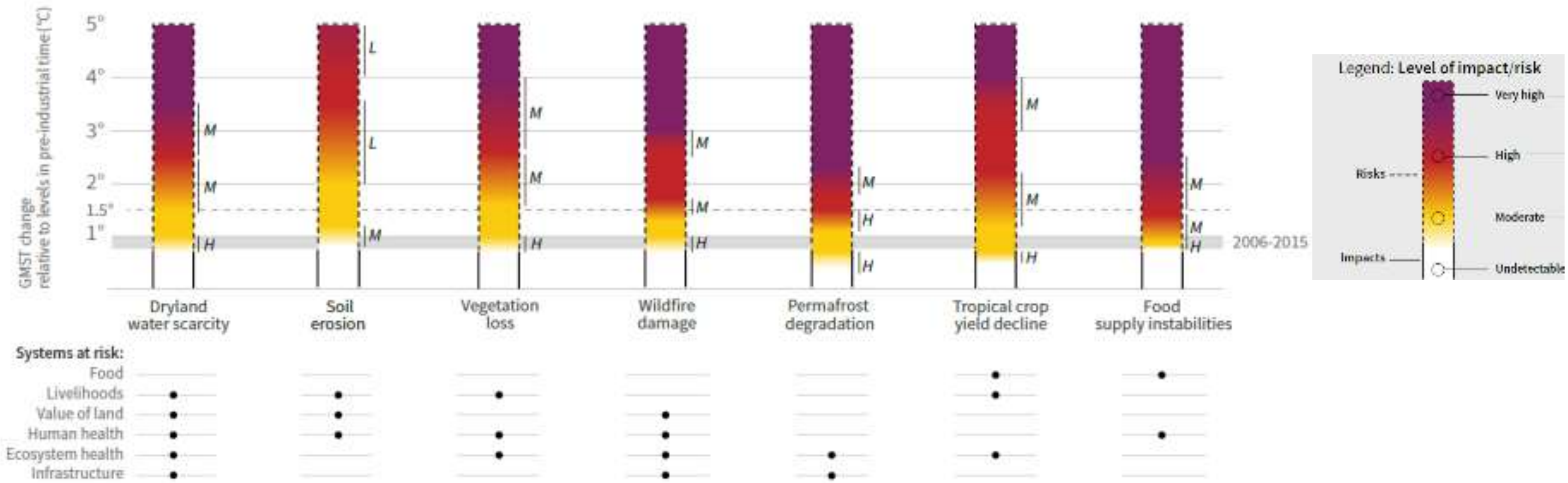
Land contributes to GHG emissions but is also a sink for carbon

There are limits to contribution of land sector to climate change mitigation

Sustainable land management responses that contributes to avoiding, reducing or reversing land degradation (LDN) can provide co-benefits for mitigation, adaptation and ecosystem services

Climate change poses severe challenges for well-being of human societies and ecosystems

Increases in global mean surface temperature (GMST), relative to pre-industrial levels, affect processes involved in **desertification** (water scarcity), **land degradation** (soil erosion, vegetation loss, wildfire, permafrost thaw) and **food security** (crop yield and food supply instabilities). Changes in these processes drive risks to food systems, livelihoods, infrastructure, the value of land, and human and ecosystem health. Changes in one process (e.g. wildfire or water scarcity) may result in compound risks. Risks are location-specific and differ by region.

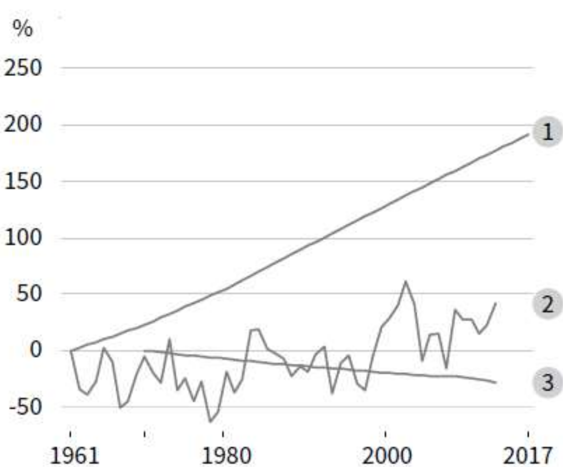


How we use land is both a problem and solution for land-climate challenges

F. Desertification and land degradation
Land-use change, land-use intensification and climate change have contributed to desertification and land degradation.

CHANGE in % rel. to 1961 and 1970

1. Population in areas experiencing desertification
2. Dryland areas in drought annually
3. Inland wetland extent



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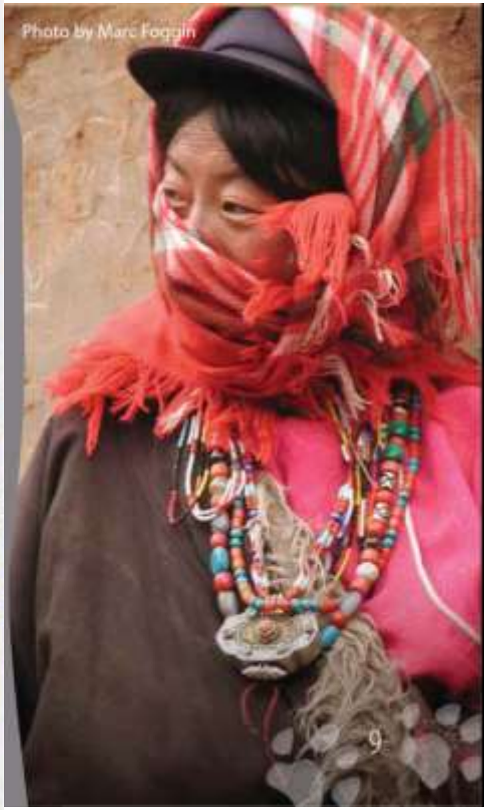
Many land based solutions have potential to reduce risk of warming, help with adaptation options to live with climate change and provide other benefits for humans, ecosystems and biodiversity

FIGURE 1 Agricultural village in Badakhshan, Afghanistan. (Photo by Matthew Emslie-Smith)



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Socio-economic pathways have implications for land-climate challenge and trade-offs

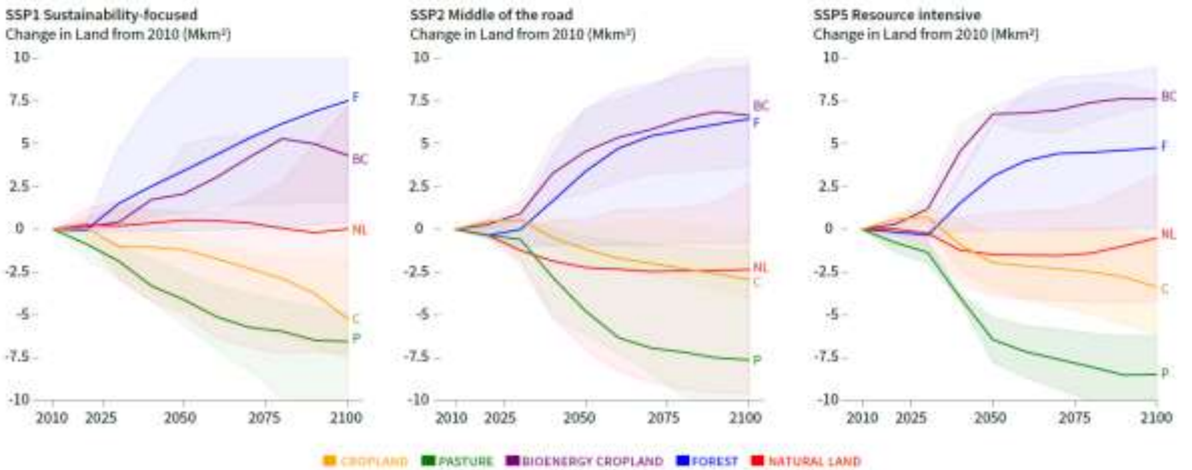
A. Pathways linking socioeconomic development, mitigation responses and land

Socioeconomic development and land management influence the evolution of the land system including the relative amount of land allocated to CROPLAND, PASTURE, BIOENERGY CROPLAND, FOREST, and NATURAL LAND. The lines show the median across Integrated Assessment Models (IAMs) for three alternative shared socioeconomic pathways (**SSP1, SSP2 and SSP5 at RCP1.9**); shaded areas show the range across models. Note that pathways illustrate the effects of climate change mitigation but not those of climate change impacts or adaptation.

A. Sustainability-focused (SSP1)
Sustainability in land management, agricultural intensification, production and consumption patterns result in reduced need for agricultural land, despite increases in per capita food consumption. This land can instead be used for reforestation, afforestation, and bioenergy.

B. Middle of the road (SSP2)
Societal as well as technological development follows historical patterns. Increased demand for land mitigation options such as bioenergy, reduced deforestation or afforestation decreases availability of agricultural land for food, feed and fibre.

C. Resource intensive (SSP5)
Resource-intensive production and consumption patterns, results in high baseline emissions. Mitigation focuses on technological solutions including substantial bioenergy and BECCS . Intensification and competing land uses contribute to declines in agricultural land.



Policy context

Mix of policies exist that can encourage sustainable land management based on regional context

Regulation (eg land use zoning, land sparing and land sharing approaches)

Land tenure could foster acceptance of sustainable land management

Voluntary (change in diet, cropping patterns, standards and certification, awareness generation, citizen science, indigenous knowledge, collective action)

Persuasive (eg payments for ecosystem services)

Risk sharing mechanisms (eg insurance)

Science-policy: Informing magnitude of trade-offs for decision making

Management of dams, barrages and reservoirs for ecological flows down stream

Decision making under uncertainty

Spatial planning for and sharing and land sparing

Location and design of energy mitigation with land implications (solar farms, small dams, wind energy farms) to minimize impacts on biodiversity and pastoralists

How much land to allocate to bioenergy without impacting food security, biodiversity and ecosystem services

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Using existing knowledge for near term adaptation

Measuring and monitoring land-use and land-cover change using shared and accessible remotely sensed data for adaptive management and governance

Early warning systems linked to network of sensors for extreme weather and pest outbreaks

Advisories for farmers based on improvements in short term weather forecasting

Cooperation and knowledge transfer for best practices at all levels of governance

Longer term

Early action on mitigation in all sectors (land use, food systems, energy and transportation, consumption) will reduce costs and burden on land and enable longer term ecological restoration with adaptation and mitigation co-benefits

THANK YOU FOR YOUR ATTENTION!

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