



Clingendael

Netherlands Institute of International Relations

Clingendael Report

Terra Incognita: land degradation as underestimated threat amplifier

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Clingendael report for the Netherlands Environmental
Assessment Agency (PBL)

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Louise van Schaik and Rosa Dinnissen

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Acronyms

AIV	Adviesraad Internationale Vraagstukken (Netherlands Advisory Council for International Affairs)
ACLED	Armed Conflict Location and Event Data
CBD	Convention on Biological Diversity
CIENS	Oslo Centre for Interdisciplinary Environmental and Social Research
CIESIN	Center for International Earth Science Information Network
ECA	East and Central Asia
ELD	economics of land degradation
EU	European Union
FAO	Food and Agriculture Organization
GDP	gross domestic product
GEF	Global Environment Facility
GNI	gross national income
HIK	Heidelberg Institute for Conflict Research
IFPRI	International Food Policy Research Institute
HPI	Human Poverty Index
IMF	International Monetary Fund
IPBES	Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES)
ISRIC	World Soil Information (formerly; International Soil Reference and Information Centre)
JRC	Joint Research Centre
LDCF	Least Developed Countries Fund
MDGs	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
MENA	Middle East and North Africa
NIC	National Intelligence Council
NPP	net primary productivity
ODI	Overseas Development Institute
PBL	Planbureau voor de Leefomgeving (Netherlands Environmental Assessment Agency)
PIK	Potsdam Institute for Climate Impact Research
PRIO	Peace Research Institute Oslo
SCAD	Social Conflict in Africa Database
SCCF	Special Climate Change Fund
SDGs	Sustainable Development Goals
SIPRI	Stockholm International Peace Research Institute
SSA	Sahel and sub-Saharan Africa
UCDP	Uppsala Conflict Data Program
UNCCD	United Nations Convention to Combat Desertification
US	United States
WDR	World Development Report
WEF	World Economic Forum
WRI	World Resources Institute
WWAP	World Water Assessment Programme
WWDR	World Water Development Report

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About this report

This study aims to explore the relationship between land degradation and associated food and water scarcity on the one hand and conflict risk on the other hand. The research was conducted by the Netherlands Institute of International Relations 'Clingendael', with support from the Netherlands Environmental Assessment Agency (PBL) in the context of their work on land degradation for the Netherlands Ministry of Foreign Affairs and others. In its large-scale research project on land degradation, PBL cooperates *inter alia* with the University of Wageningen, the University of Utrecht, the Joint Research Centre of the EU, Universität von Greifswald, World Soil Information (ISRIC), World Resources Institute (WRI), Overseas Development Institute (ODI), African Studies Center and the Potsdam Institute for Climate Impact Research (PIK). This report builds upon that project and adds a geopolitical dimension to it.

The purpose of collaboration between PBL and Clingendael is to jointly arrive at new insights into the relationship between land degradation and the risk of conflict. These insights will hopefully generate input into policy considerations by the governments of countries affected by land degradation and also by donors.

Executive summary

In recent years a debate has emerged about land degradation, its consequences and its implications for human security. The issue is particularly crucial in light of population forecasts. The expected rise in population from 6 billion now to 9 billion by 2050 will vastly increase the demand for land, food, energy and water, implying, therefore, a need to look at related security issues. Already now, food production does not keep pace with population growth making food security one of the world's greatest challenges. An optimal use of land for agricultural production is therefore of utmost importance, and in relation thereto, we cannot afford lands to degrade.

This report argues that land degradation, as a slow and insidious process associated with food and water scarcity, in combination with population growth, migration, poverty and a lack of good governance, is very likely to increase the risk of conflict. Consequently, land degradation should perhaps be considered not as a 'threat multiplier' like climate change, but rather as a 'threat amplifier', since it slowly reduces people's ability to use land for food production and water storage, which in turn increases the degree of insecurity. At the same time, we are cautious in drawing firm conclusions on policy measures, since the research identified serious knowledge gaps still exist *inter alia* regarding land degradation and its exact contribution to food scarcity. The topic to a large extent proved to be a *terra incognita*, but sufficient indications were found that the topic deserves better data-gathering and more political attention.

Land degradation: an underestimated challenge?

Land degradation is caused by long-term unsustainable use of agricultural and forestry land, and/or by exploitation and poor management of land, whereby ecosystems lose their functions and both the quality and productivity of agricultural land decrease. The quality of land may also decline by climate change or local environmental pollution. Subsequently, this may have a negative impact on food supplies and the ability of land to retain water.

Given the negative consequences of land degradation, academics and governments worldwide increasingly acknowledge the need to minimise the phenomenon and to restore degraded land, *inter alia* in the context of the Rio+20 objectives. However, the exact scope of land degradation is still not known, due to lack of data and to disagreement on how land degradation is defined and measured. Furthermore, governments might not be open about soil fertility, as it is a sensitive issue that could affect the local investment climate or cause unrest among local populations. As a result, only rough estimates exist on the extent to which land degradation has occurred.

The institute for World Soil Information (ISRIC) estimates that 24 percent of land was in the process of being degraded globally in the period 1981-2003, while about 1.5 billion people are directly dependent on land that is currently being degraded (Bai et al., 2008a). According to current population projections, an estimated 60 percent increase in food production will be needed in 2050, while the amount of agricultural land will only increase by 15 percent. Land degradation increases the risk that agricultural productivity will fall behind. The problems are most pressing in sub-Saharan Africa, where the majority of the countries have fast-growing populations and 98 percent of food is produced locally. In economic terms, it is estimated that the costs of land degradation amount to 10 percent of GDP for the whole sub-Saharan African region.

Land degradation and conflict risks: a complex relationship

This report questions how, whether, and to what extent land degradation might trigger or increase conflict risk. Based on existing literature about the influence of environmental factors on insecurity, we conclude it is very likely that an indirect relationship between land degradation and conflict exists. This applies in particular to poor countries, where populations are heavily dependent on locally produced food. This local effect appears most relevant for the countries of sub-Saharan Africa, as well as for countries in south-east and central Asia.

Given the fact that land degradation in time decreases the availability of farmland, on a global level, land degradation might reduce the availability of food. In turn, this may lead to higher food prices that could contribute to food riots, especially since rising food prices have an undeniably disproportionate impact on poor populations in (mega)cities who often devote over half of their income to food purchases. This global effect of land degradation is perhaps best illustrated by looking at the Arab Awakening. For instance, during the protests in Tunisia, a country with large amounts of degraded land and a high dependency on imported food, people waived with baguettes to illustrate their anger over high food prices.

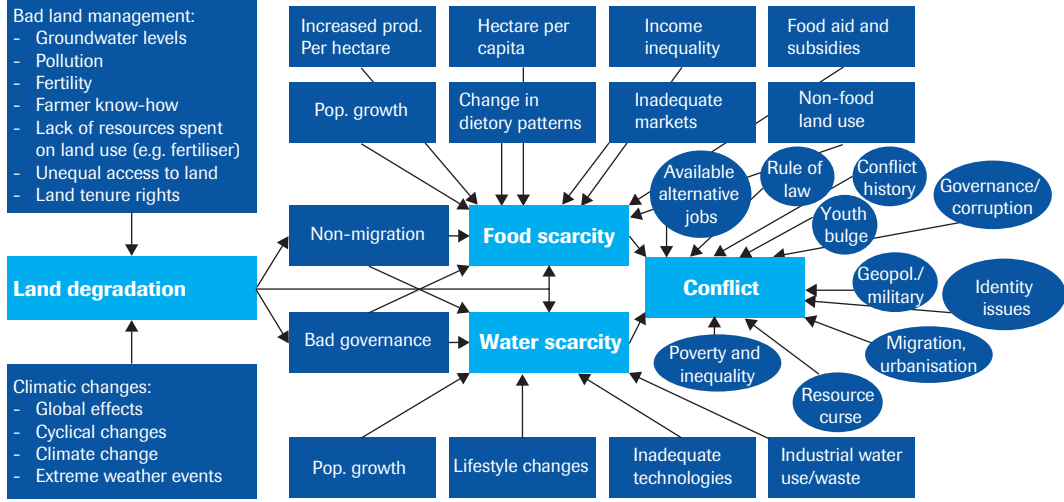
Land degradation may also aggravate water scarcity, since it is fertile soils that can best store water. The availability of water is increasingly recognised as global challenge, although research indicates that water issues have thus far predominantly induced cooperation instead of conflict. Nevertheless, in combination with high population growth, poverty, limited opportunities for migration, and lack of good governance, and linked to food scarcity, water scarcity may increase the probability of conflict risks. This complex relationship and interaction with intervening and additional factors at both local and global levels is illustrated in Figures 1.

The relationship between land degradation and conflict in conjunction with food and water scarcity, population growth, migration, poverty and good governance is analysed in case studies on conflicts in Kenya, Rwanda, Mali and Tunisia. In these four countries, land degradation was a major problem and seemed to have contributed to the outbreak or escalation of conflict(s). However, in all four cases we found other factors explaining the outbreak of the conflict, such as identity issues, the use of land for cash crops, or the massive influx of weapons from a neighbouring country.

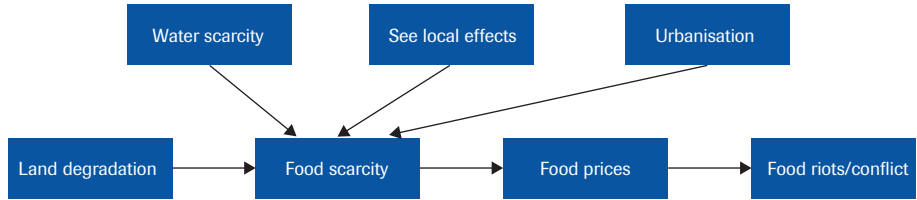
Analysis of the four cases led us to conclude that land degradation appears to act as a 'threat amplifier'. In combination with other factors land degradation can lead to the outbreak or escalation of conflict, although it has not been proven to be a direct or major cause – yet.

Figure 1 Models of the local and global effects of land degradation

Local effects (particularly relevant in poor regions)



Global effects



Policy action to focus on harnessing the knowledge gap

Given the widespread and often negative consequences of land degradation, such as migration risks and their implications, several multilateral, national and local initiatives have tried to raise land degradation as an issue of concern. During the 10th Conference of the Parties of the Convention on Biological Diversity (CBD) in Nagoya in 2010 and the Rio+20 sustainability summit in 2012, governments expressed the objective to halt land degradation and restore degraded or degrading lands. The EU Joint Research Centre published a Soil Atlas of Africa (2013) and together with Germany, South Korea and others, the European Commission is supporting a new initiative to analyse the economics of land degradation (ELD). Recently it was also decided to ask the Intergovernmental Panel for Biodiversity and Ecosystem Services (IPBES) to make an assessment of land degradation and restoration in the coming 5 years. Such efforts are likely to further raise the issue of land degradation and associated global problems. However, much more action seems necessary to fulfil the objectives of the CBD and Rio+20, let alone to justify calls for a measurable goal on land degradation in the context of the post-2015 debate on the Millennium Development Goals.

Food and water scarcity – and to a lesser extent their link to land degradation – are thus increasingly on the political agenda. However, due to lack of knowledge and openness, it is difficult to determine the precise magnitude and influence of land degradation on food and water scarcity and conflict risk. This also undermines the sense of urgency to implement concrete measures to counter land degradation, which are necessary to tackle its negative effects, and to stimulate the restoration of degraded lands. Examining existing literature and available data, we found indications that land degradation, and associated food and water scarcity, are related to migration (including urbanisation) and poverty. Combined with factors such as population growth, social inequality and weak governance, land degradation is very likely to increase the risk of conflict. If land degradation is overlooked as a potential human security issue, opportunities for improving security might be missed. Therefore, in our view, to prevent a possible threat to human security, an increased focus on obtaining good data on land degradation and how this phenomenon relates to more commonly referred to conflict-risk factors is essential. We hope this report will serve as a starting point to such efforts.

1 Introduction

In policy circles, scarcity-related phenomena are often related to political unrest and conflicts. Environmental stresses, therefore, tend to receive more attention on the political agenda, especially to create a sense of urgency to address environmental issues and scarcity phenomena. Some critics say this is unjustified and they point out that evidence on the relationship between environmental stresses and insecurity is sketchy at best. Instead, they refer to other conflict risks, such as economic, socio-political and demographic factors (Gleditsch, 1998; Urdal, 2005; Theisen, 2008; Lee et. al., 2012; Bernauer et. al., 2012; Floyd and Matthew, 2013).

This study aims to shed more light on the question of whether land degradation and conflicts are related – and, if so, how. This relationship has not been extensively investigated. The literature on environmental causes of insecurity mainly focuses on water and food scarcity, climate change, natural resource scarcity, or abundance. Land degradation is largely left out of consideration, whereas having fertile lands usually is a prerequisite for agricultural production and (access to) potable water. It is therefore essential to livelihoods. Since land degradation reduces people's ability to use land for agricultural production, it potentially reinforces scarcity issues. Particularly in poorer rural societies, where people lack the purchasing power to import food and water, degradation of agricultural land might increase grievances, tensions and rebellion. At a local level, land degradation may thus directly jeopardise human security.

Land degradation could also affect food production globally and, by extension, food prices. That could lead to food security problems, such as food riots when prices rise very steeply. Thus far, food production levels have not kept up with population growth, despite improved agricultural techniques, and this problem is likely to get worse in the future (WRI et al., 2013). More specifically, the UN Food and Agriculture Organization (FAO) projects that food production must increase by 60 percent by 2050 in order to meet the demands of growing populations (FAO, 2012). The resulting high prices, in particular staple foods, is one of the effects of increased demand and can contribute to different manifestations of instability (cf. Lagi et al., 2012; Bush, 2010). Similarly, the availability of water, a key resource for survival, can diminish with land degradation. Water scarcity can potentially have considerable security implications (NIC, 2012).

Hence, notwithstanding healthy criticism regarding alarmist statements, there seem to be potential links between land degradation and conflict. In this respect, one should not think of a direct relationship, but rather of how land degradation is related to more commonly referred to conflict-risk factors (cf. Homer-Dixon, 1994; Kahl, 2006; Koubi, 2012). In this report we will look at poverty, migration, population growth and lack of good governance. It is not feasible, certainly not at this stage, to come up with a definitive model depicting the relationship between those factors and land degradation for all potential conflict situations, but the model we develop may be a starting point for further testing and for larger quantitative studies.

To analyse and discuss the relationship between land degradation and conflict, this chapter starts with discussing these two concepts. Subsequently, chapter 2 explores the relationship between environmental factors and conflict and elaborates on the debate whether such a relationship exists and how it possibly manifests itself. It also discusses the challenges of

food and water scarcity in relation to land degradation on the one hand and conflicts on the other hand. Chapter 3 discusses other factors that can be perceived as causes of conflict and appear to be somehow related to land degradation (and associated food and water scarcity): population growth, migration, poverty and good governance. Chapter 4 contains four case studies that illustrate where land degradation has been cited as one of the causes of a conflict. It also analyses whether and to what extent this was truly the case and how the relationship is to be understood. The report concludes in Chapter 5 with a brief overview of key findings relevant for future debates and research on land degradation and insecurity.

1.1 Land degradation: an underestimated environmental challenge?

Land degradation can be defined as a long-term loss of ecosystem function and productivity caused by disturbances from which the land cannot recover (Bai et al., 2008a). It is usually measured in terms of changes in net primary productivity (NPP), a process indicating the amount of plant organic matter produced per unit of time. Simply put, land degradation can best be understood as a reduction of soil fertility or a loss of 'greenness'. Residues, such as roots and straw – which remain on the land as a result of agricultural production and forest plantations, play an important role in maintaining soil structure and fertility. A lack of sustainable land management may reduce soil moisture and organic substance content and cause a loss of nutrients. Eventually, this may lead to degradation of the soil system and loss of productivity. Over time, this causes land degradation, which in turn may have negative effects on food security, particularly when excessive groundwater extraction leads to disruption of water balance, soil salinity and reduced levels of fresh water (Van den Born and Ros, 2012).

In general, land degradation is caused by a combination of human activity and non-human factors (Nkonya et al., 2011). Human activities include deforestation, (illegal) logging, soil nutrient mining, cultivation on steep slopes, and pollution of land and water. These factors are often referred to as bad land management practices and are sometimes related to weak governance, war or other forms of conflict (e.g. fights over land). Non-human factors include rainfall variability, wind and temperature changes. These changes in weather conditions can be related to climate change. In literature, the term 'land degradation' is mostly used to describe the process of land losing its fertility, but also to describe situations where land has lost all of its fertility (and has, for instance, turned into a desert).

There is a lack of precise data on land degradation. Among other factors, this is related to differences about what qualifies as land degradation. For instance, some debates focus more on the (potential) use of land for food production and others more on its contribution to forestry or biodiversity (Caspari et al., forthcoming). These debates have emerged in multilateral talks in the UN Convention to Combat Desertification (UNCCD) and in academic circles.

Here, we acknowledge that different uses of land may be at odds with one another, and influence one's view of what counts as degraded land. For the sake of simplicity, we take the NPP measure, with its central focus on 'greenness of the land' as point of reference for looking at land degradation. On this measure, Bai and colleagues (2008a) estimated that in the period 1981-2003, about 24 percent of land was degrading globally. Worldwide, about 1.5 billion people depend directly for their livelihood on areas that are currently degrading. The 2005 Millennium Ecosystem Assessment (MEA), which looks at the broader concept of ecosystem degradation, estimated that 60 percent of the earth's ecosystem services are degraded. They point out that this is only a rough estimate due to a lack of reliable data, for instance on degraded lands in drylands (MEA, 2005). According to Nkonya and colleagues (2011), the

cost of land degradation in the whole of sub-Saharan Africa, for instance, might be as much as 10 percent of the region's gross domestic product (GDP). However, land degradation is not only a problem in developing countries. It also occurs in countries with a large yield per hectare of agricultural land, particularly when unsustainable agricultural methods are used. Thus, land degradation jeopardises food security not only in poorer regions but also globally. Consequently, land degradation can be considered as both a development and a global issue.

Most degraded areas are in sub-Saharan Africa, south-east Asia and southern China, north-central Australia, the Pampas in Latin America, and swathes of boreal forest in Siberia and the northern part of the Americas (Bai et al., 2008a). Almost one-fifth of degrading land would be cropland, which occupies more than 20 percent of all cultivated areas. Hence, although there is a general idea of where land degradation occurs, specific information is lacking and data are relatively old. The information void is related to the debate on how to define and measure land degradation, and also to national governments not having information on the quality of their country's land or not considering it to be in their strategic interest to share this information. Governments may consider such information might deter potential investors or cause grievances and unrest among local populations whose livelihoods depend on land. Moreover, the processes of land degradation are slow and insidious. As a result, problems associated with land degradation are seldom acute, but build up over time and may be overlooked for some time by policymakers.

In recognition of the problems associated with land degradation, governments agreed at the 2010 meeting of the Convention on Biological Diversity (CBD) in Nagoya that they will restore at least 15 percent of degraded areas by 2020 (CBD, 2010). The Rio+20 declaration, 'The Future We Want', adopted in 2012, agreed a target of zero net land degradation by 2030. This confirmed the conclusions of a high-level debate held within the UN General Assembly in 2011 (Akhtar-Schuster et al., 2011; Gnacadja and Stringer, 2012). In addition, several international policy initiatives are in place to restore lands or contribute to land restoration as side-effect of a different initiative (e.g. efforts by the FAO focusing on improved land management practices with a view to reducing food scarcity). However, the credibility of the CBD and Rio+20 objectives is contested as they were not accompanied by a set of implementing measures, despite them being very ambitious (cf. IFPRI, 2013). Moreover, exact data on land degradation and its consequences for key functions, such as biodiversity, agricultural production and economic growth, was not available or accurate at the time the objectives were set and are still lacking to date.

The lack of knowledge on land degradation is increasingly being realised and several initiatives are now underway to increase the amount of data on land degradation. For instance, the Netherlands Environmental Assessment Agency (PBL), Wageningen University and the EU Joint Research Centre (JRC) are developing maps on land degradation using new data from satellites, among others. The *Soil Atlas of Africa*, published by the JRC and developed jointly with the African Union and the FAO, demonstrates the relevance of looking at the quality of African soil and the functions it provides, as well as its vulnerability (EU, 2013). Acidity and desertification affect half of the African continent and the nutrient composition of soil is particularly sensitive to proper land management. In line with findings of this study, the introduction to the atlas points out that the vulnerability of African soils, combined with low use of fertilisers, a high degree of dependency on locally produced food and high population growth forecasts, poses considerable challenges for economic development and security. The European Commission, together with Germany and South Korea, also initiated a project to investigate the economics of land degradation (ELD). This project aims to boost available economic

information on land degradation and desertification in relation to food security and development. First results will be published in 2014 and 2015, with a view to influencing debates about development policy, food security, green growth and rural development in a post-MDG environment. On top of this it was decided in December 2013 that the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) will make an assessment on the status of land degradation and restoration worldwide, as well as the effect this has on biodiversity, ecosystem services and human wellbeing in the coming 5 years. At the same time, local work to improve soil quality continues. Within the context of the UNCCD, the topic received increased attention leading to somewhat higher pledges to the Global Environment Facility (GEF).¹ In the context of support for increased agricultural production, some efforts focus on combating land degradation. In Rwanda, for instance, the US and other donors are offering support with a US\$50 million project to promote sustainable hillside agriculture. This helps farmers adapt crops and develop and manage terraces in ways that reduce erosion, improve soil quality, and raise yields across 30,000 hectares of land (USAID, 2012: 16). There are also several private initiatives focusing on land restoration, such as the efforts of the NAGA foundation² or the Green Africa Initiative.³

The EU is probably the most active in promoting restoration of degraded land. Attention for environmental degradation, food and water scarcity is given in EU development cooperation programmes in particular under the heading of promoting sustainable agriculture (EU, 2011). For instance, in 2012 the EU convinced other stakeholders to jointly set up the Global Alliance for Resilience Initiative to help west African countries cope better with future food crisis. In 2008 it created a €1 billion Food Facility which, in addition to providing food aid, also funds projects aimed at structurally increasing agricultural production. In Africa, over €1 billion of the 10th European Development Fund is devoted to rural development, agriculture and food security (Caputi, 2013). Moreover, the continued support of the European Commission for drawing attention to the contribution of environmental factors to (human) security is testified by its proposal for Sustainable Development Goals (SDGs) in the context of the MDG review that was due to take place in autumn 2013. According to the Commission, the post-2015 “MDG-process” should pay more attention to issues discussed at the Rio+20 Summit. With regard to the implementation of Rio+20, a specific communication on ‘Land as Resource’ is currently in the making and foreseen for 2015.

Despite all these efforts, the link between land degradation and security does not appear to be high on the international political agenda yet. The key problem is that data on land degradation, as well as on policies to combat it, is lacking and also that little is known about how interventions might help to reduce conflict risk. This could be considered a missed opportunity, particularly in light of recent attention given to the need to look at the so-called nexus between global challenges, such as those on energy, food and water scarcity (cf. Bonn 2011 Conference, 2011; Evans, 2010: 18-21; Beddington, 2008; NIC, 2012; Beisheim, 2013). Biofuel production is often referred to as an example of a factor linked to all these challenges and possibly contributing indirectly to political instability as only a limited increase of its pro-

1 In 2010 the GEF spent US\$260 million on land degradation, which was only 1% of its total spending on environmental issues. In combination with other funding, about US\$500 million in total was available mainly for projects combating desertification and deforestation (GEF, 2011). Since then, a slight increase is foreseen following new donor pledges made to the GEF. Some land degradation projects might also be eligible for funding under the climate adaptation funds being managed by the GEF: e.g. the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF), and the Adaptation Fund.

2 Cf. <http://nagafoundation.org/>

3 Cf. <http://greenafricainitiative.com/>

duction from food crops has already proved to put notable stress on food markets (Mitchell, 2008; Lagi et al., 2012). Land degradation may cause similar effects, although it is a more gradual process. This study is a response to calls for greater insight into the nexus between various global challenges by pointing to the relevance of looking at land degradation in this context.

1.2 Analysing conflict risk

This report analyses the relationship between land degradation and conflict risk. The term 'conflict' is a very broad concept that theoretically entails everything between a mother and her teenage son having a quarrel, to thousands of men fighting a devastating war. When used in the fields of political science and international relations, a distinction can be made between interstate and intrastate (e.g. civil war). The term could refer to high-intensity wars (i.e. with at least 25 battle-related deaths), as well as to low-intensity conflict, such as lethal episodic and routine violence, terrorism, riots and violent demonstrations, intercommunal violence and political assassinations. When violent conflicts break out, it is usually against the background of a number of different factors interacting with one another.

In an attempt to analyse the role of land degradation as a factor contributing to conflict, this research limits itself to an assessment of such a relationship based on a literature review and four small-scale case studies (see Chapter 4). Since the research is rather explorative, we start with a broad notion of conflict, including both interstate and intrastate, as well as low and high violence conflicts.

There are several sources that provide an overview of conflicts in the world, for example the Heidelberg Conflict Index, the Stockholm International Peace Research Institute (SIPRI) Global Peace Index, the Global Peace Index (of the Institute for Economics and Peace) and Armed Conflict Dataset of the Uppsala Conflict Data Program (UCDP)/Peace Research Institute Oslo (PRIO). None of those look specifically at land degradation or related phenomena such as food, water scarcity or loss of economic development based on having fertile lands in relation to conflict. For instance, the Heidelberg Index includes natural resources as a conflict item, but this category refers to a broad category of resources (e.g. oil, minerals, timber) and also to abundance of resources leading to conflict, rather than singling out scarcity problems.

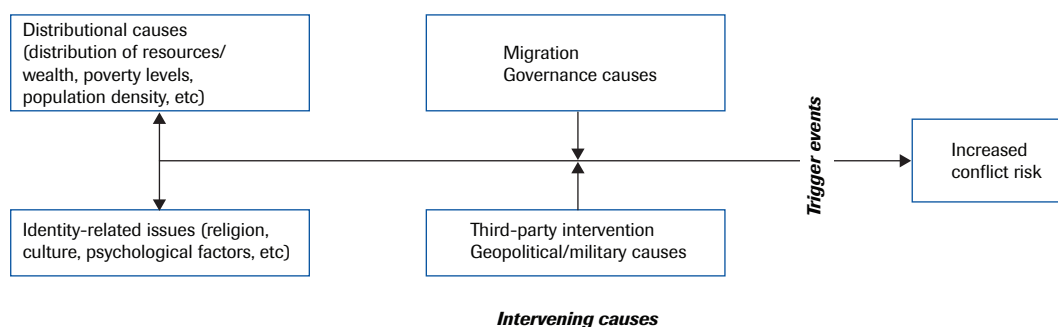
The SIPRI Global Peace Index considered sub-Saharan Africa as the least peaceful region until very recently, but in 2012 the Middle East and north Africa took over as a result of revolts in the Arab world (SIPRI, 2012). Not surprisingly, this finding is corroborated by the other overviews. For Africa, specific databases on conflict have been established: the Armed Conflict Location and Event Data (ACLED), which provides information on communal conflicts in Africa, and the Social Conflict in Africa Database (SCAD), which provides information on low levels of violence in African countries (e.g. demonstrations and riots).

In conflict studies, consensus is lacking with regard to the difficult question of what causes conflicts to break out. In an attempt to better understand the complexities of conflict, Collier and colleagues (2003) refer to root causes resulting from specific contextual circumstances. For example, the economic or geographic environment could make rebellion particularly easy and attractive (Collier et al., 2003). In addition, conflicts subsist due to perpetuating forces generated as violence erupts. Once a rebellion has started, societies risk being caught in a

‘conflict trap’. In such cases, ending the conflict is difficult, and, once a conflict has ended, the probability of new eruptions of violence is high.⁴

On the basis of this work and other resources, a distinction can be made between distributional causes of conflict (e.g. over money) and identity-related causes (e.g. over religion), although the two are usually closely intertwined or different sides of the same coin in terms of divisions between groups in society (cf. Coleman et al., 2006; Fetherston and Nordstrom, 1995). These causes may be influenced by governance, in particular with regard to the way in which distributional conflicts are managed and mitigated. Poor management or mismanagement of distribution or identity issues can be the result of weak institutions or conscious policies. For instance, people may be angered by serious human rights violations. Migration may be another mitigating factor: while it may lead to relief in the motherland, the arrival of migrants may cause instability in the regions to which migrants move. Yet another contributing factor can be labelled as geopolitical and military considerations. Especially in border regions, in the case of cross-border movement of people (for economic – key resources – or political reasons), neighbouring countries or other powers can add to instability and conflict (see also Douma, 2003 for an extensive list of causes of conflict). It is within this complex web of factors that we need to understand the impact of land degradation on the dynamics of conflict.

Figure 3 Causes of conflict



A large number of possible (sub)factors potentially influence the emergence and continuation of conflicts and they are usually interrelated. The question then is which are the dominant factors. In a systematic quantitative analysis, Collier and Hoeffler (1998) point to four variables which, according to them, are the most significant determinants of both the probability of violent conflict and its duration. First of all, income matters: the higher the per capita income on an internationally comparable measure, the lower the risk of conflict. Second, population growth can be an important variable. Third, polarisation increases the risk of violent conflict. Polarisation may be caused by political, social, economic or cultural differences. In particular, societies that are polarised into two groups are more likely to experience violent conflict. Conversely, highly fractionalised societies are less prone to conflict because of high coordination costs of rebellion. Finally, the extensive presence and availability of natural resources is found to be a key determinant increasing the probability and duration of violent conflict. This phenomenon is known as the ‘resource curse’. It is of little relevance for our research on land fertility, since this is a renewable natural resource and the resource curse refers to an abun-

⁴ A typical country reaching the end of a civil war faces a 44% risk of returning to conflict within five years (Collier et al., 2003)

dance of non-renewable resources such as oil, minerals and diamonds. In later work, Collier (2010) explicitly acknowledges that the resource curse does not apply to renewable resources such as primary agricultural commodities.

For now, it can be concluded that a general consensus on what causes conflict is lacking and many conflict experts do not even like to use the word 'cause', but prefer to speak about 'elements' or 'aspects' of conflict. They aim to identify factors that increase the risk of a conflict emerging and how these may operate in causal chains of pathways. When doing so, it appears likely that root causes identified at the start of such chains are related to distributional issues, including the distribution of natural resources and that these intermingle with identity-related factors, such as religion and historically developed grievances. In turn, land degradation, being a source of some scarcities, may be considered primarily related to possible other root causes of conflict, including the overall level of poverty, distribution of wealth and population density. On top of this, a link may exist as well with governance factors and migration flows. These propositions will be discussed in subsequent parts of this report.

2 The complexity of identifying environmental factors as causes of conflict

This chapter will elaborate on the debate regarding if and to what extent environmental factors can be considered as causes of conflict. The debate appears politicised with some scholars claiming a strong relationship does exist and others argue that there is no such relationship at all. The most accurate consideration appears to treat environmental factors above all as indirect factors and ‘threat multipliers’, increasing the risk of conflict. With regard to land degradation, we prefer to use the term ‘threat amplifier’ given the insidious nature of land degradation and its relationship with other environmental factors, e.g. climate change, that appear closer and more immediately linked to insecurity. This chapter also reviews literature and insights on the relationship between food and water scarcity (associated with land degradation) and conflict.

On the basis of this chapter and the next chapters, we aim to develop a tentative model of the relationship between land degradation and conflict risks. A caveat is made that in our research design we decided to not consider certain aspects, the most important being the effect of land degradation on local livelihoods and the possible effects of existing conflicts on land degradation (i.e. possible feedback loops). This research is, in any case, largely exploratory given the lack of data on land degradation and limited research on its relationships with more commonly referred to conflict-risk factors. For this reason, it is also rather imprecise with regard to the type of conflict focused on. In future research, and when better data is available, more specific analysis can be pursued.

2.1 Environmental factors as threat multipliers

Over the years, a considerable number of studies has been published analysing whether, in what way and to what extent environmental degradation may cause violent intra- and inter-state conflict at local, sub-national and national levels. So far, the research is inconclusive and has resulted in a debate between the so-called ‘Neo-Malthusians’ and ‘Cornucopians’ (cf. Bernauer et al., 2012). Neo-Malthusians, such as Homer-Dixon (1994; 1999), argue strongly for the existence of a relationship between conflict threats and environmental factors, notably scarcity of natural resources. Cornucopians, also referred to as ‘resource optimists’, such as Lomborg (2001) and Simon (1996), claim that humans do and will be able to adapt to resource scarcities and cope with the negative consequences of environmental degradation. They point to various causal mechanisms in which scarcity of natural resources is just one of several factors that may contribute to the emergence of conflicts (Gleditsch, 1998; Theisen, 2008).

According to Bernauer and colleagues (2012), conflict data often focuses on high-violence conflicts, whereas environmental factors often lead ‘only’ to tensions, or may even induce cooperation. Studies reviewing a larger number of case studies focusing on environmental factors or renewable resources only, i.e. without the inclusion of non-renewable resources such as oil and minerals, are more limited; examples include about 16 case studies con-

ducted by the Toronto Group on Environmental Change and Acute Conflict Project and about 40 studies conducted by the Swiss Environmental Conflicts Project. They conclude that environmental changes are most likely to lead to conflict in an indirect way via economic performance and migration (Bernauer et al., 2012).

In a volume on environmental security (Floyd and Matthew, 2013), contributors elaborate on a number of approaches to analyse the relationship between environmental problems and security. Separate chapters discuss the relationship between security and water, conservation, sustainable development, food, energy and climate change. A warning is made against over-securitisation and illegitimate use of security arguments. Nevertheless, the volume points to important implications for *inter alia* the understanding of threats, the condition of security and the practice of providing security. It also points to the need to take into account factors such as population growth and poverty, and to distinguish between local and global effects.

Climate change, one of the factors causing or aggravating land degradation, is often referred to as ‘threat multiplier’ (e.g. EU 2008; WBGU, 2008; Evans, 2010). Climate change and its consequences, such as floods, droughts and an increase of extreme weather events, may not directly cause conflict but may trigger or aggravate it. According to Smith and Vivekananda (2007), it is important to look at the “consequences of consequences”. Many of the countries predicted to be the worst affected by climate change, such as those in sub-Saharan Africa, are also affected or threatened by violence and instability. In these countries, the consequences of climate change are most likely to combine with other possible factors contributing to violent conflict: for example, poverty, bad governance and the legacy of past conflicts all put additional strain on fragile social and political systems. If these are background causes, in the foreground lie the demands, grievances and positions of the contending parties and the behaviour and credibility of political leaders. It would be misleading to think that climate change alone will cause violent conflict; the problem, rather, lies in the interaction between the effects of climate change and these other factors.

In a special issue on climate change and conflict of the *Journal of Peace Research* (Gleditsch, 2012) authors come to mixed conclusions. The overall picture is that only limited evidence can be found to support a view of climate change being an important influence for armed conflict (Gleditsch, 2012). Case studies range from the Middle East conflict, to central Asia, and the Horn of Africa and the Sahel. Like other research focusing on the relationship between climate change and security, scholars looked at various effects of climate change. Some scholars analysed rain precipitation patterns, while others looked at the effects of natural disasters or analysed food and water scarcity issues. This latter group tended to look at weather and not at the relationship between longer-term climatic changes and the occurrence of conflict. More research is needed to disentangle the causal chains between climate change and conflict, to reconsider the kind of violence expected to result from climate change and in what regions of the world the effects are most likely.

With regard to specific environmental factors, land degradation research data are even less available. Kahl (2006) cites a wide range of evidence for the argument that scarcity can increase the risk of civil war. According to his study, there is a higher than average risk of conflict in countries that are highly dependent on natural resources, in those experiencing high rates of deforestation and soil degradation, and in those with low per capita availability of arable land and fresh water. Kahl notes the importance of looking at natural resource shortages in combination with demographic developments. He also points to the local effects

of environmental degradation in least developed countries where people are highly dependent on land; if communities are deprived of this land they increasingly engage in fierce competition for natural and economic resources. Hence, economic decline leads to frustration, resentment, domestic unrest and, in some cases, even civil war. Only strong and capable states could prevent such deprivation from coalescing into organised violence – through a mix of relief for aggrieved individuals, co-optation of opposition leaders, and outright coercion. Large-scale violence would only be likely to occur when social grievances emanating from rapid population growth, environmental degradation, and natural resource scarcity combine with eroding state authority and escalating intra-elite competition (Kahl, 2006: 9-10). This supports the idea that violence is the result of a wide range of factors, of which environmental factors play an important role.

Kahl (2006) looks in his work at a broader range of environmental stresses, but the relationship between factors related to conflict, as he describes them, appear particularly relevant to land degradation, as it is a key cause of natural resource scarcity, notably of food and water (see below). Moreover, Kahl notes criticism regarding the alleged relationships and points to the need for intensified research into their specificities: for example, is environmental degradation or population growth the most important factor? What types of environmental degradation are, in this light, most relevant? He has carried out empirical research into civil strife in Kenya and the Philippines and reviewed other cases where violent conflict has occurred, as well as those where it was muted and avoided altogether.

Theisen (2008) replicated a study by Hauge and Ellingsen (1998) and in doing so looked at a number of environmental factors. He found that only a high degree of land degradation increased the risk of civil war, but the relationship was less strong in comparison to poverty and dysfunctional institutions. However, poverty, instability and dependence on fuel exports were found to be the main factors increasing the risk of civil war. Scarcity of natural resources was found to have a limited relationship to civil violence, whereas poverty and dysfunctional institutions are robustly related to conflict (Theisen, 2008). Urdal (2008) found that a combination of land scarcity and high rates of population growth increase the risk of civil conflict to some extent, and that scarcity of productive agricultural land is positively correlated with civil conflict when agricultural wages decline.

Other studies present a rather different picture. For instance, Raleigh and Urdal (2008) report that soil degradation and water scarcity have a mixed effect on armed conflict. Hendrix and Glaser (2007) report that land degradation has no impact on the risk of civil conflict in sub-Saharan Africa, and Østby and colleagues (2012) did not find evidence that significant land scarcity combined with high population growth increased violence in Indonesian provinces.

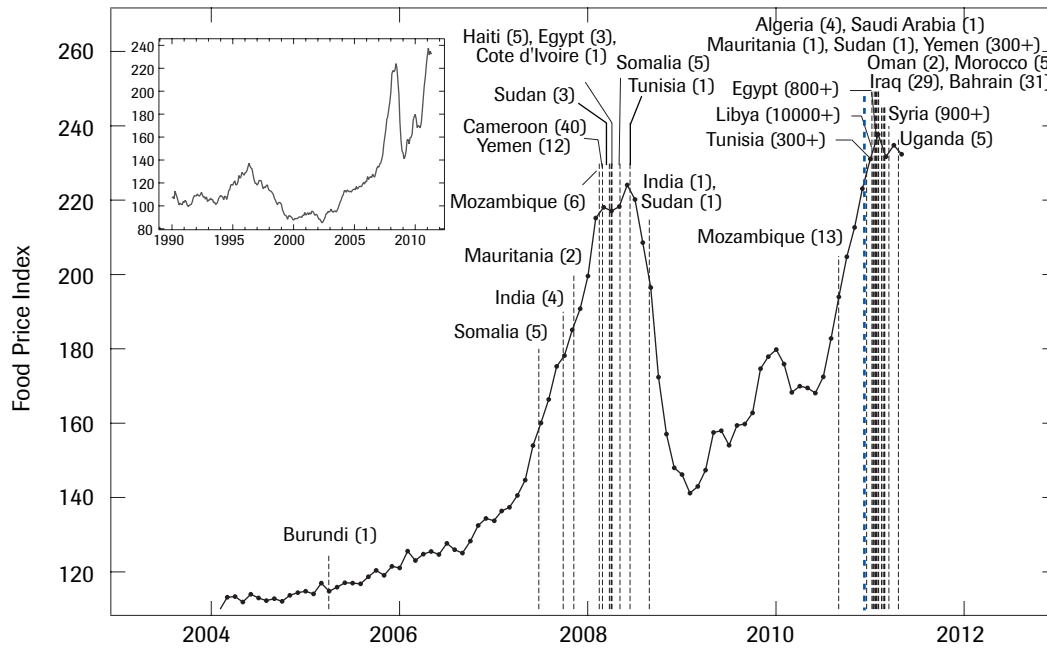
These findings suggest that land degradation can be related to conflict, but the evidence is inconclusive and more research is needed to substantiate the claim. Land degradation, like other environmental factors, is, moreover, likely to be only indirectly – not directly – related to conflict. Given the insidious nature of land degradation, we prefer not to refer to it as a ‘threat multiplier’, but as a ‘threat amplifier’. The challenge is to analyse how land degradation compounds and affects other factors such as population growth, migration, poverty and good governance. A relationship with food and water scarcity, as intervening factors between land degradation and the other factors, also appears likely. These and the other relevant factors with likely relevance for conflict will be discussed in the following sections and chapters.

2.2 The food security challenge

When does food scarcity lead people to fight each other? How is it related to land degradation? We know that malnutrition has multiple negative effects on the physical condition of humans, such as health problems and stunted growth, but in what situations does hunger drive people to pick up weapons? Many have pointed to the relationship between high bread prices and revolutions, such as the French revolution, the collapse of the Soviet Union and, more recently, the Arab Awakening (cf. Collier, 2010; Lagi et al., 2012: 24; Hendrix, 2013). Some studies have also pointed to climate change affecting conflict through its impact on agricultural productivity, which suggests the existence of a link with land degradation caused by climate change (e.g. Zhang et al., 2007). The UNCCD and IFPRI (Nkonya et al., 2011) confirm the relationship between land degradation and a decrease in global food production; if the current scenario of land degradation continues over the next 25 years, it may reduce global food production by as much as 12% resulting in world food prices as much as 30% higher for some commodities (UNCCD, 2013). However, it is not entirely clear what data and research models were used to come up with these figures.

On the relationship between food scarcity expressed by high food prices on the one hand and conflict on the other hand more research findings are available. According to Von Braun (2008), at least 61 countries experienced unrest as a result of price inflation during the food price peak of 2008; in 38 countries, these protests were violent. The existence of a strong correlation between high food prices and conflict is alluded to most clearly by Lagi and colleagues (2012) (see Figure 3). They conclude that high food prices create the conditions under which social unrest can flourish; in other words, they are a precipitating condition for social unrest. However, Lagi and colleagues do not refer to land degradation as a cause of high food prices. Instead, they point to two other often-cited causes, notably speculation and the use of land for biofuel production. Whereas the majority of food riots occurred when global food prices peaked, the few food riots that occurred during the intervening periods, when prices were low, seem to have been caused by a disruption to local food production, for example an influx of refugees in Burundi in 2005, social and agricultural disruption in Somalia in 2007, and floods in India in 2007 that destroyed local harvests (Lagi et al., 2012: 25).

Figure 4 Food prices and riots



Source: Lagi et al., 2012. Based on FAO Food Prices Index. The overall death toll is shown in brackets.

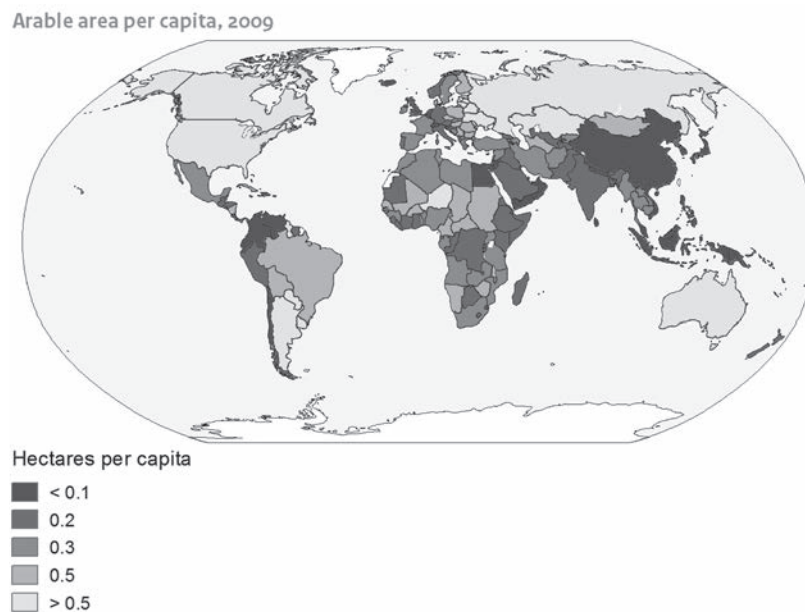
Arezki and Brückner (2011) investigated the connection between food prices, political institutions and political stability. They developed an index of annual national food prices for 120 countries from 1970 to 2007 and relate it *inter alia* to civil conflict data from PRIO/Uppsala. They found that political institutions in low-income countries weaken significantly during times of international food price rises largely because higher food prices significantly increased the likelihood of civil conflict and other forms of civil strife, such as anti-government demonstrations and riots. The same was not true for high-income countries. They explain that although rises in international food prices have the macroeconomic effect of increasing real GDP in food-exporting countries, they also reduce consumption and increase income inequality in low-income countries. Berazneva and Lee (2011) conducted an analytical comparison of African countries that did and did not experience food riots during the 2007-08 price spike. They found that higher levels of poverty and political repression are associated with a higher likelihood of riots.

It is worth mentioning that according to the FAO (2012: 10) most developing countries were less severely hit by the economic crisis of 2008-09 than was initially assumed; the prices of domestic staple food in China, India and Indonesia did not increase very much either. This may explain why there were not more food riots during this period in these countries. By contrast, African countries were fully exposed to both price hikes and global recession. Moreover, developing countries are likely to become more vulnerable to food price rises in the future. According to recent FAO studies, the global demand for food is expected to increase by 60 percent by 2050, mainly due to population growth and changing dietary patterns (FAO, 2012). This presents a huge challenge, since food supply is unlikely to keep up with this increased demand. This is caused, in part, by reduced yield growth in areas with intensive agricultural practices (e.g. in western Europe). This is related to agricultural innovation slowing down, but

also to land degradation. Scarcity of food is further aggravated by other causes, such as malfunctioning markets, inadequate infrastructure, and the use of land for industrial purposes, cash crops, biofuels and speculation.

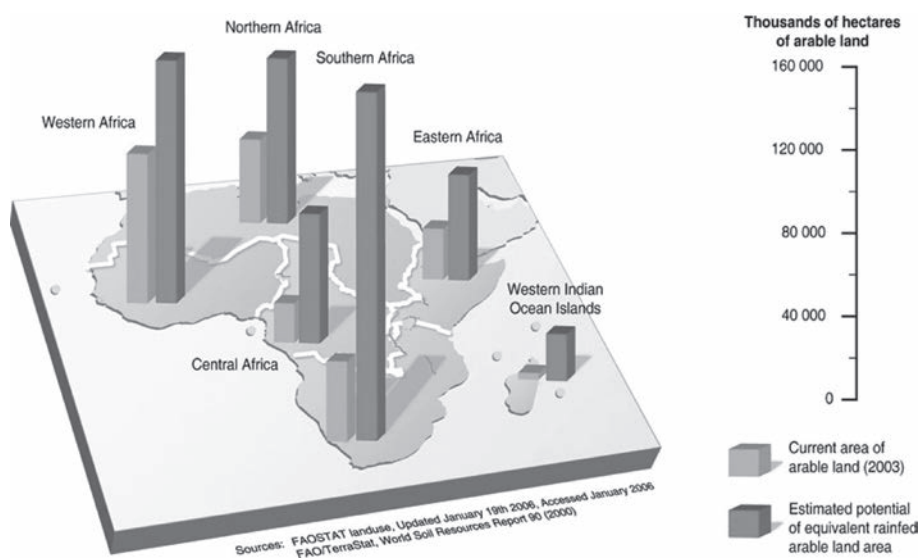
In light of the demand projections, the supply challenge appears so huge that all of these issues need to be addressed. Here, we concentrate on the question of how to improve agricultural production in developing countries, where yields are significantly lower than in rich countries, as the issue of land degradation is most relevant in this matter. Policy actions and literature on how to improve production usually concentrate on how to increase production on smallholder farms in developing countries, i.e. how to make better use of existing agricultural land (WRI et al., 2013; FAO, 2012; Rabobank Group, 2012; Fischer et al., 2008). Although such initiatives to increase food production may also aim to improve land management practices and, more specifically, to restore lands, there is often a lack of focus on combating land degradation. Figure 5 provides an overview of available arable land per capita worldwide; it illustrates that particularly in Africa there is a large discrepancy between land used for agricultural practices and land that could potentially be used for this purpose. In other words, in the areas where land is most needed, the amount of arable land is the lowest. The lack of arable land is caused by natural land (e.g. rainforest) not being made suitable for agricultural production, but also by land degradation. However, to date, a good overview of the exact contribution of land degradation towards the availability of locally produced food is lacking.

Figure 5 Arable area per capita (World Bank WDI, 2009; map produced by PBL)



Source: World Bank WDI, 2009 (map produced by PBL)

Figure 6 Difference between actual and potential arable land (FAOSTAT, 2000)



Sources: FAOSTAT land use, Updated January 19th 2006, Accessed January 2006; FAO/TerraStat, World Soil Resources Report 90, 2000

Eighty percent of all potentially suitable new arable land is located in Latin America and sub-Saharan Africa. About half of this total is concentrated in just six countries, namely Angola, Argentina, Bolivia, Brazil, Democratic Republic of Congo and Sudan. In contrast, there is virtually no spare land available for agricultural expansion in south Asia, the Middle East or north Africa, while these regions have high population growth (Rabobank Group, 2012: 13). From this perspective, it is thus likely that new price spikes can be expected in the future. Although Koning and colleagues (2008) conclude that theoretically enough food can be produced to feed the world in 2050, fluctuations in price are likely to continue due to factors such as speculation, conversion of land from food to biofuel production, inadequate infrastructure, food waste and – not to forget – bad land management practices, climatic changes and pollution leading to bad harvests and land degradation.

In short, if efforts to increase food production, for which policies to promote land quality and yields per hectare are key elements, are not greatly expanded, the likelihood of high food prices contributing to tensions in society increases. This observation appears to have particular relevance for the Middle East and North Africa (MENA) region. With little arable land (and scarce water supplies), this region imports more food per capita than any other, with imported food accounting for 25-50 percent of national consumption (Breisinger et al., 2010). By tonnage, it is the world's largest cereal-importing area and a major importer of Russian grain. Rapid population growth and changing diets have further increased the demand for imported foods, making the region very vulnerable to rising food prices. Research has pointed to the coincidence between the outbreak of the Arab Awakening and the high food prices in 2008-2010 (Johnston and Mazo, 2011; Lagi et al., 2012). The MENA region has been one of the few regions in the world where hunger levels have risen in recent years (IFPRI, 2013), despite several countries strengthening their policies on food security (i.e. by increasing reserves, food subsidies, etc).

Since the MENA region imports most of its food, land degradation can certainly not be cited as a direct cause of the Arab Awakening. Johnstone and Mazo (2011) concluded that high food prices may have led to revolutions starting earlier than they did and, like Lagi and colleagues (2012), Hendrix (2013) also agrees that the high price of food was an important contributing cause. Hendrix argues that there is a link with degraded land in the region, but is unspecific about this assertion. It can indeed be argued that food prices would have been lower when import dependency lessened as a result of increased local food production enabled by the availability of larger areas of fertile land. However, it is not clear whether countries affected by the Arab Awakening have greater amounts of degraded land than other countries in the region, let alone whether they were confronted with a higher degree of land degradation in the previous decade.

Some limited information is available on countries in the region that have a high degree of food security. According to Breisinger and colleagues (2010), these are Kuwait, United Arab Emirates and Iran, but the first two are only food secure because national income is high enough to import foods. In addition to Iran, only Lebanon and Syria had moderate degrees of self-sufficiency in 2009. However, in all three of these countries, agricultural growth was not considered sustainable, as it led to falling groundwater levels; this hints of land degradation. The MENA region may, therefore, significantly benefit from serious efforts to restore agricultural land.

2.3 The water security challenge

Many studies conclude that water shortages and competition for water is at the heart of the *global security challenge* and could increase the risk of conflict (WEF, 2008; NIC, 2012; MacQuarrie and Wolf, 2013). Others studies are very critical and claim the existence of the so-called *water wars* has never been proven. For instance, Barnaby (2009) claims that cooperation over shared water resources is more likely and that water-scarce countries tend to diversify their economies in order to import agricultural products produced with high volumes of water. Evidence supports this claim and suggests that transboundary waters are associated with low-level conflicts rather than with full-scale wars (e.g. Gleditsch and Hegre, 2000; Toset et al., 2000; Gleditsch et al., 2006; Hensel et al., 2006; Dinar, 2009). Moreover, in cases of severe water scarcity, it is not clear what happens if countries do not manage to increase imports.

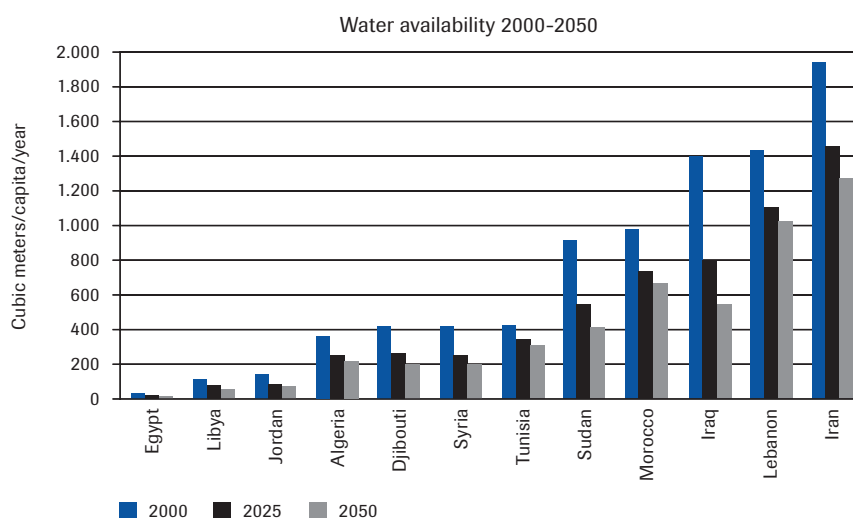
Water scarcity is the long-term imbalance between available water resources and demands. Water scarcity is the result of increased consumption of water, seasonal changes, decreased rainfall, temperature rise, the salinization of drinking water, and land degradation. Land degradation can have negative consequences for the availability, quantity and quality of water resources. It decreases the ability of land to capture water at levels accessible to humans (i.e. not too deep below the surface) and can contribute to water pollution (if land degradation is caused by pollution). Hence, when land becomes degraded, the availability of (renewable) water is likely to decline, leading to reduced access to drinking water. With a growing population, and other factors such as a decrease in rainfall and increased use of water for industrial and agricultural production, this development is likely to contribute to an unequal relationship between water supply and demand. Over time, this may increase reliance on external water supplies (UNCCD, 2012).

Based on the key factors of water security, different levels of potential risk to water security can be distinguished (extreme risk, high risk, medium risk, low risk). Figure 7 illustrates how these risks are distributed globally and shows that conflicts are most likely to occur in countries in the high risk category, particularly when the high degree of water scarcity is combined with poverty. Water resources are needed to guarantee the growth of industry and investment. Consequently, in regions with high dependence on water, competition emerges among corporations, populations or states. Over time, this competition over limited water resources may lead to internal and cross-border tensions and conflict.

According to the Water Security Index (Maplecroft, 2010), ten nations face potential risks to water security and conflict: Syria, Mauritania, Iraq, Turkmenistan, Egypt, Somalia, Sudan, Pakistan, Niger, Uzbekistan. The 2012 UN World Water Development Report argues that water constraints can result in a spiral of increasing poverty, uncertainty and instability in other parts of the world as well (WDR, 2012:357). The need for sanitation services and water in cities is increasing, and nearly one billion people worldwide still do not have access to improved sources of drinking water (WWAP, UN-HABITAT (2010). With half of humanity now living in cities, with 27 percent of urban dwellers in the developing world having no access to piped water at home, and with 60 percent of the world's population becoming urban dwellers within the next two decades, the need for water will become one of the most pressing issues in the future.

In the years to come, most countries in the MENA region will face a major challenge in sustaining their per capita land and water availability. Although the MENA region is not the only region facing challenges to water availability and security, it is perhaps the region where it is most likely to be related to conflict. With regard to the Israeli–Palestinian conflict, Feitelson and colleagues (2012) conclude it is unlikely that climate change will directly influence the conflict, although the issue of water security may affect the negotiating positions of the parties. As a result of population growth and climate change, water availability in the world's most water constrained region is expected to decrease dramatically by 2050. Moreover, imminent industrialisation – causing a reduction in water availability – is expected to increase competition in agriculture and other sectors over these scarce resources (IFPRI, 2010a). Djibouti, Iraq, Jordan, Sudan and Syria are expected to be confronted with declines in water availability in excess of 50 percent within the next decades (see Figure 8). With an estimated 60 percent decline in water availability, Iraq will be confronted with the largest fall in water availability (IFPRI, 2010a).

Figure 7 Per capita internal renewable water availability MENA 2000, 2025 and 2050



Source: IFPRI, 2010a

Water scarcity thus may pose a risk for security not only in a direct way, but also in an indirect way through its effects on food production. In fact, most water is used to produce food. Investments should be made into agricultural research to encourage innovation and new technologies focusing on drought stress and salinity tolerance, and to stimulate initiatives to develop new, non-traditional water sources, such as desalinized sea water and treated wastewater (IFPRI, 2010a). Such efforts could also contribute positively to combating land degradation, as they make it more likely that land can retain water.

Particularly in developing countries with scarce water supply, such as Pakistan, Uzbekistan and Egypt, the combination of a malfunctioning state unable to provide sufficient adaptive measures and a growing population with increased water demands is particularly dangerous and may lead to conflict. Here land degradation appears to operate as a threat amplifier due to its effects on water availability. Measures at both demand and supply side, such as a sustainable and equitable urban water management, will be necessary (WWAP, UN-HABITAT, 2010). Efforts to restore land could contribute at supply side and thereby reduce conflict risks.

2.4 Land degradation, food and water scarcity, and their relationship with conflict

This chapter opened with the debate on whether, to what extent, and in what way environmental factors increase conflict risks. The most accurate answer proved to be the labelling of resource scarcity and climate change as threat multipliers. That implies that under certain circumstances they may aggravate tensions in society that could lead to violent conflict. Land degradation appears a more insidious phenomenon and can therefore better be referred to as a threat amplifier. It is one of the causes of food and water scarcity – key challenges for economic development. They are also threats to security, although evidence in this respect is stronger with regard to food scarcity than water scarcity in relation to conflict.

Moreover, serious questions remain with regard to the exact contribution of land degradation to food scarcity and water scarcity and in which parts of the world they are most likely to be related to human insecurity. Tentatively, we expect the relationship to be most relevant in areas where people rely directly on local land for their food and water (i.e. their subsistence) and they cannot easily migrate elsewhere (see Figure 8).

Apart from this local effect, land degradation is likely to increase pressure on the global availability of food particularly. This issue has so far received relatively little attention in comparison to, for instance, the effects of land being used for biofuel production instead of food. This is remarkable and, in light of the expected growing demand for food, the neglect of land degradation as possible contributor to global food scarcity could be argued to deserve more attention. It is a more gradual factor than the conversion of land from food to biofuel production, but this may make it even more dangerous. On top of this, we found that next to food scarcity and water scarcity, and in relation to these factors, at least four other factors influence the relationship between land degradation and conflict: population growth, migration, poverty, and good governance. The next chapter will take a closer look at these factors.

Figure 8 Local (indirect) effects of land degradation

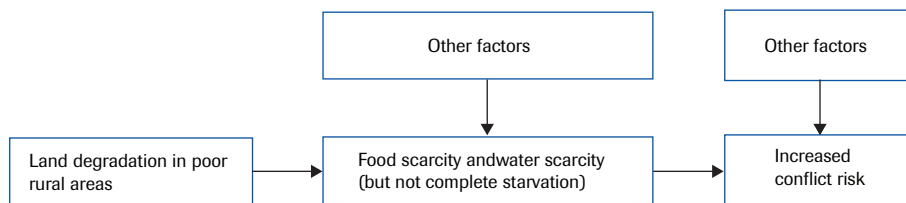
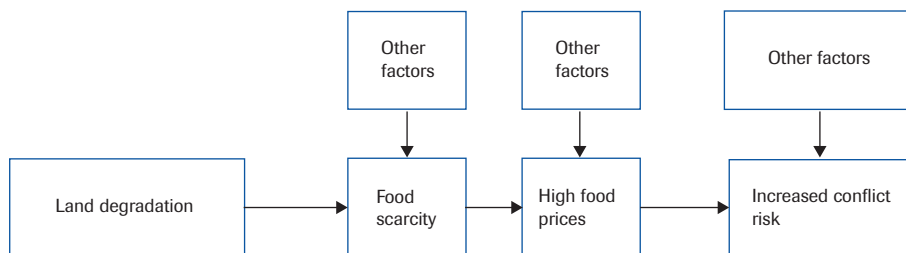


Figure 9 Global (indirect) effects of land degradation



3 Other factors influencing the land degradation and conflict relationship

In this chapter, the influence, if any, of population growth, migration, poverty and good governance on the emergence or escalation of conflict will be linked to land degradation – especially as factors that can help in analysing cases where land degradation may have operated as a threat amplifier. We have chosen to focus on these factors, as they were often mentioned in other studies on the relationship between environmental factors, food and water scarcity on the one hand, and conflict on the other (e.g. Bernauer et al., 2012; Kahl, 2006).

3.1 Population growth and the risks of a youth bulge

Rapid population growth and population density are often cited as significant conflict risk factors (e.g. Collier and Hoeffler, 1998; Sciubba et al., 2013; Urdal, 2006; Raleigh and Urdal, 2008). Kahl (2006) points to the mutually reinforcing nature of population and environmental stresses. Particularly if the combination of these two factors leads to, or coincides with, a weakening of the state and a divided society, the risk for inter-state conflict increases.

Others researchers claim that the relationship between population growth and conflict is exaggerated (e.g. Hegre and Sambanis, 2006; Collier and Hoeffler, 2004). Overpopulation in itself is not necessarily a problem. Instead, the lack of good job opportunities creates a greater problem. When young men are well educated and can adequately provide for their basic needs, but there are few job opportunities to fulfil their expectations, they may cause social unrest (Collier and Hoeffler, 2004). To fulfil their ambitions they may emigrate, commit crimes, stage a coup d'état, or engage in civil war, revolution, the expulsion of minorities or violent colonisation (World Bank, 2011b). Over time, these risks will not be only an internal problem but may spill over into other countries, creating an international problem.

Figures 11, 12, 13 and 14 on the following pages show the expected average annual population growth (2010-2050); the global youth bulges (populations aged under 30); and youth unemployment rates in developing countries. The figures show that all three indicators most often occur in developing countries, and more specifically in African developing countries. Partly for that reason, four African developing countries with high population, youth bulge and youth unemployment rates have been chosen for case studies in Chapter 4 of this report.

Figure 10 Expected population growth

Average annual population growth, 2010-2050



Source: UN World Population Prospects 2010, medium variant, 2011

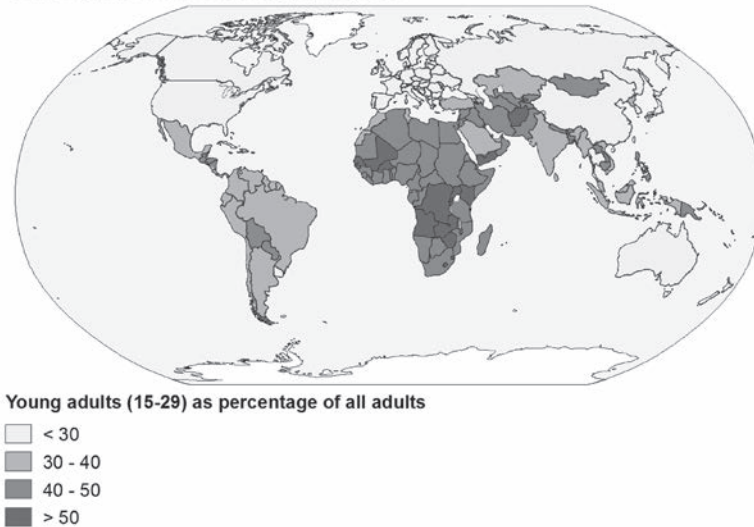
In the future, many countries will experience a *youth bulge* due to population growth (see Figure 10 for an overview of countries with rapid population growth). Such a bulge in the population occurs when at least 30 percent of the population are men aged 15 to 29. According to Leahy (2009) six out of nine new outbreaks of civil conflict between 2000 and 2006 occurred in countries with very young or youthful age structures. Urdal (2006) has compared the presence of youth bulges in combination with conflicts for the period 1950–2000 and found a strong relationship, even when controlling for a number of other factors such as the level of development, democracy, and conflict history. For each percentage point increase in youth bulges, the risk of conflict increases by more than 4 percent. When young people make up more than 35 percent of the adult population, the risk of armed conflict is 150 percent higher than in countries with an age structure similar to most developed countries. Assessing possible interaction effects, Urdal finds that the conflict risk associated with youth bulges increases when these youth bulges coincide with economic decline, expansions in higher education, or strong urban growth. The effect of youth bulges on conflict risk is greater in the most autocratic regimes as well as in the most democratic states. Finally, this study provides the first empirical results suggesting that youth bulges may be a better predictor of low-intensity political violence such as terrorism, riots and violent demonstrations than large-scale wars.

The youth bulge is a common phenomenon in many developing countries, and particularly in the least developed countries. This is often due to a stage of development where a country achieves success in reducing infant mortality but mothers still have a high fertility rate. The result is that children and young adults make up a large proportion of the population (World Bank, 2011a). This problem is particularly severe in the Middle East and North Africa (MENA) region, East and Central Asia (ECA) and Latin America (see Figure 11), although youth unemployment rates in the EU-28, more particularly the southern EU member states, have recently reached unprecedented levels. Between 2008 (annual figure) and the second quarter

of 2013 the (seasonally adjusted) unemployment rate in the EU-28 rose from 7.1 percent to 10.9 percent, while in preceding years (between 2003 and 2008) the unemployment rate fell by over 2 percent (EC, 2013). If there are enough job opportunities for the working population and the level of average income per capita increases, the youth bulge will become a demographic dividend (World Bank, 2011b), but this does not happen often.

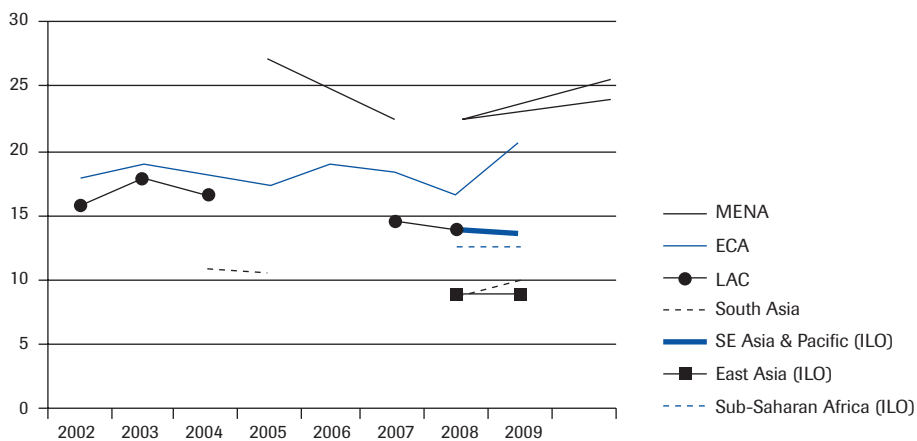
Figure 11 Youth bulge

Youth bulge, population under 30 years, 2010



Source: UN World Population Prospects 2010, 2011

Figure 12 Youth unemployment rates in developing countries



Source: World Bank, 2011a

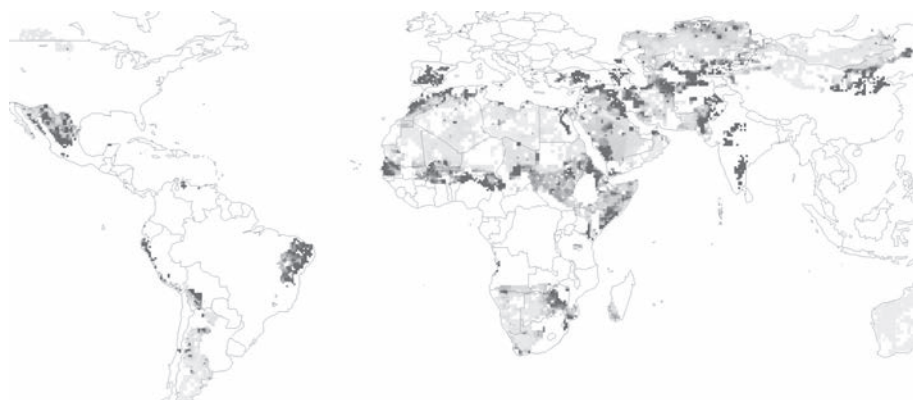
Population growth, therefore, may not necessarily lay the foundation for social or political unrest, but is more likely to do so in the absence of associated economic growth or economic opportunities to cope with such growth. In such a scenario, population growth can be expected to aggravate problems of food and water scarcity. The combination of these factors can reinforce feelings of discontent, as not all of the population are likely to have the resources to pay for food and water, and prices may rise due to increased demand. This may

make people more receptive to considering to rebel. Conflict may, in such cases, become an alternative to farming if that source of livelihood is not an option. Whether an escalation of violence occurs in turn depends on how such situations are dealt with by authorities. In some cases no backup systems are in place, stocks of food are inadequate or absent, or distribution systems are weak or flawed. This suggests that part of the problem is related to the effectiveness of governance: available sources will have to be distributed between more people; if not, this is likely to increase pressure. This is particularly problematic in areas where people depend for their livelihoods on locally produced food and water. When land degradation jeopardises these, tensions are likely to rise. Again sub-Saharan Africa appears to be a prominent example (see also WRI et al., 2013). As we will see in the next section, this is also a region with such a low degree of economic development that people cannot afford to migrate, which is an option for people possessing some kind of financial means.

3.2 Migration and urbanisation

Migration can be expected to either aggravate or mitigate the relationship between land degradation and scarcity, and scarcity leading to conflict. Here we discuss the effects of migration both between countries and regions and also between the countryside and city (urbanisation). Migration is often quoted as a source of conflict, as it increases competition over resources, which may be scarce (Reuveny, 2007). However, it can also be a mitigating factor, as clashes between competing groups might be avoided. The risks for migration to increase tensions is highest when poor people migrate to already poor and unstable countries, but lowest when they migrate to more stable and prosperous parts of the world. Migration is also related to population growth since it are often young adults who migrate. Figure 13 shows the hotspots of so called out-migration, based on extensive research carried out by the Center for International Earth Science Information Network (CIESIN, 2011).

Figure 13 Hotspots of out-migration



Source: CIESIN, 2011

Migration is motivated by various factors such as economic decline, poverty, natural disasters, social unrest or war. There is some debate about how and to what extent migration may be caused by climate change and other environmental problems.

Kolmannskog (2008) argues that it is indeed very likely that climate change impacts will contribute to an increase in forced migration, but it is unlikely to be the key factor, event or process inducing migration – or conflict for that matter. Raleigh and Urdal (2008) expect a gradual migration of people in search of more fertile land rather than large-scale resettlements. Studies on the relationship between environmental factors and migration tend to focus on drylands, areas where land is degraded completely or to a large extent. Often a link with climate change is established as a factor aggravating desertification.

In the Sahel during the 1970s and 1980s drought and resulting famines led to waves of migration (Ezra, 2001; Ezra and Kiros, 2001; Morrissey, 2008). In 2009, together with Columbia University, CIESIN published a report examining the influence of climate change on migration. The report concluded that although economic and political factors are still the dominant drivers of displacement and migration, climate change is having an increasing effect, contributing to migration and human displacement (CIESIN, 2009). Next to seasonal migration, sea-level rise and glacier melt are expected to lead to increasing migration over time. Moreover, in countries of sub-Saharan Africa tensions have occurred between pastoralists, who are permanently on the move, and farmers who live permanently on their agricultural land. In Kenya, for instance, communities are increasingly in competition as suitable land becomes less available (Kahl, 2006).

The link between environmental factors and migration is thus expected to go beyond drylands in the future, but some of this also relates to factors unconnected to land degradation, such as floods and natural disasters. Reuveny (2007) argues specifically that the link between migration and conflict can be exacerbated by sudden resource scarcity caused by climate change (i.e. extreme weather events). On the basis of 38 cases of environmental migration – of which land degradation was present in 27 cases – he finds 19 cases where a conflict emerged in the receiving area. However, Koubi and colleagues (2013) come to less far-reaching conclusions with regard to any strong relationship between scarcity and migration. They argue that people tend to respond to long-term environmental problems through adaptation rather than migration. On top of this, many people do not have the means to migrate when, for instance, agricultural production declines gradually over the years (see also Gemenne et al., 2012).

This relationship between the level of welfare and migration is confirmed by Shah (2005). In a case study on land degradation and migration in a dryland region of Gujarat, India, he found that more affluent people tend to undertake long-term, precautionary migration because their assets, skills and social capital allow them to migrate, perhaps permanently. The poor living in dryland regions, to the contrary are the least likely to migrate. Gemenne and colleagues (2012) found that in general the relationship between environmental degradation and migration is just as relevant to industrialised nations as it is to developing countries.

A related issue is urbanisation, which is a global trend. Land degradation is one of the causes, since it reduces livelihood opportunities in rural areas. When land surrounding large cities become degraded, local supplies to these cities are likely to suffer. This may lead to higher prices in local food markets and increase the need for imports, either from more distant areas or from abroad. According to Patel and Burkle (2012), rapid urbanisation increases the risk

of violence and conflict. The combination of increased food and water scarcity and a youth bulge in overpopulated cities is in particular likely to jeopardise the health and security of specific groups, such as women, migrants and refugees. This would increase pressures in society and increase the risks of riots and other forms of violence. However, other research finds little evidence that urbanisation leads to higher conflict risks (Urdal and Hoelscher, 2012; Buhaug and Urdal, 2013). Urban disorder would be primarily associated with low economic growth and economic shock as well as with ineffective or unstable political institutions. More research therefore is needed to analyse whether land degradation combined with food and water scarcity are particularly salient risk promoters for urban conflict.

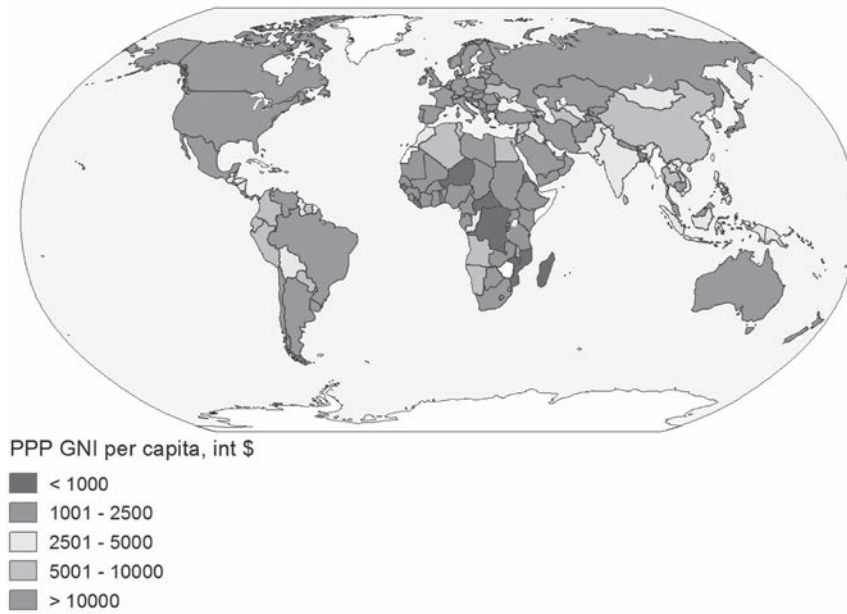
3.3 Poverty in relation to access to land

In the literature, economic decline, poverty and relatively high degrees of income inequality are considered strong indicators of conflict risks (e.g. Theisen, 2008; Miguel et al., 2004; Collier and Hoeffler, 2004; Douma, 2003). Often, it is not so much about poverty itself, but about the distribution of welfare and, related to this, power or resources. Recent reports have devoted more attention to the negative effects on human security of poverty and its distribution, both in poor and middle-income countries (e.g. WDR, 2013, AIV, 2012). They illustrate that even in regions with impressive economic growth figures, income inequality continues to foster grievances, tensions and state fragility.

The overall level of welfare and how it is distributed can be linked to land degradation, particularly when agricultural production constitutes a large part of economic activity (EU, 2012b), which is the case in developing countries. Globally, roughly 2 billion people are employed in agriculture, many of them poor (WRI et al., 2013). Poverty, imperfect capital markets and insecure land tenure may reinforce the tendency towards short-term time horizons in decisions about agricultural production and may also bias decisions on land use against long-term land management strategies. As a result, in the longer term, these decisions may not turn out to be as beneficial as initially expected (EU, 2012b). Moreover, these short-term decisions may even deteriorate the situation in certain cases. In periods of commodity booms and land speculation, wealthier households generally take advantage of their superior political and market power to access better-quality resources in order to capture a larger share of the land and property rents. Poorer households are either confined to marginal environmental areas where rents are limited, or only have access to resources once they are degraded and rents dissipated (Barbier, 1997). Figure 14 gives an overview of the GNI per country and Figure 15 of economic growth figures. As shown, Africa is as a poor region, but with high growth rates, and this is where distribution issues arise.

Figure 14 GNI per capita, 2007-2011 (World Bank, 2009)

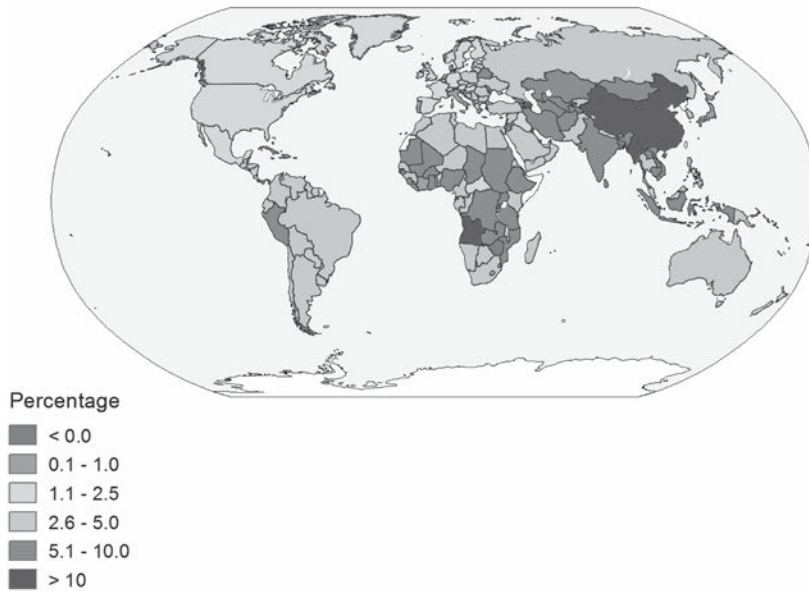
Gross National Income (GNI) per capita, most recent in 2007 - 2011



Source: World Bank WDI, 2009

Figure 15 Average annual growth, 2001- 2011

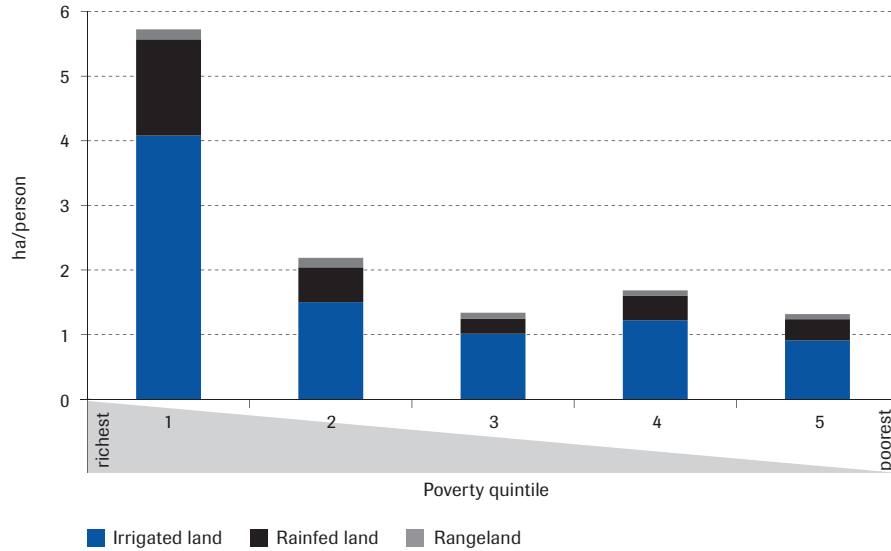
Average annual GDP growth, 2001 - 2011



Source: World Bank WDI, 2009

Some 40 percent of the world's degraded lands are in areas with high poverty rates, 30 percent are in areas with moderate levels of poverty, and 20 percent are in areas with low poverty rates (FAO et al., 2011). In particular, the poorest communities of this world appear locked in a poverty trap of small farms with poor-quality soils and high vulnerability to land degradation and climatic uncertainty. Agricultural policies thus far have primarily benefited farmers with productive land and access to water, bypassing the majority of small-scale producers (IFPRI, 2013). Moreover, inefficient land management prevails in poorer regions, which further contributes to land degradation. Therefore, the most significant trends in land degradation are associated with the poor (FAO et al., 2011). In poorer areas, communities and local municipalities are often incapable of exercising effective land management due to a lack of knowledge or resources. Over time, if the process of degradation is not halted, the fertility of soils may be damaged to such an extent that the land becomes completely useless for agricultural purposes. Recently, more attention has been given to the benefits of efforts to reverse this trend and improve farming systems in developing countries (Hussain and Hanjra, 2004; Lipton, 2007; Rabobank Group, 2012).

Figure 16 Per capita share of irrigated land, rainfed land and rangeland by poverty quintiles in rural areas in Africa and Asia

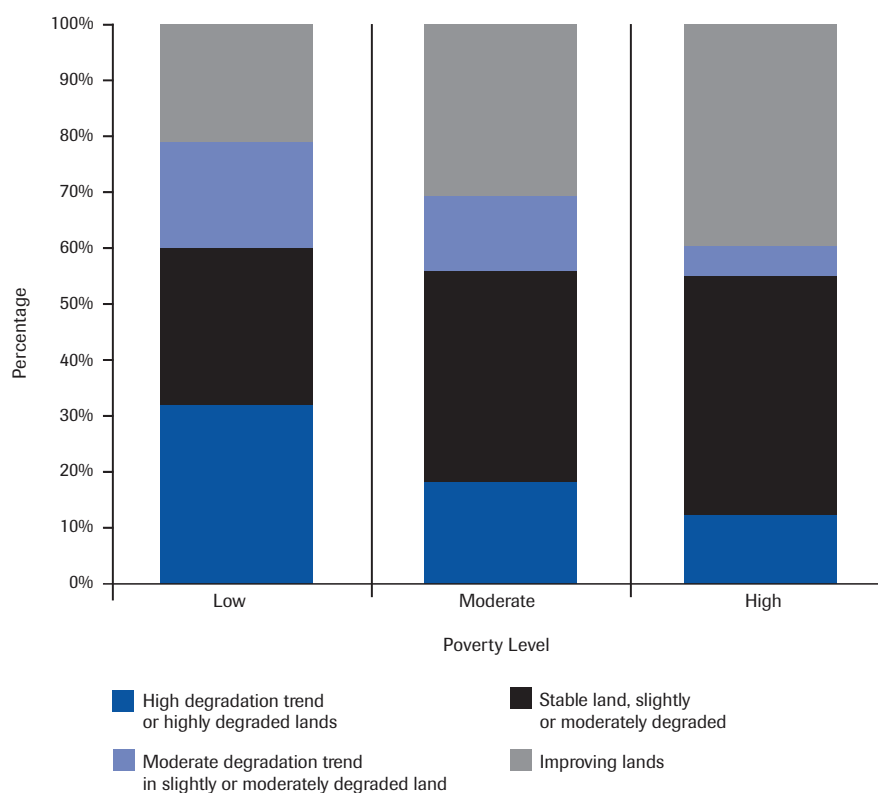


Source: Geodata Institute, 2010

Figure 16 shows land distribution per capita in developing countries in Africa and Asia. The richest group owns the largest share of rainfed and irrigated land that is most fertile and useful for agricultural production, particularly in sub-Saharan Africa and India. Hence, in sub-Saharan Africa as a whole, approximately 45 percent of the rural population is classified as poor (FAO and Earthscan, 2011). This unequal distribution of land creates a major problem in areas where poor communities depend heavily on their land for survival. When there is not enough land available to produce food and water, tensions may increase, and subsequently increase the risk of conflict.

Figure 17 shows the relationship between land degradation and poverty, distinguishing between highly and moderately degraded, stable and improving areas and their distribution over low, moderate and high poverty levels. Most improving land is distributed over low poverty levels, while individuals at high poverty levels are more often limited to the use of degraded areas. Both figures underpin the idea that land degradation mainly affects poor people.

Figure 17 Relationship between land degradation and poverty



Sources: LADA, 2010a; FAO and Earthscan, 2011

In sum, both figures and the literature show that poverty and land degradation are intertwined. People living in degraded or degrading regions can find themselves in a poverty trap, and land is likely to be used less effectively and less sustainably in poorer areas due to a lack of knowledge and resources. This implies that the relationship between land degradation, poverty and conflict is of most relevance in poor areas. Conflict risks in such situations are higher when lands are distributed unequally.

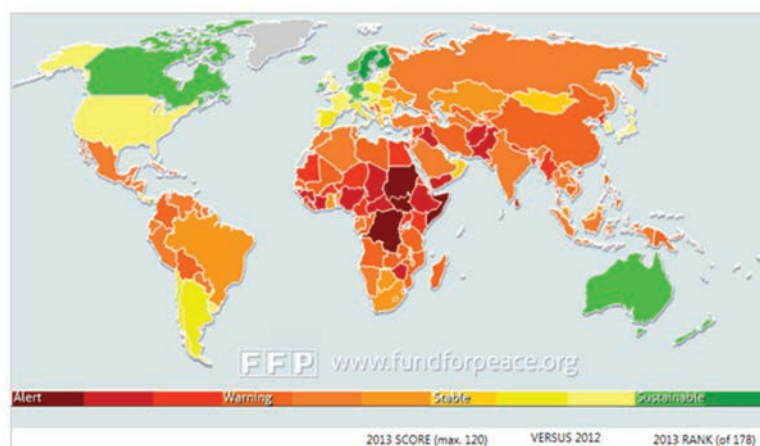
3.4 Good governance and democracy

Dysfunctional institutions, or ‘bad governance’ practices, are considered to be strong indicators that conflicts will emerge and that environmental stresses will worsen (Kahl, 2006; Theisen, 2008). Conversely, good governance is likely to benefit land management practices, food and water policies and economic growth, as well as prevent tension and conflict. Governance is important, as it defines who has the power to make decisions about the ownership, consumption and distribution of resources (Ruckstuhl, 2009).

Kahl (2006) argues that whether scarcity problems are resolved peacefully or not depends largely on the effectiveness of governing institutions. Environmental stresses are particularly aggravated when combined with rapid population growth. As the state weakens, its ability to manage emerging conflict becomes more limited. In some cases, the indirect effect of land leased to foreign investors has been unequal distribution of resources and wealth. This

phenomenon – the explosion of transnational commercial land transactions related to the production and sale of food and biofuels (Borras and Franco, 2010) – is also known as ‘land grabbing’ or the ‘foreignisation of space’ (Zoomers, 2010). For example, in Madagascar a South Korean company was offered half the country’s arable land, which it intended to use for the production of food for external markets. However, local communities protested and campaigned against this offer and prevented the deal going through, and the government that had approved the deal was eventually toppled (Christoff, 2011). Land grabbing may thus put more pressure on arable land, especially in countries where land degradation is also occurring – and local communities may be deprived of affordable food and water.

Figure 18 Failed States Index 2013



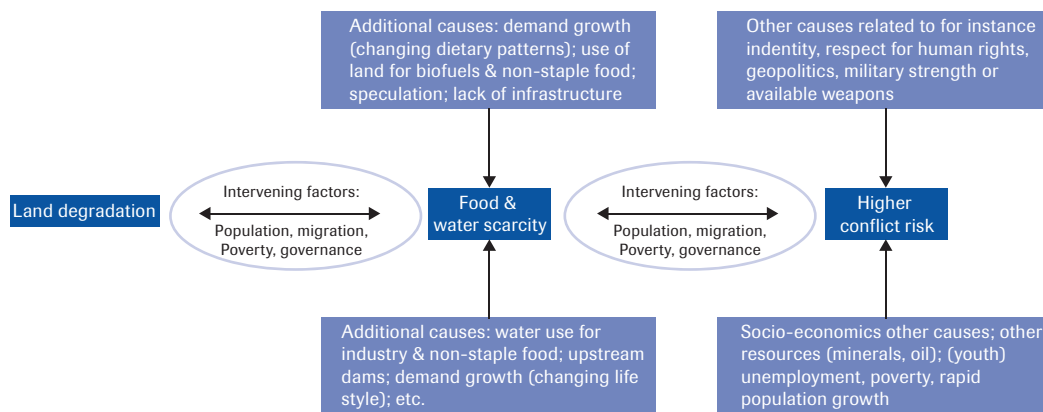
Sources: Fund for Peace (FFP), 2013

Democracy is another aspect of good governance. States with a well-functioning democracy are less likely to fight each other in violent conflicts and provide more opportunities for mitigation of tensions between groups through debate, voting and accountability procedures. Nevertheless, there is some debate about whether democracy contributes positively to the avoidance of tensions that may arise from food and water scarcity. On the one hand, Hendrix (2013) suggests that democracies are more likely to see unrest in times of high food prices. Dictatorial governments would appear more inclined to prevent protests by repression, but also to provide food and/or fuel subsidies to the poor. On the other hand, Koubi and colleagues (2012) show that democracies are more likely to avoid violent conflict when climate change slows down economic growth. Acemoglu and Robinson (2012) also point to the key contribution that effective, accountable institutions and democracy can make in countries that want to eliminate poverty. They conclude that countries are more likely to develop appropriate institutions when they have an open, pluralistic political system with competition for political office, a widespread electorate, and political leaders who are accountable and approachable. Hence, the benefit of having good institutions as mitigating factor between land degradation and conflict risks are more likely to occur in well-functioning democracies.

3.5 Towards an integrated model of land degradation and conflict

On the basis of the factors discussed in this chapter and the previous chapter, it is possible to develop a tentative model of the relationship between land degradation and conflict risks (see below, Figure 19). It has become clear that this relationship is only indirect and strongly dependent on specific contexts. In the next chapter, we will use this model as a basis for analysing the relationship between land degradation and conflict in four small-scale case studies.

Figure 19 Model of the relationship between land degradation and conflict risk



4 Four cases of conflicts related to land degradation

Based on existing data, such as several WRI and ISRIC reports and other case studies, this chapter will analyse cases from four countries facing both land degradation and violent conflict: Tunisia, Rwanda, Kenya and Mali. We will examine the dynamics of the relationship between land degradation and conflict risks in order to learn more about the factors that underlie that relationship. More specifically, the objective of analysing these four cases is to obtain a better understanding of the extent to which land degradation contributed to the conflicts, what other factors contributed to the eruption or escalation of conflict, and how those were related to land degradation.

As mentioned in previous chapters, many African countries have witnessed violent conflicts in the past decades and are still confronted with them. Furthermore, despite impressive economic growth figures in many African countries, large parts of the continent still suffer greatly from droughts and desertification (which are the main factors indicating the occurrence of land degradation), high levels of corruption, low levels of income, high dependency on locally produced food (especially in sub-Saharan Africa), and rapid population growth (see also WRI et al., 2013). Due to the existence of these factors, and due to time and scope limitations, we have confined ourselves to the African continent. Within the continent, we have chosen four cases in which both land degradation and violent conflicts are present and have had a high impact on society. Due to these restrictions, the findings will therefore be tentative with limited generalizability. However, they can serve as starting point for further research in other countries and regions. The specific conflict cases were selected on the basis of their potential relationship with land degradation. Hence, as the cases will show, there are several indications that the relationship between land degradation and conflict has to date been underestimated.

For each case study, we have looked at the presence and extent of land degradation, the historical context and type of conflict, the dynamics of four conflict factors (population growth, migration, economic development and governance) and possible other factors per case study based on existing literature. The information presented is not the result of fieldwork, but rather a careful review of secondary sources.

4.1 Land degradation and conflict in Kenya

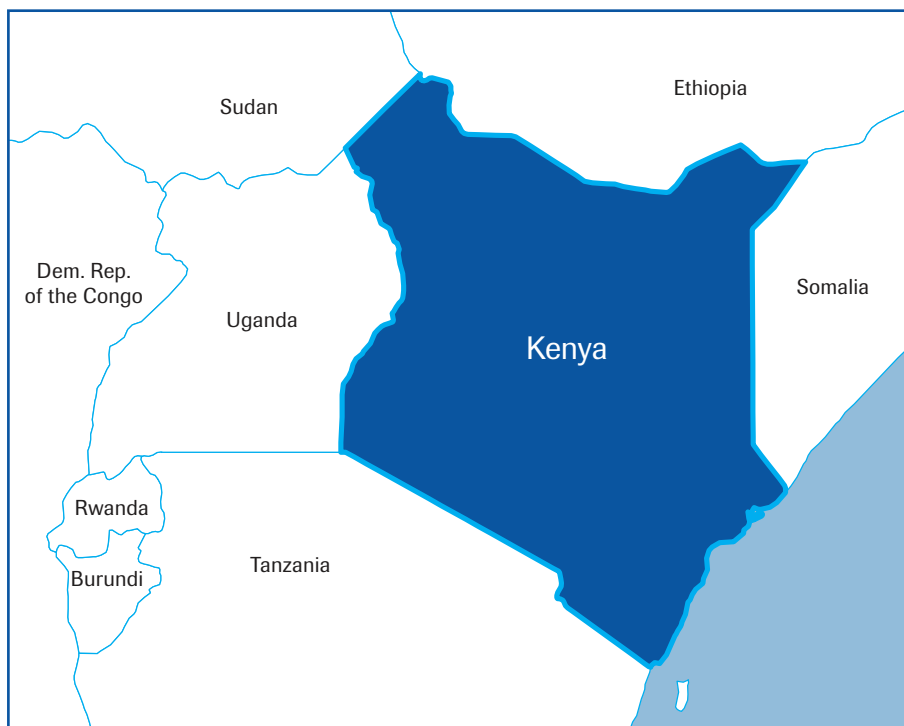
Land degradation

Land degradation is a major challenge to governments in east Africa. A global assessment of land degradation illustrates that Kenya is one of the hardest hit countries, with more than 35 percent of the population affected by land degradation (Bai et al., 2008a). In a country where the vast majority depend on agriculture for their livelihoods, there is enormous demand for fertile land. This makes it particularly worrisome that reference is made of soil erosion, fertility decline, a lack of rainfall, and changes in the vegetation and biodiversity of flora and fauna. Climate change appears to be one of the key factors contributing significantly to land degradation in Kenya, but ineffective land management and the expansion and intensification of land use are cited as causes as well. In general, only 20 percent of Kenya's land is suitable

for agriculture and there is a lack of grazing land for livestock. Consequently, the continuously growing population competes for a very small area of the country. These developments poses serious threats to the food security situation (Straziuso and Odula, 2013).

The decline in the availability of pasture land is taking place simultaneously with an increase in the demand for land, food and water. Furthermore, land subdivision has also reduced the availability of livestock pasture in Kenya (Boone et al., 2005). Consequently, Kenya faces major challenges to resource availability, a situation exacerbated by additional complicating factors. For example, changes in land use – the establishment of a wildlife sanctuary and the transformation of the herding system into a more sedentary agro-pastoral system, with increased allocation to tea and horticulture production – have led to less land being available for food production. The intensive agricultural methods used have not always been sustainable – for example, in regions where relatively large amounts of water are used, water security is jeopardised. A significant loss of dry season grazing reserves for livestock was also observed. These changes have increased tensions among local populations. Furthermore, tensions over water availability have extended beyond Kenya's borders: for example, around the border with Ethiopia receding water resources have caused several conflicts between Kenyan and Ethiopian communities (Pulitzer Center, 2008).

Figure 20 Map of Kenya



Historical context and conflict

Land-related disputes and grievances in Kenya date back to colonial times, when British colonists displaced people from Kenya's fertile highlands and resettled them elsewhere or left them landless, turning them into squatters. After independence in 1963, large areas of land were appropriated by the government and much of it distributed to outsiders in a system of

political patronage (Kahl, 2006). Consequently, Kenyans were deprived of legal ownership and the right to use their customary lands (Wakhungu et al., 2008).

The land redistribution increased the intensity of competition for land and water resources (Campbell et al., 2003). Moreover, it created a paradigm of disenfranchisement and dispossession among the original population (Wakhungu et al., 2008). From the start of the colonial period in Kenya, land-related grievances had been used in instrumental ways and often manipulated for political reasons by both the government and the people, often resulting in conflict. For example, small-scale settlements (to displace original populations), newcomers (accused of 'milking the land') and 'secondary rights' tenants (i.e. with ability to claim land use rights) are among the minority groups that have been negatively affected by conflicts over land (Wakhungu et al., 2008).

Tensions and recurring conflicts between different population groups, depending on either herding, farming or wildlife for their subsistence, reached a high point during Kenya's disputed presidential elections in 2007 and early 2008. The violence that occurred during the elections left more than 1,000 people dead, and over 600,000 had to flee their homes (Straziuso and Odula, 2013). Election fraud, rising food prices and land-related grievances were among the main factors mentioned as causes of the violence. With regard to land-related factors specifically, a decline in rainfall, number of livestock, available land, soil erosion, and an increased population were linked to conflicts over livestock, pasture and water (Kioko and Okello, 2010). For these reasons Campbell and colleagues (2003) had warned back in 2003 that the intensity of competition for land and water resources was likely to escalate.

A specific conflict factor of increasing relevance for Kenya are attacks carried out by the terrorist movement Al Shabaab that is located in neighbouring Somalia. Recent attacks on a shopping mall and tourist attraction jeopardise the image of Kenya as safe (holiday) destination and therefore may reduce interest of business investors in the country.

Population

As in many other African countries, Kenya faces a youth bulge, which will only increase in the future. The median age of the Kenyan population is 18.8, with a population growth of approximately 2.4 percent and a birth rate of around 32 births/1,000 population, in comparison with a death rate of an estimated 7/1,000 population (July 2012, estimate). In 2012, almost half the population (42.2 percent) was in the age group 0-14 years.

Migration/urbanisation

Migration figures for Kenya thus far have been low. The country is faced with extensive urbanisation. In 2010, the urbanisation rate was 4.2 percent (annual rate of change from 2010-2015), meaning that 22 percent of the total population moved into cities, a percentage that is likely to increase in the future (2010, estimate). Based on current figures, the World Bank (2012b) has recently underlined the need for Kenya to create more jobs for its burgeoning, educated, young population, which is either already urban or heading towards the cities.

Poverty

Despite its relatively large economy, poverty is still a severe problem in Kenya. According to the World Bank, the proportion of people living below the poverty line is about 44-46 percent out of a population of 40.5 million (2012, estimate) – a percentage that has been constant for the past six years (World Bank, 2012b).

Governance

Kenya is also plagued by an ongoing lack of good governance, and tenure security has been greatly undermined (Wakhungu et al., 2008). The country suffers from arbitrary decision-making, backtracking on the part of government, and lack of redress for those who have lost land through violence or corruption. For example, despite government intentions to reduce corruption, Kenya still ranks high (number 139 out of 176 countries) on the Corruption Perceptions Index, making it one of the most corrupt countries in the world (Transparency International, 2012).

Summary

Competition for land largely explained the violence after the elections in 2008. Land degradation has contributed to that competition, although also other factors were influential. For example, grievances over unequal land distribution have led to serious social tensions. Furthermore, the use of land for wildlife sanctuaries and horticulture and tea production have also played a role. The combination of declining agriculture productivity, a growing population, and increasing demand for land, food and water have increased tensions in society and might continue to do so in the future. Although Kenya's economy has seen considerable growth figures of 4-5 percent in recent years (World Bank, 2012b), this percentage is unlikely to be sufficient to raise the level of welfare such that tensions and conflicts over resources will be halted. It is expected that if the status quo regarding land and natural resources governance is maintained, periodic violence will continue to be seen in Kenya (Wakhungu et al., 2008).

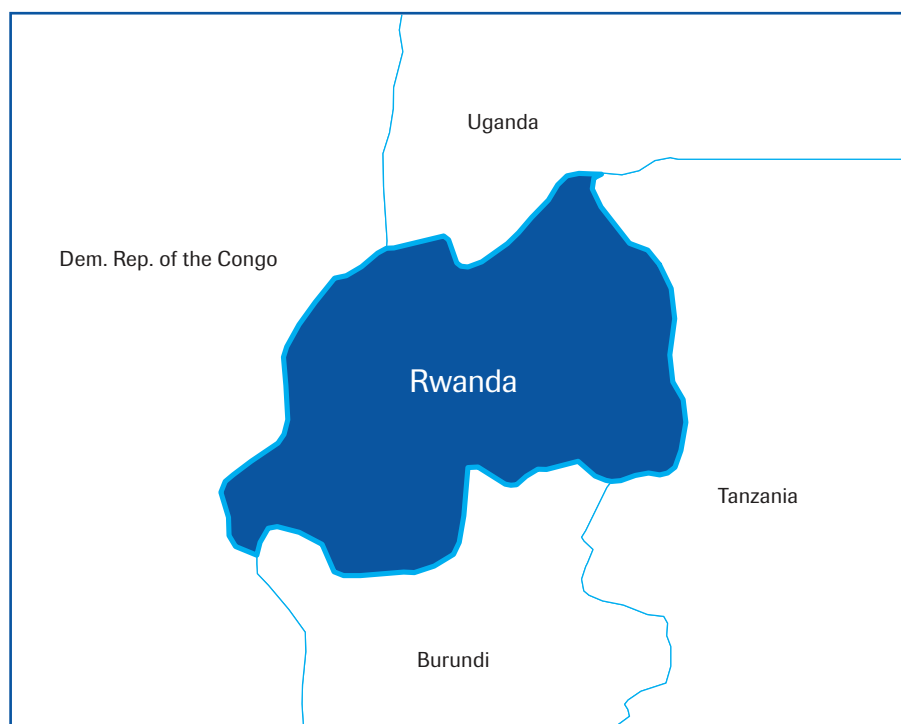
4.2 Land degradation and conflict in Rwanda

Land degradation

Rwanda is a land-locked upland country located in Central Africa, bordered by Burundi, Tanzania, the Democratic Republic of the Congo and Uganda. The geography of Rwanda can be called diverse ranging from stretched savannah areas, highlands, swamps and wetlands, to large mountainous regions and regions with a sub-tropical climate. The majority of the population is rural and lives from self-sufficiency farming, which is together with upcoming tourism, the backbone of the economy. Even though Rwanda is characterised by a varied geography, the country highly relies on imports due to the presence of only a small amount of resources (WRI 2011).

Land degradation is a major problem throughout the whole country, but has particularly affected the southwest. According to Gasana (2002), as an effect of soil degradation, inequitable land distribution and continuing high population pressures – partially caused by the high rates of rural unemployment that followed from an increasing scarcity of arable land – environmental scarcities became acute from the 1980s onwards (see also Kahl, 2006). Several other studies in similar ways point to severe soil loss and declining productivity of agricultural land (e.g. André and Platteau, 1998; Brosha, 2006). Despite the presence of abundant water resources, deforestation and erosion form a major challenge to the country. One of the reasons is that water resources in the past were badly managed.

Figure 21 Map of Rwanda



Historical context and conflict

The Rwandan genocide of 1994, the extreme violent conflict between the majority Hutu and the minority Tutsi populations, left 500,000 people dead and millions of refugees (of whom 2.4 million fled to neighbouring countries). While ethnic grievances between the Hutu and Tutsi appear to be the main cause of the violence, the underlying causes are multi-faceted and include factors related to the distribution of resources and environmental factors, including land degradation. More specifically, the shift from traditional agricultural practices to less sustainable alternatives resulted into land degradation, which increased the pressure on food and water resources and ultimately helped to trigger the violence in 1994 (Brosha, 2006). In general the country has always suffered from a lack of resources and high degrees of import dependency making it vulnerable to prize fluctuations (WRI, 2011).

Just prior to the Rwandan genocide, the worsening economic situation created dissatisfaction among the Rwandan population and led to tensions among the poor peasantry. Unsustainable practices created increased tensions in communities. Environmental pressures delivered a critical blow to the country's resilience when the government proved unable to respond effectively to the crisis in the agricultural sector. By 1994, farm size, on average, was less than one hectare, while population density was more than 450 people per square kilometre of arable land (World Bank, 2012a).

Environmental degradation – in combination with economic decline, population pressure, structural adjustment policies and a growing internal opposition – eroded the capacity of both Rwandan society and the government to respond to effectively (Brosha, 2006). A lack of good governance and a well-functioning rule of law meant that internal tensions could not be stabilised, thus weakening the legitimacy of the government. This legitimacy problem – and

thus the underlying political, economic and environmental issues – also contributed to the Rwandan genocide (Brosha, 2006). The Rwandan regime took extensive military measures to reverse its fading legitimacy and authority. The environmental scarcities, specifically loss of livelihoods, provided political forces with an opportunity to coerce certain populations – made vulnerable by poverty – into committing atrocious acts.

Population growth

Population pressures played a major role in the emergence of political tensions and eventually the upraise of the Rwanda Genocide. The Rwandan population density rose from 1,740 people per square mile in 1988 to 2,040 in 1993. Consequently, there was not only a predictable drop in the amount of available food but also a noticeable increase in the inequality of land holdings, as well as an abrupt fall in the median size of farms (Brosha, 2006; André and Platteau, 1998).

Ever since, the population has continued to grow. Rwanda currently has a predominantly young population. For instance, in 2012, the country had a median age of 18.8 years, (2012, estimate) and 61.8 percent of the population was aged 0-24 years. With high unemployment rates this jeopardises the stability of the country, since it leads to a continuously high pressure on available arable land, water and food. The population growth rate of 2.8 percent and the birth rate is 36.1 births/1,000 population (compared to a death rate of 9.6 deaths/1,000 population) continues to be a challenge for Rwanda (2012, estimate)

Migration/urbanisation

The urbanisation rate in Rwanda is high, with 19 percent of the population moving to the larger cities in 2010. Overall, Rwanda has a 4.4 percent annual urbanisation rate of change (2010-2015, estimate). Migration rates were very high during the genocide, reaching record rates in 1994. Since then, however, the net migration rate has declined (1/1,000 population).

Poverty

Today, environmental scarcity, among other hardships, is the cause of widespread poverty and loss of livelihoods in Rwanda. In 2009, the country had a Human Poverty Index (HPI) value greater than 30 percent of the population.

Governance

On the basis of the continued pressure of land, food and water resources, and in light of the genocide of the 1990, it can be expected that the Rwanda regime's legitimacy may be threatened by socio-economic crises in the future. For instance, recently, the government and farmers disagreed on the implementation of approaches to reduce soil loss. The government imposed biological approaches on farmers – who see the problem more as the reduction of available manure to fertilise the fields – resulting in a legacy of resistance to soil conservation measures, causing increased tensions (Olson and Berry, 2003).

However, there are also rays of hope. In terms of governance, Rwanda appears to do better than other African countries; on the corruption perceptions index of Transparency International (2012) Rwanda ranks the 50st position (out of a list of 175 countries). A possible explanation of this high position may be the high level of control by an authoritative government. Considering Rwanda's demographic characteristics and ongoing land degradation throughout the country, the political stability of the country may continue to be severely challenged. However, in recognition of the problem, land restoration programmes have recently been initiated as part of a broader development cooperation effort. The United States and other

donors have contributed an estimated US\$50 million to support a project promoting sustainable hillside agriculture. This helps farmers to adapt crops and develop and manage terraces in ways that reduce erosion, improve soil quality, and raise yields across 30,000 hectares of land (USAID, 2012: 16). The Rwandese government has also made some excessive investments to support water supply systems.

Summary

In several sources, land degradation is related to the Rwanda genocide. Environmental factors are even mentioned as causes (Brosha, 2006). The Rwanda case also illustrates that problems associated with land degradation have not been resolved, which explains the tensions and violence that still prevail and continue to put pressure on the stability of the country, although there has been some recognition that land restoration is worth pursuing.

4.3 Land degradation and conflict in Mali

Land degradation

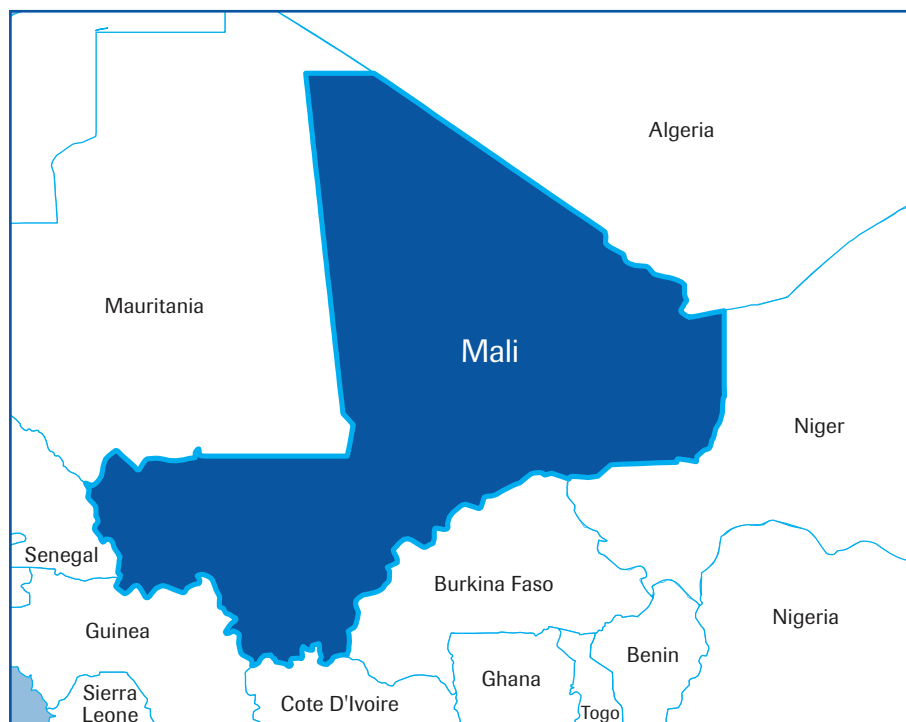
Mali, situated south of the Sahara desert – with central Mali covered by the Sahel region – is characterised by semi-arid to arid conditions with seasonal rainfall distribution (Anyamba, 2005). Land degradation can be considered a major problem in Mali, as in many parts of the Sahel and sub-Saharan African (SSA) region. Many areas in SSA have been identified as environmental ‘hot spots’ for declining soil nutrients, soil erosion, and vegetative degradation (Scherr and Yadav, 2001). More specifically, climate variability is a long-standing phenomenon in Mali. Periods of severe drought have resulted in diminished land and water resources and stress on livelihoods, while southern parts of the country experienced floods due to heavy rains in 2012.

Since 2011 a severe drought has affected the region, leading to a massive intervention of food aid in 2012. Unfortunately, this did not prevent the occurrence of a *coup d'état* mid-2012 followed by the emergence of a violent conflict at the end of that year. The conflict led to an intervention by France with support of the UN, EU and others of the international community. It partially caused the displacement of more than 400,000 people (internally and in neighbouring countries), disrupted trade flows, pressure on already limited local food resources, and a worsening of the precarious and drought-ridden food security situation in neighbouring countries created by the poor harvest of 2011 (UNCHR, 2012).

Due to population growth, urbanisation, drought, poverty and a lack of good governance, food insecurity has gradually become serious and widespread problem. According to the World Food Programme, 3 million people in Mali, were vulnerable to food and nutrition insecurity as of January 2012. The current food insecurity in the Sahel region is a reflection of the region's chronic, long-term vulnerability (Vitale and Lee, 2005). The resilience of chronically vulnerable communities in the region is weak. People barely had time to recover and rebuild their already-limited assets from previous droughts before the 2011 drought hit the region (IFPRI, 2013).

A good indicator of the problem is the rapid rise in food prices. Prices for many coarse grains soared in the Sahel region in 2011 and 2012: in Mali, millet prices rose by 63 percent compared to 2011, sorghum prices by 43 percent and maize by 44 percent. Towards the end of 2012 prices lowered somewhat, partly due to massive food support provided by international donors, but prices continue to be high. This was reinforced by the political situation, which resulted in a threat to the food security of nearly 19 million people (IFPRI, 2013).

Figure 22 Map of Mali



Historical context and conflict

Prior to the current tensions and conflicts, Mali has always been confronted with tensions between pastoralists and the government (IDS, 2012). Desertification has caused pastoralists to migrate to agricultural areas, where the lands are more fertile and there is more water. This provokes farmer-herder conflicts between established groups in these areas and the 'newcomers', intensified by livestock damaging cropped fields and competing for water. The Tuareg rebels traditionally maintain a nomadic pastoralist lifestyle (IDS, 2012). Their rebellion is related not only to struggles over land but also to social and political factors, such as a desire for more autonomy for the northern region and ideological motivations (Jihad). The Tuareg became involved in the channelling of weapons into Mali that began after the fall of the dictatorship in Libya, which explains the outbreak of the conflict in the north of the country. Nevertheless, other factors also contributed, for example poverty, rapid population growth and high food prices.

Population growth

The vast majority of Mali's population consists of young people. Out of a population of 15.5 million, more than 65 percent are between the ages of 0 and 24 years, with an estimated median age of 17 years. With a birth/death rate of approximately 47 births versus 14 deaths per 1,000 population (2012 estimate), the proportion of young people will rise further. In combination with increasing urbanisation (4.4 percent annual rate of change, 2010-15 estimate), this will create major challenges.

Poverty

In the Sahel region, and more specifically Mali, poverty is cyclical and conditional upon climate patterns. In 2010 an estimated 78 percent of Mali's population was living below the international poverty line of US\$2 a day. Although poverty is chronic, there are better and worse years, depending on how successful families are in coping with the irregularities of weather, land productivity, prices, and fluctuations in labour supply and cost (Findley, 2004). Climate variability hampers economic development projects such as expansion of agricultural irrigation (IDS, 2012). Until now, a lasting solution to the irregularity and cyclical downfalls of poverty has not been achieved.

Migration/Urbanisation

Migration has been one of the responses to the cyclical swings of poverty in this region (Findley, 2004). More specifically, in 2012, the net migration rate from Mali was -5.08 migrant(s)/1,000 population.

Governance

Mali has been plagued with high levels of corruption for years. The World Bank ranks Mali in the 25-50th percentile on control of corruption and rule of law in its governance indicators and Mali is number 105 out of 174 countries on the Corruption Perceptions Index (Transparency International, 2012). Public frustration over corruption was one factor behind the 2012 military coup. Therefore, the transitional government intends to adopt a new anti-corruption law before the presidential elections. However, people have little faith in the impact of such laws.

Conclusion

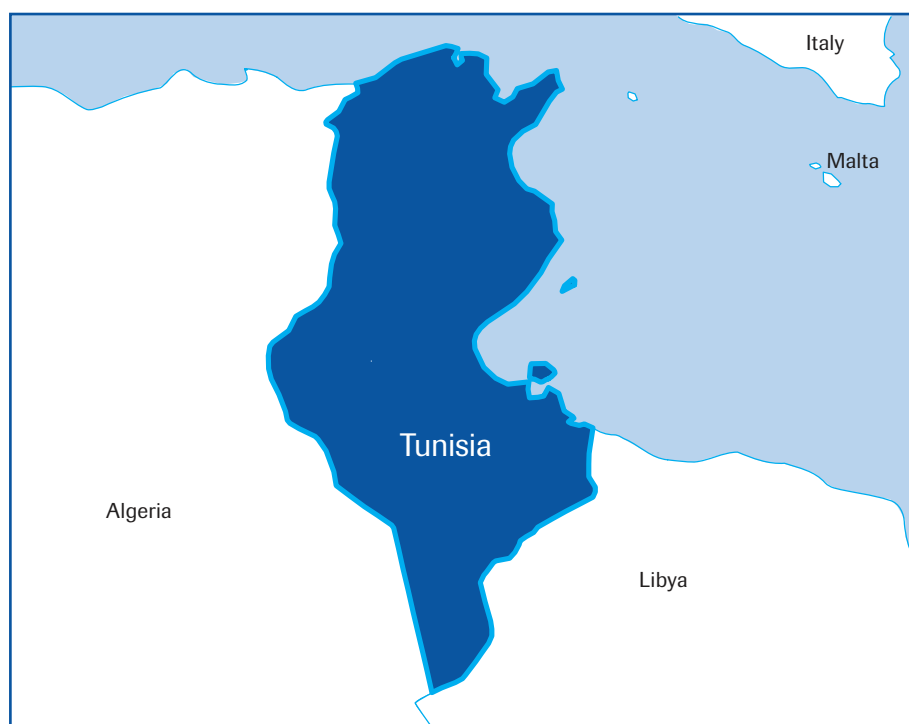
In sum, land degradation in Mali, in combination with the drought of 2011, indeed seems to be one of many contributing factors leading to the outbreak of the current conflict. Bad harvests had an immediate impact on people's livelihoods and the price they had to pay for food. Along with weak institutions, poverty, migration, the situation in neighbouring Libya, high population growth and political and identity factors motivating the Tuareg rebellion, a complex violent conflict has emerged – jeopardising stability in neighbouring countries as well. The Mali case study shows that land degradation contributes to an increased risk of conflict. In addition, geopolitical factors, such as the spillover effects of the conflict in Libya, have contributed to the outbreak of conflict.

4.4 Land degradation and conflict in Tunisia

Land degradation

Tunisia is one of the main countries facing severe land degradation. Large parts the country are experiencing severe land degradation, much of which began decades (and even centuries) ago: over the period of 1981-2003, the overall net primary productivity of land used for agriculture increased slightly. This indicates that arable land was exploited more intensely, and appears to have rendered it more 'exhausted'. The process of land degradation is still ongoing today. According to Bai and Dent (2008) around 8 percent of the country's territory can be considered as to be in the process of degrading. This affects around 1.5 million Tunisians – around 13.5 percent of the total population of approximately 11 million people. Bai and Dent's study showed only a weak correlation between rural population density and land degradation and no correlation between land degradation and proxy indicators of poverty.

Figure 23 Map of Tunisia



Historical context and conflict

Compared to Kenya, Rwanda and Mali, the political conditions of Tunisia seem to have changed the most in recent times. Since 2010 – with the outbreak of protests followed by the first Arab revolution in the MENA region – there has been a conflict over national power (Heidelberg Institute for Conflict Research (HIIC) 2012, 2013). Tunisian opposition groups repeatedly protested against economic shortcomings (unemployment), lack of free press, poor living conditions, and the lack of improvement regarding civil rights (HIIC 2012, 2013). At the outbreak of the revolution, protests repeatedly escalated into violent confrontation with the police. Although the government was replaced and the conflict de-escalated in 2012, several protests and strikes occurred and the unrest and the violence have continued. Consequently, the interim president Moncef Marzouki prolonged the state of emergency to January 2013 (HIIC 2012, 2013). Since July 2013, political turmoil has further enveloped the country, increasing the political deadlock.

High food prices seem to have contributed to the unrest that emerged in 2010. At some demonstrations, protestors symbolically waived baguettes in the air to illustrate the frustration caused by rapid increase in price of this core element of their daily food intake. Tunisia strongly depends on imports for primary commodities, such as food. Its population suffered considerably during the 2008-10 global food crises (Breisinger, Collion, et al. 2011; IMF 2011), despite the country's impressive economic growth figures of the past decades. The proportion of poor people was reduced from 11 percent of the population in 1985 to 7 percent in 1990. In 2005, 3.8 percent of the population was living below the poverty line and according to the World Bank (2013) about two-thirds of Tunisia's poor live in rural areas (World Bank, 2013), whereas the protests started in the urban areas.

Population growth

The median age of 30.5 years in Tunisia is higher than that of Kenya, Rwanda or Mali. However, 40 percent of the population is aged 0–24 years and the birth rate (17 births/1,000 population, 2012 est) is much higher than the country's death rate (6 deaths/1,000 population, 2012 est).

Migration/urbanisation

Tunisia is a highly urbanised country (67 percent in 2010). This percentage is likely to increase in the future with an annual urbanisation rate of 1.5 percent. Less than half of the working-age young population is employed (Abdih, 2011; Clark, 2011). With 1.78/1,000 population, the migration rate is higher than Rwanda, but still not alarming.

Poverty

The revolution in Tunisia has had negative effects on the poverty rate and levels of corruption. Although the poverty rate decreased from 18.9 in 2011 to 16.7 in 2012, the 2012 percentage is still above the pre-revolution level of 12 percent (World Bank, 2012). These statistics show that, in combination with the ongoing land degradation, post-revolution Tunisia will face major challenges in the upcoming years to stabilise the political situation.

Governance

Before the revolution, Tunisia already had a comprehensive and strong anti-corruption law. In 2012, the new government launched an anti-corruption portal, aiming to promote integrity throughout the country. However, so far, these regulations have not been implemented and therefore failed to provide sufficient barriers against corruption (Business Anti-Corruption Portal, 2012).

Post-revolution Tunisia has attempted to overcome corruption, but as the revolution occurred so recently, this remains a difficult task for the Tunisians despite their frantic efforts. To support the new Tunisian government to successfully finalise the transition and consolidate social and economic change, the World Bank initiated the US\$500 million 'Governance and Opportunity Development Policy Lending Program' for Tunisia (World Bank, 2012).

Conclusion

In sum, it is not likely that land degradation is a direct cause of the unstable situation in Tunisia, but the indirect effects of higher food prices globally did contribute. Despite poverty levels not being dramatic, high food prices contributed to the unrest, although other factors, such as youth unemployment and general dissatisfaction with the authoritarian government also contributed. Therefore, it could be argued that restoring degraded land, with a view to reducing dependency on food imports and creating employment in the agricultural sector, might help in structurally alleviating the risk of conflict in Tunisia.

4.5 Learning lessons

All four case studies illustrate the complexity of the relationship between land degradation and conflict. Land degradation was never the sole or direct cause of a conflict, but did contribute to its outbreak and to tensions in society in general. In Rwanda, Kenya and Mali, unequal distribution of land has always been problematic, with tensions occurring between various population groups. These tensions increased through a combination of land degradation and population growth. They were also linked to identity-related grievances. In the case

of Mali and Tunisia specifically, rising food prices had a major influence on conflict and instability. In Mali, prices were more closely linked to a decrease in locally produced food resulting from droughts and land degradation. The Mali conflict was also related to external factors, notably the war in Libya.

Long-term poverty has caused problems and created tensions in all four countries, as have the high levels of corruption and the malfunctioning government institutions. However, good governance is not automatically a guarantee of peace and stability. For example, although Rwanda has a relatively strong government and low corruption rate, the country is plagued by tensions and conflict. The same can be said of Tunisia, where the government has tried to reduce corruption through regulation and monitoring, although without much success. This shows that in addition to the four factors influencing the relationship between land degradation and conflict risk (that is, population, migration, poverty and governance), a 'correction factor' may be integrated into our model, stressing the influence of other factors or trigger events that are not directly related to the issues raised (election fraud, terrorist attack, etc) but which can have a significant effect. Figure 24 provides a refined overview of the relationship between land degradation and conflict risk. It is based on the model set out in Chapter 3 as well as on insights gained from the case studies. This overview could possibly be used as a starting point for integrating land degradation in mainstream security analysis instruments, such as early warning mechanisms, which are used for conflict prevention and resolution.

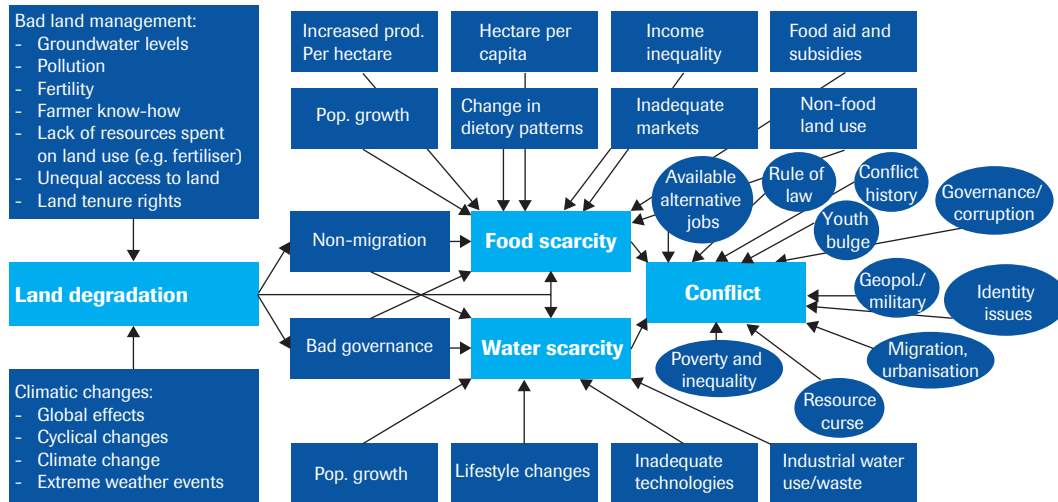
In sum, land conflicts are not isolated, but are linked to systemic disputes and tensions. They can, therefore, best be conceptualised as 'nested' within larger conflicts or tensions (Wakhungu et al., 2008). However, the case studies also show that there is no single 'meta-narrative' that can explain the shifting nature of land conflicts in Kenya, Rwanda, Mali or Tunisia, with greed, grievances and other identity factors at play. In addition, land issues over ownership, access and further use all feature in land tenure conflicts and may cause the emergence or escalation of conflict. Moreover, over time these issues may cause poverty and economic instability as well, which in turn may intensify conflict (Wakhungu et al., 2008).

Table 1 Overview of case studies: Kenya, Tunisia, Rwanda and Mali

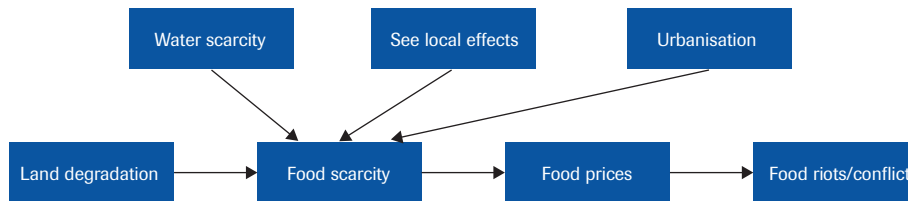
Kenya	Violent conflict after elections	2008	Youth bulge; high population growth (2.40%); young median age (18.8); high birth rate (est. 32/1,000); low death rate (est. 7/1,000)	High urbanisation (22%); 4.2% annual rate of change (2010-15 est.); net migration rate (est. -0.23/1,000)	Economic prospects positive with 4-5% GDP growth expected (tourism); well-developed social and physical infrastructure, however, also poor governance and corruption	Democracy is a fragile proposition (election fraud); corruption in institutions, although transparency improving	Ethnic tensions, land used for horticulture and wildlife; land grabbing	Bad land management; pollution; desertification; climate change; degrading ecosystems
Tunisia	Revolution	2010	Youth bulge; medium median age (30); 40% population 0-24; est. 1% population growth (2012)	Net migration rate -1.8/1,000; excessive urbanisation (68% of total population, 1.5% annual rate of change)	Poverty rate under 7% (due to strong governance); excessive lending 2011 (US\$5916m), low in 2012 (US\$50m), 1.9% GDP growth in 2011; recover in 2012 (3.6%); high unemployment (est. 17%)	Strong calls for democracy, power distribution conflicts		Highly dependent on food imports due to limited agricultural land; high degree of degraded and degrading lands
Rwanda	Civil war (Hutu and Tutsi)	1994	Rapidly growing population (2.7%); high median age 18.8 (61.8% population 0-24)	7.5 million refugees during Rwanda genocide (1994, 2.4 million; 2012, 15,109)	70% dependent on agriculture; fragile economic base; dependent on international aid	Limited freedoms; restricted democracy; corruption besides growing effectiveness, transparency	ethi Ethnic tensionsX	High degree of land degradation; initial efforts started to restore lands
Mali	Coup d'état; independence, civil war	2012 - present	Very young median age (17); over 65% of population is between 0-24 years. Birth/death rate of 47 births versus 14 deaths /1,000 population (2012 est.)	In 2012, net migration rate was -5.08 migrant(s)/1,000 population	High degree of poverty	Weak central government; coup d'état	Land grabbing; geopolitical factors (spill-over from Tunisia conflict)	Severe drought in 2011

Figure 24 Refined model of the relationship between land degradation – food and water scarcity – and conflict risk

Local effects (particularly relevant in poor regions)



Global effects



5 Summary and conclusions

Throughout this report we have discussed the relationship between land degradation and conflict risks and several factors influencing that relationship. In this final chapter, we summarise key findings and point to the research limitations and gaps that we identified. We hope this will stimulate further debate on and research into land degradation.

5.1 An indirect relationship between land degradation and conflict risks

Our tentative model on the relationship between land degradation and conflict risks was based on an extensive literature review and four case studies (i.e. Figure 26). The model refers to the relationship between short- or long-term land degradation and conflict. Food and water scarcity are included in relationship to land degradation and conflict, and population growth, migration, poverty, and governance were included as intervening factors. Land degradation was found to be, above all, a threat amplifier rather than a direct cause of conflict. However, we found other relevant factors to explain the conflicts that broke out in the countries studied, such as tensions over land caused by the use of it for cash crops (Kenya) and a massive inflow of weapons from a neighbouring country (Mali). Therefore, more research would be needed to analyse whether our model sets out the predominant factors and if their relationships are accurately depicted.

In any event, researching just four case studies is insufficient to make bold claims about the relationship between land degradation and conflict. This research, therefore, continues to be explorative. Moreover, throughout the discussion of factors and relationships we discovered a number of research limitations that deserve further attention. First of all, our research suffered from a lack of knowledge on the scope of the land degradation problem and its effects on, for instance, agricultural production and (life-threatening) food and water scarcity. Second, it is debateable whether a generic model depicting causal relationships relating to conflict can be developed, or whether conflict by nature is dynamic and context-specific. It might be more accurate to work with meta-level models and distinguish between local and global effects of land degradation, for instance, but this would dilute the possibility of using the model for large scale N-studies. Third, due to the explorative nature of this research, we have been imprecise with regard to the type of conflict we focused on, which limits the specificity and policy relevance of our findings. In some research, it appeared that land degradation is particularly relevant for explaining low-violent conflicts, but evidence was insufficient and the Rwanda case study provides evidence of the link with a highly violent conflict. Fourth, we have not focused on other possible effects of land degradation on livelihoods, beyond food and water scarcity. Throughout the research, we found several hints that this might be a relevant issue; land may also be used for different livelihood activities and loss of such opportunities due to land degradation may be a potential source of conflict. Fifth, we have omitted to investigate the likelihood of conflict causing land degradation, whereas feedback loops may be of great significance. Sixth, we have not always been specific regarding the process of land degradation we refer to in terms of time. Due to climatic changes, land degradation may be worse in some years than others. In general, this is a gradual process, but a tipping point may occur, transforming fertile land overnight into land that is useless for agricultural production and/or water capture. Finally, we looked at land degradation primarily from a per-

spective of it being a problem for the developing world, and more specifically as a problem for sub-Saharan Africa. There were several indicators to justify this choice, but this is not to deny that the developed world, including Europe, also faces the negative consequences of land degradation. For example, increasing areas of the Mediterranean, and more specifically Spain, contain degrading lands. Therefore, it is also of direct importance for developed countries that more research focuses on the consequences of land degradation and the ways in which degraded or degrading areas can be restored in the future. All these topics deserve further thought and research.

5.2 Local and global effects

The case studies highlight the importance of distinguishing between local and global effects. In developing countries, where people depend to a large degree on local land for their subsistence, immediate effects of land degradation on availability of food and water, and on poverty levels, can be witnessed. In combination with other factors (population growth, inability to migrate and weak governance), this is particularly dangerous in terms of conflict risk. Countries in sub-Saharan Africa come out as most likely cases, as they score badly on most, if not all criteria (see also WRI et al., 2013). The global effect of land degradation in relation to conflict risk is more difficult to capture and describe in exact terms. Both land degradation and population growth reduce available food and water per capita. The risk of conflict is increased particularly in countries with declining economic growth, high dependency on food and water imports, and weak governments. The MENA region is a prime example of this phenomenon, although attributing the Arab Awakening to land degradation is overstating the situation.

The above is not to say that the relationship between land degradation and insecurity is strictly confined to sub-Saharan Africa and the MENA. In other parts of the world, local or global effects of land degradation may be felt. The conflict risk may, moreover, be mitigated by development policy interventions, such as the provision of food aid or food and water subsidies. An overview of such policy interventions and development policies aimed at restoring land, with a view to increasing food and water security, is not available, neither can we quantify in exact terms the effects of good governance on mitigating conflict risks.

5.3 Conclusions

In light of the abovementioned research limitations, it is difficult at this stage to make the case for the urgent need to address land degradation from a security viewpoint. The topic was found still to be largely a *terra incognita*. Nevertheless, we did find that in comparison to other environmental issues, such as climate change and the use of land for biofuel production, land degradation is a highly neglected topic, whereas it potentially is a significant contributor to food and water scarcity. Since land degradation mainly occurs in low-income countries, with growing populations and decreasing soil fertility, it could have a major impact on the availability of food and water and on the risk of conflict in those countries. The relationship of land degradation to both environmental and food and water policies perhaps explains why it has for a long time been left in a void, as clear ownership over the issue appears divided between those focusing on environmental policies and those targeting agricultural policies. Countries not being open about the quality of their land has not helped to stimulate the debate.

Increased attention on food and water security, linked to alarming population growth forecasts, have recently raised interest in land degradation as an increasingly important policy issue. This study has illustrated the relevance, but also limitations, of looking at land degradation from a conflict-risk perspective. At this stage, more research and case studies, as well as exact information on land degradation and when it truly jeopardises food, water and general security, is necessary. In the authors' view, this study clearly points to the relevance of obtaining these insights. It should, therefore, above all be seen as a starting point for further research and debate. We hope in particular that our model will be used for further testing, possibly in large N-studies, when more accurate data on land degradation and its contribution to food and water scarcity become available.

The recent decision to ask the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) to make an assessment of land degradation and restoration worldwide in the coming 5 years is therefore certainly a promising development. Caution should be made with regard to the definition of land degradation chosen and the establishment of a proper mechanism for verification of data. Moreover, a certain amount of speed and urgency seems needed in light of debate on the Millennium Development Goals (MDGs). The UNCCD and others are calling for a goal on land degradation to be included in the Sustainable Development Goals (SDGs) that are to succeed the MDGs post-2015. However, land degradation will be competing with other pressing issues, such as climate change, education and health, and it might be difficult to make the case for a land restoration goal to be included in the absence of accurate information, let alone to subsequently measure progress. Therefore, early results of the IPBES and other assessments on land degradation are most welcome, and this may in turn reduce the terra incognita character of the topic also with regard to its relationship to security and conflict.

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