A Horizon Scan of Environmental Drivers of Poverty

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Report Summary

This report presents the results of a rapid desk-based study of the environmental drivers of poverty, based on a review of peer-reviewed and grey literature for the last 10 years. The major non-climate environmental drivers of poverty are identified: biodiversity loss (at the global scale) and a variety of pollution and resource degradation issues at smaller scales.[1] The relationship between environmental degradation is not a straightforward one, but is complex, multifaceted and highly context-specific.[2] Although in principle environmental protection and poverty alleviation are twin objectives that can and should be pursued simultaneously, evidence to date suggests that this has not always occurred, for a variety of reasons.[3] Whether efforts to improve environmental management actually lead to poverty alleviation depends very much on how policies and projects are implemented, as well as on a host of other factors. Several crosscutting themes – including valuation of natural resources, country systems, and crime/legality emerge. It is also important to acknowledge that other overarching issues, including conflict, gender inequity, globalisation and population growth interact with both environmental degradation and poverty reduction.[4]

Approaches to environmental management for poverty alleviation therefore require an integrated, holistic, transparent, inclusive and participatory approach, based on agreed goals and processes.[5] Increasingly, researchers are highlighting the need to take ecosystem-based approaches to the management of linked social-ecological systems in which effective environmental management and poverty alleviation are pursued simultaneously.[6] These approaches offer the best chance for yielding both environmental and poverty alleviation benefits. Many examples of small-scale initiatives (often community-based) are found that could serve as models for transfer elsewhere or for scaling up.[7] Strong institutions with broad acceptance and inclusive processes are required to ensure that the goals and purposes of environmental management are understood and communicated clearly alongside development goals, particularly to poor people, to women and to other marginalised or disadvantaged groups.[8] Assessments of environmental resources need to be based on better economic valuation, and this requires ongoing work to adapt developed-country approaches and instruments to developing-country settings, as well as to communicate the value of such approaches.[9] Crime – including corruption and environmental crime – undermines efforts both to promote environmental management and poverty alleviation, and stronger institutions are required to counter this.[10] Finally, environmental protection and poverty alleviation should be pursued within integrated

1 UNDP (2011); Roe (2013)

2 Many authors have made this point, including Gray and Moseley (2005); Bass et al. (2006); Kahuthu (2006); Nkonya et al. (2008); Alam (2010); Barbier (2010); UNDP (2011)

3 UNDP (2011, pp.1-2)

4 McMichael (2008, p.58), for instance, has highlighted the importance of population growth as a crosscutting issue that "means that we may be less than one generation away from exhausting much of the biosphere's environmental buffering capacity." Alam (2010) and Musvoto et al. (2015) are other examples of authors who have identified population growth as an important crosscutting issue.

5 For instance, see Amechi (2009); Islam et al. (2012); Mwakaje et al. (2013)

6 See Adger (2006); Brown (2012)

7 An example is provided by Nkonya et al. (2008)

8 See, for instance, the study of a new fishing rights allocation system in South Africa, based on a participatory approach, by Joubert et al. (2007)

9 Adhikari et al. (2010) provide an example based on the economic valuation of mangrove ecosystems in Pakistan

10 See Amechi (2009); Ikejiaku (2009); Knapp (2012)

frameworks – with adequate policy at all levels, and policy integration between levels – to address the challenge of climate change and to promote sustainable development.[11]

[11] Boersema et al. (2009); Thurlow et al. (2015)

SECTION 1

Introduction

Safe environments and secure access to environmental resources are both essential prerequisites for development and are necessary for poverty alleviation.[12] At the same time, environmental processes, environmental change and environmental degradation can pose grave threats to people, their livelihoods and their wellbeing, and they can significantly impede – or even reverse – sustainable development. Moreover, historically, improvements in environmental quality in some parts of the world have been driven by, and in turn have facilitated, development.[13] On the other hand, specific forms of development have themselves contributed to environmental degradation and poverty, particularly in developing countries. Thus the linkages between environment and development are multifaceted and complex ones, and they are also context-dependent.[14] Nevertheless, in general, there is a consensus that environmental quality and poverty alleviation are twin objectives that can and should be achieved simultaneously, although there remains considerable debate about how this is most effectively promoted in policy and practice, in particular settings, given competing priorities and values and significant resource constraints.[15]

Sustainable development requires that development policy and practice should be based on at least a certain basic level of effective environmental protection in order to preserve key human securities for water, food and energy (among other goods); to promote health, livelihoods and wellbeing; and to protect ecosystem services.[16] It also requires poverty alleviation as well as efforts to reduce inequalities both within and between generations of people. At best, sustainable development is a paradigm that goes much further than this, however, promoting environmental integrity as an essential aspect of human wellbeing. This means reducing economic, social and ecological vulnerability – especially of poor people – and building resilience so that individuals, communities and ecosystems are better able to cope with the system shocks and the longer-term environmental transformations that are projected to occur – and that in some cases have already started to occur – with ongoing climate change and biodiversity loss, for instance.[17]

Considerable progress has been made recently in understanding the significance of environmental change for development, at scales ranging from global to local, and there is now a large and rapidly-growing literature on the interactions between environmental change, environmental degradation and poverty (although much of this is context-specific). Nevertheless, despite a much greater level of awareness of the linkages between environment and development, significant obstacles to integrating these objectives remain, especially at the global scale, and environmental factors remain very important – and in some cases increasing – drivers of poverty. Environmental factors also significantly impede

12 UNDP (2011). Many other authors have also made this point; for instance, see Narain et al. (2008)

13 Bass et al. (2006). In addition, although it is beyond the scope of this report, there is some evidence that development and level of environmental concern are correlated; see Givens and Jorgenson (2011); Fairbrother (2012) and Jorgenson and Givens (2014).

14 Many authors have made this point; see, for instance, Gray and Moseley (2005); Agrawal and Redford (2006); Kahuthu (2006); Nkonya et al. (2008); Alam (2010); Barbier (2010)

15 For instance, see DESA (2008); Nayak et al (2014)

16 Lufumpa et al. (2005, p.379)

17 UNDP (2011, 2014)

poverty alleviation, and in some cases they are very likely to negate the progress that has been made in reducing poverty over the decadal timescale.[18] Therefore it is important to identify, understand and mitigate the main environmental drivers of poverty and to prevent the recent benefits of poverty alleviation work from being lost.[19]

This report presents the results of a rapid, desk-based, horizon-scanning study that aims to identify the current major negative environmental factors that are driving poverty and preventing its alleviation; to outline briefly their causes; and to highlight potential solutions for sustainable development. It is based on a qualitative review and assessment of evidence from the last 10 years, with a focus on peer-reviewed material supplemented with grey literature. As noted, that literature is vast and highly context-specific, so this study focuses on general findings with broad applicability, and in particular on key findings that could most usefully inform policy in relation to the countries in which DFID's work is focused. The purpose of this study is:

- to present recent evidence of the main environmental drivers of poverty;
- to assess their relative importance;
- to provide deeper analysis into some of the most important of those issues;
- to help DFID to evaluate strategically its focus on environmental issues; and
- to help to inform briefings for new ministers on this subject.

Specifically, this report contributes to a broader exercise aimed at answering the following questions:

1. What are the major environmental drivers of poverty and their main causes?
2. What are their relative impacts on poverty and poverty alleviation?
3. What action is DFID taking to address these?
4. Where are the gaps in effort?
5. What should be done differently, through programming and through external and internal policy influence?

This report first outlines the major current environmental challenges at the global scale (Section 3) and then examines how some critical environmental issues – especially environmental degradation – interact with poverty and prevent development (Section 4). Environmental degradation is a central theme in this study because it is both a cause and effect of poverty at a global scale, and because its mitigation must be an integral part of poverty alleviation. Hence some specific forms of environmental degradation – biodiversity loss and a range of various pollution issues – are covered next along with some of the key environments in which degradation has important implications for poverty, including marine, rural and urban environments (Section 5). The crosscutting themes of valuation, country systems and crime/legality are then considered (Section 6). The most important implications for poverty and poverty alleviation are drawn together (Section 7) and key interventions and recommendations to reduce poverty and create a more sustainable path for development are outlined. The evidence base was assessed in terms of its quantity and quality, and some gaps in the evidence have been identified. Gender-based differences in impact were also specifically searched for. Relevant case studies are included and an annotated bibliography is provided (Section 8).

[18] This point has been made in various ways and is sometimes captured in the idea of the 'downward spiral' of environmental degradation and poverty; see Strange and Bayley (2008); UNDP (2011, 2014). Some studies provide evidence of how environmental degradation – such as disruption of the global climate system – may directly reverse development progress; for instance, see Schipper and Pelling (2006); Stern (2006, pp.27, 63-103, and particularly 104-105ff)

[19] UNDP (2011, 2014)

Climate-related issues are beyond the scope of this report, which focuses instead on non-climate environmental issues including air pollution, soil degradation, land contamination, coastal and marine degradation and biodiversity loss. Land-use change and deforestation is also well-covered elsewhere within DFID and is not a specific focus here, although studies have been reviewed where relevant to biodiversity loss and soil degradation. Specific consideration is given to marine, rural and urban environments in which environmental degradation takes particular forms and has particular implications for poverty and its alleviation. Several cross-cutting themes – valuation, country systems and crime/legality – are considered in this study and are confirmed to be priority areas for attention. However, agriculture, water and forestry are beyond the scope of this study as they are well-covered elsewhere.

SECTION 2

Methodology

We conducted a rapid, desk-based study of literature published during the last 10 years on the subject of non-climate environmental degradation and poverty. We used the Athens, Academic Search Premier, EBSCOhost, Economic and Social Data Service (ESDS), IngentaConnect and International Bibliography of the Social Sciences (IBSS) databases to identify relevant peer-reviewed publications. We supplemented these publications with further resources obtained through personal archives of references and relevant grey literature sources. We reviewed, analysed and assessed these sources qualitatively to identify evidence of the current major negative environmental factors that are driving poverty and preventing its alleviation; to outline their causes; and to highlight potential solutions for sustainable development. Some case-study material was also identified and reviewed (Section 8), although the main focus was on large-scale linkages with broad applicability.

SECTION 3

Overview of major environmental challenges

This section presents a brief overview of the major current environmental challenges globally, which are conveniently categorised as climate change (outside the scope of this report), biodiversity loss (covered here), pollution issues (some of which are covered here) and various resource security issues (outside the scope of this report). In addition, environmental hazards and 'natural' disasters represent another important type of issue, although it is now acknowledged that these are not simply environmental issues but also have significant economic, social and political dimensions. This section provides context for what follows; the major environmental challenges that are most relevant to poverty are the focus of subsequent sections.

Climate change is unequivocally the most significant major environmental challenge at the global scale. It is driven by emissions of greenhouse gases, largely due to fossil fuel and biomass burning, and is exacerbated by land-use changes such as deforestation. Human actions combined with the natural variability of the global climate system now interact to cause both observed and projected changes to many aspects of the Earth system including average surface temperatures and seasonality, precipitation regimes, ice extent and thickness, sea level, flood risk, freshwater availability, patterns of agriculture and pastoralism, species distribution and ecosystem integrity, ocean acidity and marine productivity, and patterns of human and animal health and disease.[20] Climate change will have immediate and longer-term, direct and indirect impacts on the poor and will make poverty alleviation more difficult.[21] However, its effects also extend beyond its relevance to poverty and it has the potential to impact all aspects of human economic, social, political and cultural life. Addressing the challenge of climate change is dependent on the development of an effective international policy framework based on agreed emissions reductions.

Biodiversity loss is the other major environmental challenge at the global scale. Biodiversity loss occurs through habitat degradation and destruction and through the spread of disease as well as through direct mortality to animal and plant populations (for instance, through over-fishing, hunting, poaching and collecting). Biodiversity loss leads to depleted ecosystem services (such as provision of freshwater, food and fuel) and in turn affects human health, livelihoods, income and wellbeing.[22] Since the poorest people are frequently those most directly dependent on adequate local ecosystem services such as freshwater provision, coastal protection and fuelwood provision, there is a direct link between biodiversity loss and poverty.[23] However, as with climate change, the relevance of biodiversity loss is broader than its significance for poverty; biodiversity is a critical aspect of biosphere integrity which in turn underpins all aspects of human economic, social, political and cultural life. Moreover, biodiversity loss and climate change are issues that are interrelated in multiple ways; for instance, long-term changes in global climate affect the viability and health of ecosystems,

20 IPCC (2014)

21 Schipper and Pelling (2006); Stern (2006, pp.27, 63-103, and particularly 104-105ff); UNDP (2011, 2014)

22 Roe et al (2011); Turner et al. (2012)

23 Reid and Swiderska (2008); Haynes-Young and Potschin (2010); IUCN/DFID/EC (no date)

driving shifts in the distribution and spread of plants, animals, disease vectors and pathogens.[24]

Stratospheric ozone depletion is a global environmental issue that emerged during the 1970s. It is caused by the emission of ozone-depleting substances, including halocarbons such as chlorofluorocarbons (CFCs) which cause the catalytic destruction of ozone molecules in the Earth's stratosphere. This in turn allows greater levels of solar ultraviolet radiation to reach the Earth's surface, causing biological effects including the increased incidence of skin malignancy in humans. Under the Montreal Protocol, the production of ozone-depleting substances is now significantly curtailed and the global average depletion of stratospheric ozone has now stabilised (although with significant year-to-year variability), and the ozone layer is expected to recover slowly over the decadal timescale.[25] There are also linkages between the issues of stratospheric ozone depletion and climate change: many ozone-depleting substances are also potent greenhouse gases and their reduction has helped to mitigate climate change, although this in turn partially concealed the full radiative effects of other greenhouse gases on the climate system.[26]

Other environmental issues may be regarded as regional, rather than global-scale, problems. Pollution issues are the most important of these: air, water, soil and land pollution/contamination are the major categories of pollution. Air pollution includes the emission of greenhouse gases and ozone-depleting substances mentioned above, but it also encompasses the release of black carbon (soot), aerosols, nitrogen oxides, sulphur oxides, lead and other forms of particulate matter, as well as the problem of acid deposition. These and other pollutants are responsible for significant human mortality and morbidity as well as for multiple ecological effects, such as impaired plant growth and depleted aquatic ecosystems. Water pollution includes both point-source and diffuse release of multiple pollutants ranging from agricultural fertilisers and pesticides to municipal and industrial effluents. These in turn cause health impacts and a wide range of environmental problems, including eutrophication (due to nutrient enrichment of water bodies), harmful algal blooms, the creation of anoxic 'dead zones' in coastal waters, estuaries and lakes, and impacts on fisheries and livelihoods. Water pollution may occur as a result of discrete catastrophic events – such as major oil spills – and these may have profound consequences for ecosystems, fisheries, tourism and livelihoods at regional and local scales. Pollution of freshwater, groundwater, soil and land resources encompasses myriad point-source and diffuse types of contamination – that in some cases may be severe (for instance, due to inappropriate release of hazardous waste), but again these are generally localised events. Some exceptions to these for which the evidence base is currently sparse include the pollution of air, water and soil by substances for which the regulatory frameworks are currently embryonic – such as for nanoparticles, micro-plastics and pharmaceuticals – and for which potentially widespread pollution may now be occurring in the absence of effective environmental regulation, monitoring or management, with unknown consequences.[27]

Besides pollution issues, other environmental issues that occur at regional and local scales include soil degradation and erosion, which occur for several reasons such as the removal of vegetation cover (including riparian vegetation); the use of intensive farming practices without soil conservation measures; and the over-abstraction of water (leading to salinisation). Deforestation is a major driver of soil erosion and degradation, with potentially long-term consequences for land productivity as it is unlikely that soils lost as a result of tropical deforestation will regenerate on the decadal timescale.[28] Soil degradation and soil

24 Millennium Ecosystem Assessment (2015); Reid and Swiderska (2008)
25 Prevdi and Polvani (2014)
26 IPCC (2005)
27 For example, see Caplain et al. (2006), Bakshi et al. (2008), Andrady (2011)
28 For example, see Ramankutty et al. (2007); Senna et al. (2009)

erosion lead to reduced land productivity and farm incomes, in turn affecting livelihoods and wellbeing. However, the impacts of soil erosion, in particular, extend beyond their relevance to poverty and can lead to downstream issues of siltation, sedimentation and reduced productivity of coastal ecosystems.

Other significant regional and local environmental issues include the inundation of land and the river regime changes associated with dam construction, which is an environmental issue that has re-emerged as many dams continue to be constructed for hydropower generation, in part driven by the need to find secure energy sources that do not depend on fossil fuels. Other significant environmental issues related to infrastructure development include the impacts of transport system development (such as road-building), which create linear disturbances that can fragment habitat and disrupt patterns of wildlife migration.

Resource security issues (such as water, food and energy security) are closely related to natural resource availability and ecosystem services, and are sometimes regarded as 'environmental' issues. However, these are more properly regarded as economic issues that are as strongly driven by access to, and use, of resources – including demand and supply considerations – as by natural resource availability.

Environmental hazards and 'natural' disasters are also sometimes regarded as environmental issues, although it is now understood that these are rarely purely 'natural' occurrences but rather have important economic, social and political dimensions. These problems include the mortality, morbidity and risk associated with major geological (earthquake, volcanic, tsunami and landslide) and atmospheric/hydrological (flooding, drought and storm) events. However, these may be distinguished from the environmental issues listed above as they represent the normal functioning of the Earth system, although there may nevertheless be devastating impacts on human communities when they do occur. Their impacts are exacerbated by the inappropriate siting of human settlements, infrastructure and activities in places where the risks of occurrence are known to be high (for instance, where dwellings are constructed on marginal slopes that are prone to failure).

SECTION 4

Overview of environment-poverty linkages

This section presents a brief overview of the main environmental challenges most relevant for poverty. It focuses on environmental degradation – which is both a cause and effect of poverty – and which can significantly impede poverty alleviation. It covers the relationships among environmental degradation, poverty and poverty alleviation. The main causes of the environmental drivers of poverty, including those operating at a global scale, are considered in the next section.

The linkages between environmental degradation and poverty were not widely acknowledged until the late 1980s and, as recently as 2005, Bass et al. argued that the environmental concerns of the poor remained marginalised within the context of national development planning, despite the fact that poor people depend critically on ecosystem goods and services including fertile soil, clean water, wildlife and healthy ecosystems. That reliance "creates complex, dynamic interactions between environmental conditions, people's access to and control over environmental resources, and poverty".[29] In 1993, Boutros Boutros-Ghali, the United Nations Secretary-General, acknowledged that ecological degradation was one facet of the multidimensional phenomenon of deprivation.[30] At that time, conceptualisations of poverty were broadened to reflect the fact that poor people are frequently found in degraded environments, because they are relegated to occupy environmentally-unsafe areas of land in addition to suffering other forms of economic, social, political and cultural exclusion. It was recognised that this tendency was increasingly exacerbated by the twin processes of urbanisation and globalisation[31], both of which have created major new flows of people in search of work, who as a result of their vulnerability are forced to live and work in marginal, precarious environments (for instance, the people living and working on Manila's municipal waste tips). Poor people are displaced from their resources by more affluent claimants, or due to competition for land or work, and these processes are in turn driven by development, commercialisation and population growth. As a result, displaced people are forced to migrate to more marginal environments.

Another linkage between poverty and environmental degradation was also recognised at that time: the fact that, in many poor countries, rapid rates of urbanisation and population growth, in combination with the need to produce goods for export, were causing environmental degradation. That degradation was acknowledged to take various forms and to have various causes:

- Deforestation – due to land clearance for agricultural production of export crops, and firewood collection
- Desertification – due to over-cultivation and over-grazing on marginal land (combined with the natural environmental variability of many arid and semi-arid environments), firewood collection, and land salinisation due to inappropriate irrigation practices
- Biodiversity loss – due to deforestation and other forms of land clearance, habitat degradation, disease and direct overexploitation
- Soil erosion – due to deforestation, over-cultivation, and misuse of sloping land

29 Bass et al. (2005, p.39)
30 See Mabogunje (2002)
31 For instance, see Jorgenson and Kick (2003)

- Urban pollution – due to the development of slums, lack of water and sanitation facilities, use of biomass fuels for cooking, and transportation emissions
- Water pollution – contamination of drinking water due to poor sanitation and lack of solid waste management systems, especially in slums; and pollution due to runoff of agricultural fertilisers and pesticides
- Climate change – due to greenhouse gas emissions and land-use change

Those forms of degradation are exacerbated by population growth in areas where resources are already scarce, which leads to further division of resources, over-use of divided land and/or inappropriate use of environments that are unable to meet the demands placed on them.[32]

A further linkage between environmental degradation and poverty centres on the fact that environmental hazards and 'natural' disasters – which may in turn be closely related to environmental degradation – have disproportionately severe impacts on poor people. This is a consequence of the fact that poor people may already be living in marginal, unsafe environments; and it is exacerbated by the fact that poor people lack the resources to create or maintain protective defences against hazards such as disease, drought, flooding, soil erosion, landslides or pests, or to repair infrastructure damaged by those factors. Consequently, poor people living in degraded environments are also the most vulnerable to environmental hazards and natural disasters, which can in turn drive further environmental poverty and further environmental degradation as people are, for instance, forced to (a) adopt riskier practices such as cultivation of more marginal land; (b) further deplete existing resource stocks, such as forest resources; and/or (c) abandon beneficial environmental management practices as their efforts are diverted to more immediate survival tasks. Furthermore, in many developing countries, insufficient attention is given to environmental management in areas occupied by poor people, with the result that they suffer greater exposure to environmental hazards (such as carbon monoxide poisoning due to the use of biomass fuels in poorly ventilated dwellings). Women and children are particularly vulnerable to such environmental hazards and natural disasters.[33]

Another linkage between environmental degradation and poverty is the fact that other aspects of poverty – such as increased exposure to and prevalence of disease (such as malaria, tuberculosis and HIV/AIDS) – may operate synergistically to increase the environmental vulnerability of poor people, partly because people suffering comorbidities have less capacity to learn, implement or communicate improved environmental management practices.[34]

The issues described briefly above amounted to a perception of poverty-environment interactions as a 'downward spiral' in which poor people are forced to over-exploit environmental resources, and their degradation of the environment further impoverishes them.[35] In contrast to this view, however, a further linkage between poverty and environmental degradation is also acknowledged: the fact that many poor people make ongoing efforts to conserve their environment, and particularly their natural resources, as a critical source of income and livelihood, even in the face of significant short-term economic pressures.[36] The linkages between environmental degradation and poverty are therefore complex and contain multiple feedbacks. Moreover, the nature of the links between poverty

32 For instance, see Mbonile and Kivelia (2008)
33 Cutter (1995); Cutter et al. (2003)
34 Damon et al. (2015)
35 Gray and Moseley (2005)
36 See Hirono (2003)

and environmental degradation are context-specific.[37] Consequently, although environmental quality and poverty are closely-related, there is no simple causal relationship between them.

Hence the main linkages between environmental degradation and poverty may be summarised as follows:

- Poor people depend critically on environmental resources, particularly fertile soil, clean water wildlife, and healthy ecosystems, for their livelihoods and well-being.
- Poor people may have no option but to live and work in marginal, unsafe environments and may have been displaced to those environments as a result of poverty.
- In poor countries, rapid urbanisation and population growth, combined with the need to increase production for export, has led to environmental degradation through deforestation, desertification, biodiversity loss, soil erosion, urban pollution, water pollution and climate change. This has been exacerbated by population growth in areas where resources are already scarce, leading to excessive demands being placed on environments and environmental resources.
- Poor people living in degraded environments are more vulnerable to environmental hazards and natural disasters, partly because they already live in marginal, unsafe environments, and partly because they lack resources to create, maintain and repair defences. Consequently, poor people living in degraded environments are also the most vulnerable to environmental hazards and natural disasters, which can in turn drive further environmental poverty and further environmental degradation.
- Inadequate environmental management in areas occupied by poor people leads to greater exposure to environmental hazards.
- Other aspects of poverty – such as increased exposure to and prevalence of disease (such as malaria, tuberculosis and HIV/AIDS) – operate synergistically to increase the environmental vulnerability of poor people.
- Many poor people make significant efforts to manage their environments and natural resources as an important source of income and livelihoods.
- Many locally-determined factors, together with the existence of feedback effects, mean that the relationship between poverty and environmental degradation is context-specific.
- Poverty and environmental issues are increasingly understood as involving interwoven connections within linked social-ecological systems. From this perspective, poverty alleviation and environmental protection are holistically grounded in the coupling of human and environmental systems to facilitate a positive feedback loop between human economic activity and the environment.[38]
- Poor people are often more vulnerable to the loss of ecosystem function that restricts the supply of natural goods and services.
- Poor people depend upon ecosystem services, but the nature of that dependence is not necessarily uniform throughout the year.
- The poor also tend to benefit less from environmental conservation efforts than those who are not poor.[39]

37 See Grimble (2002); Gray and Moseley (2005)
38 Lin and Chang (2013)
39 Kumar and Yashiro (2014)

SECTION 5

Major environmental drivers of poverty

This section examines the major environmental drivers of poverty, focusing on three main areas. First, the global scale problems of biodiversity loss and ecosystem change are outlined. Second, a range of pollution issues are examined: local and regional air pollution; land contamination and soil degradation; and coastal and marine degradation. Third, the environmental drivers of poverty are considered specifically for urban environments.

5.1 Biodiversity loss and ecosystem change

Biodiversity loss is the reduction in genetic, species and ecosystem diversity that occurs as a result of habitat degradation and destruction, due to the spread of disease, and through direct mortality to animal and plant populations. Biodiversity loss is now occurring at an unprecedented rate, leading to depleted ecosystem services (such as provision of freshwater, food and fuel), which in turn affect human health, livelihoods, income and wellbeing.[40] Since the poorest people are frequently those most directly dependent on adequate local ecosystem services such as freshwater provision, coastal protection and fuelwood provision, there is a direct link between biodiversity loss and poverty, and poor people are disproportionately affected by biodiversity loss.[41] The relationship between biodiversity loss and poverty is not straightforward, however, but rather is context-specific; moreover, many of the linkages between poverty and biodiversity are not fully understood.[42] Nevertheless, there are some common features of the linkages between biodiversity and poverty:

- There is spatial overlap between areas of high biodiversity and high poverty, creating a geographical rationale for pursuing both poverty alleviation and biodiversity conservation simultaneously in those countries (in the 'hottest hotspots'), particularly in Sub-Saharan Africa and South Asia.
- The poor are dependent on biodiversity for their day to day livelihoods; for instance, over one billion people globally make use of forest-based goods for their livelihoods, and for them the loss of biodiversity is equivalent to the loss of biological insurance.[43]
- Biodiversity loss in one part of the global ecosystem (such as North Atlantic fish stocks) can affect poor people elsewhere (for instance, as commercial fisheries move to West African waters; this affects West African populations who depend on fish as a source of protein).
- Although the highest density of poor people occurs in highly modified human areas, the deepest poverty can occur in remote forest or wilderness areas where people are highly dependent on biodiversity.
- Poverty may contribute to biodiversity loss, although only as one of multiple factors.[44]
- Biodiversity conservation can potentially be a mechanism for poverty reduction.

40 Roe and Elliott (2005)
41 Millennium Ecosystem Assessment (2005, p.6)
42 Walpole and Wilder (2008); Billé et al. (2012); Fasse and Grote (2013)
43 Millennium Ecosystem Assessment (2005)
44 Adams et al. (2004); Díaz et al. (2006); Sachs et al. (2009)

In addition, it is possible to identify both positive and negative linkages between biodiversity and poverty. Positive linkages include the creation of income through biodiversity conservation and trade as well as through the maintenance of ecosystem services. Negative linkages include the creation of poverty through reduced access to protected areas, and the loss of cultural and traditional values. Although the relationship between biodiversity and poverty is not straightforward, recent research has shown that biodiversity acts as an emergency lifeline and/or a social 'safety net', preventing people falling into – or further into – poverty, and that these securities are eroded by biodiversity loss.[45]

5.2 Pollution issues

5.2.1 Local and regional air pollution

Local and regional air pollution includes the release of black carbon (soot), aerosols, nitrogen oxides, sulphur oxides, lead and other forms of particulate matter, as well as the problem of acid deposition. These and other pollutants are responsible for significant human mortality and morbidity as well as for multiple ecological effects, such as impaired plant growth and depleted aquatic ecosystems. Household air pollution due to biomass fuels – which is strongly poverty related – is a known risk factor for acute respiratory infection in children in developing countries, and household air pollution from burning biomass fuel is increasingly recognised as a major global health concern.[46] Biomass smoke is associated with chronic obstructive pulmonary disease (COPD) in Asian and Central American countries; the evidence is sparser for African countries, although a study for Malawi has confirmed that wood smoke and poverty contribute to reduced lung function in rural Africans and that COPD is common in this population. However, the use of charcoal in rural populations may be relatively protective, and this idea deserves further study.[47] Poor health induced by air pollution in turn leads to reduced benefits from education, employment, livelihoods and wellbeing. However, the relationship between air pollution and poverty is acknowledged to be bi-directional, with poor people being more susceptible to air pollution but poverty also fostering more air pollution.[48]

The highest concentrations of ambient air pollution in the world now occur in developing country cities (see below); a recent study of air pollution in Accra has confirmed high air pollutant levels in the city with peak levels occurring in the poorest neighbourhood.[49] Reducing air pollution in African cities requires policies related to energy, transportation and urban planning, as well as to forestry and agriculture, with particular consideration given to the impacts of each strategy on poor communities. Such cross-sectoral integration also requires a strong focus on urban environment and urban poverty in the post-2015 Development Agenda.

5.2.2 Soil and land degradation

Land degradation may be defined as the loss of productive and ecosystem services provided by land resources. It is defined by the United Nations Convention to Combat Desertification (UNCCD) as the reduction or loss of the biological or economic productivity and complexity of pastoral, agricultural and wooded land due to soil erosion, soil impoverishment (such as nutrient depletion) and/or the loss of natural vegetation. Around 24% of the word's land surface area is degraded; around 1.5 billion people depend on that land; and much of it lies

45 Roe et al. (2011, pp.2, 8)
46 Emmelin and Wall (2007)
47 Fullerton et al. (2011)
48 Lipfert (2004); Mehta et al. (2006)
49 Zhou et al. (2013)

in sub-Saharan Africa where it is critical to the livelihoods of poor farmers.[50] Yet while interest in research on poverty and its linkage with environmental degradation has grown rapidly over the last few decades, there is still no consensus on the impact of poverty on land degradation and *vice versa*, for three main reasons: (1) the complexity of the linkages; (2) the fact that linkages are highly context-specific; and (3) a shortage of systematic, comparative empirical evidence. Some research, for instance, has found that there is little difference between the levels of soil degradation occurring on the farms of rich and poor households in some settings.[51] Nevertheless, many specific connections between land degradation and poverty can be made. Land degradation can lead to food scarcity, loss of income, resource conflicts and further environmental degradation as remaining productive land is exploited more heavily. In turn, the implications of land degradation for food security, in particular, lead to malnutrition and poor health. A recent study has found that land degradation in Ghana has reduced agricultural income nationally, increased the national poverty rate by 5.4%, and slowed poverty reduction in the three northern regions which currently have the highest poverty rates in the country.[52]

In areas particularly prone to land degradation, such as rural drylands in developing countries, some research has investigated the potential for alternative livelihood strategies to promote rural development while reducing the impact of intensive land-uses.[53] In one such area – the Central Rift Valley area of Ethiopia – environmental vulnerability is high. Recent research has shown that changing land use and land degradation in this area have resulted from population and livestock growth in regions of limited resources, unsustainable farming techniques, the Ethiopian land tenure system and poverty. This study showed that the level and area of Lake Abiyata are falling, and ongoing land degradation has reduced agricultural productivity, in turn causing worse food insecurity and poverty in the area.[54]

5.2.3 Coastal and marine degradation

Coastal and marine degradation occur for several reasons: pollution of coastal and marine waters; eutrophication due to nutrient runoff from adjacent coastal land; overfishing; aquaculture; and over-exploitation of other coastal and marine resources. However, again, the relationship between these issues and poverty is not a straightforward one; indeed, there is some evidence that some of these activities – such as aquaculture – may have some benefits for poverty alleviation.[55] Tourism, similarly, may have benefits for economic development and poverty alleviation, although this is dependent on factors such as the ownership of the enterprises.[56] Likewise, fishing can both support local livelihoods and deplete valuable natural resources, depending on multiple factors including the regulation of the fisheries.[57]

A case study of local fisheries of the Chilika Lagoon, Bay of Bengal, India, has examined a social-ecological system that has already broken down due to resource degradation.[58] This study highlighted impoverishment processes (including economic exclusion, social marginalisation, class exploitation, and political disempowerment) as key mechanisms that accelerate poverty; when combined with processes of environmental change and degradation, the outcome in this case was a deterioration of both local fisheries and

50 Nkonya et al. (2008, p. vi)
51 Moseley (2005)
52 Diao and Sarpong (2011)
53 Adhikari (2013)
54 Meshesha et al. (2012)
55 Irz et al. (2007)
56 Manyara et al. (2006)
57 Sesabo and Tol (2007)
58 Nayak et al. (2014)

livelihoods. The authors concluded that poverty in local fisheries is a process rooted in social and institutional factors, influenced by ecological dynamics. Hence understanding poverty requires a focus on the social-ecological system as a whole, and that addressing poverty involves rebuilding not only collapsed stocks but the entire social-ecological system, including restoring relationships between resources and people.

5.3 Urban environmental issues

The environmental hazards in urban areas can be put into three groups: biological pathogens, chemical pollutants, physical hazards.[59] It should be noted that environmental hazards are a separate issue from environmental degradation in urban areas. Exposure at significant levels to environmental hazards leads to a serious burden in terms of ill health, injury and premature death, which contributes to poverty. Exposure can occur at homes, places of work and during the daily commute to work.

The principal biological pathogens that are present in urban areas are waterborne (cholera, dysentery, etc.) or carried by insect/animal vectors (malaria, dengue, etc.).[60] The urban poor are especially at risk as informal settlements commonly lack sufficient provision of water, sanitation, drainage, solid waste collection.[61] Furthermore, the overcrowding and lack of ventilation favours the spread of all communicable diseases, including airborne disease.[62] Adequate provision of infrastructure and services (whether public, private, NGO or community based activity) is required to control the spread of infectious diseases in poor urban areas.[63]

Many of the chemical pollutants present in urban areas are hazardous to human health. Burning of fossil fuels releases sulphur compounds, volatile organic compounds (VOCs), heavy metals and other pollutants that cause respiratory and heart disease, lung cancer, acute respiratory infections in children and chronic bronchitis in adults, aggravating pre-existing heart and lung disease, or asthmatic attacks.[64] Industrial chemical pollutants such as methylmercury, polychlorinated biphenyls (PCBs), and toluene are neurotoxic and recognised causes of subclinical brain dysfunction and neurodevelopmental disorders.[65] Occupational exposure occurs in large factories and small workshops; domestic exposure occurs when biomass/coal is used for cooking and heating homes; and vehicle traffic creates ambient air pollution in urban areas. Chemical pollutants impact more severely on urban poor populations as both unhealthy working conditions and the use of inappropriate fuels for indoor cooking stoves and heaters are characteristic of a typical urban poor lifestyle.[66] Reducing chemical pollutants is largely achieved by regulating the activities of enterprises.

Physical hazards are often overlooked in environmental diagnoses but are a major cause of premature death and injury.[67] The principal physical hazards present in urban areas are accidents in the home, motor vehicle accidents and accidents in the workplace. These issues impact most severely on the urban poor because populations often live in shelters made from flammable materials with many people to a room and open stoves. Poor road safety management and lack of urban planning often requires urban poor populations to

59 Satterthwaite (2003)
60 Riley et al (2007)
61 Smith (2013)
62 Unger and Riley (2007)
63 Satterthwaite (2003)
64 Kampa and Castanas (2008)
65 Gradnjean and Landrigan (2006)
66 Kjellstrom et al. (2007)
67 Kjellstrom et al. (2007); Dimitriou and Gakenheimer (2011)

walk along unsafe sections of roads.[68] The lack of measures to hold employers responsible for worker conditions leads to unhealthy and unsafe working environments for urban poor in many countries in the developing world.

By 2030, about 3 billion people, or about 40 per cent of the world's population, will need proper housing and access to basic infrastructure and services such as water and sanitation systems. This translates into the need to complete 96,150 housing units per day with serviced and documented land from now till 2030.[69] Slum upgrading is a popular approach that is being taken to reduce the impact of environmental hazards on the urban poor in developing countries. The Cities Alliance (supported by DFID, UN Agency, the World Bank and other bilateral donors) is a global initiative to develop new tools, practical approaches and knowledge sharing to improve living conditions of the urban poor, living in slums in cities of the developing world. Lack of planning, overcrowding, land tenancy issues and lack of infrastructure and public services are cross cutting issues that are relevant to slums all over the world. Due to the inherent linkages urban poverty programmes are often designed to also target environmental hazards and vice versa (e.g. Promoting Composting as a Business for the Urban Poor, DFID: India, Bangladesh and Sri Lanka, 2002-2005). Community participation is recognised as an essential element if the impacts from slum upgrading projects are to be sustainable.[70]

68 Dimitriou and Gakenheimer (2011)
69 UN Habitat (2014)
70 Burra (2005)

SECTION 6

Crosscutting themes

This section covers several crosscutting themes (valuation, country systems and crime/legality) that are priority areas for policy and for further research. While the environmental drivers *per se* are context-specific – they may or may not lead to poverty and/or poverty alleviation in a particular setting, depending on other factors – these crosscutting themes are critical in determining whether or not these environmental drivers lead to actual poverty reduction. Further crosscutting themes include gender inequity, globalisation and population growth.[71]

6.1 Valuation

A large body of research covers the economic valuation of environmental resources in developed countries, with most environmental impacts (air and water pollution, biodiversity, solid waste and health effects) being investigated. Valuation techniques are being applied to developing country contexts, with some adaptations (for instance, studies place a greater emphasis on environmental resources as inputs to primary production, and some are combined with participatory research methods in order to increase the familiarity and acceptance of economic valuation approaches locally).[72] Research in this area is still developing and some key areas remain under-researched, such as the effects of fluctuations in income and in environmental impact over time. Nevertheless economic valuation of environmental resources is important because many such resources have conventionally been undervalued, yet they often represent a substantial 'hidden' proportion of livelihoods, contributing to food security and 'masking' poverty.[73] Considerable difficulties are associated with the valuation of ecosystem services, which may be incompletely understood by science, which are not traded in markets, and whose linkages may be complex. Nonetheless, the commercialisation of environmental resources – such as biodiversity-based products – is increasingly recognised as one of several strategies for improving livelihoods opportunities, especially in rural areas.[74] Joubert et al. (2007), for instance, have investigated the benefits provided by a new fishing rights allocation system in South Africa, based on a participatory approach to the valuation and management of fisheries resources.[75] Adhikari et al. (2010) provide another example based on the economic valuation of mangrove ecosystems in Pakistan.[76]

Particularly in relation to biodiversity, the link between conservation and poverty alleviation is contested and controversial. In an authoritative study, Turner et al. (2012) evaluated ecosystem service flows provided by key terrestrial habitats of high conservation value, including estimates of the value of those habitats to poor people.[77] The authors considered both direct benefits and payments for ecosystem services, and they concluded that the

71 McMichael (2008); Alam (2010) and Musvoto et al. (2015) have identified population growth as an important crosscutting issue, for instance.
72 An example is Yaron et al. (2011)
73 See, for instance, Turner et al. (2012)
74 Roe et al. (2011)
75 Joubert et al. (2007)
76 Adhikari et al. (2010)
77 Turner et al. (2012)

potential for biodiversity conservation to support poor communities is high at the global scale (with the top quarter of the conservation priority areas potentially providing more than half of the benefits).The authors also concluded that these key conservation areas provide more than US $1 of benefit per person per day for 331 million of the poorest people in the world. This study indicated the need to pursue win–win synergies between conservation and poverty alleviation (although trade-offs exist in some areas), and it notes that effective financial mechanisms can enhance these synergies. Overall, the authors conclude, biodiversity conservation should be a fundamental component of sustainable economic development, and this study demonstrates that environmental valuation plays a central part in determining where such win-win synergies could lie.

Evidence of the role of protected areas in poverty alleviation has been provided by Andam et al. (2009), who note that the socioeconomic impact of protected areas has been intensely debated.[78] The authors note that this debate has persisted because of a comparative lack of research into the links between protected areas and poverty alleviation (and specifically because of a lack of knowledge about potential confounding factors). In this study, the authors applied comprehensive national datasets and quasi-experimental matching methods to estimate the influence of protected area systems on poverty in Costa Rica and Thailand. They present evidence that, on balance, protected areas make a significant contribution to poverty alleviation in those settings, despite the fact that communities near protected areas were still poorer than national averages.

Many policy approaches have emphasised the need for poverty alleviation through closer integration of poor people or areas with global markets, and studies of global value chains have revealed how companies and farms in developing countries are upgraded by being integrated in global markets. Few of these studies have explicitly focused on the impact on poverty, gender and the environment, nor how environmental factors may have been restructuring value chains. Recent research has attempted to overcome the shortcomings in 'stand-alone' value-chain, livelihood and environmental analyses by integrating the 'vertical' and 'horizontal' aspects of value chains that together affect poverty and sustainability.[79] Yet despite the contributions of studies such as those reviewed briefly here, there is considerable scope for more research to be undertaken into the ways in which ecology can inform, and can play a role in, poverty alleviation, as DeClerck et al (2006) have acknowledged.[80] They have argued that knowledge of ecosystem functions and processes can be applied to improve the lives of millions of poor people, particularly in relation to the issues of hunger, water provision, energy supply, preventable diseases and natural disasters. Their study describes ways in which ecological theory and approaches could be used to help improve the efficacy of poverty alleviation programs. Again, however, environmental valuation is a critical part of identifying where significant benefits may be achieved and in evaluating their magnitude.[81]

6.2 Country systems

Country national administrative systems and national policies should be an integral part of paths to environmental protection, poverty alleviation and sustainable development.[82] A large literature now exists on the environmental governance aspects of poverty, covering policy, regulation, norms, institutions, procedures and financing institutions.[83] Governance challenges centre on the need to integrate poverty-environment linkages into development

78 Andam et al. (2010)
79 Bolwig et al. (2010); Riisgaard et al. (2010)
80 DeClerck et al. (2006)
81 This point is also made by Ferraro et al. (2011)
82 See Amechi (2009) and Ikejiaku (2009)
83 For example, see Poverty and Environment Initiative – Kenya (2006)

policy and planning. Research into the institutional dimensions of environment-poverty linkages is relatively well-advanced for the issues of climate change and deforestation, although is less so for other environmental issues. Considerable attention has focused on the reducing emissions from deforestation and forest degradation (REDD+) initiative, a mechanism to address simultaneously climate change, biodiversity and poverty reduction challenges at the margins of tropical forests. Recent research into these institutional dimensions indicates that there is still limited understanding of how to build adequate and strong institutional relations that could shape the reforms required; evidence suggests that there is a need to develop a governance model nested in relevant policy frameworks, particularly where frameworks are currently lacking.[84] Increasingly, institutional arrangements are considered in relation to notions of a 'green economy', as in the case of South Africa.[85]

Case study evidence of the links between poverty and forest degradation in the Swat district of Pakistan shows that institutional arrangements are the main drivers of degradation.[86] In this setting, there was no evidence of a particular association between poverty and resource degradation; instead, the poor and other income groups were equally resource dependent and the poor were no more likely to cause environmental degradation than other groups. Instead, the evidence points to alternative explanations for resource degradation, including the existence of historical selective and rotating ownership patterns that now provide limited incentive for resource conservation. These institutional arrangements have also created persisting tension between *de jure* and *de facto* owners, which is one driver of forest degradation. Evidence also suggests that poorly-defined resource rights have exacerbated the impacts of several other factors contributing to forest degradation, compounded by poor management, corruption and perverse incentives.

Some evidence of the role of country systems in promoting livelihoods through more secure livestock keeping is provided by Randolph et al. (2007), who argue that livestock keeping is a critical issue for many poor people, not least because it promotes health and nutrition and it contributes to multiple livelihood objectives and offers pathways out of poverty.[87] This study examines the linkages between livestock keeping and the physical well-being of the poor, and examines social/cultural obstacles to development that limit the scope of intervention programs to promote livestock keeping and poverty reduction. The authors highlight the complexity of the roles that livestock play in household decision-making and the fact that interventions to promote livestock keeping are should account for local factors, which in turn are influenced by country systems.

Better management of environmental resources alone will not necessarily lead to poverty reduction; this requires conducive political, institutional and governance frameworks. The relevant mediating factors at different levels must be well-understood and addressed for interventions to reach their intended goals.[88]

6.3 Crime/legality

The issues of crime/legality are priority areas for further research because literature in this area is comparatively sparse – particularly for developing countries – and there are substantial research gaps for better understanding of the links between crime/legality, environmental degradation and poverty alleviation. There is significant overlap between the overarching issues of country systems, corruption and crime. Within the literature on crime,

84 Ngendakumana et al. (2014)
85 Musvoto et al. (2014)
86 Khan and Khan (2009)
87 OECD (2008); Miller et al. (2013)
88 Randolph et al. (2007)

environmental crime is a crosscutting theme that encompasses many environmental issues, including illegal logging; wildlife crime; smuggling of ozone-depleting substances; ivory trading; illicit disposal of hazardous waste; and illegal, unregulated and unreported fishing.[89] Environmental crime both contributes to environmental degradation and it undermines efforts to support livelihoods through, for instance, ecotourism schemes that also aim to promote biodiversity conservation. Again, however, the relationship between environmental crime – such as wildlife crime – and poverty is complex and should be assessed and understood within a holistic, ecosystem-based approach.

Some evidence exists to show an interrelationship between poverty, degraded environments, poor mental health and consequently crime in low- and middle-income countries, as exemplified by the systematic review conducted by Lund et al. (2010).[90] There is scope for considerable more research of this type.

89 Banks et al. (2008); Knapp (2012)

90 Lund et al. (2010)

SECTION 7

Implications for poverty and poverty reduction

Various implications for poverty and poverty reduction have been identified as a result of this study. The main points are:

- Environmental degradation remains an important driver of poverty and can hinder or even negate poverty alleviation.
- The relationship between environmental degradation and poverty is not a simple, linear one: multiple outcomes are possible, in different contexts, depending on the other factors at play.
- In general, however, environmental protection and poverty alleviation are twin objectives that can and should be promoted simultaneously.
- Increased public and private investment in the productivity of environmental assets can generate strong returns for poverty reduction, and is needed to create opportunities for people to lift themselves out of poverty.
- The nature of the policies and processes for promoting environmental protection and poverty alleviation are important in determining success: policies, practices and processes should be participatory, inclusive, transparent, accountable, and based on agreed goals.
- Climate change is the most important environmental driver of poverty at the global scale and its impacts are projected to increase significantly over the decadal timescale, requiring urgent action to promote adaptation and mitigation.
- Biodiversity loss is also an important environmental driver of poverty at the global scale; again, its relationship with poverty is not straightforward but is context-specific. Nevertheless, biodiversity conservation is an important aspect of poverty alleviation and policy and practice should seek to achieve these two objectives simultaneously.
- Biodiversity is a broad concept and different components and attributes of biodiversity (such as abundance, diversity or ecosystem services) are important to different people, in different ways and in different contexts. It is important to understand which attributes of biodiversity matter to poor people and why.
- Environmental degradation is increasingly addressed through an ecosystem-based approach, in which the integrity and functioning of entire ecosystems is considered alongside economic and social goals.
- Poverty and environmental issues are increasingly understood as involving interwoven connections within linked social-ecological systems. From this perspective, poverty alleviation and environmental protection are holistically grounded in the coupling of human and environmental systems to facilitate a positive feedback loop between human economic activity and the environment.
- Strong local institutions are critical to improving environmental management for poverty reduction and should be a strategic focus of capacity development efforts.
- At the local level, many examples of small-scale initiatives exist (such as eco-tourism and other community-based enterprises) that successfully combine poverty alleviation and environmental protection objectives, and that could be replicated elsewhere or scaled up.
- At the national level, policies, institutions and processes are amongst the most important mediating factors in the environment-poverty relationship; environmental

protection should be ‘mainstreamed’ into policies for economic production activities (including agriculture, forestry, fisheries, mining and tourism).

- Policy integration between these various levels is also required.
- Integrated approaches are needed to put pro-poor investments in the productivity of environmental assets at the heart of national development and poverty-reduction strategies and sectoral planning at the national, subnational and local levels.
- The dynamic patterns of dependence on ecosystem services of the poor and their coping strategies require regionally specific and in-depth evaluation.

SECTION 8

Annotated Bibliography and Case Studies

Fasse, A., and Grote, U. (2013) 'The economic relevance of sustainable agroforestry practices — An empirical analysis from Tanzania', *Ecological Economics*, Vol. 94, pp.86-96.
This study investigates the economic relevance of sustainable behaviour of agroforestry practices for smallholders, based on a case study of firewood exploitation in rural Tanzania. The authors investigated the extent of sustainable practices and whether households that implemented sustainable practices had increased incomes. They present evidence that the poorest households generate higher income if they extract firewood unsustainably, although the opposite is true of more affluent households. Therefore they conclude that the poor are likely to increase environmental degradation to generate more income, causing a 'downward spiral' of the poverty-environment trap, resulting in longer-term income losses and ongoing poverty.

Khan, S. R. and Khan, S. R. (2009) 'Assessing poverty–deforestation links: Evidence from Swat, Pakistan', *Ecological Economics*, Vol. 68, pp.2607-2618.
This case study examines the links between poverty and forest degradation in the forest-rich Swat district of Pakistan. The authors do not find evidence of a particular association between poverty and resource degradation; instead, they found that the poor and other income groups were equally resource dependent and the poor were no more likely to cause environmental degradation than other groups. Instead, the authors provide alternative explanations for resource degradation, including the existence of historical selective and rotating ownership patterns that provide limited incentive for resource conservation. These institutional arrangements have also created persisting tension between *de jure* and *de facto* owners, which is one driver of forest degradation. The authors note that poorly-defined resource rights have also exacerbated the impacts of several other factors contributing to forest degradation which is compounded by poor management, corruption and perverse incentives.

Mbonile, M. J. and Kivelia, J. (2008) 'Population, environment and development in Kinondoni District, Dar es Salaam', *The Geographical Journal*, Vol. 174, No. 2, pp.149-175.
This case study investigates the micro-scale relationship between population, environment and development in Kinondoni District, Dar es Salaam. The authors present evidence that poverty can lead to overdependence on a single resource. In these circumstances, rapid population growth can lead to the invasion of marginal lands, environmental degradation and further poverty In response, the authors argue for the importance of community-based environmental conservation. The study also highlights the importance of strengthening resource conservation regulations and environmental policies more generally.

Narain, U., Gupta, S. and van't Veld, K. (2007) 'Poverty and resource dependence in rural India', *Ecological Economics,* Vol. 66, pp. 161-176.
This study examined the use of common-pool resources (such as fuel-wood) by rural households in Jhabua, India, finding evidence of a complex relationship between resource dependence and income: the poorest and richest households depend more on resources than households with intermediate incomes, although the precise resources used varied. These findings indicate that common-pool resources provide important sources of income

not just for the poor but also for the rich, and that improving the stocks of these resources could potentially form the basis of poverty reduction efforts in developing countries.

Nayak, P. K., Oliveira, L. E. and Berkes, F. (2014) 'Resource degradation, marginalization, and poverty in small-scale fisheries: threats to social-ecological resilience in India and Brazil', *Ecology and Society*, Vol. 19, No. 2, p.73.
This study examines poverty in local fisheries in India and Brazil, based on the model of impoverishment processes (including economic exclusion, social marginalisation, class exploitation, and political disempowerment) as key mechanisms that accelerate poverty. Those processes are combined with analysis of processes of environmental change and degradation. The authors conclude that poverty in local fisheries is a process rooted in social and institutional factors as influenced by ecological dynamics. They argue that understanding poverty requires a focus on the social-ecological system as a whole, and that addressing poverty will mean rebuilding not only collapsed stocks but the entire social-ecological system, including restoring relationships between resources and people. The Indian case study examines the Chilika Lagoon on the Bay of Bengal – a social-ecological system that has already broken down.

Nkonya, E., Pender, J., Kaizzi, K. C., Kato, E., Mugarura, S., Ssali, H. and Muwonge, J. (2008) *Linkages between Land Management, Land Degradation, and Poverty in Sub-Saharan Africa: The Case of Uganda*. Research Report 159, Washington, DC: IFPRI.
This report examines the linkage between poverty reduction and sustainable land management using Uganda a cases study. The authors argue that these two goals can be achieved simultaneously, but that designing policies to achieve this requires a clear understanding of the linkages between them. Nkonya et al. (2008) found that only limited empirical evidence existed demonstrating the linkage between poverty and land management in Africa; they then examined that linkage using several poverty measures and several indicators of sustainable development. In general, the link between poverty and land degradation was found to be strong, giving weight to notions of a 'land degradation–poverty trap', although there were some exceptions. Importantly, their results suggest that certain poverty reduction strategies being implemented through agricultural modernisation in Africa can simultaneously increase productivity, reduce poverty and reduce land degradation. Examples of such strategies include promoting investments in soil and water conservation and agroforestry. Some strategies (e.g. promoting road development, non-farm activities and rural finance) appear to yield benefits without significant trade-offs, although others involve trade-offs among different objectives, which in turn require consideration and management. Nkonya et al. (2008) conclude that investment in poverty reduction and agricultural modernisation alone is not sufficient to address the problem of land degradation in Uganda; it must be supplemented by greater efforts to promote sustainable land management practices.

Zaman, K., Ikram, W. and Shah, I. A. (2010) 'Bivariate cointegration between poverty and environment: a case study of Pakistan (1980–2009)', Journal of Environmental Planning and Management, Vol. 53, No. 8, pp.977-989.
This case study investigated the relationship between rural environmental degradation and poverty in Pakistan using statistical methods. The authors found that poverty does have a detectable effect on rural environmental degradation, but that this effect is uni-directional rather than bi-directional.

SECTION 9

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