WPS6231

Policy Research Working Paper 6231

# Is Green Growth Good for the Poor?

*Stefan Dercon*

The World Bank
Development Research Group
Environment and Energy Team
&
Sustainable Development Network
Office of the Chief Economist
October 2012

Policy Research Working Paper 6231


## Abstract

The developing world is experiencing substantial environmental change, and climate change is likely to accelerate these processes in the coming decades. Due to their initial poverty, and their relatively high dependence on environmental capital for their livelihoods, the poor are likely to suffer most due to their low resources for mitigation and investment in adaptation. Economic growth is essential for any large-scale poverty reduction. Green growth, a growth process that is sensitive to environmental and climate change concerns, is often seen to be particularly helpful in this respect, leading to a win-win in growth and poverty reduction terms, with additional gains for the cause of greening the planet and avoiding further disastrous environmental change. This paper argues that such a view ignores important trade-offs in the nature of "green growth" strategies, stemming from a poor understanding of the sector and spatial processes behind effective poverty reduction. High labor intensity, declining shares of agriculture in gross domestic product and employment, migration, and urbanization are essential features of poverty-reducing growth. The paper contrasts some common and stylized green-sensitive growth ideas related to agriculture, trade, technology, infrastructure, and urban development with the requirements of poverty-sensitive growth. It finds that they may well cause a slow-down in the effectiveness of growth in reducing poverty. The main lesson therefore is that trade-offs are bound to exist; they increase the social costs of green growth and should be explicitly addressed. If not, green growth may not be good for the poor and the poor should not be asked to pay the price for sustaining growth while greening the planet.


---

This paper is a product of the Environment and Energy Team, Development Research Group, and the Office of the Chief Economist, Sustainable Development Network, in the World Bank. It was produced for the Green Growth Knowledge Platform (www.greengrowthknowledge.org), a joint initiative of the Global Green Growth Institute, Organisation for Economic Co-operation and Development, United Nations Environment Programme, and the World Bank. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are posted on the Web at http:// econ.worldbank.org. The author, Stefan Dercon, may be contacted at stefan.dercon@economics.ox.ac.uk.

# Is Green Growth Good for the Poor?

Stefan Dercon

University of Oxford

Keywords: growth and poverty reduction. Environment and poverty. Poverty alleviation. Green growth.

JEL Codes: O13; O16; O44; Q01

Sectors: Environment, Poverty Reduction

**Is Green Growth Good for the Poor?**[1]

Stefan Dercon

## 1. Introduction

Environmental degradation is occurring in many parts of the developing world. Nationally and locally, it is the result of deforestation, soil degradation, depleting of water resources and environmental pressures linked to urbanization and economic change. Globally, the overall process of climate change is expected to bite gradually but increasingly sharply in coming decades with mean temperature rises, sea-level rises, and spatial changes in rainfall and other climatic conditions, as well as an increased frequency or severity of extreme weather events.

Environmental change is rarely equity-neutral. The poor are generally considered the main losers from climate change, as well as from the burdens of local environmental damage and natural resource degradation. They are typically more dependent on environmental capital and climate for their economic activities, not least as most of the poor still live in rural areas, dependent on agriculture. Those in urban areas face the consequences of environmental hazards, linked to overcrowding, pollution and inadequate water and sanitation provision. The poor are also more vulnerable to extreme events affecting economic productivity, health and security of livelihood, with limited insurance or social protection, while informal insurance mechanisms are not suited to deal with covariate risks such as climate risks or other risks affecting entire communities. They may also find it harder to adapt their livelihoods to changing environmental conditions, as they lack the resources to invest in more appropriate profitable economic activities.

Development and poverty reduction investments are powerful instruments to mitigate these environmental impacts on the well-being of the poor, and to offer them the resources to build up their resilience to further environmental pressures. Economic growth in the poorest economies is essential to build this resilience. It has been the key element for large-scale poverty reduction, most notably in Asia, although there are considerable geographical, sectoral and structural differences in the speed with which poverty reduction is delivered in the context of growth (Ravallion, 2000). Growth has been found to be important specifically for increased climate change adaptive capacity: for example, looking at time series data across countries over the last 50 years, Dell et al. (2008, 2009) found that higher temperatures significantly reduced economic growth rates in poor but not in rich countries. Raddatz (2009) showed large declines in GDP per capita from climate-related disasters in low-income countries; in percentage terms, they were four times the size of the declines in rich economies. Noy (2009) showed that higher GDP per capita, as well as better institutional and human development indicators reduced losses from climate-related disasters. Raddatz (2009) also shows that the larger impacts in low-income countries are much more than could be explained by the relatively high share of agriculture in these countries, so it is not simply solved by diversification away from agriculture.

[1] University of Oxford. Paper prepared for the World Bank project on Green Growth. I am grateful for helpful comments by Mike Toman. All views and errors are mine.

Although hard to identify statistically, Fomby et al. (2012) also show losses in both agricultural and non-agricultural growth, although the type of shocks appears to matter to generalize on this.

Unfortunately, engineering these growth and poverty reduction processes in a world of environmental change is problematic. It is generally acknowledged that the pressures of climate and other environmental change will have serious implications for the growth prospects of some of the poorest countries in the developing world in coming decades (IPCC 2007; World Bank, 2010). Changes in climatic conditions will change the mean return to agriculture, as well as increase its variance. Furthermore, the increased impacts of extreme weather events will affect the accumulation of productive assets, not least in low-lying areas such as coastal cities, where potential returns to economic activity are especially high. It is also likely to accelerate the depletion of many forms of environmental capital and increase threats to human health from disease and water scarcity. The impacts of climate change on both agriculture and other sectors of the economy are bound to affect the scope for their transformation from economies largely dependent on agriculture towards a more diversified, higher-return economy.

Climate change is only one source of environmental pressure with serious impacts in many developing countries. There are also difficult choices to be made with respect to curbing *current* environmentally damaging activities. Depletion of soil, forests, coastal fisheries, and more accessible fresh water supplies reflects an ongoing loss of potential productivity in the economy. Air and water pollution represent significant burdens on human health in a number of locations, lowering productivity and diverting scarce resources into treatment of pollution related illnesses. These externalities rarely are adequately internalized into the decisions made by the users of these resources, so addressing them can have potentially significant impacts on growth and the distribution of gains from growth. On the other hand, curbing environmentally damaging *now*, to reduce natural resource degradation and improve the population's health and the quality of life, means diverting resources from other conventional growth-oriented opportunities.

To address these issues, various strategies have been discussed to provide a blueprint for 'green' growth, in which the need to protect the environment is internalized, while leaving sufficient opportunities for economic growth (OECD, 2011). This would appear particularly attractive when viewed from a poverty angle. First and foremost, it retains and even may give further impetus to a growth focus, essential for poverty reduction in low-income economies, while contributing to their resilience in the face of environmental problems. Furthermore, as currently environmental damage is not equity-neutral, it could help to ameliorate the consequences of environmental costs for the poor under current growth trajectories.

Much of the discussion on 'green growth' remains relatively vague in terms of specifics, including for poor countries. But not all measures that maximize growth given environmental constraints will maximize poverty reduction as well, just as not all growth leads to the same degree of poverty reduction or to the same environmental impacts. The question rarely asked is how various green growth strategies and resilience-enhancing investments interact with poverty. To what extent is green growth good for the poor? Under what conditions can certain green growth strategies lead to unwelcome adverse impacts on the poor, even 'green poverty'?

In this paper, we will first provide a stylized discussion of the nature of poverty, and especially its dynamics and interaction with growth. Here, we will not just focus on the various assets and capital

sources of the poor, but also on the sectoral and spatial dimensions of the dynamics of poverty. Then, in section 3, we will discuss how global and local environmental change affects these dynamics, if current patterns of change persist. In section 4, we introduce a number of stylized examples of 'green' growth initiatives, and assess their impact on poverty, based on their interaction with patterns identified section 2 and 3. Section 5 concludes.

## 2. Framing Poverty and the Environment

In this section, we offer a stylized discussion of poverty and how current environmental pressures may affect the poor. First, we offer the standard microeconomic analysis, as implicitly also embedded in much of the basic writing on welfare costs of environmental damage, and the correction of market failures. It also underlies some of the writings using a simple livelihoods framework to discuss environmental pressures (Ellis, 2000). Then we will expand the framework to take sectoral, spatial and dynamic (intertemporal) dimensions into account, relevant in a growth context, and show that this affects the way to think about poverty and environmental linkages. This then forms the basis of a more in-depth discussion of how a 'green growth' strategy may affect poverty in plausibly troublesome ways in the rest of the paper.

### *Profile of the Poor and the Environment*

Much analysis of poverty and its links with environmental change is rooted in a micro-level analysis of household and community livelihoods. In a stylized way, households are viewed as having access to various assets, such as financial, physical and human capital, and importantly, environmental (or natural) capital, such as land, air quality or water resources. Markets define the opportunities for earning a living from combining these assets, and the benefits households can get from them. Ownership and control of the use of these assets is not always well defined. While financial or human capital is typically private with well-defined property rights, rights to environmental capital are not always clear, with a mixture of private, communal and rather often contested or undefined rights. Obvious examples are the use of water resources, fisheries and forests, whose use and management is rife with collective action problems. Furthermore, the use of environmental capital often involves externalities on others, from local level effects of local air or water pollution, soil degradation and increasingly adding up to global impacts, with impacts on production opportunities and welfare.

These problems lead to some of the standard economic and welfare impacts of environmental pressures, with the emphasis on market failures (stemming from externalities and coordination failures). Overcoming these market failures will improve efficiency in the economy (in the Pareto sense). This does not mean that the poor will be better off: starting from a distribution of income and environmental impacts with market failures, there will be winners and losers. The possibility of efficiency gains only means that the winners in principle would be able to compensate the losers sufficiently given the size of the gains, but such redistribution of gains certainly does not occur automatically. This is an issue we will return to later on in the discussion of green growth.

### *Labor Demand, Sector and Spatial Dimensions*

Beyond a standard treatment of environmental externalities and policy responses, it is helpful to add specifically sectoral, spatial and dynamic elements, relevant for understanding poverty. They are crucial in setting the stage for how environmental pressures and green growth strategies affect the poor. First, there are sectoral elements to poverty and the way it interacts with growth. Most of the poor are living in rural areas, still engaged in agriculture, either as smallholders or farm workers. Their labor productivity and therefore their incomes are low. At the same time, a substantial and probably increasing number of the poor are living in urban areas (Ravallion et al. 2007), working in low paying jobs or self-employed in the informal sector. A high dependence of the poor on agriculture or self-employment implies risky livelihoods, with limited wealth or sources of informal or formal insurance to protect themselves against these risks. Rural livelihoods are most directly linked to environmental and agro-climatic risks, with particularly important implications given the pressures of climate change.

This is still nevertheless only a static picture. Poverty reduction will require structural and sectoral change, with a decline in the dependence on agriculture for the poor, a vast reduction in the number of peasants, a reduction in informal sector employment and increasing wage employment in other sectors. Furthermore, besides a change in livelihoods, this structural change will also have large spatial dimensions, implying large migration out of rural areas, into urban areas (Dercon, 2009). Large-scale migration is a standard feature of the process of large-scale poverty reduction. For example, in the last two decades, poverty reduction was accompanied by large migration in China, with well over 170 million people moving into cities from rural areas since 1990 (Chan, 2012). Internal migration is also closely linked to welfare increases (Beegle et al. 2011).

Successful poverty reduction will have other spatial dimensions too, with a massive increase in the coastal population (as this is where economic activity will increasingly be located due to comparative advantage) and a vast reduction of the size of the population living in areas relatively far away from urban areas and from the coast (as incomes in agriculture can only keep up with other incomes where demand is located or where transport is cheap).

Of course, this is not just a deterministic process of the poor uprooting, changing livelihoods and migrating, as a necessarily successful strategy to move out of poverty. With their limited capital sources, and often only their labor as an asset, the poor will not be the engine of growth and transformation themselves. They can at best be responsive to changing opportunities, but even then these processes are fraught with problems and risks, even in a context of rapid growth. The speed of these sectoral and spatial dimensions of poverty change during growth is largely dependent on the evolution of labor demand of the growth process: are the growth sectors in the economy labor-intensive? The higher the growth of labor demand, especially for the lower skilled labor that the poor are largely endowed with, and the more the poor are able to respond to it via sectoral and spatial mobility, the faster the poverty reduction in the face of growth.

### *Poverty Dynamics*

There is no necessity that this transformation will happen, always and everywhere. Others have argued for the existence of combinations of economy-wide processes that could results in low growth and high poverty ‘traps’, such as linked to the natural resource curse, conflicts, governance, geography or even aid (Sachs, 2005; Collier, 2007). All these could stifle growth and the economic transformation

needed to lift large populations out of poverty. Here, our focus is on the constraints that stop particular poor populations *to benefit* from growth. A framework allowing for various market failures can again be helpful to illustrate the risks and constraints for poor populations, limiting their ability to move out of poverty, and potentially even trapping them in persistent poverty. Three types of market failures are conducive to such poverty traps. In each case, sufficiently high growth may well unravel these traps, but they offer a useful framework to assess later on the impacts of environmental change and green growth. As will be explained, each of these will limit the ability of the poor to take advantage of generally rising opportunities in the economy from growth, making growth less intensive in the endowments of the poor, more specifically their labor, by limiting the sectoral or spatial mobility, and as a result, less inclusive.

The first one is the failure of credit markets to offer capital to the poor. Credit market failures tend to lead to collateral requirements for access to credit, in turn resulting in those without collateral being frozen out of the market. If livelihood transformation requires at least some threshold level of capital, then a trap may occur whereby some can take advantage of opportunities, but others remain trapped in livelihoods with low returns. It offers much of the justification of microcredit interventions, even if their transformative success is not clearly proven (Armendariz and Morduch, 2010).

The second one relates to risk, and the lack of insurance for the poor. In this case, the poor may be induced to choose safety over higher returns, resulting in limited investment in high return activities and technologies, but choosing to hold safe assets and activity portfolios, implying a choice of poverty to reduce their exposure to even more dramatic risks (Dercon, 2002; Barrett and Carter, 2006). A variation of both credit and insurance market failures relates to the impact of large shocks, which if uninsured could push the poor back to lower levels of assets, from which, due to limited credit, recovery is slow or even impossible, leading again to poverty traps. We have to be careful with the evidence for poverty traps narrowly defined – in fact, it is hard to find strong evidence – but there is plenty of evidence of poverty persistence, in the sense of very slow escape and recovery, and actions that lead to a perpetuation of poverty to avoid risk (Dercon, 2009).

A third source of market failure relates to spatial externalities. In a positive form, they are the basis of increasing returns to scale linked to location and agglomeration, central to much thinking about growth and geography (Fujita et al. 2001). In a negative form, they imply that areas that stayed behind, for example linked to particular poor geographical features, or very limited human, physical or social capital, may find it increasingly difficult to keep up with progress elsewhere. In turn, this may make poverty here persistent (Ravallion and Jalan, 1997). Migration may be way of overcoming these spatial traps; however, here, interactions of various types of market failures conspire to make this difficult. Migration tends to be costly, and often only the relatively better off will manage to leave when opportunities are better elsewhere, while successful migration also tends to require networks in destination areas (Massey, 2002), and again, those from poorer geographical areas may find it even more difficult to set up these 'chains' of migration. The result is that some may end up trapped in locations with limited income opportunities.

Taken together, the spatial and sectoral dimensions are crucial in understanding the dynamic relationship between economic growth and the inclusiveness of growth, the extent to which the poor can participate. Poverty and its reduction is not just about the assets the poor currently own or have access to, the activities they are engaged in now and where they are currently living, but also these

dynamic processes of poverty reduction. As a result, the poverty impacts of taking into account environmental capital, for example by appropriately pricing environmental costs, should not just be assessed via the static consequences on the value of their assets, their current activities and location. Key will be to assess the nature of the growth process and its dynamic consequences on the poor: how will it mediate the relationship between growth and poverty, via its sectoral, spatial and other dynamic consequences. Key questions are then: how will it affect particular spatial or sector growth incentives, as well the extent to which growth is intensive in the production factors owned by the poor. Before turning to green growth policies, we will discuss how environmental change, not least climate change affects these dynamic processes at the moment.

## 3. Environmental Change and Poverty

How does environmental change affect the poor? There are various dimensions of change, such as the processes of deforestation, soil degradation, depleting of water resources and environmental pressures linked to urbanization and economic change. There are also risks linked to climate change, magnifying other environmental pressures, that appear likely to impact increasingly negatively in coming decades with mean temperature rises, sea-level rises, and spatial change in climatic conditions, as well as an increased frequency of extreme weather events. While the poor will no doubt be strongly affected, as they have limited resources to protect themselves, it will be helpful to give structure to the patterns of consequences by revisiting some of the features of the poor and the poverty reduction processes discussed.

A first feature of much environmental change is the gradual erosion of the environmental capital base in many rural settings, affecting the livelihoods of the poor, such as loss of forests, soil erosion, depletion of fish stocks and water scarcity. Lower environmental capital will make income generation harder, affecting wealth accumulation. Given credit market imperfections, this will then affect entry into more profitable activities, including the potential exit from agriculture or diversification into other higher return activities. Climate change is likely to accelerate these pressures, with some winners but many losers in terms of potential in agricultural production and other climate-dependent activities. Higher frequency of extreme weather events and disasters, including droughts and floods, will put further pressure on rural livelihoods, and contribute to the possibility of poverty persistence cycles as described above, as more investments focus on minimal livelihood security rather than higher returns, while assets are lost without scope for much recovery. In urban settings, livelihoods are also affected by environmental change, not least in many industrial or informal sector activities dependent on water and local fuel sources, such as wood. The lives of the urban poor are further blighted with increased scarcity of clean water and air, and pressures on sanitation and risk of disease. In both rural and urban areas, climate change and extreme events will also erode infrastructure and other types of public capital.

Just when higher incomes and growth could provide a route to economic diversification, investment in more productive or less environmentally damaging capital, and more resilience in the face of environmental change, those missing the boat may well end up trapped in lower return activities, perpetuating their poverty. Importantly, the economic and *sectoral transformation* required for rising

living standards is likely to be negatively affected: for example, negative impacts of climate change on agriculture are likely to affect growth and demand for labor, slowing down poverty reduction. Furthermore, unlike wealthier farmers, the poor may not have the means to make the necessary investments in agriculture to adequately adapt to new circumstances (including adjusting output patterns to take advantage of likely higher food prices), trapping them in low productivity agriculture. Of course, environmental degradation or specifically climate change may lead to winners among some of the poor – in areas where agricultural opportunities increase or where adaptation investments by richer parts of society provide jobs and higher labor demand.

The *spatial* consequences for economic activity and the location of the poor are also considerably affected, not least when climate change takes hold. Some have argued that climate change would create large numbers of displaced international 'climate migrants' – with figures of 200-300 million bandied about (Myers, 2002). The empirical basis for this scale of displacement is all but non-existent, however (Gemenne, 2011). On the contrary, lower wealth accumulation in rural settings is likely to hinder large-scale migration from marginal areas, contributing to 'spatial poverty trap'-like processes, in which populations may remain trapped in marginal and vulnerable areas (Black et al. 2011; Government Office for Science, 2011).

In a limited number of island and other locations, migration may be the only option, but its scale will be more modest. Nevertheless, there will be migration pressures, even if recent reviews suggest that other drivers of migration rather than just environmental (such as those linked to economic opportunities and socio-political pressures) may still dominate (Connell et al. 2011). Economic growth and transformation as experienced especially in Asia in the recent decades has meant rapid urbanization in low-lying coastal areas, and especially these areas will be vulnerable to extreme events and sea-level rises – in other words, migration *into* vulnerable areas has been the pattern, and is likely to continue (Blake et al. 2011) ). These relatively recent and poor settlers may end up becoming more marginalized, undoing some of the progress they experienced previously, unable to move into better areas of cities , exposing them to poverty, poor water quality and sanitation leading to deprivation and higher disease burdens (Black et al. 2011). Environmental change may then even cause the emergence of further spatial poverty traps, linked to higher threshold costs to move to better areas, as these settlers lack the wealth to invest in necessary adaptation.

All these processes would be exacerbated as pressures to reduce greenhouse emissions lower global growth, with impacts on the export demand of these transforming economies, and therefore jobs and income growth. These poor and emerging economies will also face pressures to reduce their own emissions, lowering growth opportunities as well. Indirect effects also could arise as pressures for global reduction of greenhouse gas emissions impose costs on the world economy, limiting global GDP growth, affecting the demand for poorer countries' exports, and thus their income growth. Furthermore, although poor countries generally have much lower greenhouse gas emissions than higher-income countries, pressures are also likely to grow to force low-income countries to curb their emissions as well. This would further increase the costs of transformation to a higher-return economy. Finally, climate change is only one source of environmental pressure with serious impacts in many developing countries and elsewhere. Curbing environmentally damaging activities now, to safeguard natural resources for the future as well as the population's health and the quality of life, will divert resources from growth-oriented opportunities and so impose further costs on their economies and current economic growth opportunities.

## 4. Green Growth and Poverty

Can alternative growth paths be designed to avoid these negative consequences linked to climate change and other long-term environmental pressures? 'Green growth' would allude to patterns of growth consistent with internalizing some or all environmental costs, but leaving sufficient opportunities for economic growth. Internalizing the social costs linked to negative environmental consequences makes the allocation of resources more efficient in a static efficiency framework. Hallegate et al. (2011) offer a careful discussion of when and why green growth could improve overall growth as well. Using an output (frontier-expanding) growth-equivalent of the static efficiency arguments discussed before, properly assigning values to environmental capital would raise potential output, as it unlocks production factors. The output gains are higher the less substitutable environmental capital is by other sources of capital. Furthermore, there could be efficiency gains on other production factors and more scope for technological progress. The key for these results is that we use an output measure that accounts for the environmental capital, and uses appropriate (shadow) prices. In that case, appropriately valued overall output should be able to compensate any losses in efficiency gains on other factors.[2]

As Hallegate et al. (2011) helpfully point out, growth in conventionally measured output or GDP may not necessarily increase. Environmental regulation could *reduce* conventionally measured output growth, if other growth-benefitting efficiency gains or technology changes are discouraged or not possible and the net return from those investments exceeds the net return from the environmental measure.[3] If particular green policies did reduce overall growth, then given the close link between GDP growth and poverty, its reduction may be slowed down. Much of the overall assessment of the beneficial impact of 'green' growth will depend on the overall welfare objectives, and the way we measure it, and whether returns to environmental capital, ecosystem services, are valued directly and appropriately.

Even if welfare gains are valued properly taking into account returns from environmental capital, a conclusion that there will necessarily be welfare gains from this internalization is only correct 'on average', for the welfare of the country as a whole, as any (appropriately valued) output gains create the possibility of compensation. But among a heterogeneous population, with different people owning

[2] Note, however, that in an endogenous growth framework, with growth externalities from accumulation of certain factors of production, this may not *necessarily* be the case. For example, in some models, temporary reductions in growth, due to increases in costs of production, may actually have permanent consequences, for example if, say, increasing environmental costs may reduce short-run resources for human capital investment, then overall growth may slow down. Of course, there is no necessity to this either – all depends on the specific endogenous growth model applied (Aghion and Howitt, 1998).

[3] This same reason could also be the case for *appropriately* valued output growth, if only *some* environmental regulations take place, without a full accounting of environmental capital so that not all factors are appropriately accounted for. A well-known welfare-economics result from the theory of second-best is that if only *some* and not all distortions are removed, then the allocation may actually become *less* efficient – both statically and dynamically. Applying this, then, for example, environmental regulations on some forms but not all forms of fuel-intensive transport may make the allocation less efficient, and slow down *appropriately* valued output growth.

different endowments and supplying or using factors of production, when we are starting from a particular allocation that did not take into account these environmental valuations, there will be distributional effects that do not necessarily imply Pareto improvements for each and every one *unless* there are also (lump-sum) transfers to compensate the losers. Given that this compensation rarely happens, it will be important to identify those policies that will favor or hurt the poor, even if overall they increase output or welfare measured in particular aggregate or global ways.

***Identifying Distributional Linkages***

This is our key concern in the remainder of the paper: under what conditions do different green growth policies indeed favor the poor. We are not considering further whether any overall growth trade-off exists between the greening of growth and growth itself. As discussed above, under certain assumptions, green growth that appropriately values environmental capital will increase overall output, potentially allowing compensation of any losers from this new growth path. But this does mean that this compensation will take place, and as a result, it does not follow that poor gain from this move to green growth. In other words, we only focus on the distributional costs and benefits of green growth. As green growth is framed in a growth context, the appropriate counterfactual to consider is how a green growth path would *change* the relationship between growth and poverty reduction. As was argued before, this will have to include a consideration of the spatial, sectoral and dynamic consequences of greening growth.

To do this, we first must make 'green growth' more specific, by articulating a number of possible families of policies that could have spatial, sectoral and dynamic consequences. We consider green growth to consist of three types of (linked) policies. First, they relate to policies that aim to change *prices or shadow prices* of environmental capital in order to internalize the externalities and other market failures inherent in the use and management of environmental capital. Key examples would be fuel prices, products with high intensity of fossil fuels (such as inorganic fertilizer), or water charges. As correct pricing, including via taxation and subsidies, may not always be feasible, it could also involve other non-price interventions to affect production processes, typically via *regulation*, for example on the nature of technology allowed in production processes – examples are environmental controls on vehicles, or manufacturing technologies linked to use of water or air.

A second set of policies considered are interventions that focus more directly on *investments* in low carbon, or otherwise less environmentally damaging production processes. The main instruments considered are public investment, and financing deals to encourage private investment or other forms of joint ventures between the public and private sectors. Examples here include the location and nature of transport or water infrastructure.

A third set of green growth policies might in principle be considered a subset of the other two, but this set of policies often is considered separately, particularly in the context of *climate change adaptation efforts and climate-resilient investments*. Examples here would be efforts to make growth more resilient to factors such as sea-level changes or increased risks in production linked to extreme weather events. In this class would be infrastructure investment to reduce the impact of sea-level rises, urban planning in flood plains, or development of lower risk crops for (increasingly) drought prone areas. What we are not considering here are policies that are in general good for growth but that also make sense to make growth more resilient in the face of climate or other environmental change and extreme events. Examples are human capital investments, flexible market access including by the poor,

appropriate macroeconomic policies and the development of better savings and insurance mechanisms (DFID 2010).

Although we do not yet have empirical evaluations of well-defined examples of 'green growth' in action in low-income settings, we can try to think conceptually through its consequences and at times offer suggestive evidence. In principle, there are several channels through which green growth could favor the poor. For example, it could ensure that negative costs on the poor's livelihoods are properly internalized by producers – such as halting unmanaged commercial deforestation, or halting pollution of water and air with serious health and sanitation consequences. In that case, this is likely to have positive consequences for the poor's living conditions, even if there may be reduction in incomes or GDP growth. Or it could make growth more labor intensive, so that labor demand could rise faster, with real income benefits. Or it could facilitate the structural transformation from agriculture into other activities, for example, as it may increase the prices and returns to those agricultural activities the poor are more involved in. Or it may increase the connectivity between poorer and richer areas and help the migration into less vulnerable areas. For example, if green growth investments are used to make roads connecting marginal and richer areas more resilient to extreme events.

These examples reflect four central dimensions to assess various 'green growth' measures and their consequences on the poor as developed earlier: first, (static) efficiency gains, whereby through internalizing externalities it may offer potential welfare gains to the poor; second, how green growth could contribute to poverty reduction via growth in employment, i.e. the labor intensity of green growth; third, the livelihood and sectoral transformational dimension of green growth, the extent to which it allows the poor to move into higher return activities, and finally, the spatial connectivity and mobility dimension of green growth, in terms of migration opportunities and the linkages between poorer and richer areas.

It is then possible to test a number of core examples from each of the three categories of green growth policies: environmental pricing and regulation, low carbon investment (as an example of clean investment more generally), and adaptation investment (as an example of risk-mitigation investment) as to their potential impact on the four dimensions above. The result will be that certain elements of the 'green growth' policy set considered may have far less positive (or even negative) impacts on poverty reduction than others. The list is definitely not exhaustive, but the overall patterns will become clear. Note again that these examples are not making any assumptions about their effectiveness to increase growth – this is left to other work to assess: we just assume that they may offer reasonable growth prospects that are 'green', and at most a simple narrative is offered about how this may happen.

***Environmental Pricing and Regulation***

Let us first consider charging prices for natural resources such as fuel or water that more closely reflect their full social opportunity costs of production and use. Considering first the poor as consumers, such charges would be paid in absolute terms more by the rich than the poor, simply because they are using more fuel and water. However, the welfare effects on the poor will be more appropriately assessed by the share of spending on these commodities, which is likely to be relatively high for the poor. In any case, the poor will be affected as consumers, irrespective of whether they are relatively less or more affected by the charges than are the rich. These impacts can be very considerable (Coady et al. 2006). In theory, the efficiency gains should allow for enough resources for lump-sum transfers to

compensate the poor, but ex-post redistributive measures in practice have been difficult to institute. This reflects an important general principle in *any* pricing-based green growth strategies: without complementary actions, the poor will be harmed as consumers. *Compensatory social protection must be part and parcel of any attempt to internalize shadow prices of natural capital, in order for the poor not to suffer reduced real income.*[4]

Forms of regulation could have similar impacts as pricing, even in cases that the poor may not be forced to pay more directly. In terms of distributional consequences, it is easy to imagine gains from regulatory changes for poor slum dwellers, exposed for example to air and water pollution. For their part, richer groups already will have more resources to adapt to environmental pressures (say, via private clean-up of local environmental damage or better garbage collection). Provided that the improvement in environmental consequences for consumers do not substantially or even totally exclude the poor, and the benefits they obtain any additional costs such as increased payments for public or private services (such as garbage collection), this may even be seen as pro-poor. In general, therefore, the design and enforcement of pricing policies or other regulation as part of green growth policies will determine the extent to which the poor will benefit.

Considerable capture by richer groups in society is also a distinct possibility. Regulation in the form of planning restrictions is a good example. As part of introducing green growth in some middle and low-income countries, stricter planning restrictions may exist for industries to be forced to not to locate near residential areas to protect air quality. But if the poor live in unplanned city settlements, then they may end up suffering more as these may not be covered by the regulatory protection and industries relocate towards these areas (Blake et al. 2011).

Thus far, we only considered the poor as consumers of ecosystems services from environmental capital. Poor households are also dependent for their incomes on environmental capital. Whether poor households are losing or gaining will therefore also depend on how regulation or pricing affects their production and job opportunities. Many of the poor are using environmental capital directly, for example in agriculture or fisheries. Internalizing environmental capital costs is then predicted to have a positive impact on sustaining this source of capital. But a longer-run improvement can be accompanied by lower returns to their activities in the nearer term. If the poor have relatively high discount rates (as seems reasonable, see Deaton, 1990), then they will put a relatively higher weight on nearer-term costs compared to the rich, and it is possible that the policy could redistribute wealth away from the current poor.

The poor may also be employed in industries with strong impacts on the environment. If the cost of using environmental capital rises, then there would be incentives to move to production processes that are less intensive in environmental capital, and more intensive in alternative production factors, such as physical or human capital (e.g. linked to more costly, and sophisticated technologies that require more capital and technical support). Although the size of these effects would depend on the

[4] The exception would be if the benefits for the poor that result from the new pricing of scarce resources – such as cleaner water or air – have a larger value to them than the costs of increased payments for public services (or for private goods whose costs are higher to reflect internalization of externalities outweigh the cost). This is possible, but they are likely to be potential benefits in the long run, for higher short-run costs in the form of reduced real income.

substitutability of environmental capital with these other capital sources, the poor tend to have less access to human and physical capital, so it may well make it harder for the poor to enter into these now more-profitable profitable activities and compete with wealthier incumbents or more-skilled workers.

A similar concern is related to labor demand of the type the poor can supply, and the consequences for labor demand from rising relative costs of using environmental capital, such as the impact of a relatively rise in fuel or water prices, or environmental regulation. Key for the poor would always be the low-skilled-labor intensity of this 'new' growth trajectory. Arguments are often made for 'green jobs', but a priori, the expectation that industries need to find more energy efficient ways of production may well lead to higher intensity in human and physical capital with sophisticated technologies, and these are hardly *necessarily* labor intensive. In any case, it will be crucial to explicitly assess the labor intensity of these alternative technologies for cleaner production: their efficiency and ability to sustain longer-term growth is not sufficient to make a judgment on whether these green growth changes are good for jobs, in the nearer-term and even in the longer-term if the poor continue to face barriers to acquiring additional human capital.

There is as yet no evidence for developing countries, so views expressed on this are mainly conjecture. Even though often taken for granted, the evidence on green jobs in rich economies in response to reducing incentives for use of environmental capital is at best not clear-cut, and positive effects – if any – are dependent on local circumstances (Huberty et al. 2011). Some of the highest quality evidence on reducing incentives for use of environmental capital gives one pause: using very detailed plant-level growth data, Greenstone (2002) shows that 590,000 jobs were displaced between 1972 and 1987 in the US due to a particular key environmental regulation, the US Clear Air Act. More recent work on more cost-effective incentive-based policy instrument finds milder negative effects (Harrington et al., 2012). In any event, how this would play out in the developing world is hard to judge, but maintaining labor-intensive growth internalizing environmental capital costs is not automatic. The discussion above indicates that the implications of the second for the first will depend on numerous adjustments of factor proportions and technology within sectors, and adjustments of output shares across sectors.

If the labor-intensity of growth cannot be maintained, this leads to further consequences, in terms of structural transformation. Growth that is less labor intensive will slow the labor absorption from agriculture. Moreover, inputs into agricultural growth, such as fertilizer, water or transport, will become more expensive. While this may preserve the environmental capital required for agriculture in the long run, it will slow down the agricultural and labor productivity growth that feeds structural transformation nearer-term. If policies reduce incentives for mobility (due to fuel costs, or transport regulation), the spatial development effects could be considerable as well, as longer distance trade may become less profitable, and with populations in more remote areas at risk to lose their connectivity with urban centers.

***Low Carbon and Other Environmentally-friendly Public Investment***

The second set of green growth policies we consider here is the direct implementation or encouragement by the public sector of environmentally-friendly investment. In the transport sector, for example, some capital may be allocated away from long-distance travel (say, highways connecting towns over large distances), making movement of goods and people more expensive and affecting the integration of economies. Investments may instead focus on local-level development (such as

supporting growth focused on local linkages, such as agriculture near cities and other local products focus). More marginal areas would then find it again harder to catch up as the integration of economies would be affected. In both examples the dynamic transformation of economies across sectors and space would be affected; whether the local growth effects would compensate for these negative effects is a priori not clear. Whether such plans would survive any serious economic scrutiny is nevertheless highly unlikely.

Among the more serious options, some have argued that investment into low carbon energy production could raise employment considerably, as it will require considerable labor. This view would lead to green growth as an engine of pro-poor job creation. For example, Engel and Kammen (2009) give some data on the labor intensity in years per GWh for various means of producing energy – including via gas, coal, nuclear, solar, geothermal, biomass, etc. The data suggest that much more labor is required per GWh for low carbon alternatives than for gas or coal. The implication of this higher labor intensity is that moving resources to invest more into low carbon alternatives would create more jobs for the same energy supply and therefore moving to low carbon would be pro-poor. However, this reasoning is incorrect, as this shift is not necessarily keeping the cost of fuel constant. At present, low carbon energy sources are more expensive, leading to some of the effects discussed above: the impact on jobs and the poor will require a proper accounting of the impact on labor demand both directly, in energy production, and indirectly in the rest of the economy as a result of changes of costs and price incentives.

Of course, investments in these sectors may well be subsidized to ensure that delivered energy costs themselves are not affected (while energy production is made relatively greener), and these jobs may then seem 'secure'. Huberty et al. (2011) reviews some of the evidence from richer economies, and correctly remarks that these jobs then are effectively 'Keynesian' demand boost jobs and their sustainability can be questioned. Even if 'Keynesian' consequences are expected (in that these jobs are securely created, due to the growth impacts of these investments), there is still an opportunity cost to creating jobs using this investment capital to be considered. If these investments occur with subsidies or public capital, then the net impact on pro-poor jobs should be compared to alternative ways of stimulating positive impacts on the poor. It really remains to be seen that spending resources on greening energy production is necessarily the best option. In many circumstances, a trade-off between poverty reduction and greening energy production would seem most plausible. Strand and Toman (2010) offer a further discussion of trade-offs between "green" investments beyond energy production and employment and poverty reduction.

***Adaption and Other Resilience-enhancing Investments***

A particular set of investments to consider further are those made to make economies more adapted to the new realities of climate change, including providing more resilience against extreme events. These are examples of a broader class of investments that can increase resilience (e.g. greater capacity to mitigate impacts of extreme weather with the current climate). It is sometimes hard to distinguish these from the previous two categories of intervention, although conceptually they differ: policies considered previously are largely trying to reduce the pressures on the environment (via pricing, regulation and environmentally-sensitive investments), while here we focus more on green growth investments that are intended to reduce the socioeconomic hazards we face as consequences of climate and other large-scale environmental change.

Again, the range of investments involved can be considerable. Their relative poverty impact will depend on similar considerations as discussed above: How will they affect prices for natural resources, such as fuel or water? How will they affect the quality of resources available, and the efficiency with which they are used? What are the labor demand consequences of these changes? Are these investments themselves labor intensive? But it is worthwhile to reflect briefly on two further aspects, the consequences for structural and spatial transformation, and thus on poverty.

There is considerable discussion on how to make agriculture, the main sector in which the poor are involved, and especially smallholder agriculture, more resilient to extreme events as well as adapted to shifts in potential climate conditions (e.g. Howden et al., 2007). In a context of poverty in potentially affected areas, it is not surprising that the response is largely focused on increasing local food security and self-sufficiency. Furthermore, to reduce the consequences of extreme events, the use of drought-resistant or salt-tolerant crops is promoted. These may be sensible policies, although they also can reduce mean returns. For example, many drought-resistant crops have low returns, leading to more security but also less poverty reduction (Morduch, 1995; Dercon 1998). Some alternative investments may reduce risks without affecting expected returns, for example flood protection infrastructure, even though nevertheless with substantial upfront investment.

More crucially, these policies appear to start from a premise that for poverty reduction, the best investment is to ensure that adaptation occurs at the location where the poor are located at present. However, as this adaptation investment has opportunity costs, for a dynamic process of poverty reduction, investing in agricultural resilience for marginal, increasingly drought-prone areas may not be effective or efficient. Investment instead could also be used to speed up diversification out of agriculture for affected populations, including via migration, in line with well-established routes of out poverty (Blake et al. 2011). Without such careful weighing of different alternatives for adaptation for the poor, one may exacerbate the risks that the poor remain trapped in unsuitable areas and with low-value livelihoods, and find it increasingly difficult to move out of agriculture as part of economic transformation. In short, processes consistent with spatial poverty traps as discussed earlier also are a risk with forms of adaptation investments that focus disproportionately on marginal rural areas.

Related concerns should be highlighted when considering adaptation or other resilience-enhancing investments in urban settings. For example, consider infrastructure investment to avert consequences of sea level rises or to protect assets against extreme weather events, in one of the many large coastal cities at risk. The highest direct economic returns for these investments would be from protecting the business districts or the residential areas of the rich, as these assets are of the highest value. Similarly, if relocation investments need to be done, these would again be most easily done by or for protecting business and the highest value assets in cities. Meanwhile, many of the poor are currently often located in flood plains and in unplanned settlements and would find it far costlier to permanently move, partly as their main assets are the houses they live in, without legal title. Large-scale infrastructure investments to protect them are hardly sensible, as these marginal areas should not be places of urban settlement. Sensible urban resettlement policies would need to be designed to ensure poor populations are not spatially trapped, with sensitive relocation strategies (see for example Patel et al., 2002, for a description of sensitive resettlement in the case of Mumbai; other examples are in World Bank, 2011).

## 5. Conclusion: Is Green Poverty a Possible Consequence of Green Growth?

There is no doubt that environmental change is affecting the poor disproportionately, while growth is essential for poverty reduction. Green growth is then offered in recognition of the need to sustain growth as required for poverty reduction while ensuring that environmental costs are internalized. So far, however, discussions of green growth have said little about *how* it is to be realized, other than conventional measures for externality internalization and innovation; and even less has been said about the potential consequences for poverty reduction of sets of policies that steer an economy onto an environmentally more sustainable trajectory.

In this paper, we do not take issue with whether growth can be sustained, even if environmental costs have to be internalized. However, it is argued that internalizing environmental constraints may change the patterns of growth with distributional effects that are not necessarily pro-poor growth.

In developing this, the paper focuses on three elements of green growth policies: pricing and regulation to internalize environmental capital costs (such as via fuel or water pricing, or regulation on water and air pollution); low-carbon and other environmentally-sensitive public (or publicly-stimulated) investments; and 'green' adaptation and other resilience-enhancing investments, in particular to deal effectively with the consequences of climate change. Four elements of assessing a green growth strategy for its effectiveness to reduce poverty are offered: first, the efficiency gains from internalizing environmental externalities; second, its labor intensity as labor is the main asset of the poor; third, whether it contributes to a transformation of the livelihoods and sector of employment of the poor, as most of the poor are either engaged in agriculture or in low return informal sector self-employment; and finally, how it contributes to the spatial transformation of economies during growth, and how it affects the opportunities for poverty reduction from internal migration and urbanization.

We argue that green growth could potentially have important negative consequences for the poor that may even outweigh the benefits for the poor from growth. In particular, *environmental pricing and regulation* may have considerable negative consequences for the poor as consumers, and would require specific social protection measures to compensate for price rises. In terms of regulation, there is a risk of potential capture by the rich, excluding the poor from the benefits of regulation or even make them worse off, for example by displacing pollution.

Environmental pricing and regulation affect the poor also as producers, as they may not have sufficient access to the wealth nor human capital required to substitute for more expensive energy or other natural resources in their production processes. Furthermore, as the poor often only have their labor to sell, they depend on the labor intensity of growth for rapid poverty reduction linked to growth. With higher costs of natural resources and other services of environmental capital, incentives are likely to be present to substitute human and physical capital for fuel and environmental capital. The labor intensity of such 'green' growth is crucial, however. More technology and capital intensive growth is unlikely to favor the poor.

*Low carbon and environmentally sensitive investments* also can have some impacts that are not pro-poor. For example, even if low carbon energy production may be more labor intensive, the size of the subsidy and/or public investment required may crowd out more pro-poor ways of spending resources. Other environmentally sensitive investments, such as promoting local food self-sufficiency or discouraging movement of goods and people, are also not necessarily benefiting the poor as poorer

areas may face increased risk getting trapped in low incomes and disconnected from higher growth areas.

The tradeoff is even starker when considering adaptation and other resilience-enhancing investments. In rural areas, they may induce the poor to adhere to lower return, but lower risk livelihoods with little chance of escaping even in increasingly marginal areas. This would follow if local adaptation is seen as the main option, rather than also considering the critical need for economic transformation, including options related to migration and investing in urbanization. In urban settings, creating climate-resilience may be targeted towards the most important economic assets, while the poor may end up trapped in environmentally marginal and unsuitable areas, but with little hope to be included in infrastructure plans for climate resilience.

Green growth is in no way necessarily bad for the poor. But the key message of this paper is that promises that green growth will offer a rapid route out of poverty are not very plausible; there may well be less rapid an exit than with more conventional growth strategies. To sustain growth, green growth also needs to be weighed in terms of its ability to reduce poverty. To sustain poverty reduction, green growth may involve giving up some possible environmental benefits, to keep the growth-poverty elasticity high. Since poverty reduction remains at the top of the agenda, different shades of green may be needed. In particular, poverty reduction is a powerful force for giving the poor more resilience to the increasing risks of climate change; they should not be asked to pay the price for greening the planet.

**Bibliography**


Aghion, P. and P. Howitt, (1998). *Endogenous Growth Theory.* Cambridge, MA: MIT Press.

Armendariz de Aghion, B. and J.Morduch (2010). *The Economics of Microfinance, MIT Press, 2nd edition.*

Blake, R., A. Grimm, T. Ichinose, R. Horton, S. Gaffin, D. Jiong, L. Bader and D. Cecil (2011), "Chapter 3: Urban Climate: Processes, Trends and Projections". In C. Rosenzweig, W.D. Solecki, S.A. Hammer and S. Mehrotra (eds.), *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network.* Cambridge: Cambridge University Press.

Carter, M. and C. Barrett (2006). "The Economics of Poverty Traps and Persistent Poverty: An Asset-based Approach, *Journal of Development Studies* 42(2):178-199.

Chan, K.W. (2012) , "China, Internal Migration", in I.Ness and P.Bellwood (eds.) *The Encyclopedia of Global Migration*, Blackwell.Publishing.

Coady, D., M.El-Said, R.Gillingham, K.Kpodar, P.Medas and D.Newhouse (2006), "The magnitude and distribution of fuel subsidies: evidence from Bolivia, Ghana, Jordan, Mali and Sri Linka", IMF Working Paper WP/06/247, Washington DC.

Collier, P. (2007), *The Bottom Billion. Why the Poorest Countries are Failing and What Can Be Done About it.* Oxford University Press.

Connell, J. (2011), "Quantifying change in ecosystem services and exposure to hazards, and non-environmental drivers of change, in low-lying islands and small island states over the next fifty years that might be relevant to migration", Paper DR16, *Migration and Global Environmental Change*, UK Government Office for Science, Final Project Report, Foresight, Government Office for Science, United Kingdom.

Deaton, A. (1991), "Savings and Liquidity Constraints", *Econometrica*, 59(5): 1221-48.

Dell, M., B. Jones and B. Olken (2008), "Climate Change and Economics Growth: Evidence from the Last Half Century", NBER Working Paper 14132.

Dell, M., B. Jones and B. Olken (2009), "Temperature and Income: Reconciling New Cross-Sectional and Panel Estimates", *American Economic Review Papers and Proceedings*, 99(2), May: 198-204.

Dercon, S. (1998), "Risk, Crop Choice and Savings : Evidence from Tanzania", (1996), *Economic Development and Cultural Change,* vol. 44, no. 3, April, pp. 485-514.

Dercon, S. (2002), "Income Risk, Coping Strategies and Safety Nets", (2002), *World Bank Research Observer*, December, Vol. 17 (2), pp. 141-66.

Dercon, S. (2009), "Rural Poverty: Old Challenges in New Contexts", 2009, *World Bank Research Observer* vol. 24: Spring, pp. 1-28

DFID, (2010), "Climate-Resilient Growth: Preparing Growth Strategies for Climate Change", How To Note, A DFID Practice Paper, November.

Ellis, F. (2000), "Rural Livelihoods and Diversity in Developing Countries", Oxford University Press.

Engel, D. and D. Kammen (2009), “Green Jobs and the Clean Energy Economy”, Thought Leadership Series #4, Copenhagen Climate Council.

Fomby, T. , Y. Ikeda and N. Loayza (2012). “The Growth Aftermath of Natural Disasters," *Journal of Applied Econometrics,* forthcoming.

Fujita, M., P. Krugman and T.Venables (2001), *The Spatial Economy: Cities, Regions, and International Trade*, MIT Press.

Gemmene, F. (2011), “Why the numbers don’t add up: a review of estimates and predictions of people displaced by environmental changes” *Global Environmental Change* 21, supplement, S41-49.

Greenstone, M. (2002), "The Impacts Of Environmental Regulations On Industrial Activity: Evidence From The 1970 And 1977 Clean Air Act Amendments And The Census Of Manufactures," *Journal of Political Economy*, 110 (6): 1175-1219

Hallegate, S., G.Heal, M.Fay and D.Treguer, (2011), “From Growth to Green Growth”, Policy Research Working Paper WPS 5872, The World Bank, November.

Harrington, W., R. Morgenstern, and D.Velez-Lopez (2012), “Tools for assessing the costs and benefits of green growth: the US and México.” Paper presented at the Green Growth Knowledge Platform conference, January 12-13 2012

Howden, M., J.-F.Soussana, F.N.Tubiello, N.Chhetri, M,Dunlop and H.Meinke (2007), “Adapting agriculture to climate change”, Proceeding of the National Academy of Science, USA, 104(50): 19691-96.

Huberty, M., H.Gao and J.Mandell (2011), “Shaping the Green Growth Economy: a review of the public debate and the prospects for green growth”, The Berkeley Roundtable on the International Economy.

IPCC (2007), Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Core Writing Team, Pachauri, R.K. and Reisinger, A. (Eds.) IPCC, Geneva, Switzerland.

Massey, D., J.Durand, and N.J. Malone, (2002), *Beyond Smoke and Mirrors: Mexican Immigration in an Era of Economic Integration*, New York: Russell Sage Foundation.

Morduch, J. (1995), “Income smoothing and consumption smoothing”, *Journal of Economic Perspectives*. 9(3):103-114.

Myers, N. (2002), “Environmental Refugees: A Growing Phenomenon of the 21st Century”, *Philosophical Transactions of the Royal Society B*” 357(1420): 608-13.

Noy, I. (2009), “The Macroeconomic Consequences of Disasters”, Journal of Development Economics 88 (2009): 221–231.

OECD, (2011), *Towards Green Growth*, Paris.

Patel, S., C.d’Cruz and S.Burra (2002), “Beyond evictions in a global city: people-managed resettlement in Mumbai”, Environment and Urbanization 14: 159-72,

Raddatz, C. (2009), "The wrath of God: macroeconomic costs of natural disasters", Policy Research Working Paper Series WPS 5039, The World Bank.

Ravallion, M. (2000) “Growth, Inequality and Poverty: Looking Beyond Averages”, 21 (11): 1803-1815.

Ravallion, M., S.Chen and P. Sangraula, (2007), “New Evidence on the Urbanization of Global Poverty“, World Bank Policy Research Working Paper 4199.

Ravallion, M. and J. Jalan (1997), “Spatial Poverty Traps?”, World Bank Policy Research Paper no 1862.

Sachs, J. (2005), *The End of Poverty: Economic Possibilities for Our Time*, Penguin Press.

Strand, J. and M.Toman, 2010. “Green stimulus,economic recovery, and long-term sustainable development” Policy Research Working Paper Series 5163, The World Bank.

UK Government Office for Science, (2011), *Migration and Global Environmental Change*, Final Project Report, Foresight, Government Office for Science, United Kingdom.

World Bank (2010), *World Development Report 2010: Development and Climate Change*. Washington DC: World Bank.

World Bank, (2011), Building Resilience to Disasters—*Delivering Results. Global Facility For Disaster Reduction And Recovery Annual Report 2011*.