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Climate Change, Green Growth and Aid Allocation to Poor Countries

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Abstract

With serious impacts of climate change looming in a few decades, but current poverty still high in the developing world, we ask how to spend development aid earmarked for the poor. Poverty reduction tends to be strongly linked to economic growth, but growth impacts the environment and increases CO_2 emissions. So can greener growth that is more climate-resilient and less environmentally damaging deliver large scale poverty reduction? Can aid be used for effective poverty reduction now without affecting carbon emissions substantially? We argue that there are bound to be trade-offs between emissions reductions and a greener growth on the one hand, and growth that is most effective in poverty reduction. We argue that development aid, earmarked for the poorest countries, should only selectively pay attention to climate change, and remain focused on fighting current poverty reduction, including via economic growth, not least as future resilience of these countries and their population will depend on their ability to create wealth and build up human capital now. The only use for development aid within the poorest countries for explicit climate-related investment ought to be when the investments also contribute to poverty reduction now, including for increasing resilience to current impacts of environmental shocks, or when the investments done now have serious intertemporal 'lock-in' problems so that they have implications also for when climate change bites by 2050. In our conclusions, we offer a series of concrete principles to judge development spending.

Keywords: Green growth, poverty, environmental externalities

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Introduction

There is increasingly little doubt that man-made climate change is occurring. It is leading to changes in mean climate and in its variability, and more extreme weather is expected to become more frequent (IPCC, 2013). There is also little doubt that poor countries and the poor within countries are at most risk to suffer. While the impact of mean climate changes on poor countries is likely to be spatially heterogenous and uncertain, the increased variability and extreme weather events are bound to have larger impacts on poor countries and the poor in general (IPCC, 2012). There is good micro-evidence that the poor are least able to deal with serious climatic shocks and thus sustain high losses in terms of incomes, assets, health and human capital (de la Fuente and Dercon, 2008). Raddatz (2009) documents large declines in GDP per capita from climate-related disasters in low income countries, four times the size of the declines in rich economies in percentage terms. 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. As higher frequency of extreme events will leave less time for recovery, these asymmetries in relative vulnerability are unlikely going to reduce.

Currently, with or without climate change, many poor countries and poor people are considerably affected by climate shocks. They need increased resilience now, in the form improvements to their living conditions, economies and societies so that they are not as highly sensitive to climatic conditions as they are now. Nevertheless, time scales matter, even though often forgotten. The more serious consequences of climate change are typically predicted to start hitting when temperature increases reach about 2°C, which is predicted to happen somewhere between 2040 and 2050 (Meinshausen et al. 2009). Therefore, poor countries and people have only have a window of opportunity of about 30 years or so to build up resilience to the systemic change in climate.

Meanwhile extreme poverty remains high: World Bank data suggest that in 2010 about 1.2 billion people were living on less than USD 1.25 per day in 2005 PPP (Purchasing Power Parity) terms, or about 18 percent of the world population.[3] This hides substantial progress, and the Millennium Development Goal (MDG) of halving world poverty in percentage terms between 1990 and 2015 may well be obtained – albeit substantively due to large progress in a small number of countries, most notably China. In the recent decade, there also are positive signs, with strong growth in the developing world: growth in the developing countries of Asia persisted, increasing from 7.4% in the 1990s to 8.2% between 2000 and 2012, but also in sub-Saharan Africa growth, increasing from 2.2% in the 1990s (or near zero in per capita terms) to 5.5% since 2000 (IMF, 2013). Poverty has continued to decline in most of Asia, with India, the country with the largest number of poor people (with a head count in the latest data drifting under 30% but with a population of 1.2 billion) beginning to bring down extreme poverty substantially and likely to contribute most to poverty declines in coming years. Even in sub-Saharan Africa, the poverty head count has now been declining since the late 1990s, and in recent years faster than population growth, so that the number of poor people appears to have reached a turning point.

Growth has been instrumental to this decline in extreme poverty. No country has reduced extreme poverty considerably without sustaining high growth. There is also a strong and persistent co-

[3] Data on extreme poverty are from the PovCal, at the World Bank http://iresearch.worldbank.org/PovcalNet. See also Basu (2013) for a discussion of recent trends.

movement of mean incomes in economies and the incomes of the poorest groups (Dollar et al. 2002, 2013) even if this may not be quite the same as proving a necessary condition for poverty reduction (Basu, 2013). In any case, 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). Recent growth and poverty reduction across the developing world has made observers and policy makers more positive about the prospect of removing extreme poverty in the current generation (Ravallion, 2013; United Nations 2013).

Growth and poverty reduction has also been found to be important specifically for increased climate change adaptive capacity. Noy (2009) showed that higher GDP per capita, as well as better institutional and human development indicators reduced losses from climate-related disasters. Micro-data show that those with more assets can cope better with severe shocks, not only but not least those linked to climate (de la Fuente and Dercon, 2008). The best predictor for resilience is development.

So where does that leave us now? It is likely that the poorest countries will find building up their wealth much harder once climate change really starts hitting in about three decades. Their window of opportunity to increase their resilience seems short. Furthermore, reducing poverty and building up human development now is no doubt going to require increased private and public resources, and without economic growth, many of these countries are unlikely to be able to finance these. But economic growth as we have known it in the last century has been particularly damaging for the environment and the major contributor to anthropogenic climate change. So what ought these countries do? And for those countries offering aid to these countries, including the UK, how should they respond to these challenges?

Our focus in this paper is strictly on the poorest countries in the world. A group of about 50 countries currently have per capita GNI below USD 3500 in current international dollars (expressed in PPP, so that a dollar in each country has the same purchasing parity as in the US). This threshold is chosen in line with the analysis in Ravallion (2010), as a level of income per capita in a country at which it becomes plausible to use redistribution, i.e. taxing the richer part of the population, to eliminate extreme poverty.[4] In a similar vein, it could be considered as referring to a country where grant aid loses some of its legitimacy, as its own reasonable taxation and redistribution efforts ought to be sufficient to eliminate extreme poverty. These countries account for about 65% of current extreme poverty, and include many lower middle income countries. This list does not include India as its GNI is now very close to USD 4000 in current international (PPP) dollars, even though it accounted for a quarter of the world's poor in 2010 (nor other richer large countries such as Indonesia, China and the Philippines).

[4] Ravallion (2010) asked whether extreme poverty could be eliminated using taxation of the better off in each country, here defined as those earning more than USD 13 per capita per day in PPP, which is similar to the US poverty line. This is hardly a rich group by international standards. In most poor countries, Ravallion finds that the marginal tax rate of this group would have to be above 100% to eliminate poverty. Focusing on consumption expenditure per capita as taken from the national accounts, expressed in PPP, he also finds that virtually no country with PPP per capita below USD 2000 could do so, and once it starts approaching USD 4000, the marginal rate is low, so that it is unlikely to be economically distortive or politically impossible. I use USD 3500 as the threshold here, but it is based on GNI and not on consumption as part of GDP data.

As growth appears to remain crucial for these poorest countries, it has become quite common in response to these challenges to argue for a development and growth process across the world, including in the poorest countries, that is greener and is less contributing to emissions (United Nations, 2013). Such 'green growth', in which the need to protect the environment is internalized, while leaving sufficient opportunities for economic growth, has been proposed as one that is both feasible and can be supportive of poverty reduction (OECD, 2011). In the next section, we briefly discuss the scope for such growth processes for the poorest countries and revisit the question whether such growth is good for the poor, building on Dercon (2012). Our argument is that such green growth is by no means a priori more poverty reducing than 'brown' growth – indeed, greening growth may well have considerable negative poverty impacts in the near future. The next section uses some of the insights from this discussion to ask how the poorest countries ought to allocate resources, in response to looming climate change, if there is a trade-off between poverty reduction now, and more climate-resilient and less carbon-intensive growth in coming decades. Finally, we translate some of this discussion in more practical principles for aid allocation by rich countries like the UK: how to spend aid to fight poverty in a world with substantial future climate change risks.

Green Growth and Poverty

When is growth green? While green growth easily stated, it is not always clearly defined. The definition as in OECD (2011) referring to "patterns of growth consistent with internalizing some or all environmental costs, but leaving sufficient opportunities for economic growth" hardly offers precision and leaves much room for interpretation and trade-offs. To make the discussion more tractable, it is useful to distinguish three types of 'green' growth policies often promoted and use them to discuss how to think about their growth and poverty reducing impacts. In line with Dercon (2014), we consider three set of policies. The first set are 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.[5] Examples include fuel prices, products with high intensity of fossil fuels (such as inorganic fertilizer), or water charges. Correct pricing, including via taxation and subsidies, may not always be feasible, so these policies 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 and technologies – including in energy. The main instruments considered are public investment, and financing deals to encourage private investment or other forms of joint ventures between public and private sector. Examples here include low carbon energy investment, the location and nature of transport, water and sanitation infrastructure and investments in R&D for greener technologies. A third set of green growth policies are *climate change adaptation efforts and climate-resilient investments*. In principle, they might be considered a subset of the other two, but this set of policies often is considered separately, not least in the context of development. Examples here would be efforts to make

[5] I will use the term 'environmental capital' as referring to a country's renewable and non-renewable resources.

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.

Would any of these policies in general be good for growth, in a developing country context? The impact of the first set of policies on growth may well depend on the concept of GDP and growth used. Overcoming missing markets and externalities, and getting the prices 'right' would offer efficiency gains in terms of output in standard static models. Dynamic versions can be formulated as well. For example, Hallegate et al. (2011) use an output (frontier-expanding) growth-equivalent of the static model in which they properly assign values to environmental capital and show that it would raise potential output, as it unlocks production factors.[6]

That higher output is generated is only necessarily true for appropriately value output – i.e. a measure of GDP that values inputs and outputs at the (environmentally) right prices. As Hallegate et al. (2011) concur, growth in conventionally measured output or GDP may not necessarily increase, and could well reduce. Environmentally correct pricing or appropriate regulation could *reduce* conventionally measured output growth, for example, 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. This should hardly be a surprising potential outcome, not least in the short run: costs will be imposed on production processes, and while new markets and opportunities will emerge, it is reasonable to expect that output will be affected.

All this makes simple guidance on the output impacts of green growth difficult, let alone the impact on poverty reduction. The second and third sets of policies similarly cannot offer necessarily overall growth benefits, as they are largely about using public resources to boost these 'green' investments. Whether this will be good for growth or not, not least in the context of developing countries, has partly to do with the overall impact of public investments on growth in these countries, and specifically, whether the opportunity cost of investing in these greener forms of investment outweigh the benefits, overall and over what horizon. The yardstick should not be conventionally measured growth or rates of return, but a reasonable assessment of costs and benefits would require green accounting, whereby all environmental costs and benefits are appropriately included in the appraisal, as a sensible check on the more standard costs-benefit analysis using only observed market prices.

The presumption has to be that for many of these investments the benefits will largely be further into the future – possibly several decades – although not necessarily all (World Bank, 2012). For some fast-growing developing countries, not least China, the benefits of embarking on such policies – especially the second set, focusing on targeted investments in low carbon technologies and processes – is particularly attractive, as part of its growth strategies and the diversification from its current development model, and a long-run perspective is clearly feasible (World Bank and DRC,

[6]In an endogenous growth framework, this simple result does not necessarily hold, for example if we have growth externalities from the accumulation of particular factors of production. In some growth 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. Temporary slowdown in human capital investment may then lead to permanent growth losses. Of course, there is no necessity to this either – all depends on the specific endogenous growth model applied, and its empirical relevance (Aghion and Howitt, 1998).

2012). For others, especially for many of the poorest economies, the need for a return in the short or medium run is much more binding, so it would be particularly valuable to identify a set of policies that have high returns in the short run as well. Examples may be low carbon energy for some countries, for example those with substantial hydropower opportunities. IRENA (2012) shows that hydropower tends to compete very favourably with carbon-fuel energy sources in much of Asia and Africa, even at current prices, provided it is available. As it is a low-carbon source of energy, investment in hydropower in those areas suitable for it would then not just be sensible from a green growth point of view, but also in GDP terms within a relatively short time frame (even if it may involve some environmental costs that may make it contentious for some). But would investment in rural road infrastructure in the poorest countries, typically with a life span of much less than a few decades, really be best done with a climate change lens, both in terms of resilience to its impacts or its contribution to climate change? The resilience benefits would at best, if at all, accrue in several decades from now for these countries, making the appraisal strongly dependent on the way present and future streams are valued. We will return to this in the next two sections of this paper, including with a discussion of those investments that may have irreversible (lock-in) elements, which would make the case for greener investment in poor developing countries *now* stronger.

In the rest of the section, our focus is on poverty and we ask whether green growth is good for those currently poor. As mentioned earlier, the poor are most affected by climate shocks now, and are likely to be so in the future. They also often depend on environmental capital for their livelihood. Smallholder farming is the most obvious example, dependent on land, water and climate. But also the urban poor tend to depend on environmental capital for their livelihoods and living conditions, being more affected by pollution of air and water, and often living in floodplains in cities, with huge consequences for health and wellbeing. But does it mean that they are served by green growth policies in the poorest countries? Here we focus on those people currently poor, and do not discuss future poverty. Intergenerational equity and future poverty linked to climate change will be picked up in the next section.

In Dercon (2014) it was argued that the impact on poor people of green growth policies is not necessarily positive. In the short-run growth may well be lower, with likely poverty impacts. But beyond the overall growth impacts, there is likely to be a further trade-off: green growth versus poverty reduction.

Take the first set of policies – internalising environmental costs. Charging for the full social opportunity cost of using environmental capital will increase prices for commodities such as fuel or water. In absolute terms, the rich use more of these goods, and their bill will for these charges will be highest. Indeed, a big focal point for environmental policy campaigning are the large fuel subsidies in many developing countries. They are both large and well-known to be regressive. Developing countries as a whole spent about USD 630 billion in direct fossil fuel subsidies in 2012, according International Energy Agency estimates, but some would argue that that is a considerable underestimate (Whitley, 2013). It would seem a no-brainer that just abolishing these subsidies would not only offer huge resources but also realign incentives more in line with this element of green growth policies, and indeed much campaigning focuses currently on this. Would this necessarily be beneficial to the poor? The fact that these subsidies are regressive does not mean that the poor would not face a higher bill if the subsidies are removed: there is an income effect for

all, even if relatively speaking the bill for the rich would be higher. And it should then not come as a surprise that the political economy of this reform is difficult and complicated.

This is nevertheless a potentially 'Pareto-improving' policy but only if the economists' favourite principle for any reforms, the 'compensation principle', is applied not just in theory but also in practice: the efficiency gains of the removal of the subsidies can more than compensate the losers of this policy change (at least in terms of output appropriately measured). And here is the rub. As fuel subsidy and fuel tax reformers all over the world have discovered – from energy taxes in the UK to fuel subsidies reformers in Nigeria - fuel subsidies or taxation are easily exploited through populist politicking, as there is an income effect so that *all consumers* tend to be hurt by the removal of these subsidies or the introduction of higher energy taxes in line with true environmental costs. In general, the lesson is that removing fuel subsidies or any other environmental pricing and regulation is not necessarily 'good for the poor', even if these subsidies are regressive or the taxation may be progressive. It also implies that compensatory social protection must be part and parcel of any attempt to internalize shadow prices of environmental capital, in order for the poor not to suffer reduced real income.[7]

Dercon (2014) discusses other mechanisms by which the poor may or may not gain from green growth policies. For example, it may be that greener production is more dependent on capital-intensive technology, and less labour. The evidence on the dynamic impacts on employment in rich economies is at best mixed and context specific (Huberty et al. 2011; Greenstone, 2002; Harrington et al., 2012; Engel and Kammen, 2009 ; Strand and Toman, 2010). Green policies may affect spatial aspects of development, including the balance between rural and urban economies, and the links between urbanisation and growth – again, with plausible mixed impacts on the poor. Overall, there may well be trade-offs between green growth and poverty reduction now. There may be some windows of opportunity whereby poverty reduction now can be combined with greener growth, but a priori assuming that these are plentiful and effective would be wrong. It would risk making the poor pay for greening growth in developing countries.

Decision-making on growth in poor countries in the face of environmental change

So would this mean that there is no scope for a climate-lens for current investments in the poorest countries? Should we just consider boosting conventionally measured growth in the poorest countries, ignoring environmental and climate externalities? Should they not contribute where they can for the overall global public good for reducing climate emissions? This section will address these questions.

[7] Energy subsidy reformers may take a leaf out of Iran's efforts to start reforming their fuel subsidies in 2010. Government found no credible way of doing this – as parliament was unlikely to vote for this and general public opinion was sceptical that compensation for the poor and others would be forthcoming. In December 2010, Iran nevertheless managed to increase domestic energy and agricultural prices by up to 20 times, making it the first major oil-exporting country to reduce substantially implicit energy subsidies. A cash transfer scheme combined with a careful public relations campaign pre-deposited substantial compensation funds on 80% of the population's bank accounts that would only be unlocked if parliament voted for the reform. This credible commitment device and other careful preparation essentially did the trick (more details in Guillaume et al. 2011).

Investing in resilience

First, promoting resilience is a strong but also somewhat paradoxical argument for looking at investment now through a climate-lens. IPCC (2012) defines resilience as 'the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions'. At times, given its focus on negative shocks, it tends to be interpreted as investing to reduce downward spikes or to cope with these spikes more effectively. For much investment, reducing (downside) risk is usually at the expense of returns. Nevertheless, there are sensible dynamic arguments for avoiding shocks due to their longer term persistent growth effects (Dercon, 2011). The key is *whether and when* to invest in resilience to particular likely hazards.

Investing in resilience has an opportunity cost in terms of other investments. While for example building all housing typhoon-proof across South-East Asia would indeed bring down mortality and economic losses, spending resources on this may well result in reducing public resources for, say, health care or education: there are trade-offs, and zero risk is unlikely to be the optimal level of risk to face. Time horizons will matter as well: while no doubt certain risk-proofing investments will get high returns when climate change bites in a few decades, it does not necessarily mean that they need to be done *now.* It is likely that resilience investments in the poorest countries for those risks that are present today – such as sensible diversification or social protection systems for drought-prone areas – would make more sense than projects that base themselves on plausible but not quite proven increased risk (with some reasonable confidence). For example, the Horn of Africa and the broad Sahelian zone is a known drought-prone zone in Africa, so more resilience investments there make sense, and the case for moving resources away to other areas where risks may well increase in the future is not quite strong at this stage.[8] Finally, the strong correlates in all macro and micro-research on the determinants of resilience should not be ignored. The evidence in Raddatz (2009) and Noy (2009) emphasise how higher GDP growth, GDP levels and better human development indicators all correlate strongly with achieving increased resilience, so that in the face of future likely increased shocks (of forms hardly easily predicted), investing in growth and broad-based development may well be the *best* policy for many of the poorest countries, even if, as the previous section suggested, there is potentially a trade-off with 'green' policies.[9]

The argument for investing now in greener growth policies is not just about resilience, but also to safeguard the mere possibility of future growth and development once climate change impacts become more and more pronounced, or more in general, safeguarding the environmental capital basis for growth for future generations. Three issues will be considered in turn: how to appraise in the face of environmental and climate change, the issue of 'lock-in' in high carbon and unsustainable

[8]For example, the evidence from IPCC (2013) suggest that there is low confidence in any observed long-term (i.e., 40 years or more) increases in tropical cyclone activity, tornadoes or hail, while medium confidence that droughts in West Africa have become more intense and longer.

[9] An argument for more resilient investment as future shocks may otherwise wipe out these gains in development is also hard to maintain. Both Raddatz (2009) and IPCC (2012) find that, in percentage terms, the losses sustained by richer countries are smaller due to environmental shocks than by poorer countries. Raddatz (2009) and Noy (2009) offer macro-level analysis; the micro-evidence highlights the importance of ensuring that the poor are benefiting from these rising living standards, building up their assets and gaining access to social protection (Dercon, 2002).

development paths and the role of poor countries in global mitigation. These issues may well bring back a stronger case for 'green' growth policies.

Appraisal in the face of high poverty and looming climate change

First, on what grounds should decisions on growth-enhancing investment take a climate and environment lens? Here, the first step to a sensible answer is relatively straightforward. Any country – poor and rich – will need to make a call on how to value its own environmental capital in its appraisal, in line with 'green accounting'. Such green accounting is a pre-requisite for sustainable development, commonly defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). But as is well known, there is still scope for much interpretation, and judgements, including normative ones, are required to settle on the relevant prices, and indeed whether to assume strong or weak sustainability, with implications for any appraisal. Strong sustainability requires a non-declining value of environmental capital and its service flows. Weak substitutability requires a preservation of a non-declining overall welfare, so substitution between environmental capital and man-made capital is allowed.[10] It will also need to find a sensible way of weighing the present versus the future.

Nothing seems to have been more controversial in the environmental policy literature than the discussion on the appropriate social discount rates: how to weigh present versus future costs and returns, in the face of climate change (Stern, 2007; Nordhaus 2007; Weitzman, 2007), and this paper is hardly the place to examine the detail of these arguments. For most, the framework to think about the social discount rate is based on a simple version of the Ramsey model. This leads to a definition of the social (or consumption) discount rate as the sum of the pure rate of time preference (or utility rate of time preference) (δ), and the product of the growth rate of consumption (g) and a term describing how fast marginal utility decreases in consumption (θ). A number of general issues in appraisal have been brought out much more strongly in the wake of these debates, including whether to follow either a normative or a positive approach. In the former case, welfare judgments on the treatment of future generations feature strongly, often leading to arguments to use low social discount rates for intergenerational equity reasons driven by zero rates of pure time preference. In the latter case, judgements on relevant market rates of return dominate. The treatment of uncertainty about future growth also led to further contributions, leading to a broad consensus that also in practical applications, in the face of climate risk and especially the possibility of very low future correlated outcomes, the appropriate discount rates need to decline over time (Weitzman, 2013; Gollier, 2012; Hepburn and Koundouri, 2007). There may be good reasons to question the appropriateness of using discount rates (or indeed standard cost-benefit analysis) to do appraisal in the face of the highly multidimensional and uncertain prospect of climate change (Stern, 2013). But practical guidance is nevertheless required.

The UK government, for example, has guidance that aims to acknowledge at least some of these debates, by introducing a declining schedule for the social discount rate after 30 years for all government investments – starting from 3.5%, it is reduced after 30 years by 0.5% and gradually

[10] See Neumayer, 2003, for an extensive discussion. This is not just a normative but also a positive issue. Hallegate et al. (2011) show for example, that assumptions on this substitutability affect the growth benefits from 'greening' growth relative to 'brown' growth, including in terms of conventionally measured growth. The evidence base for this judgement is rather limited.

more later (HM Treasury, 2003). The basis for using this for a rich developed economy such as the UK seems reasonably firm. [11] The UK's official guidance, the Green Book, also states that for aid, this is not necessarily appropriate advice: "For international development assistance projects, a discount rate derived from estimates of the social time preference rate appropriate to the recipient economy should be used." (HM Treasury, 2013, pp. 90). The case for a declining discount rate is most solid when based on the possibility of very bad future outcomes and downward spirals; a *faster* declining schedule after 2050 may then be more reasonable for developing countries than the schedule applied in the UK.[12] It may also reach much lower levels and reach them sooner post 2050 for poor countries as they are going to be least resilient (i.e. their bad outcomes are likely to be worse than for rich countries.

But for the short-run, what guidance could one give to poor economies? Pure rates of time preference can be considered high reflecting impatience or other behavioural features, consistent with poverty (Becker and Mulligan, 1997; Frederick et al. 2002; Haushofer et al. 2013). A 'present-bias' or even hyperbolic discounting may seem a reasonable alternative. Social discount rates that *look* like hyperbolic discount rates as derived from behavioural studies can also be obtained more *directly* from a Ramsey model that allows for (absolute) subsistence constraints, without hyperbolic pure (utility) rates of time preference.[13] In this case, the resulting social (consumption) discount rate is higher, the closer consumption is to the subsistence level, as the marginal benefit of consumption (θ) is then very high. A declining social discount rate schedule emerges directly with positive growth, as θ would decline as the consumption becomes larger relative to the subsistence level.

The link with subsistence levels and social discount rates offers a suggestive way for approaching appraisal across poor countries: social discount rates may start at higher levels for lower initial living standards, with a declining schedule. Initial living standards could be measured by the mean standard of living or probably more appropriately, levels of absolute poverty. Nevertheless, with climate change looming, a sharper declining path would be reasonable with considerably lower social discount rates by about 2050, when the negative impacts of climate change will start hitting, possibly even zero. Subsequently, rates close to zero or even further declining rates to negative values would seem appropriate. When poverty declines or when we are considering projects starting closer to 2050, appropriate initial social discount rates ought to lower.

Lock-in in a high carbon development path

[11] This is not uncontroversial. Some have argued that also for richer countries, much lower discount rates ought to be applied currently for projects going beyond 2050 as there is a nonzero probability that a 4 degree world may emerge subsequently. Stern (2013) for example argues that the lasting damage and huge consequences of such a world are largely underestimated at present in most models. Dasgupta (2008) and others have argued to use negative discount rates for the longer term future, given the type of damage and consequences of climate change that are plausible, forcing a future bias in investment now.

[12] Note that it would also mean that over time, and the closer we get to a 2 degree world and 2050, this decline will have to be done after fewer years of the project.

[13] In particular, instead of using instantaneous utility, $u_1(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}$, suppose we use a Stone-Geary formulation with $u_2(c_t) = \frac{(c_t - C_{\min})^{1-\gamma}}{1-\gamma}$ in which C_{min} is a minimum subsistence level needed to reach a minimal standard of living. See also Steger (2000).

One of the key weaknesses of conventional project appraisal is the assumption that investments are marginal: they are not large enough to change the underlying distribution of future growth. In aggregate this is not an appropriate assumption, and one of the big arguments for a stronger climate lens for assessing public investments is that together they are non-marginal and the overall growth and dynamic general equilibrium effects should not be ignored, both nationally and globally.. Furthermore, it is a common but ignored criticism that most economic models, even in developed countries, hardly take into account the risks from the overall development paths taken (Stern, 2013 and Pyndyck, 2013 for discussions).

There is little doubt that many rich economies, as well as some of the fastest growing emerging economies appear to use a high carbon path that hardly is sustainable, if global externalities are appropriately considered. For example, according to the World Bank World Development Indicators, the three BRICS economies China, Russia and South Africa, have relatively similar CO_2 emissions per USD GDP measured in 2005 PPP (about 0.91 kg per dollar per year in 2010), about double otherwise highly emitting rich economies such as Canada, Australia and the US. At the moment, low income countries and many lower middle income countries do not appear to be locked in such patterns. For example, the 52 countries with GNI per capita (in international dollars) below USD 3500[14] had a footprint of about 0.20 kg per dollar per year.[15]

Nevertheless, this risk cannot just be ignored. We first look at this entirely from the country's perspective (ignoring the global externalities, which will be considered further below). When considering specific public investments, the overall path taken (including the sum of all public investments) has to be taken into account. In practice, this would mean that in appraisal of specific projects, the intertemporal values used for environmental capital must take into account those implied by the overall development path taken. This is of course not straightforward, not least as much of the overall portfolio and the long-term development path are hardly known with certainty at present: for example, how will pressures for global economic growth but also for global deals affect energy prices, or how will the impacts of global warming affect reasonable values for water? Cautious discounting helps only partially. A more sensible approach in the face of climate change (or broader environmental change), not least for a poor country, is to be conservative in the assumed values at least for those investments whose benefits and costs may be highly sensitive to possible 'bad' scenarios, i.e. those intensive in or dependent on resources likely to be strongly affected by climate change, and therefore may prove to be unsustainable.

[14] The list of 52 countries is: Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Ethiopia, Eritrea, Gambia, Ghana, Guinea, Guinea-Bissau, Guyana, Haiti, Kenya, Kyrgyz Republic, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Papua New Guinea, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Tajikistan, Tanzania, Togo, Uganda, Yemen, Rep. Zambia, Zimbabwe. Note that not all these countries have complete data necessary for the analysis here and below.

[15] Among these countries, a few may currently be on a high carbon path: based on data from 2010, the highest were Kyrzyg Republic (0.58 kg per 2005 PPP USD per year) and Yemen (0.41 kg per USD). Pakistan had about 0.40kg per USD and India (not included in the list of countries below USD 3500 GNI in international USDs) reached 0.53kg per USD in 2010. Note that a measure of emissions relative to the value of production, as used here, is more appropriate than a per capita measure as a reflection of the 'development' path. It may be argued that there are economies of scale in emissions per unit produced, for example from urbanization processes, although the evidence, not least for developing countries early stages of industrialization and development, is limited or not based on the most convincing methods (Jones, 1991).

Not all investments that use these resources intensively are automatically of this category: investments that use water, energy or land intensively or are dependent on climate are not necessarily causing unsustainable paths. The key is to focus on those investments *whose costs and benefits, appropriately valued,* would be strongly affected - including from the signal the investment it sends to private sector investments - when climate change starts causing large impacts. This will mean investments with a long horizon, and whose net benefits would stretch past 2050. The term 'carbon lock-in' is often used in this context, not least in terms of energy policy, as fossil-fuel (or other) energy investment choices imply such long-term horizons, leading to responses and complementary investments affecting long terms costs and benefits to society. Lock-in implies a long-term irreversibility, and creates path dependence. The policy guidance following from this is to conduct especially careful appraisal with investments that may involve a long-term lock-in into paths that are from the country's point of view, environmentally and economically unsustainable, especially when climate change starts hitting, as these would be particularly costly or at risk if the worse outcomes of climate change were to materialise.

To identify the relevant investments, focusing on investment that use environmental capital intensively is not enough[16]; the key here is to think of investments that may have benefits in the future in terms of the development path taken, and focus on those that have more lock-in and irreversibility. World Bank (2012, p. 17) offers some useful guidance on the type of prioritisation this may imply for developing countries. Examples of investments to focus on are those that have implications for coastal zones, forest cover, fishing stocks or potentially causing permanent damage to soils (all renewable resources that require careful management as they may be irreversibly destroyed) – and are part of the usual scope of environmental policies. But such a lens would also argue for much closer attention to land use planning, especially related in urban areas, as urban development patterns, including linked to water, sanitation, transport and energy efficiency will have huge and likely hard to reverse implications for future development paths, potentially locking them into high-carbon and irreversibly high pollution paths. Other possible investments, such as stricter wastewater regulation or even investment in drinking water, sanitation and solid waste management are given less priority, relative to the others, from the point of view of the implied development path, as existing systems do not involve much irreversibility. Interestingly, energy gets less priority than often suggested as "while lower-carbon energy from renewable sources is highly desirable, it is easier to build renewable plants later (even if this requires retiring thermal power plants) than to try and reverse poor land-use planning that has resulted in sprawling cities (World Bank, 2012, p.17)". Of course, this would still imply that low-cost and competitive renewable energy opportunities (such as hydropower in some countries) may be worthwhile investments; the point is that the lock-in argument plays less than with some other policies. The same would apply to carbon pricing, loss reduction in electricity distribution or removing energy subsidies – these may be worthwhile for the developing country involved, also for general economic reasons now or in the future, but delay is less costly in terms of the development path, than some choices that are irreversible.

[16] Note that this is *not* suggesting that environmental capital should not be valued for these more reversible investments, but rather that extra focus should be given to irreversible investments in view of possible more extreme future negative scenarios linked to climate change and long-term sustainability in such world, such as a 4 degree or even higher temperature world.

Should the poorest countries be concerned with mitigation?

The elephant in the room for this discussion is how the poorest countries ought to take into account the contribution of their growth and development path to the global externalities causing climate change. Indeed, the discussion thus far suggests that growth is likely to remain essential, not least for poverty reduction, and even for future resilience. Poor countries should still have a responsible valuation of their own environmental capital in their appraisal, and be cautious in the way they take into account the future, both via the relevant social discount rate and a careful assessment of those investments (or lack of them) that may cause lock-in and irreversibility leading to unsustainable growth paths from the country's point. Their low standards of living and high poverty levels would also make a relatively high short-run discount rate relevant. But thus far, we have ignored whether any of these choices ought to take into account the current and likely contribution of these countries to climate change in coming decades.

There is no doubt that OECD and other rich economies, but also emerging economies such as China, *ought to* adjust their development paths - to avoid the serious risks of an above 2°C world of man-made climate change. For these countries, a discussion of lock-in has to take fully into account the global externalities from their choices, and not just the country-level sustainability of their development paths. This would mean that their portfolio of public investments and policies should provide incentives to change this path. A global deal is essential to make the emergence of these measures credible. The poorest countries are also likely to commit to need to play their part for the world to move towards an appropriate global deal. But would this mean that these countries ought to take into account the *global* externalities from their emissions in their current development paths?[17] A simple answer could be that this is an irrelevant question, given free rider problems related to lack of a globally binding deal. Also, given the current contribution of the poorest countries, this would also seem rather questionable from a global (historical) equity point of view. For example the 50-odd poorest countries with GNI in internationally comparable dollars below USD 3500, present less than 3% of world output, 20% of world population and 1.5% of global emissions (World Bank, World Development Indicators). They also represent more than two-thirds of world poverty as measured by the USD 1.25 poverty line.

But given that earlier arguments strongly suggest that these countries will need to continue or accelerate growth in coming decades, not only to bring poverty down but also to increase their own resilience, it is a reasonable question, from a *global* (and normative) perspective, to ask what such growth would do for global emissions, and whether this could be allowed without reference to its implications for climate change? Recall that we use this GNI cut-off point of about USD 3500 as an estimate, in line with Ravallion (2010), of a level of income at which extreme poverty could be removed through redistribution by taxing the rich with incomes more than USD 13 in PPP per day at reasonable marginal rates. What would be the implications for global emissions of allowing these 52 countries to increase their growth substantially in the next two decades, to move beyond this cut-off point?

[17] For example, one way could be to insist that carbon prices consistent with incentives to reduce their emissions proportionately to the global emissions reduction are required.

Table 1 Features of Catch-up Growth for 52 Poorest Countries to reach USD 4000 GNI per capita in PPP

Current indicators	
Mean GNI per capita in 2010 (PPP)	USD 1870
2010 contribution to global CO_2 flow	1.5 percent
2010 contribution to global population	20 percent
Current carbon footprint per year (total) (Gigatons or billion metric tons)	0.46 GT
Current carbon footprint per capita (in tons per capita)	0.4 mtons p.c.
Per capita growth rate required to lift all countries to GNI per capita to USD 4000 by 2030	4.4 percent p.a.
Scenario 1: current population growth (2.3% p.a.) + current carbon intensity (0.20 kg per USD output)	
Carbon footprint in GT in 2030 (Gigatons or billion metric tons)	1.52 GT
Implied carbon footprint per capita (metric tons per capita)	0.8 mtons p.c.
2030 contribution to global CO_2 (assuming global freeze but fast growth poorest 52)	5 percent
Scenario 2: lower middle income population growth (1.5% p.a.) and higher carbon intensity (0.43 kg per USD output)	
Carbon footprint in GT in 2030 (Gigatons or billion metric tons)	2.84 GT
Implied carbon footprint per capita (metric tons per capita)	1.7 mtons p.c.
2030 contribution to global CO_2 (assuming global freeze but fast growth poorest 52)	9 percent
Memorandum items	
China emissions *increase* 2009-10 (one year)	0.59 GT
Memorandum item: OECD emissions level 2010	12.6 GT
OECD tons emissions per capita 2010	10.1 mtons p.c.
US emissions per capita 2010	17.6 mtons p.c.
OECD population share in global population 2012	18 percent

Source: calculations based on World Bank, World Development Indicators.

A simple calculation can offer some guidance and Table 1 gives the details. Mean GNI per capita in 2010[18] in the 52 poorest countries is around USD 1,870. Suppose we allow each country to increase their GNI per capita to USD 4000, i.e. above this limit. Their joint GNI per capita would need to grow at a rate of 4.4 percent per year to reach this level by 2030. They would need more growth in absolute terms, as their population is likely to keep on growing. Suppose population growth will not slow down (as one would expect when the country gets richer) but stays at recent levels of 2.3 percent per year. At their current carbon intensity of these countries' total GDP (0.20 kg per USD, scenario 1 in the table), their carbon footprint would increase to 1.52 GT per year or be 3.3 times current levels. This may seem a lot but it isn't that much as they start at very low levels in 2010: contributing only 1.5 percent of global CO_2 emissions and in absolute levels less that the *growth* of China's CO_2 emissions between 2009 and 2010. Despite this large proportional increase, their per capita claim on emission flows would also be only 8 percent of the per capita claim by the OECD or 4.5 percent of the claim per capita by the US, despite bringing levels of incomes per capita well into the middle income category for all the poorest countries in the world. Even if all emissions remain

[18] All values are in international USDs for 2010, i.e. in PPP but expressed so that the international USD has the same purchasing power as in the United States in 2010.

constant between 2010 and 2030 from all other countries in the world, the increase would raise the share of these poorest countries to less than 5 percent in total global CO_2 emissions (of about 31 GT).[19]

Of course, one may question the assumption that this growth can be obtained keeping current carbon intensity, not least if one takes into account that the countries near the USD 4000 GNI cut-off point have higher carbon intensity: the GDP produced by the 21 countries with GNI per capita between USD 3500 and USD 5000 was about 0.43 kg per USD GDP.[20] At the same time, the assumed population growth increase of 2.3 percent per year is above the population growth of these lower middle income countries of 1.5 percent per year. Using this carbon intensity for the growth to push the GNI of the poorest countries up to USD 4000 and allowing for a lower population growth rate (scenario 2) would yield a substantially higher footprint, but still only a global footprint of about 9 percent by 2030, assuming all other countries in the world freeze their contributions.[21] With a footprint per capita of only 1.72 metric tons per capita, this would is still be well below footprints of richer economies such as the OECD members.[22]

GTGTStill, these numbers would argue that the implications for a fast growth rate by the poorest countries, representing the vast majority and increasing share of the world's poor and hardly able to achieve extreme poverty eradication without substantial growth, should not be overestimated. Mitigation and global emissions reductions should not be seen as a priority for these poorest countries, given the importance of wealth creation in these countries for poverty reduction and resilience against the future consequences of climate change: their investment calculations ought to take their 'national' and own intergenerational externalities into account (leading to careful 'green' accounting and appraisal), but not necessarily the global externalities, given their current poverty.

How to allocate aid in the face of climate change?

Development aid may be allocated for various reasons. Here, we focus on development aid with the specific intention to promote development and poverty reduction across the world. For example, the UK's development aid is governed by the International Development Act 2002, which stipulates that development assistance should be done to promote poverty reduction.[23] It tends to focus on

[19] Including India in this analysis, it would imply we cover more than 90 percent of the world's poor. Allowing it to reach a GNI in PPP of USD4000 would not make much difference as it is very close to this level at present.
[20] The larger countries among these 21 countries are India, Indonesia, Philippines and Vietnam.
[21] The population growth rate assumption would result in 250 million fewer people in these countries compared to scenario 1. If we assumed a further scenario with 2.3 percent per year population growth then the global share in CO_2 emissions of the poorest 52 countries would go to 10.5 percent – not a dramatically high additional increase, showing the relatively limited role played by population growth despite occasional claims to the contrary.
[22] Note that this assumption of a global freeze in contributions (i.e. leading to total emissions of 31 GT) is not in line with projections based on current policies for the International Energy Agency, which would put likely global CO_2 emissions at around 35 GT by 2030, although above the 25 GT proposed as their 450 scenario (that comfortably keeps global warming below 2°C by the end of the century) (International Energy Agency, 2013).
[23] Specifically, the International Development Act states that "(1) The Secretary of State may provide any person or body with development assistance if he is satisfied that the provision of the assistance is likely to contribute to a reduction in poverty. (2) In this Act "development assistance" means assistance provided for the purpose of—(a) furthering sustainable development in one or more countries outside the United Kingdom, or (b) improving the welfare of the population of one or more such countries. (3) For the purposes of subsection (2)(a) "sustainable development" includes any development that is, in the opinion of the Secretary

the poorest countries: its full bilateral aid programmes are in some of the poorest countries as defined above.[24]

It is clear that the rich and industrialised countries (and increasingly some of the emerging economies) bear much of the responsibility for man-made climate change; moreover, they are still responsible for the vastly larger share of global emissions, so they ought to be willing to pay for the global externalities from their actions now and possibly in the past. However, it seems wrong to reinterpret development aid from a rich country as if this is a payment for the global externalities from their own development. If, as in the UK, development aid is to be focused on poverty reduction now (albeit in a sustainable way), then using this aid, for example, to buy emissions reductions where they are cheapest and/or to invest in the poorest developing economies so they would emit less at the cost of their own growth potential would be a rather unfortunate interpretation of the purpose of development aid. In that case, it would be as if one uses the aid budget in order to avoid having to cut emissions in the particular industrialised and rich economy. The argument here is not that such 'trade' would not be reasonable: indeed, from a global economic perspective, buying emissions reductions where they are cheapest is plausible, provided one compensates fully for the growth reductions that that may imply. It is reasonable that public resources may be used for this, but the use of the aid budget for this purpose is not appropriate, in line with its stated objectives. In short, *aid*, to the extent that it is earmarked for poverty reduction especially in the poorest countries, ought not be used for mitigation – other public resources ought to be earmarked for this.[25]

Does that mean that programmes ought *not* to be developed with a climate and environmental change in mind? Not at all! The guidance developed for the poorest countries in the previous section ought to be applied, albeit with a stronger lens focused on (extreme) poverty if aid is allocated on that basis. But we have to be careful not to confuse the urgency for *rich* economies to change their development paths (in order to offer future generation within these countries and across the world a decent future) with what is right for the poorest economies and the poor in the world. So *how* we should act and prioritise when spending public resources on such rich economies or to fight global externalities is likely to be different, compared to the needs and priorities for poor countries facing the future.

Developed countries have nevertheless expressed a preference to develop programmes that look at development through an environmental and climate change lens, for example as reflected in the ongoing discussions on the post-MDG framework, where sustainability of environmental capital

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of State, prudent having regard to the likelihood of its genera ting lasting benefits for the population of the country or countries in relation to which it is provided." There is clearly some room for interpretation for what this means for weighing current and future poverty, but in recent times, this has been largely interpreted as fighting current poverty, such as in line with the Millennium Development Goals, in a way that we would not lose these gains in the future.

[24] 25 of its 26 full bilateral programmes are in countries defined in this way. It also has a bilateral aid programme in the Occupied Palestinian Territories, whose GNI is likely to be just above the cut-off but full data are not available in the World Development Indicators. Two further countries are in the process of graduating from a bilateral aid programme: India and South Africa, even though they would be counted as full bilateral programmes during the data period considered.

[25] The rules at the OECD's Development Assistance Committee (DAC) that govern what can be called Overseas Development Assistance (ODA) appear consistent with this in that carbon credits to offset own emissions cannot be counted as ODA.

features strongly. The World Bank has recently also adopted targets on eradicating extreme poverty but also with long-term sustainability in mind, including in an environmental sense. The Chief Economist of the World Bank, Kaushik Basu, has argued that these targets would involve trade-offs (Basu, 2013). These trade-offs cannot be ignored. From a more pragmatic point of view, the discussion in this paper leads to a number of principles that would appear important when deciding on aid allocation in general and on such specific programmes in the poorest countries. They are summarised below and a flavour will be given what a reasonable portfolio of programmes with a climate lens could look like.

General principles

1. Growth is really important for the poorest developing countries: it is crucial for poverty reduction and human development now and the future. It also has a role to play in ensuring resilience for these countries when the impacts of climate change start to bite.
2. Time horizons matter for climate change. Globally, the priority clearly has to be to ensure that climate change is restricted, but for the poorest developing countries, climate change makes development *now* and in the coming decades even more important, including via economic growth as well as broader human development, as a means of building up wealth and resilience to cope with the challenges ahead. Calls for sustainability of development should not be used to limit the importance of eradicating extreme poverty now.
3. Green growth should not be presented as a panacea that will offer high growth for the poorest countries. While there may be elements of this that will have growth benefits in the relatively short run (maybe in the space of energy sources such as hydropower), by its nature, any growth benefits are likely to be in the long run. If green growth offers lowers growth, then a positive impact on resilience should also not be assumed.
4. Green growth is not necessarily good for the poor. This partly follows from the fact that the growth benefits tend to be long-term. But also: even if removing subsidies and introducing pricing to internalize environmental costs maybe progressive (in the sense that most of the costs will be paid by the rich), the poor will still have to pay more. Furthermore, by their nature, low-carbon technology investments or climate-resilient investments may result in labour market or sectoral impacts that are harmful to the poor, or inferior to other public investments for growth with largely poverty reducing impacts. Without appropriate social protection systems, well-intentioned green growth policies may be counterproductive for the fight against poverty now.
5. Lock-in of development paths may well be an emerging problem, but its importance for the poorest countries should not be overstated, and a careful and selective focus, based on good evidence, is important. It is hard to argue that the poorest economies, at their stage of development, industrialisation and CO_2 emissions, show much signs of general 'lock-in' that is irreversible, beyond in terms of the management of their own environmental capital. This should allow them to embark on a broader set of possible developmental directions, including via conventional means, rather than a more radical, but far more risky 'green growth' alternative.
6. A focus on emissions reduction or stability for the poorest countries would not just be unfair, as from a global perspective, their contributions remain very limited and would remain so even if they doubled their GNI per capita in coming two decades. For their development path, while a careful 'green' accounting for their own environmental capital is relevant, an emphasis on global CO_2 emissions mitigation would be misplaced. Aid may be used to pay for these countries'

contribution to a global deal, but to use it to compensate for lack of emissions reduction in donor countries would be wrong.

Allocation decisions to particular aid programmes

1. Appraisal should be done using careful accounting for the country's environmental capital, although, in general, *global* carbon values and the *global* cost of CO_2 emissions are not generally expected to be used. Note that if aid were to be offered to countries that are already richer, say above the USD 3500 GNI per capita cut-off point, then it would be totally reasonable to start expecting at least a partial accounting for CO_2 emissions. Examples here would be Indonesia or Vietnam; given its high poverty, India would be a borderline case, given its relatively high poverty and being very near to the cut-off point, but some accounting for global costs would be reasonable there as well.
2. Social (consumption) discount rates for early periods of a programmes should be higher, the higher initial poverty. [26] In line with gradually increasing uncertainty and the possibility of very bad outcomes post 2050, they should go down, to become close to zero (or even negative) post-2050. For countries with high extreme poverty, this will still mean that programmes that have short-run poverty reduction impacts will get relative priority. Note that while the pattern of social discount rates may look like hyperbolic discounting, they do not stem from cognitive bias, nor from market based opportunity costs of capital, but stem from normative arguments, including based on a reasonable valuation of subsistence constraints.
3. Programmes that risk 'lock-in' or irreversibility (for example, due to complementary private investment responding to the incentives from public policies and investments) ought to receive a more careful and cautious treatment, as plausible bad outcomes linked to climate change may lock recipient countries in economically and environmentally unsustainable paths, as seen from these countries' perspective. An evidence-based approach to lock-in is required, and the likely time-horizons of investments remain important. As was discussed, the permanent destruction of renewable resources or patterns of urban development may be more important *in this respect* compared to aspects of energy policies in these poor economies.

What could a climate and environmental programme portfolio look like using this lens?

1. A resilience focus and short-run poverty lens is most effectively combined in programmes that are focusing on those poor people with livelihoods that are *currently* strongly affected by climate and other environmental shocks, creating opportunities for jobs and income growth and diversification out of risky and low-return livelihoods. It is irrelevant here whether these are signs of man-made climate change or not – they are just programmes good for poor people.
2. Programmes that use resources and influence to promote climate-resilient growth and poverty reduction investments could be developed (a) to the extent that they offer short-run poverty reduction impacts and/or (b) to avoid a serious lock-in or irreversibility in locally or nationally

[26] It may be argued that using different appraisal values and consumption discount rates for aid compared to other public resources from rich economies creates inconsistencies in the donor's allocation decisions. Note that the meta-choice between aid and all other public spending purely to the direct interest of the donor country has to be done using consistent means. But, once this first of the two-stage budgeting is done, and once the aid budget is allocated including to particular countries, country-specific appraisal is reasonable. The UK's Green Book for example suggests using discount rates of relevance to the recipient country (HM Treasury, 2003).

unsustainable development paths in terms of future growth and poverty for this country. Lock-in refers to investment choices that are not easily or are extremely costly to be reversed, and may make you much more vulnerable to the consequences of climate change, for example with development in the wrong locations or using 'wrong' energy. Depending on the relative emphasis of the donor country, (a) or (b) may be a more important guiding factor – but programmes that combine (a) and (b) are obviously a sensible way of biasing programmes, with reasonable benefits from both perspectives.

To apply these principles, let us assume that donors or recipient governments may *choose* to allocate some resources to environmental programmes in one of the poorest countries considered. These programmes are not necessarily superior to other programmes for poverty reduction, but we just want to illustrate what a portfolio of environmentally or climate focused investment programme may look in view of these principles. Building on World Bank (2012) and the discussion above, Table 2 offers examples of possible investments that no doubt have implications for the environment and are often promoted as part of a development programme with a climate and environment lens.They are organised along the lines of irreversibility and short-term. All these policies or programmes could be considered to be favourable to the environment. However, only the right-hand column is likely to have high poverty benefits in the near future, while the left-hand column may offer a better allocation of resources, but benefits would be in the long run, risking poverty impacts now. To take some examples, energy demand management via tax and subsidies would have low poverty benefits unless it involves reallocating the efficiency gains towards the poor, including via appropriate transfer schemes. Climate change proofing of infrastructure that in the poorest countries is likely to have a life-cycle of only 10 or 20, such as some rural roads, or primary health care or local primary school facilities, would also seem not the best use of resources from a poverty point of view. Strict management of forests or fisheries may also be costly in the short-run for the poorest – if it restricts their access, even if in the long-run there may be benefits. The latter is nevertheless something that is essential to avoid lock-in, as these renewable resources may be permanently destroyed, so a climate and environment lens may want to prioritise this due to its lock-in effects, even if there are possible negative impacts on poverty. There are nevertheless programmes that are likely to satisfy both principles, and the bottom right box offers examples. For example, urban master planning, and the mix of transport, land use, infrastructure and waste management challenges can both avoid lock-in and, given the role of cities in structural transformation of economies, can have hugely positive impacts on poverty as well. For all these examples, details and evidence matter – but the table shows that a more selective, nuanced discussion of environmental and climate change issues may lead to be better choices for poverty now, while serving sustainability more efficiently. With all of these, the devil is in the detail, and one could only operationalise this by building up the evidence base for different settings.

Table 2 Environmental programmes through a poverty and irreversibility lens

		Fighting poverty NOW in poor countries	
		Low benefit in next few years	**High benefit in next few years**
Risk of LOCK-IN in poor countries (IRREVER-SIBILITY)	**Low Risk Lock-In**	ENERGY Low carbon, higher cost energy Carbon pricing Energy Tax/Subsidy reform without poverty lens WATER, SANITATION, HYGIENE Stricter wastewater regulation AGRICULTURE Intensification regulation or long-term climate proofing of smallholder agriculture INFRASTRUCTURE Higher cost hazard proofing of schools, health centres	ENERGY Low carbon, low cost energy Loss reduction in energy/electricity grid etc. Energy demand (incl tax and subsidies), with careful poverty lens WATER, SANITATION, HYGIENE Drinking water and sanitation Solid waste management
	High Risk Lock-In	ENVIRONMENT/AGRICULTURE: Deforestation Coastal zone/natural areas protection Fisheries management	CITIES/INFRASTRUCTURE Urban master planning: waste management, urban transport, urban land use, urban infrastructure WATER, SANITATION, HYGIENE Large scale water resources AGRICULTURE/FOOD Environmentally sensitive land use/ intensification in commercial agriculture

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