CHAPTER 5

LAND RESOURCES AND HUMAN SECURITY

This chapter looks at some of the wider human security issues related to the condition of land. Many of the underlying pressures on land resources are not immediately obvious. Considerable evidence suggests that people are more likely to use land sustainably if they have secure tenure. Yet insecurity remains high in many countries and the growing phenomenon of "land grabbing" is making it worse.

Gender inequalities put many women and their families at increasing risk, leaving them among the most vulnerable. Yet in practice they are expected to take responsibility for land management as a growing number of men migrate in search of employment.

Income growth simultaneously creates large middle classes with new consumption patterns that drive unsustainable land use and heighten the existing massive inequalities in wealth. Conflict over scarce resources can generate additional local and sometimes global pressures. One result has been greater rural to urban migration, primarily within states or between neighboring states. Increasingly, longer distance migration is contributing to social and political tensions with ramifications throughout the world.

INTRODUCTION

The interplay of ecology, climate, and the human management of land resources has shaped the world for millennia. It is almost 9,000 years since the early settlement of Ain Ghazal, now Amman, Jordan, was partially abandoned seemingly due to land degradation caused by tree felling and intensive goat husbandry.[1] Similarly, the periodic cooling of the climate has wreaked havoc with farming communities, leading to their disintegration and the abandonment of once-fertile areas. In Britain, upland areas that had been farmed for thousands of years were deserted during colder periods at the end of the Bronze Age and only a few have been resettled.[2] Even if the climate remains stable, the mismanagement of natural resources can lead to the loss of essential ecosystem services, potentially followed by the collapse of human societies dependent on them.[3] Humans do not always have a proud history of land management with examples from virtually every part of the world, from earliest history to the present day.[4] The wave of colonization originating in Europe in the 16th century led to the massive over-exploitation of land resources by those who had little interest in their long-term status.[5]

It is simplistic and usually inaccurate to assume that land degradation is a primary cause of major social upheaval, migration, discord, or conflict. Human cultures are complex, and societies evolve as a result of multiple interacting social, political, economic, and environmental factors. But it is increasingly recognized that the availability of and access to land resources are contributing factors to some of these social upheavals.[6,7] There are connections between the health and stability of managed and natural ecosystems, e.g., the degree to which they ensure food and water security, and the overall security of human communities, their resilience to stress and shocks, and eventually to issues of migration or risk of conflict.

Box 5.1: Easter Island – ecocide, genocide, or epidemic?

Rapa Nui or Easter Island is one of the world's most remote inhabited islands, in the middle of the Pacific Ocean a thousand miles from its nearest neighbor, and famous for hundreds of massive stone heads (moai) carved by the inhabitants for reasons that are not fully understood. Rapa Nui suffered an ecological collapse with the extinction of many native species (including all land birds); the destruction of what may have been one of the world's largest seabird colonies; almost complete deforestation and the extinction of several tree species; and widespread soil erosion. But who is to blame?

Debates about Rapa Nui show the difficulty in identifying cause and effect, and the dangers of simplistic explanations. Polynesian people settled the island a long time ago[8] and are thought to have gradually cleared the forests over a 400 year period. It is hypothesized that the introduction of rats may have increased the rate of loss,[9] although the pollen records show no evidence of a rat invasion.[10] Some researchers argue that they literally ran out of space and fertile soil and suffered societal collapse, leading to inter-tribal conflict and cannibalism; by the time European settlers arrived only remnants of the population remained.[11] Others argue that while Polynesians definitely caused widespread ecological damage, their society was viable until the Europeans arrived and were then devastated by diseases for which they had little resistance.[12] Still others point to the impacts of Peruvian slave traders, who captured many people in the 1860s.[13] Widespread sheep farming led to the final stage of degradation[14] causing some species to go extinct in the 20th century. Was the society on a course of self-destruction when the Europeans arrived, or could they have stabilized the soil and maintained agriculture? Agriculture in some parts of the island had apparently been abandoned long before European arrival.[15] Did Europeans exacerbate or precipitate society collapse? What role did climate play? These are some of the recurring questions when working out exactly how humans and environment interact.

This chapter looks at some of the wider human security issues related to land degradation and the convergence of evidence described in Chapter 4:

1. **Land tenure:** sustainable use is heavily influenced by the security of people's rights to land resources
2. **Gender issues:** traditional, usually patriarchal, societies disadvantage women
3. **Resource shortages:** are adding to global insecurity, in terms of the amount of land resources and materials needed
4. **Increasing inequality:** the drive towards rapid economic growth is further disadvantaging the "have-nots," who are as a consequence often forced into unsustainable land management approaches
5. **Migration and security:** is partially attributed to ecological changes in many parts of the world

1. LAND TENURE

Who owns land, who has rights to use land and natural resources, and how secure those rights are significantly influence the way that land is managed. Shifts between various forms of public, private, and communal governance are driven by wider social and political changes that are often well beyond the control of people living in any one place. Ownership is distinct from tenure and most states ultimately "own" the land, in that they reserve the right to supersede individual rights.

Sustainable Development Goal target 2.3 aims to "*double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.*"

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Box 5.2: Types of tenure

Nationalized land tenure: the state has full ownership where individuals have use rights only. The central government may pass on authority to regional governments.

Freehold land tenure: considered to provide strong ownership rights, implying the right to own, control, manage, use, and dispose of property, although most states also have controls over what can be done on freehold land. Rights can also be overridden by state expropriation. Freehold may be conditional, for example when payments or developments have been completed.

Leasehold land tenure: based on the notion of rentals for varying periods. Land belonging to one entity – either the state or an individual – is, by contractual agreement, leased to another entity. Such leases can be long or short. In practice, 99-year leases are considered as secure as freehold land tenure.

Rental: rental occupation of state-owned or privately owned land.

Cooperative tenure: land is owned by a cooperative or group in which members are co-owners.

Customary land tenure: land is owned by indigenous or local communities and administered in accordance with their customs. Ownership is vested in the tribe, group, community, or family. Land is often allocated by customary authorities such as chiefs. Customary land rights are location-specific and often flexible, overlapping, and include dispute resolution mechanisms and individual as well as group rights to use local land resources.[19]

Tenure – the conditions under which land is held and occupied – is more significant than ownership. Clearly defined and secure tenure and access to land and other natural resources provide the basis for long-term stewardship as well as mechanisms for reconciling competing claims made by different users and interest groups. Secure land tenure is recognized as being an important factor in sustainable land management and in reducing the risk of environmental degradation; for example secure tenure is linked with reduced deforestation.[16] However, land degradation can sometimes continue to take place under conditions of secure tenure, such as in many parts of Europe, reinforcing the fact that tenure needs to be supported by clear policies and regulations if degradation is to be avoided.

Land tenure systems differ widely between and within countries. They are a product of historical and cultural factors, comprised of the customary and/or legal, statutory rights to land and related resources as well as the resulting social relationships between the members of society.[17] Tenure can be defined as the way land is held or owned by individuals and groups, or the set of relationships legally or customarily defined among people with respect to land.[18] Tenure systems have evolved gradually and often continue to change over time. In some cases, they have been influenced by revolutionary processes, such as the turnover of existing land tenure systems through redistributive land reform or forced land collectivization as in the various revolutions of the 20th century. In some countries, policy makers have strengthened the role of the state in allocating and managing land, often through the nationalization of non-registered lands held under customary tenure or conversely through more formalized tenure that gives individuals and communities greater control of their land. Although many countries have restructured their legal and regulatory frameworks related to land and in some cases harmonizing statutory law with customary arrangements, insecure land tenure and property rights remain prevalent, particularly in the developing world.

During the 19th century, colonialism introduced new dimensions to land ownership and titling in many parts of the world, based on freehold and leasehold, and usually ignoring or overriding existing forms of customary land tenure. The drive to establish private property continued throughout the 20th century and was subsequently embraced by many governments at the time of independence. As a result, tenure systems are increasingly based on formal, statutory rights that include private freehold and leasehold rights alongside more informal, customary rules and arrangements.

This range of tenure possibilities forms a continuum, each providing a different set of rights and different degrees of security and responsibility. There are various forms of religious tenure as well as temporary or informal tenure systems, including illegal occupation.[20] Additionally, a study of 64 countries found that 10 per cent of the land is owned by indigenous people and local communities, with a further 8 per cent designated for or "controlled by" these groups.[21] Some forms of tenure may only relate to certain kinds of uses, or particular times of the year.

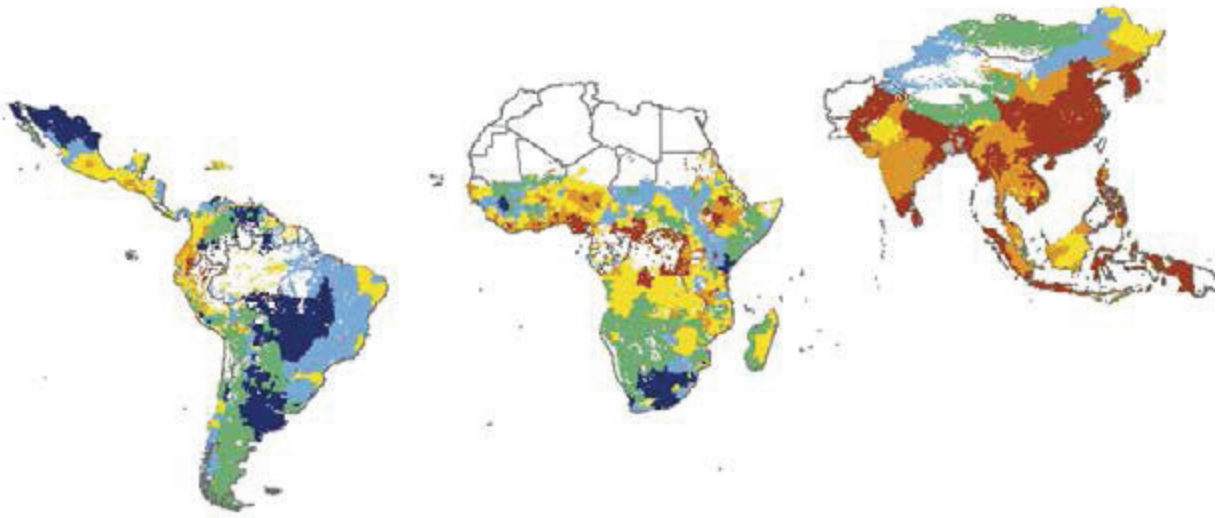

Figure 5.1: Size of agricultural concerns in the developing world: Used with permission[23]

Key

- Urban
- Extensive grazing (mean > 15 ha, > 90% pasture)
- Very large (mean > 50 ha)
- Large (mean 15- 50 ha)
- Medium (mean 5- 15 ha)
- Small (mean 2-5 ha)
- Very small (mean < 2 ha)

The dominant role that agriculture plays in rural land use means that farmers control and manage much of the land. It is estimated that there are 570 million farms worldwide, of which the large majority are small; for example 410 million are less than a hectare in size and 475 million less than 2 hectares. Despite the numbers, smallholders farming less than 2 hectares only occupy 12 per cent of total agricultural land, with the remainder held by significantly larger farms.[22]

While some governments have, to varying degrees, recognized a range of tenure arrangements as legitimate, "secure tenure" still tends to be strictly defined in terms of legal, statutory forms of tenure, such as individual land titles. However, this fails to reflect realities on the ground, and severely reduces the number of people who can afford or access such "formal" tenure, particularly women and rural poor in developing countries. Formalization can also have perverse impacts in that poor people may be tempted to sell land to make ends meet, or it can erode and displace existing social networks and arrangements that potentially offer greater security.[24] The problems are especially acute in sub-Saharan Africa, where the majority of the population remains landless. In South Africa, for example, 80 per cent of farmland was still owned by the white minority in 2013.[25] Overall in Africa only about 10 per cent of rural land is registered, leaving 90 per cent informally administered.[26] Similar land tenure issues extend around the world; India has the largest population of landless people on the planet.[27]

Today, systems of land tenure and property rights are changing quickly, as evidenced by the growing incidents of land expropriation and land-related conflicts,[28] in part due to speculation and the high value placed on good agricultural land.

Land tenure, registration, and dispute resolution

In countries where tenure systems remain informal or are in flux, one common response has been to introduce a land registry initiative: recording land rights in the form of deeds or through the registration of title. In these cases, there are two important elements to consider: the registry, which records the rights to land and the cadastre, which provides information on the location, boundaries, use, and values of land parcels. This approach is being introduced by many governments in developing countries to provide land users with greater security,[29] with the aim of enhancing land-related investments[30] and fostering the development of financial markets; efforts to date have met with varying success. While sometimes useful in addressing long-term tenure problems, new land registration systems often institutionalize inherent inequalities.

Most titling systems have been conceived in terms of individuals and often ignore those with informal use rights, such as women, children, migrants, Internally Displaced Persons (IDPs), pastoralists, hunters and gatherers, and other minority groups. In addition, collective land rights, such as family land rights, have not been adequately addressed, nor have issues relating to the legal position of community lands, including forest, wetlands, and grazing lands, which are usually under customary management. Land titling can be a lengthy and expensive process, particularly if community owners of land are not clearly defined and if new formal entities have to be established.

Land disputes often center on the demarcation, ownership, custodianship, and inheritance of land, or originate from the infringement of customarily held

rights. Land disputes have led to social tensions and open conflict in many countries. In Latin America, the conflicts are primarily between the landless and large landholders, and between the landless and indigenous communities. The key drivers of land conflicts include a combination of inequitable access to and control over land, natural resource degradation, historical grievances, and demographic pressures, exacerbated by weak governance and political corruption.

Inequitable distribution and lack of access/control of land and its resources can be key drivers of poverty, food insecurity, and land degradation. The reallocation of rights to establish a more equitable distribution of land can be a powerful strategy for promoting both economic development and environmental sustainability, but there is no direct link between formalizing land rights, security of tenure, economic development, and peace.

As mentioned, standard approaches to formalizing land tenure, which focus solely on private and/or individual property rights, can create problems because they do not take account of collective rights. Other approaches seek to build land governance regimes that encourage cooperation between the central administration, local government, and customary authorities. Elements of successful processes include reconciling legality and legitimacy; building consensus; defining a realistic and adaptable implementation strategy; and ensuring financial viability for the stewardship of land services.[31]

A number of mechanisms have been developed to resolve disputes at a national or local level. In Ghana, a council of elders and land allocation committees are expected to help the customary trustees.[32] In Tanzania, the Land Commission recommended participation of the elders (Wazee) in the courts to ensure equitable land dispute resolution.[33] In Colombia, a quarter of the land became indigenous territory when a new constitution came into force in 1991.[34]

While there is a general consensus on the need to redistribute land in many countries, there is often controversy about how to do so peacefully, equitably, and legally, without invoking rampant corruption, political interference, rent seeking, or social conflict.

While there is a general consensus on the need to redistribute land in many countries, there is often controversy about how to do so peacefully, equitably, and legally, without invoking rampant corruption, political interference, rent seeking, or social conflict.[35] There are frequent contradictions between formal and informal tenure rules and institutions, which lead to conflicts and inefficiencies. One aim of land reform policies is to find ways of combining these different systems so as to ensure equal rights for both women and men to hold and use property as a cornerstone of social and economic progress.

Land grabs and virtual land

"Land grabs" are a growing phenomenon in Central and South America, Africa, the Pacific, and south-east Asia[36] and refer to the acquisition by outside interests of rights to harvest timber or establish large-scale commercial farms, plantations, or livestock operations on lands in developing nations where tenure has historically been collective, communal, or customary in nature.[37] Although the best known cases involve large investment companies based in the Middle East, Asia, North America, and Europe acquiring farmland in sub-Saharan Africa, land grabs are more commonly initiated by domestic investors supported by their own governments.[38] Such abrupt changes in control over large tracts of land are a modern reflection of a historical phenomenon, including chronic territorial wars, colonization, socialist collectivization, and the dispossession of indigenous people.

Land grabs are often either illegal, in that they contravene the law, or irregular, in that they exploit loopholes in the law, inconsistencies between laws and tenure systems, or take advantage of corruption or low levels of government coordination and capacity. However, completely legal land grabs can exhibit many of the same problems.

Wealthy countries unable to meet their own food and water needs have been acquiring lands in developing countries with abundant arable land and water resources, in some cases to hedge against food and water shortages at home. During 2004-2009, land was acquired by foreign investors in 81 countries;[40,41] however, many transactions are conducted without public notice. It is estimated that in the period 2000-2011 around 200 million hectares changed hands with the average size of land deals around 40,000 hectares. Approximately two-thirds of these acquisitions were estimated to have occurred in Sub-Saharan Africa, where over USD 2 billion has been invested. Almost 10 per cent of the total area under cultivation, and 35 per cent of the remaining potentially-available cropland in Africa has been acquired by large entities, with over 70 million hectares allotted for biofuels.

It is estimated that over 12 million people worldwide experience the loss of household income as a direct consequence, with significant impacts being felt for instance in Gabon, Liberia, Malaysia, Mozambique, Papua New Guinea, Sierra Leone, South Sudan, and Sudan.[42] Scientists have also raised alarms about the volume of water captured and used by these powerful new concerns in dryland countries and about high deforestation rates in land-grabbed

Box 5.3: The Tirana Declaration[39]

Large-scale land acquisitions or concessions are defined as land grabs if they are characterized by one or more of the following:

- Violations of human rights, particularly the equal rights of women;
- Not based on free, prior, and informed consent of the affected land users;
- Not based on a thorough assessment or are in disregard of social, economic, and environmental impacts, including the way that they are gendered
- Not based on transparent contracts that specify clear and binding commitments about activities, employment, and benefits sharing;
- Not based on effective democratic planning, independent oversight, or meaningful participation.

Examples from Tanzania, Kenya, and Madagascar confirm that land grabs often occur against the will of existing inhabitants, that corruption is rife, and that local socio-economic divisions increase after the land grab is implemented.

areas in south-east Asia and Brazil.[43] Land grabs tend to be a small percentage of the total available agricultural land but cluster in places where fertility, transportation, and access to water and markets are especially good.[44] Although little empirical data is available, it seems likely that this is causing considerable displacement and involuntary migration.[45] Examples from Tanzania, Kenya, and Madagascar[46] confirm that land grabs often occur against the will of existing inhabitants, that corruption is rife, and that local socio-economic divisions increase after the land grab is implemented[47] Land grabs can also increase tensions and the potential for conflict within communities and between affected groups and governments.[48]

Food security concerns are important driving forces behind countries outsourcing land resources abroad either indirectly or through foreign direct investment via large-scale land acquisitions[49] Most new cropland expansion globally can be linked to the production of crops for export, especially commodity crops in tropical countries. Other important drivers include the recent economic recession and biofuel targets linked to climate mitigation strategies. An analysis of 1,204 concluded deals, covering over 42.2 million hectares of land, showed that food and non-food crops play the most significant role, both in terms of number of land deals and their area along with growing demand for liquid biofuels by the EU and many other countries.[50] Malaysia, the United States, the UK, Singapore, and Saudi Arabia constitute the top five investor countries and account for 45 per cent of global lands under contract and 37 per cent of all global land deals.[51]

However, there is evidence of increasing large-scale acquisitions through cross-country investments within developing country regions: for example, Libya's investments in Mali; Mauritius's investments in Mozambique; and Egypt's in Ethiopia.[52] In Africa, governments often act as joint venture partners in some of these land deals. Furthermore, government policies can stimulate private capital to invest in foreign land acquisition, and deals have been stimulated by the World Trade Organization, domestic policies on food, agriculture, and trade, and the rolling out of commercial land markets.[53,54]

Pervasive tenure insecurity exacerbates the problems created by land grabbing. Small-scale farmers and pastoralists often have no formal title to land even though they have customary land tenure,[55] and compensation is paid in only one third of cases to people or communities who lose access to land.[56] Supporters of large-scale land investments argue that it offers opportunities for increasing productivity on land which has not yet been intensively cultivated. At the same time, those who oppose these investments contend that while such investments offer opportunities for development, the rural poor are being evicted or losing access to land, water, and other related resources[57] or being trapped in poorly paying contract farming agreements. Almost half the existing land deals analyzed involved land formerly owned by communities,[58] pushing people into cities, marginal areas, or remaining natural forests.[59] In the Democratic Republic of the Congo, large-scale agricultural investment has apparently pushed local farmers into a national park.[60]

A more fundamental criticism of the modern manifestation of land grabbing is that it is predicated on the assumption that large-scale monoculture agriculture is the only realistic way forward, closing the door on alternative approaches.[61] Mixed farmland that provides ecosystem services and supports biodiversity along with many families is replaced with monocultures, which supply none of these additional benefits.[62] Olivier de Schutter, UN Special Rapporteur on the Right to Food, has argued that "what we need is not to regulate land grabbing as if this were inevitable, but to put forward an alternative programme for agricultural investment."[63]

More secure and equitable tenure

Addressing land tenure issues requires a number of clear steps, which will vary depending on the stage of development within a given country. The FAO has established Voluntary Guidelines on the Responsible Governance of Tenure, which provides a strong framework for action.[64] Key elements include:

1. Policy and legal frameworks: policy and legal reform is often needed to ensure security of land tenure for smallholder farmers, rural communities, and indigenous people. This entails developing pro-poor land policies and laws, along with capacity-building programmes that empower traditional rights holders to use the law and make informed decisions about their land.

2. Conflict or dispute resolution: respected conflict resolution mechanisms are essential at both local and national scales. The nature and scope of land conflicts must be thoroughly understood before any intervention. Decisions and adjudications need to be enforced and resolution mechanisms viewed as legitimate by citizens.

3. Redistribution: sources of available land must be identified if redistribution is to be an option, although this is controversial and often difficult to achieve. Land purchase and redistribution by governments, directly by beneficiaries, or by land trust funds should support the livelihoods of marginalized groups. Funds are needed for compensation and the provision of rural infrastructure.

4. Land administration: improvements in efficiency are needed for registration and titling systems, formalizing and securing land transactions and regulation of land markets, including the establishment of local administrative bodies to define rules and maintain information systems and regular land valuation.

5. Land use planning and the conservation of natural resources: development of a new long-term integrated approach to land use planning and the conservation of natural resources, including building resilience of vulnerable communities to environmental degradation and climate change.[65] Planning should be intergenerational, inspirational, participatory, involving all relevant stakeholders, and based on efficient, comprehensive data gathering and processing.

6. Land protection: the issue of land grabbing is complex and requires a territorial vision that 1) recognizes the rights of local communities to use, manage, and control land and other natural resources as a basis for community-driven development and building equitable and just societies; and 2) encourages models of investment in agriculture and other rural land-based activities that are socially, economically, and environmentally sustainable.

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2. GENDER ISSUES

Gender dynamics and community relationships with the environment determine the ability of women and men to manage livelihoods and the land. Women in many developing countries often do not have ownership, tenure, or control over land, natural resources, or commercial production. Women, whose rights are facilitated by their husbands, brothers, or fathers, become even more vulnerable as they can lose their property or tenure rights following migration, widowhood, divorce, or desertion.[66] Tenure is often seen as a positive element contributing to sound land management practices, higher agricultural output, and greater influence in community decision-making.[67] As societies change, more men migrate in search of work or experience higher mortality rates, which may leave women as the responsible heads of households.[68]

The proportion of women farmers is gradually increasing in many places and a feminization of agriculture is taking place in many countries that will continue to change the way in which women's farming roles are perceived.

Women play an important role in many forms of land management, including food production, but are often seriously disadvantaged because of entrenched gender-specific rights, roles, and responsibilities, reducing the quality of life for them and their children. Women are believed to make up 43 per cent of the world's agricultural labor force, with significant regional differences (on average less in Latin America and more in Africa).[69] Many women work as unpaid laborers on family farms rather than as farmers. In Europe, women make up 41 per cent of farm laborers but this masks large differences between countries.[70] In the United States, less than 3 per cent of "commercial" farmers operating stable, successful businesses are women, and the average male farmer makes 17 times more than the average female farmer.[71] There is still no accurate estimate about the proportion of food produced by women[72] and some researchers believe the number of women farmers has been exaggerated,[73] but the importance of their role is not in doubt.

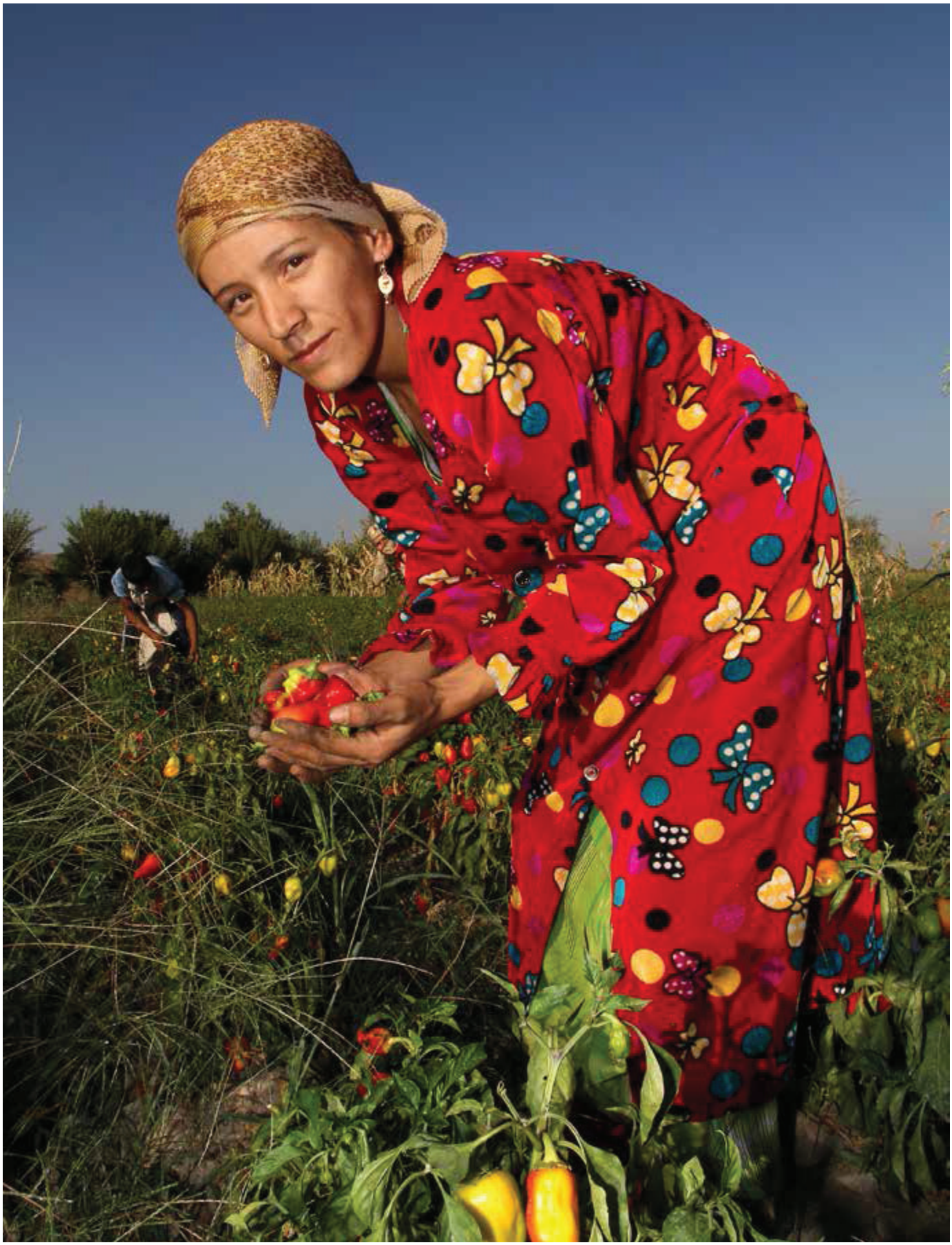
Female farmers generally have lower output per unit of land[74] and are less likely to be involved in commercial activities[75] than male farmers. This is a result of women tending to have smaller farms on more marginal lands; less access to technical information and credit facilities; facing social constraints and family responsibilities that hamper productivity; and often having more dependent relatives and relatively less labor to help with work. Extension services normally target men and in some societies cultural norms present additional barriers for male extension service providers to work with women farmers. Yet if these constraints are removed, women farmers are on average found to be as productive as or more productive than men.[76] Closing the gender gap in the use of inputs and technologies could increase yields for women farmers by 20 to 30 per cent, and raise total agricultural output in developing countries by between 2.5 to 4 per cent.[77]

Gender differences also exist with respect to livestock rearing, although much less is known about the relative productivity of women and men in this area.[78] Women have been estimated to make up two-thirds of poor livestock keepers, and are likely to keep poultry and other animals around the home.[79] However, as livestock enterprises scale up in size, the role of women often declines.[80]

However, gender roles in agriculture are changing. Male out-migration from rural areas in search of jobs is a significant factor in not only increasing women farmers' workloads but also in triggering new roles for women. Out-migration compels women to carry out some of the work previously done by men, such as tending to farm animals[81] and engaging in income-generating activities, in addition to their farm production and household activities.[82] The proportion of women farmers is gradually increasing in many places and a feminization of agriculture is taking place in many countries that will continue to change the way in which women's farming roles are perceived.[83]

Particularly in the developing countries, women's traditional roles make them responsible for many other aspects of land use and management, including the collection and preparation of fuelwood, water, fodder, medicinal herbs, fruits, and seeds.[84] It has been estimated that women in parts of Kenya can burn up to 85 per cent of their daily calorie intake just fetching water.[85] Women are predominantly responsible for fuelwood collection in dry tropical forests except where there are social constraints such as purdah (female seclusion).[86] Environmental degradation increases the burden on women: for example, the time required for firewood collection in the Himalayas has increased by around 60 per cent in the last quarter century because of the declining productivity of the forest; women and children undertake virtually all this work.[87]

Rural women are at the frontline of marginalized groups impacted by land degradation, making gender-responsive land degradation neutrality policies and their implementation an imperative at the local and national levels. If rural household land becomes degraded, the burden on women is increased because they need to find additional ways



Box 5.4: Understanding gender roles and the land

Various theoretical frameworks exist for examining gender roles. *Ecofeminism* covers a "variety of different feminist perspectives on the nature of the connections between the domination of women (and other oppressed humans) and the domination of nature..." along with "theories and practices concerning humans and the natural environment that are not male-biased."[93] *Human vulnerability analysis* can be applied, for instance, to the positioning of parties towards land degradation and what role the state may be playing in conferring privilege and favor to men to the detriment of women. *Vulnerability analysis* emphasizes the importance of taking a life-cycle approach to societal problems, with special attention paid to the needs that arise from roles, responsibilities, and life-stage.[94] While ecofeminism focuses on the patriarchal approach to nature, vulnerability analysis considers how governments might usefully respond. Vulnerability analysis calls for the recognition of hidden tasks relating to reproduction and caretaking in the family, primarily undertaken by women; this caretaking role extends to the land, where women farmers' subsistence roles are not valued and are thus excluded from the Gross Domestic Product. In the context of land degradation, the approach is to examine how gender inequality places women farmers in a less resilient socio-economic position, with respect to maintaining or increasing land productivity and responding to climate change.

Under the agrarian reform programme in the Philippines, over half of the land certificates issued still do not include the name of the wife, despite a longstanding order to include the names of both spouses.

to supplement their declining food production while maintaining their reproductive and caretaking roles. These activities typically include selling their labor to wealthier farmers or petty trading just to buy enough food for their own families.[88]

One way in which women manage multiple roles is through the formation of women's groups where they assist each other with both production duties (e.g., tilling, sowing, harvesting), childcare, and other forms of cooperation, such as financial services assistance. Such groups are found in many countries in Africa,[89] Asia,[90] and the United States.[91] Climate change and its impacts amplify existing gender inequalities, putting additional pressure on "already fragile, undervalued and precarious gender roles at the community level, which shape the nature and extent of exposure, sensitivity and impacts."[92] The vital role women play as producers of goods and services makes them an important strategic partner both in the realization of the SDGs and the climate change agenda.

Traditional systems of inheritance and property transfers, especially of agricultural land, are predominantly patrilineal; however, an increasing number of countries now recognize women's land rights in their constitutions and laws. In Laos, a married woman is entitled to one-half of any property acquired during marriage;[95] Rwanda has recognized women's land rights under law.[96] Where women farmers already have informal or customary land rights, formal title can sometimes be acquired through the conversion of customary title to freehold title registered with the state or through statutory recognition and codification of customary title in the government registry.[97] However, in most developing countries women still only have access to land and related natural resources through their husbands or male relatives. This is particularly important for a woman if she becomes the de facto head of household as a result of male migration, abandonment, divorce, or death. In both urban and rural settings, independent property rights under these circumstances can mean the difference between dependence on family support or charity and the ability to form a viable, self-reliant, female-headed household.[98]

Change comes slowly and legal reforms do not always equal changes in reality on the ground for communities faced with the most severe land degradation. Even when reforms are made, customs and tradition can slow the uptake and rate of change. Under the agrarian reform programme in the Philippines, over half of the land certificates issued still do not include the name of the wife, despite a longstanding order to include the names of both spouses.[99]

Box 5.5: Gender strategies for achieving land degradation neutrality

Sustainable Development Goal target 5.c states "*Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels*." These strategies should be geared towards ensuring gender equality, which can mitigate the unjust effects of the patriarchal norms and attitudes that still prevail in many rural communities around the world, including:[100]

- Recognizing and engaging women as land managers in various aspects, including as farmers, not just farm helpers[101]
- Ensuring that all initiatives undertaken to rehabilitate and restore degraded land are gender sensitive and responsive to the interests and needs of women farmers and land managers
- Sharing best practices and where necessary changing legislation to enable women to overcome the obstacles they face in securing land tenure and resource rights
- Addressing perverse laws and policy incentives that hamper the efficiency and development of women in food production activities
- Ensuring that agricultural extension services include women and address gender-specific needs of women as well as men,[102] through for example training women extension workers, changing teaching practices, peer-to-peer initiatives, re-training, etc.[103]
- Ensuring that women farmers have direct access to resource inputs and financial services, such as micro-finance schemes that are not mediated through their husbands[104]
- Strengthening the voices of women land users at all levels in policy processes through reforms, capacity building, and incentives
- Increasing female participation in agricultural research and development[105]

3. RESOURCE SHORTAGES

Conflict over scarce resources can generate additional local and sometimes global pressures. Ever since the Club of Rome published its report Limits to Growth in 1972,[106] concern about the eventual exhaustion of the Earth's natural resources has received increasing attention. Price volatility and localized competition over limited natural resources can be the precursors to future instability and conflict. While many of the early studies were accurate in their recognition that the world was reaching limits in terms of available resources, the timeline was often overly pessimistic; the world has already survived many of the predicted tipping points for the availability of food, minerals, and energy. But for how much longer?

So far, when shortages have emerged, they have often been issues of politics in the case of both[107] energy and food,[108] or a combination of factors[109] rather than real resource scarcity. Past mistakes also highlight just how difficult it is to estimate resources on a global scale.

Estimates of the remaining stocks of minerals and other materials distinguish between reserves and resources: reserves are reasonably well known and accessible using current technology while resources are less fully known (including their quantities) and perhaps not viable due to the high economic or environmental costs involved in extraction. Some analysts include a third category of "undiscovered" reserves, which are inferred from a general understanding of geology and landforms. Our knowledge of global resource stocks is less exact than is often assumed. In 2004, the oil company Shell shocked the financial market by downgrading its own oil reserves by about one-third, a "loss" of over 4 billion barrels. Table 5.1 summarizes the state of knowledge on some important resources while the rate of their consumption is increasing. Annual global extraction of raw materials grew from 22 billion tons in 1970 to around 70 billion tons in 2010, with non-metallic materials used for buildings showing the steepest increase; over this period there has also been an overall decline in material use efficiency resulting in even greater extraction than the statistics suggest.[110]

Table 5.1: Global outlook for key natural resources

Natural resource	Estimated availability
Land	The availability of good farmland per capita is declining due to rising populations, urbanization, increasing demand for food and non-food crops, and land degradation, leading to the use of marginal areas and the continued conversion of natural ecosystems. See Part Two.
Food	Most analysis concludes that rising population and consumption levels will strain the ability of agronomists and farmers to maintain productivity increases that are large enough to keep pace. Under these circumstances, global shortages could be addressed by reducing waste and changing diets, particularly reducing the proportion of animal products eaten. See Chapter 7.
Water	The amount of water is constant but its availability in different parts of the world is changing and growing problems of water scarcity are expected in many places. See Chapter 8.
Oil and natural gas	Some analysts believe that oil supply has peaked and the world will face energy shortages;[111] others disagree.[112] Many believe there are sufficient supplies of oil and natural gas to see a transition to renewable energy sources; it assesses supplies to be abundant but most are classified as resources rather than reserves, which means that they are not fully known, or present technical difficulties in extracting them in an economic or environmentally sound manner.[113] See Chapter 10.
Coal	In theory, there are hundreds of years of supply left but concentrated in a few countries; some analysts predict the end of cheap coal and a peaking towards the middle of the century due to a variety of factors including pollution and climate concerns.[114]
Timber	There are sufficient supplies of industrial timber. Currently, 1.2 billion hectares of forests are managed for production, half in high-income countries but only 8 per cent in low-income countries: removals in 2011 were around 3 billion m^3, less than one per cent of the growing stock.[115] Sustainable forest management is still severely lacking in many tropical countries, although the area recognized as sustainably managed is increasing.[116] Access to some high-value native tree species, particularly tropical hardwoods, is declining leading to damaging impacts on remaining natural forests. In 2004, around half the tropical timber traded was estimated to be illegal.[117]
Fuelwood	Localized shortages exist which have important social and ecological impacts.[118]
Nitrogen	Industrial ammonia synthesis through the Haber–Bosch process converts atmospheric nitrogen and hydrogen, usually from natural gas, to ammonia, thus facilitating the large-scale and unlimited production of nitrate fertilizers, provided the cost of energy remains low.
Phosphate	Primarily mined from phosphate rock; current global reserves will be depleted in 50-100 years, with some projections of a peak around 2030.[119] Global supplies are uncertain and rest heavily on very large inferred reserves in Morocco.[120] At the same time, phosphate recycling technologies are increasing.[121]
Potassium	Potassium reserves remain large, although concentrated in a few countries, particularly Canada (Saskatchewan) and Russia.[122]
Iron	The US Geological Service estimates global iron reserves at 800 billion tons of crude ore, containing 230 billion tons of iron; sufficient for 200 years of production at current levels.[123]
Copper	Copper reserves are thought to amount to 680 million tons[124] and copper resources are currently estimated at 2,100 million tons known with an estimated 3,500 million tons undiscovered.[125]

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Box 5.6: Sand mining[126]

Sand and gravel account for the greatest amount of materials, by volume, mined in the world. Global production in the year 2000 was estimated to exceed 15 billion tons. Coastal sand with high silica content has been used in glass manufacture, however, due to the ecological and hazard regulatory functions of dunes, its removal is now generally prohibited. Sand from fluvio-glacial drift and fluvial channels, lakes, lagoons, and backwaters is used for building construction. Marine dredged sand forms an important component of aggregate supply, particularly in north-western Europe. River sand has been so extensively mined in some areas that it is in short supply in many parts of the world. Continued and indiscriminate sand mining can cause irreversible damage to ecology and economies by transforming habitats and associated biodiversity, damaging civil construction structures attached to river environments, reducing important ecosystem services, reducing ground water supplies, and impacting drinking water quality. The environmental costs of extracted sand seldom figure in the cost-benefit analysis or environmental impact assessment of the extractive industries, making extraction more profitable than other alternatives. A lack of information on the adverse impacts presents a major problem when developing suitable regulatory systems for wise use. Although some countries have mechanisms to address sand extraction in situ (e.g., Australia and Malaysia) which are proving successful in the protection of river and other sand producing systems, many developing nations need to strengthen their policy to move legal mining to more sustainable levels and to tackle illicit sand mining operations.

Making sand use more sustainable requires, in brief:

- River sand to be used for construction and not for land filling and reclamation.
- New building technologies with reduced sand requirements.
- New technologies for the use of all grades of sand in construction.
- Alternatives to concrete and cement–sand mix in building technology.
- Penalties for illegal and overuse of sand.

4. INCOME INEQUALITY AND UNSUSTAINABLE CONSUMPTION PATTERNS

Income growth and inequality affect the land base in two major ways. First, a general increase in the middle classes in many countries creates a larger pool of people with disposable income, which generates higher consumption levels, and in some cases a demand for resources that are in short supply or are disproportionately land-intensive. Second, an unprecedented increase in income inequality is occurring, forcing poorer people onto marginal land where degradation is more likely, as are the risks of civil conflict.[127]

Sustainable Development Goal 10 aims to "*Reduce inequality within and among countries*" and target 10.1 encourages countries to "*progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average*."

The huge increase in the fashion industry and the rapid turnover of clothing has resulted in a boom in cotton production, which is one of the heaviest pesticide users, responsible for almost a quarter of the world's pesticide usage.

Increasing consumption patterns are stressing land resources: soil, water, biodiversity, and minerals. The global economy is based on people consuming more, a phenomenon recognized a generation ago[128] and still accelerating. Consumption levels have impacts that are more complex than simply an increase in products used. For example, the huge increase in the fashion industry and the rapid turnover of clothing has resulted in a boom in cotton production, which is one of the heaviest pesticide users, responsible for almost a quarter of the world's pesticide usage.[129] The explosive demand for land-intensive, high-protein foods discussed in Chapter 7 has meant, among other things, huge forest losses to grow soybeans and create grazing land for cattle. Rising middle classes in some developing countries are also financing an increase in bushmeat trade,[130] the killing and selling of wild animals: most notoriously in the case of large predators like the tiger but also new markets for wild mammals, birds, and reptiles, which is threatening whole species with extinction. Other wildlife product markets, such as elephant ivory[131] or rhino horn used for medicine,[132] are also creating a crisis for conservation management.[133]

Income inequality is even more complicated. The richest one per cent of the world's population now own more than the rest of us put together; just eight men hold the same amount of wealth as the poorest half of the world. Over the last 30 years, income growth of the poorest half of the world has been zero while the incomes of the top one per cent have grown 300 per cent.[134] Direct causal links between poverty and land degradation are contested, although the balance of evidence suggests that social inequality is bad for the environment, which may in turn explain why societies with more inequality appear to be less healthy.[135]

5. MIGRATION AND SECURITY

An estimated 244 million people live and work outside the country of their birth;[136] many more migrate within their own countries. Migration takes place for many reasons, including the desire for a better life, to escape repressive regimes, or to move away from difficult environmental conditions. When things get tough, people have two options: to stay put and try to sort things out in place, or to move somewhere else. Many people opt for the latter although the poorest and most vulnerable may be unable to do so. Mobility and the ability to migrate are important livelihood strategies, especially among rural populations that depend on land-based goods and services, but also among the rich and educated who are prepared to move for career or economic opportunities.

Sustainable Development Goal target 10.7 encourages countries to "*Facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies*."

Three forms of human mobility can be distinguished: migration by people moving within or beyond their country for socio-economic reasons; displacement, usually referring to forced movement due to conflict or disaster; and planned re-location, the movement of communities to a safer place in response to irreversible environmental changes. While migration can be a positive adaptation strategy, displacement can increase vulnerability and planned relocation often has mixed results, moving people out of immediate harm but sometimes leading to new vulnerabilities.[137]

As a response to land resource pressures, some migration takes place because regions are over-populated, while in other areas depopulation and land degradation are a contributing factor. Migration is more likely to be a strategy to address climate change in vulnerable ecosystems, such as drylands, mountains, and low-elevation coastal zones.[138] Rural–urban migration, when people move from the countryside to towns and cities, is the most common direction of movement. In some countries, governments encourage migration from crowded peri-urban areas to less developed natural frontiers,

encouraging the clearance and conversion of forests and increasing land degradation in new areas: the Indonesian transmigration programme is a well-known example of this approach with mixed results.[139]

Most migration takes place within countries and international migration mainly occurs between contiguous countries.

Most migration takes place within countries and international migration mainly occurs between contiguous countries. Long-distance international migration from low to high-income countries averages just over 4 million people per year, making it a relatively small contribution to the more than 200 million international migrants worldwide,[140] although the numbers of "forced migrants" are currently rising.[141] Migrants tend to move to places where people like them have gone before, using family or social networks to help with the journey and getting established at their destination.[142] Migration preferences change over the course of a person's life, with young adults typically the most mobile people in any society, although retired people also migrate, often returning to their place of origin.[143]

Migration can be temporary or permanent and can take place in an orderly fashion or suddenly because of natural disaster, political repression, or conflict. The connections between land degradation and migration are complex, influenced by social, economic, political, demographic, and environmental processes that operate at local to global scales. Most land degradation-associated migration occurs not under conditions of absolute distress but as households take advantage of opportunities to generate new income sources and reduce their exposure to risks and hazards associated with land production activities. While migration may be voluntary or forced, most often decisions are a combination of both.

The global number of forced migrants (i.e., refugees and displaced persons) and stateless people is estimated to be 65 million,[144] two-thirds of whom are internally displaced persons.[145] Voluntary migrants are sometimes enticed by economic benefits such as labor markets, commodity prices, housing costs, and valuation of workers' skills,[146] but also as a way for households to reduce and diversify their exposure to economic uncertainty and unexpected difficulties.[147] For example, rural populations in West Africa use migration strategically to cope with the inherent seasonality of the climate,[148] sending young adults to the cities in the dry season to reduce the demands on household food supplies and in the hope they may earn money.[149] In many poorer countries, the money sent back from overseas migrants represents a large proportion of household incomes;[150] but, as the poorest people are often unable to migrate, this can further increase inequality. Migration can be an important factor in sustainable livelihood strategies, particularly in the drylands.[151]

How environmental change affects migration

The term "environmental refugee" was coined to describe people displaced by famines and other disasters,[152] including people forcibly relocated to make way for the construction of dams and other infrastructure.[153] Millions of environmental refugees were forecast.[154] The United Nations has been prominent in linking human movement and conflict to resource issues, including an analysis of civil wars over the past 70 years that indicate that at least 40 per cent are linked to the contested control or use of natural resources, such as land, water, minerals, or oil.[155] However, many analysts are cautious as to the reality of environment as a direct driver for human movement,[156] with a split between "alarmists" and "sceptics."[157] Scholars have been wary of drawing links between environmental change and human migration due to fears of being accused of geo-determinism,[158] and argue that estimates are exaggerated,[159] yet policy makers, the military, and governments are increasingly treating this phenomenon as a perceived reality.

The terms *environmental refugee* and *climate refugee*, used by social campaigners, have no status under international law, which confines the term refugee to those moving across national borders to escape political or religious persecution. This has led to environment and climate often being neglected in the discussions about migration. International law remains limited in its capacity to address climate- and environment-induced population movements, although the fact that the Cancun Adaptation Agreement acknowledges migration, displacement, and re-location as adaptation strategies is an encouraging development.[160] More recently, vulnerability to climate change has been recognized as a driver of migration,[161] being seen as one way in which people cope with and adapt to environmental change.[162,163]

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Land degradation and migration

Growing human populations put stress on the carrying capacity of land. Sometimes these pressures can be offset, at least for a while, with innovation, intensification, and/or collaboration in food production:[164] in the Machakos region of Kenya, an area that once suffered severe soil erosion, was rehabilitated by conservation practices which were in fact stimulated in part by a growing population.[165] However, in other cases, an imbalance between population and the carrying capacity of the land can lead to large displacements, as in sub-Saharan Africa in the 1980s and early 1990s.[166] Innovation is more likely when people have secure land tenure and a stake in remaining in place,[167] with numerous examples of both.[168]

Migration out of rural areas has typically been a last-resort strategy for households experiencing the loss of crops or livestock due to drought.

Land degradation can cause migration and vice versa; sometimes the two take place simultaneously. Land degradation and migration are thus often closely interconnected processes, which are also influenced by population growth and the conversion of traditional or communal land tenure rights to private ownership. There are currently no reliable statistics about the number of people globally who may have been induced directly or indirectly to migrate because of land degradation.

Rough estimates suggest that at present the total is already in the millions, likely tens of millions of people each year, most of whom live in rural areas.[169] Some project that as many as 200 million people will be displaced for environmental reasons by 2050.[170,171] Others recognize environmental factors as important secondary drivers,[172] or threat multipliers,[173] with hotspots identified in the Sahel, the Middle East, central Asia, and coastal regions of east, south, and southeast Asia.[174]

Small-scale dryland farmers use seasonal labor migration strategically to cope with the general variability of precipitation.[175] Longer-term migration processes within countries, particularly the accelerating trend toward rural-urban migration, is driven primarily by social and economic processes,[176] but gradual land degradation is also a contributing factor. A key driver of land degradation in traditional pastoral regions is land enclosure and the conversion from communal to private tenure in order to facilitate commercial development and the intensification of livestock and agricultural production. In East Africa, some pastoralists, increasingly confined to smaller areas, are obliged to keep more animals on degrading pastures and must purchase supplemental fodder or graze their herds in areas that put them into conflict with other land users.[177,178] Pressures are increased by larger stock numbers and can be exacerbated by government efforts to settle nomadic farmers. This combination of factors creates a growing need for cash which spurs the outmigration of young people to urban centers.[179] A similar process is taking place in the Andes, where the collective campesino model of land management is being undermined by governments,[180] fragmenting grazing lands and resulting in higher stocking rates,[181] land degradation, and out-migration.[182] A self-reinforcing process of settlement, wage labor migration, and greater integration of formerly pastoral peoples into the market economy has emerged.

Much of this migration may be temporary. In Ethiopia, most migration has traditionally been within the drought-prone rural areas, including:

Box 5.7: Common characteristics of land degradation-associated migration

- Most land degradation-associated migration, as with all forms of migration, takes place within countries, or between contiguous countries
- Precipitation variability, extreme temperatures, deforestation, overgrazing, and drought are important influences on migration in many dryland areas
- The most prominent type of migration is labor migration, used strategically to overcome the risks associated with living in a challenging environment
- Migration generally but not always tends to flow out of areas with higher rates of land degradation to areas with lower rates
- Migration rates are high in places where governments are unable or unwilling to provide responses to land degradation
- Social networks facilitate migration, making them less costly and channeling migration to particular destinations
- Migration is gendered, usually with a disproportionate number of women, children, and older people left behind
- Land degradation and migration can aggravate existing societal tensions
- Climate change will impact migration, likely increasing flows out of drought-prone and degraded areas
- Measuring and monitoring migration is improving but reliable data remain scarce, particularly for internal migration

temporary, seasonal, and indefinite migration.[183] Migration out of rural areas has typically been a last-resort strategy for households experiencing the loss of crops or livestock due to drought.[184] In Mexico, a proportion of migration is linked to drought although another important motivation is the pursuit of additional income to remit home.[185] While most migration occurs within Mexico, a proportion of young men also migrate to the United States,[186] with an increase usually coming a couple of years after drought[187] underlying the importance of migration as an adaptation strategy for dryland farmers;[188] conversely when precipitation is above average and agricultural productivity is better than usual, migration to the US drops sharply.[189] China has a floating population of an estimated 120 million undocumented migrants living primarily in coastal cities with booming economies, many of whom come from poor households in degraded dryland regions.[190]

Alongside discussions about where migrants come from is the equally important question of where they go;[191] a sudden influx of people can cause further environmental degradation elsewhere. In Ethiopia, human migration is both caused by and a cause of deteriorating environmental conditions.[192] In tropical regions, forest loss is increasingly being driven by the exploitation of forests by outside commercial interests using unsustainable harvesting practices,[193] often leading to higher rates of degradation than where small-scale forestry is conducted.[194] Cleared areas are often replaced with commercial farming or grazing, displacing local and indigenous communities. Commercial forestry companies often actively avoid employing local people, preferring to bring in migrant workers.[195]

In many rural areas of Central and South America, south and southeast Asia, and sub-Saharan Africa, artisanal mining attracts migrants to areas where the activity is unregulated or carried out clandestinely.[196] An estimated 10-20 million people are engaged in artisanal mining worldwide.[197] Artisanal mining is a significant driver of environmental degradation, which can include deforestation,[198] erosion,[199] water pollution, and contamination of soils and groundwater by mercury.[200]

When migration results from the loss of agricultural land, the causes may sometimes be deliberate, or as a result of some major disaster. In 2000, it was estimated that between 20 and 40 million people worldwide had been displaced by dam projects.[206] The Three Gorges dam project in China, completed in 2012, alone displaced an estimated 1.3 million people.[207] Many of the new lands to which farmers were relocated were on steep slopes and prone to erosion,[208] causing on-migration to cities.[209]

Mega-disasters that have caused widespread migration include the desiccation and salinization of the Aral Sea by poorly planned irrigation projects,[210] which were clearly deliberate but with unforeseen consequences. The Aral Sea shrank dramatically, exposing sediments heavily laden with agricultural chemicals and other toxins, and the region's population subsequently experienced chronic respiratory illnesses and renal problems well above national averages.[211] Farmland became increasingly unproductive, and groundwater contaminated, leading to widespread migration and impoverishment of the remaining population,[212] problems that will take at best decades to overcome.[213]

Box 5.8: Migration in China

China has land use controls and a household registration (*hukou*) system that make migration patterns distinctive. The use of agricultural land is regulated by the state, and recent decades have seen growing intensification as well as large areas of agricultural land being consumed by infrastructure projects and urban expansion, with an estimated 50 million people directly displaced in this way.[201] In western and central China, large areas of dry forests and grasslands have been degraded by overgrazing and conversion to cultivated land.[202] In Xinjiang and Gansu provinces, governments actively encouraged agricultural expansion in marginal drylands.[203] In the grasslands of Inner Mongolia and Tibet, governments have actively relocated and resettled pastoralists and rural populations to towns or other rural areas, often citing overgrazing as a reason, with mixed results in terms of the welfare of those relocated.[204] Households use migration as a means of adapting, either legally in the case of richer families, or illegally as undocumented migrants living primarily in coastal cities.[205] The nature of institutional arrangements in China means that government has a disproportionate role in managing both land degradation rates and population flows relative to other countries. The results have been mixed; sometimes migrants' remittances home help take pressure off the land, while in others depopulated lands undergo a domestic land grab and production is intensified.

In the future, climate change will influence the dynamic interactions of land degradation and migration by exacerbating natural phenomena that influence soil, water, and biodiversity, such as precipitation variability, droughts, and extreme weather events, and by affecting agricultural productivity, which in turn affects household incomes and the price of food. Some traditionally productive areas will become less so, while productivity will increase in others; the net balance in terms of food security is hard to predict.

Drought, land degradation, conflict, and migration

There is a complex and poorly understood relationship between land degradation, droughts, migration, and violent conflict. While academics continue to debate the links between land degradation, migration, and conflict, businesses are quietly organizing. While politicians still discuss the reality of climate change, those with a responsibility for security such as the military, have for years been analyzing the implications and are planning responses.[214] Conflicts, particularly between rival factions within states, for example in Africa, are thought to have been exacerbated by drought, migration, subsequent competition with other groups, and resulting social tensions.[215,216]

Slow onset disasters, such as those associated with drought and desertification, can increase tensions between resources users like pastoralists and farmers, which can lead to violent conflict although usually on a local scale.[217] In Sudan, farmers burned grasslands and destroyed water sources to deter nomadic grazers;[218] tensions can also rise between pastoralists if one group is forced to move into the territory of another.[219]

However, the processes leading to violent conflict are invariably complex[220] and in some places land degradation and drought conversely lead to greater cooperation and resource sharing.[221] The current consensus is that resource scarcity, land degradation, and sudden climatic changes do not cause conflicts on their own,[222] but are "threat multipliers" increasing the risk of violence breaking out in areas where tensions are already high.[223] Areas of Ethiopia prone to rebel activity and communal conflicts experience an upswing in activity during droughts and extreme rainfall events,[224] while across the Horn of Africa, scarcity in vegetation can exacerbate existing conflicts among pastoral groups, especially when other non-environmental influences are concurrently strong.[225] However, it should be noted that persistent conflicts also occur in areas with no particular environmental stresses.

In the majority of cases environmental scarcity is managed in a peaceful way, where broadly accepted rules lead to cooperative outcomes of one kind or another.[226,227,228] Having said that, there is evidence that getting land governance and management right can help to reduce tensions and avoid conflict.[229,230] Such forms of governance can potentially be initiated in places where the state is failing to mitigate conflict through its own institutions. The establishment of transnational peace parks for example (i.e., protected areas in former conflict zones) is a proven way of building community stability following periods of unrest and violence.[231] In the same vein, evidence from Ethiopia showed that while a large refugee influx and population pressures led to localized conflict over natural resources, effective management regimes were able to ameliorate these tensions.[232]

Migration is likely to continue and even to increase in the near future. The current debate convulsing Europe, where boatloads of migrants from Africa and the Middle East are daily making their way across the dangerous waters of the Mediterranean, are mirrored by the increasingly protectionist policies emerging in a number of powerful economies. Some countries have practiced policies excluding other nationalities for many years. Others, including some of those where the issues are most controversial, rely heavily on migrant labor to keep their economies growing. In general, migration policies have been less restrictive.[233] The presence of a tiny proportion of terrorists among the migrants creates fears leading to the rejection of people fleeing war and persecution, thus worsening existing humanitarian catastrophes.

A new approach to migration is urgently required, one which is closely linked with many of the other issues discussed here. People often migrate because they feel they have to. From the perspective of the land, this is likely because crops are failing, they have insufficient access to land and resources, poor security of tenure, or because the climate is changing and they can no longer produce adequate amounts of food or income. Most of these issues can only be addressed by decision makers far from the affected areas, although often in the same country. A scale shift from rural to urban areas is underway with a smaller but more visible shift from poor to rich countries. Migrants need to be once again welcomed for the diversity and skills that they bring to their new homes but, at the same time, migration out of desperation requires larger-scale political and environmental responses.

CONCLUSION

Humans have always had an intimate relationship with the land, and settlements have ebbed and flowed, appeared and disappeared, partly as a result of the interaction between natural resource management and climate conditions. These relationships are complicated and easy explanations usually misleading.

Today, many ecological problems are made worse by a range of social, economic, and political issues. Too many people are either landless or have no security of tenure, desperately poor and without any safety net to withstand climate change or other stressors. Social relationships and gender inequity further hamper progress towards food, water, and overall human security. Most of the issues that create the largest challenges for the poorest and most vulnerable members of society are completely outside of their control. At the same time, everyone, rich or poor, is vulnerable to future shortages on a planet of finite resources. Competition for dwindling resources risks destabilizing communities and countries. One result is a rapid increase in migration, with millions of people on the move. Some of the outcomes have been positive, while others increase pressure and add to regional tensions.

The result is a general increase in economic, political, and social insecurity, with established social and political orders breaking down, often leaving a vacuum. People are feeling anxious, frightened, and looking for scapegoats. While we have stressed that making a simplistic link between land degradation and human insecurity is precarious, the catalytic effect of these factors is becoming increasingly clear. The fact that peace and security are often expressed in other terms – such as religious or ethnic intolerance – should not distract us from the massive destabilizing impacts of soil loss, crop declines, desertification, and water scarcity. Addressing these fundamental land issues can help relieve a host of societal and political tensions.

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