MAPS

Low Carbon Development and Poverty

Exploring poverty alleviating mitigation action in developing countries

Energy Research Centre, University of Cape Town

FINAL Draft

Cape Town, South Africa

Authors:

Holle Wlokas, Britta Rennkamp, Marta Torres, Harald Winkler, Anya Boyd, Emily Tyler, Catherine Fedorsky

MAPS

Mitigation Action Plans & Scenarios

Abstract

Climate change and poverty mostly fall into the adaptation category in the current research literature and relevant policymaking. The strong connection between poverty and adaptation rests on the assumption that poor countries produce only low carbon emissions. They will also be most affected by the impacts of climate change. Therefore, efforts on poverty and climate change concentrate mostly on adapting to the consequences of climate change.

If we acknowledge current findings of poverty research, we find that this separation between mitigation and adaptation does not hold anymore. Recent research suggests that poverty demographics have changed between 1990 and 2010. The majority of the poor nowadays live in middle-income countries, and not only in low-income countries. Emissions in middle-income countries increase, while their governments try to reduce emissions in the long term without jeopardising socio-economic development.

Climate change presents a threefold policy challenge for middle-income countries. They need to: i) design mitigation actions in such a way that they contribute to alleviate poverty; ii) reduce emissions, helping to slow global warming in a way that does not compromise the competiveness of their economies, because without collective action by all, the costs of inaction affect mostly the poor; and iii) prepare to adapt to the unavoidable consequences of climate change.

The paper unpacks the linkages between low-carbon development, mitigation and poverty in middle-income countries (where the majority of the poor live). Most middle-income countries pursue carbon-intensive development paths and will need to mitigate emissions towards low-carbon development paths. How can mitigation actions contribute to poverty alleviation?

An explorative analysis of mitigation actions in five middle-income countries shows that mitigation has moved on the political agendas over the past five years. Yet, these efforts are not necessarily linked with poverty alleviation instruments. Most mitigation action can have positive and negative poverty effects. Their impacts depend on an adequate pro-poor policy mix.

Keywords: low-carbon development, mitigation actions, poverty alleviation, developing countries

Contents

Abbreviations and acronyms

BAU	Business As Usual
BRT	Bus Rapid Transport
CC	Climate Change
CDM	Clean Development Mechanism
FDI	Foreign Direct Investment
GNI	Gross National Income
HDR	Human Development Report
HDI	Human Development Index
IBRD	International Bank of Reconstruction and Development
LCD	Low Carbon Development
LCE	Low Carbon Economy
LDC	Least Developed Countries
LIC	Low Income Countries
MA	Mitigation Actions
MAPS	Mitigation Actions, Plans and Scenarios
MDG	Millennium Development Goals
MIC	Middle Income Countries
MRV	Measurement, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Actions
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PAMA	Poverty Alleviating Mitigation Actions
REDD	Reducing Emissions from Deforestation and Degradation
SARI	South African Renewables Initiative
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
WCED	World Commission on Environment and Development

1 Introduction

Slowing climate change and promoting socio-economic development creates a dual challenge for developing countries. Economic development is associated with reducing poverty and inequalities, but development processes involve increasing emissions unless development paths change in emissions intensity. Low-carbon development (LCD) is a concept that embraces the challenge to reduce carbon emissions while advancing socially and economically. It is a way of conceptualising the objective of the United Nations Framework Convention on Climate Change (UNFCCC), which aims to stabilise concentrations of greenhouse gases in the atmosphere, while allowing developing countries to proceed in a sustainable manner (UNFCCC 1992).

Developing countries have commitments to reducing emissions, but these mitigation targets have been qualitative under Article 4.1, while developed countries – with greater responsibility given their historical polluting developments paths and current fossil fuel-based economies that mainly contribute to the problem – have agreed to take the lead and are supposed to make quantified emission reduction commitments. The urgency and scale of the mitigation challenges, however, will require all countries to reduce emissions. Developing countries are expected to increase the level of ambition of their nationally appropriate mitigation actions (NAMAs) and make these quantifiable (or measurable, reportable and verifiable, in the language of the negotiations). At the same time, aligned with the 'common but differentiated responsibilities' principle, developed countries are expected to provide support financing for adaptation and mitigation actions in developing countries to further reduce emissions worldwide, in addition to their quantified emission reduction commitments. The Bali Action Plan therefore linked the increased ambition on NAMAs to support, with both becoming quantifiable (UNFCCC 2007).

The trade-off between mitigating climate change and the right to socio-economic development has long been recognised as a key issue in the climate change negotiations between the developed and developing countries, with the Convention affirming in 1992 that climate change responses must take 'into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty' (UNFCCC, 1992: Preamble). Yet, developing countries deal with this challenge in very different ways. Whereas emitters try to find lower carbon-intensive developing paths, others try to remain low-carbon while advancing socio-economically.

The sharp distinction between developed and developing countries that characterised earlier decades in the international climate change negotiation has become more differentiated. The template of a two-category world 'is "out of sync" with other components of the current global economic and trade regime' (Saran 2010). The spectrum of developing countries embraces least developed countries (LDCs) and low-income countries (LICs) as well

as the middle-income countries (MICs) such as China, India,[1] Brazil, Colombia, Chile, Peru, Argentina and South Africa (IBRD 2011).

Poverty demographics have changed. Whereas in 1990, approximately 93% of the poor lived in LICs, in 2007 almost two thirds lived in MICs (according to Sumner 2010).[2] The fact that the majority of the world's poor live in MICs nowadays, and not just in LICs, requires a different approach to climate change and poverty. This new approach needs to integrate adaptation and mitigation.

This paper unpacks the linkages between mitigation and poverty in MICs. Mitigation action is particularly relevant in such countries, where reducing intensity of emissions is of immediate necessity - if not yet absolute emissions. Mitigation in LICs is also important, but the challenge is of more pre-emptive nature: it is about avoiding emissions in the first place and remaining low-carbon. In both country groups, potentials of pro-poor mitigation activities have been weakly explored.

In this paper, we argue that climate change presents a threefold policy challenge for MICs/ They need to i) design mitigation actions in a way that they contribute to alleviating poverty; ii) reduce emissions, helping to slow global warming in a way that does not compromise the competiveness of their economies, because without collective action by all the costs of inaction will be borne mostly by the poor; and iii) prepare to adapt to the unavoidable consequences of climate change.

So far, the literature on poverty and climate change focuses mostly on adaptation (Beg, Morlot et al. 2002; Schipper 2007; Mertz, Halsnaes et al. 2009; UNDP 2010; Anderson 2011; Eriksen, Aldunce et al. 2011). The literature on mitigation, in turn, barely recognises poverty as a problem (Mocarquer and Rudnick 2011); others concentrate mostly on emission reductions in a wider sustainable development context (Halsnaes and Shukla 2008; Halsnaes, Shukla et al. 2008), but not on poverty alleviation specifically.

We argue that the strong bias towards adaptation in the literature on poverty and climate change derives from the underlying assumption that the majority of the poor live in LICs and that such countries barely contribute to the global emissions. Therefore they do not need to reduce emissions and much rather need to adapt to the consequences of climate change. This assumption has led support for adaptation to focus mostly on helping the poorest countries. We recognise that this approach is valuable and necessary. The links between adaptation and poverty are not difficult to understand conceptually. Impacts of climate change will affect the poor the most, and their adaptive capacity is the lowest. The key challenge lies in the political economy, getting sufficient support to the most vulnerable countries and groups in their societies. The transition towards less carbon-intensive economies is a process that societies

[1] According to the World Bank classification, India is a lower middle-income country, whereas Brazil, Chile, Peru, South Africa, Argentina and Colombia are high middle-income countries (http://data.worldbank.org/about/country-classifications(.

[2] These estimates depend on the poverty measures that will be explored in more detail in section 2.2.

need to promote as a whole. LCD requires compromise and commitment to reducing emissions at the individual, local, national and international level.

A focus on mitigation provides a different perspective to addressing poverty and climate change. Mitigation is one way of addressing poverty that is necessary in MICs if we acknowledge the changing global distribution of poverty. The majority of the world's poor people live in relatively economically and politically stable middle-income countries, where industrialisation based on fossil fuels advances, and the climate change versus development trade-off is a pressing reality.

The paper consists of two parts. The first presents a review of the existing research literature on LCD, climate change and poverty. The literature is assessed from two perspectives: of poverty and climate change respectively.

The second part presents an initial conceptual framework for poverty-alleviating mitigation action (PAMA) and its application in five country studies on mitigation action through the poverty perspective in Brazil, Colombia, Peru, Chile and South Africa. These five countries are collaborating in a process on long-term mitigation scenarios and actions, the so-called MAPS programme.[3] These countries show high levels of poverty and income inequality as well as industrialisation and economic advance at the same time. The empirical basis for the case studies are five country studies on mitigation action[4] (MA) prepared in the context of the MAPS project.

[3] MAPS is a four-year programme supporting a collaboration between developing countries to produce mitigation action plans and scenarios (MAPS). MAPS works explicitly in the context of sustainable development. In-country work engages stakeholders from all sectors in a participatory process, partnering with the best indigenous and international research. MAPS is supported by the team that led the technical work on South Africa's Long-Term Mitigation Scenarios (LTMS). MAPS is a South-South collaboration platform share lessons, build best practice research and unlock the opportunities for low-carbon future. It supports the development of climate compatible development plans. It is characterised by raised levels of mitigation ambition in the context of sustainable development. The aim of MAPS is to directly promote policy steps driving emissions reductions at scale over the long-term using a solid evidence based approach. MAPS support in-country driven mitigation scenario planning processes based on research and modelling, together with stakeholder processes. MAPS also records an evolving best practice through knowledge management and strengthened South-South collaboration.

[4] All five studies are published as MAPS working papers at http://www.mapsprogramme.org/knowledge-sharing/.

2 Low carbon development, mitigation and poverty alleviation: a literature review

Combating poverty while preventing harm to the environment is not a new concern in international and domestic politics. In 1992, the Rio Earth Summit brought the concept of 'sustainable development' to the international development agenda. This concept has been with us for the last twenty years (WCED 1987), as a principle to manage human development in a socially, economically and environmentally sustainable way. On the lead-up to the Rio +20 summit in 2012, the concept is still relevant. In the year 2000 the UN Millennium Development Goals were formulated, goals 1 and 7 articulating poverty eradication and environmental protection as crucial. The challenges of novel environmentally friendly human development paths remain. Although these problems are more pressing than ever, they remain unresolved.

The literature contains abundant definitions and concepts on economic development and environmental protection. However, these concepts are generally poorly defined in the literature, with the risk of turning into 'buzz words' that confuse actors and constrain precise action. The role of mitigation remains unclear in most of the literature on sustainable development, green growth, green economy and even LCD. Mitigation easily disappears as explicit action.

2.1 Definitions and concepts: Low carbon development and poverty

This chapter presents the existing concepts for development and environmental protection, followed by the existing poverty definitions and measurements. The oldest concept of 'sustainable development' addresses the trade-off between three dimensions: i) economic development (resource intensive development, competitiveness); ii) social development, poverty alleviation; and iii) environmental conservation. The literature on climate change mitigation and poverty does not address all three dimensions equally. The mitigation literature focuses mostly on the environmental and economic dimensions. The poverty and climate change literature focuses on the social and environmental dimensions. Furthermore, the interpretations of the 'green economy' and 'low-carbon development' depend on the underlying economic theory. All forms of green economics have underlying economic assumptions either from the classical or neoclassical schools or from alternative approaches. Many authors fail to reveal their theoretical basis in the literature, as we will exemplify later.

Differentiating between 'sustainable development', the 'green economy' and 'low carbon development'

Many concepts try to capture the challenge of economic development and environmental protection. As mention above, the discourse on 'sustainable development' dominated the literature throughout the 1990s (Daly 1990; Pearce, Barbier et al. 1990; Sharachchandra M

1991; Stern 1996). 'Sustainable development' and 'green economy' have their origins in the 1980s and 1990s, whereas the LCD discourse is recent (Skea and Nishioka, 2008; IDS 2009; IBRD 2009). This section outlines brief definitions of the three concepts. We chose to work with the concept of LCD for two reasons. Firstly, we think that the LCD approach captures best the environmental and economic development challenge in developing countries, including mitigation. Yet, there is a lot of overlap between all three of them. Some authors have published work on all three concepts (Pearce, Barbier et al. 1990; Pearce 1989; Barbier 2005). Secondly, LCD is the concept that best accommodates mitigation as a major part in the challenge between carbon emissions reductions and continuous development.

Sustainable development

Sustainable development is a term widely used with many different associations and multiple definitions (e.g. Pezzoli 1997, Martinez Alier et al 1997, Robinson 2004). The concept emerged from concerns about a sustainable society and the management of renewable resources (Brown 1981). In forestry, the notion emerged of using no more resources from a forest than would allow it to grow back without depleting the forest. Early debates on 'green issues' focused on preservation or conservation of natural resources and developed concepts such as maximum sustained yield (Nash 1982; Wilson 1989). Another strand of the debate focused on 'brown issues' such as pollution, population growth and the limits of resources (Ehrlich 1968; Meadows, Meadows et al. 1972). Questions were raised about the limits to growth, and sustainability conceived by some as keeping society within ecological limits. In the 1980s, the concept of sustainable development emerged in attempts to link concerns about ecological limits with those about poverty and development (IUCN, UNEP et al. 1980; WCED 1987). The Brundtland Commission set forth this concept in 1987 (Brundtland 1987). It became the most recognised paradigm for international, national and local development under the Agenda 21 during the 1992. At the core of the concept is a triangle that suggests that development processes are only sustainable if their sustainability can be proved in all three dimensions: social, environmental and economic.

Green economy

The 'green economy' has a narrower focus on economic development. David Pearce was among the first to set forth the concept in 1989 (Pearce, Markandya et al. 1989). He identifies three features – 'constraining human greed, sustainability and decoupling'– that are common to all forms of green economics. Pearce defines the green economy as 'one that has the capability of replicating itself on a sustainable basis' that is 'consistent with non-declining human welfare and with the sustainable use of resources' (Pearce 1992). Milani develops the concept of the green economy further, setting forth the idea of economies of quality rather than economies of quantity. Quantitative economic development suggests that economic advance generally seeks quantitative wealth through industrial production. Industrial production is environmentally destructive. Qualitative economics, in turn, suggest an idea of

qualitative wealth that derives from ecologically efficient production. This requires an overall strategy for social change that is driven by individual behaviour under the assumption that symbiosis between humanity and nature is possible (Milani 2000). Both authors exemplify the different underlying economic approaches within the writings on the green economy. Pearce sees a 'greedy', self-interested economic actor, whose behaviour needs to be constrained or incentivised, acknowledging human greed. This thinking is in line with neoclassical assumptions of rational cost-maximising economic actors. Milani, in turn, suggest that individuals drive social change towards a possible symbiosis with the environment. Milani's conception has a more holistic approach to the green economy, arguing for social change strategies that use the potentials that the green economy offers for all aspects of human development.

None of these authors make an explicit argument about poverty and inequality. Milani recognises the need for the transition to be inclusive. Pearce does not address socio-economic inequalities in his 'blueprint for a green economy'. The different approaches of the two authors reflect well the two main problems of the green economy literature.

First, the writings reflect the authors' underlying understanding of economics. Pearce's (and others) thoughts on the green economy build on neoclassical economic thinking with the rational and cost-maximising actor at its core. In the world of neoclassical thought, quantitative wealth maximisation drives everyone's behaviour. There is no room for values beyond wealth that might motivate economic behaviour, so the role of policy and regulation is to constrain this behaviour through prices and taxes. Milani, in turn, acknowledges the quantitative drive in conventional economics and argues that green economics involve a transition towards more qualitative economics. This idea of qualitative wealth rests on the assumption that people can change behaviour according to their values; for example, reputation is an incentive for firms to make their production more efficient, although energy costs might be low and wasteful behaviour is unconstrained. Consumers can influence these production patterns through their choices, which do not only depend on quantity and price, but also on values, quality and awareness.

The different approaches to actors' behaviour dominates the debate in economic theory between classical, neoclassical and evolutionary approaches. These approaches also differ in their explanations of economic development. Evolutionary economics takes into account regional, geographic and cultural factors that influence economic development. This means that not only capital, labour and their respective prices determine a country's wealth as classical economic thinking suggests. These differences in economic theory are crucial when it comes to making policy, as each theory has different policy implications. Neoclassical theory assumes that markets regulate themselves and therefore the state only needs to intervene in the case of market failure. In neoclassical green economics, market failure manifests through greedy actors that then would have to be constrained through incentives and regulation. Evolutionary economics, in turn, assumes that there is no market equilibrium anyway and

market failures are infinite. Geography, history and demographics matter and therefore policy needs to focus on solving articulated problems.

Second, most papers on green economics do not recognise the debate between evolutionary and neoclassical economic thinking when addressing green economies. This is problematic, because the lack of clarity in underlying assumptions on economic theory prevents the authors from formulating clear instruments and measures for green economic policy. This leads to fuzzy and blurring understanding of green economics and confusion about the way forward. 'There is a fuzzy concept of green economy and the near- to medium-term implications for developing countries and least-developed countries to transition to a green economy,' Tariq Ahmad Karim, Bangladesh's High Commissioner in India, stated at the recent meeting organised by the UN Conference on Sustainable Development (UNCSD) and India's Ministry of Environment and Forests in New Delhi (Padma 2011).

The more recent literature on the green economy (UNEP 2011) builds on Pearce et al. (1989), although the authors have failed to address poverty explicitly.

Low-carbon development

We have seen that the green economy is a more general concept that applies to all countries independently of their stage of development; it has no explicit focus on developing countries. 'Green economy' and 'sustainable development' are more about linking the opposing poles of environmental protection versus economic growth in general. Whereas LCD is a more recent concept that focuses on mitigation, reducing carbon intensity; although of course again there are different interpretations, narrow and broad ones. LCD is more focused on reducing carbon emissions, whereas the green economy concept is wider.

We work with the concept of LCD for this paper because it captures best the process of socio-economic development while reducing emissions. We understand LCD as the process towards a low carbon economy (LCE), which represents a final state. The literature on LCE is very narrowly focused on economic activity (OECD 2010). LCE is also widely used in the developed countries and refers to a transition from an already developed economy to a less emissions-intensive trajectory. In developing countries, in turn, the transition to a LCE needs to be part of the developing process. This requires a holistic understanding as a process of socio-economic and human development. Therefore, we leave out the simplistic growth-driven approaches to LCD (Ellis, Baker et al. 2009; Project Catalyst 2009; GGGI 2011). These growth-driven approaches occasionally hide under the LCD umbrella as well, as Urban points out in the case of the British government's definitions (Urban 2010).

DEFINITION: Low-carbon development

In our view, LCD is the process of socio-economic and human progress, which minimises the output of GHGs. This process requires the participation of capable, free individuals in the society as a whole. Individual freedom and capability depend on political, economic and social arrangements. The process cannot be left to the belief in self-regulating markets or government as a provider of public goods. Poverty alleviation is not a natural side effect of LCD, because its benefits are not equally distributed among the society. Individuals cannot access and participate equally, because opportunities are uneven. Therefore, LCD needs the will of the powerful as well as political interventions that addresses both market and system failures to ensure a more equal distribution and access to the opportunities and benefits of low carbon development. Access, freedom and inclusion for poor communities to the low carbon economy are key to poverty alleviation.

Our definition builds on the following assumptions:

1. LCD needs to be understood as a process that goes beyond economic growth. Economic development is a process that occurs in a system. The actors in this system depend on existing institutions and mindsets that determine the development paths. These mindsets and institutions prevent the actors from easily switching to more efficient development paths. Powerful elites have a strong influence on advancing or stalling economic development. The evolutionary approach to economic development derives from Darwinian thought.
2. Economic and technological development is therefore highly path-dependent (Nelson 1992). Actors are never independent from other actors, institutions and mindsets in the system. This assumption holds also for carbon development. The LCD process depends on the existing institutions, mindsets, power constellations and development paths (Foxon et al 2008). Changes towards LCD paths are therefore slow and incremental. Success and failure depend on the society as a whole, as their actions are interdependent. Interdependency does not mean dependency. This leads to our third assumption.
3. LCD needs freedom. This assumption rests on Sen's ideas of development as freedom. According to Sen (1999, 36): 'development […] is the process of expanding human freedoms, and the assessment of development has to be informed by this consideration.' Freedom comprises political freedoms, economic facilities, social opportunities, transparency guarantees and protective security. Individual capabilities crucially depend on these freedoms, economic, social, and political arrangements. This understanding of development goes way beyond growth as the driver of economic development. The development process is the process of abolishing constraints to human capability in Sen's understanding.
4. Low carbon development is a process that needs to be driven by free individuals in a society as whole.

Other definitions fall short in clarifying the underlying assumptions for economic development that are necessary to understand their model of two messages from the OECD definition and the Danish DIIS study. The OECD report on the transition to low-carbon society rightly indicates that it is a process that requires the participation of the society as a whole (OECD 2010). The DIIS study states that

> Low carbon development refers to an economic development process which minimises the output of GHG emissions into the atmosphere. In addition to such a development process, there may then be a number of positive effects on poverty alleviation, although importantly it should not be assumed that these come automatically from a low carbon development process. (Funder, Fjalland et al. 2009).

In its analysis, the DIIS study focuses on least developed countries, although the absolute share of the poor is in the densely populated countries – India, China, Brazil, Nigeria and Indonesia. The question of creating inclusive LCD paths that contribute to poverty is equally relevant in other developing countries, too. The transitions in these countries might be even more difficult because, energy intensive industries have established over decades. Economic development has historically been energy-consumptive and emission-intensive, as demonstrated by the development paths of European, US and Japanese economies.

Our definition goes beyond the DIIS by making the point about access to the low-carbon economy rather than distribution. Access to the LCE is crucial in combating poverty, because only if the poor can become economic actors, they can unfold entrepreneurial opportunities as vocal citizens with equal rights and equal access to education and knowledge. Poor communities need to be at the centre of LCD as actors who shape the process together with the rest of the society, which means empowering the poor, as opposed to passive behaviour and exclusion at the receiving end that creates unfortunate dependencies. This point links to a multi-dimensional poverty definition, one that goes beyond determining poverty by income alone and also includes access to education, energy, health services that the next section will present.

Overall, few papers in the climate change literature address poverty explicitly. Urban makes a strong point for the benefits of mitigation for the poor in the LDCs (Urban 2010). Other authors mostly concentrate on poverty as one aspect of a wider sustainable development concept (Halsnaes and Shukla 2008; Winkler, Hoehne et al. 2008) and/or linked to the international cooperation mechanisms (Michaelowa and Michaelowa 2007; Olsen 2007) rather than focusing on the link between domestic poverty and mitigation action in developing countries.

Poverty

Getting rid of poverty is a primary challenge of the 21st century and central to the Millennium Development Goals (MDGs). Poverty and its appearance on the agenda of the international aid

community has many facets. Poverty is a complex socio-economic phenomenon which is described from many different angles: from the social construct of poverty to the calculation of international average values of money required to sustain a minimum standard of living. To inform action on poverty, benchmarks and definitions are helpful in quantifying the problem and relating it to other domains – notably LCD.

Scholarly measurement of poverty began in the 1960s, when the international community started to engage with the developing world through development aid. Statistics are fundamental to any poverty alleviation effort. These measurements make use of several approaches to define who lives in poverty. Such expert-driven approaches often stand opposed to participatory reached judgments about the categorisation of households as poor (Studies in Poverty and Inequality, 2007, Simon, 2010). Poverty measurements can be categorised in four frameworks (Simon 2010): money-based poverty, capabilities approach, vulnerability and social exclusion.

Currently poverty lines, the UN's three-dimensional Human Development Index (HDI) and the recent Multidimensional Poverty Index (MPI), are the dominant measurements in the international arena.[5] Poverty lines describe poverty as a lack of income or expenditure. Relative and absolute poverty lines are used. The United Nations Development Program defined international poverty lines at one dollar and two dollars per day. The purchasing power parity exchange rates were used for the conversion of existing national poverty line values into a dollar value (UNDP, 2007). Such lines give no information about how far households are from reaching them (UNDP, 2007). Income poverty lines are still very common, as in the World Bank's differentiation of countries into low-, middle- and high-income which we also use in this paper.

The Human Development Index provides some more insights. It brings income, health and education together and is seen as suitable for in-depth analysis of constraints and relationships which need to be overcome for the achievement of the internationally accepted development goals (MDGs). While also starting with the three dimensions (living standard, health and education), the MPI looks deeper. Ten additional indicators allow for much more detailed data collection and analysis. The dimension of health is subdivided into nutrition and child mortality, education into years of schooling and school attendance; when analysing living standards, cooking fuel, sanitation, water, electricity, floor and assets are looked at (Alkire and Santos, 2010).

Income inequality is a major problem in the middle-income countries where poverty remains despite carbon-intensive economic growth. Recent research suggests a U-shaped relationship between inequality and CO_2 emissions. This means that for highly unequal countries, inequality reductions result in reducing emissions, whereas in more equal societies reductions in inequality produce higher emissions (Grunewald, Klasen et al. 2011). Inequality and poverty are closely related. Inequality is a relative measure for the difference between

[5] The United Nations Development Program publishes the Human Development Report yearly to measure changes in human development based on the HDI. Oxford University supported the UNDP in developing a MPI.

distribution of income in an economy. The same study found that inequality and the consumption of carbon intensive goods correlate in a negative relationship. This means that higher inequalities reduce the access of poor communities to goods that proxy carbon intensity (Grunewald, Klasen et al. 2011).

Inequality is an important additional measure to poverty, especially if poverty is measured as income poverty. Poverty lines determine a group of people as poor, depending on the measure. Inequality measures then additionally provide information of how much the rich and the poor diverge. Inequality is an important additional poverty index. Both poverty and inequality show negative relationships with emissions per capita.

Figure 1: Emissions and poverty (> 1US$ per day)

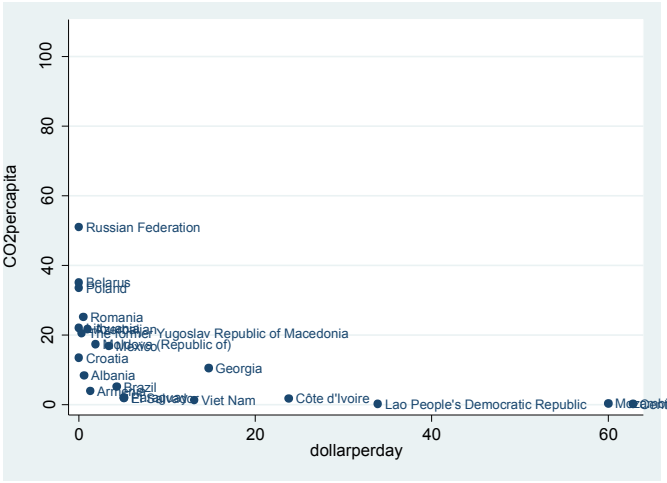
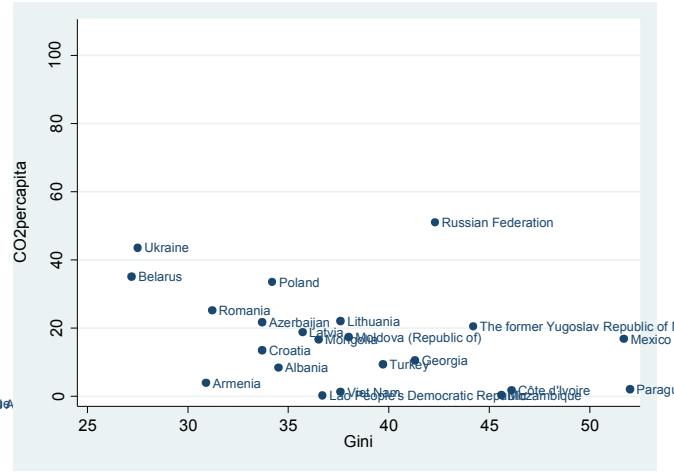


Figure 2: Emissions and Inequality (Gini)



Source: own compilation based on World Development Indicators, Human Development Indicators

The Millennium Development Goals, as the presently most comprehensive compilation of developmental goals (UNDP, 2007), play a central role in this paper. They are seen as a general policy framework, beyond which further efforts are required in order to meet global development objectives including equity and sustainability (HDI 2011). Such efforts are outlined in the latest HDI report and discussed in the following section. The MDGs include eight goals (see Table 2) and define a set of quantitative targets under each goal.

Table 2: Overview of the Millennium Development Goals

Goal 1: Eradicate extreme poverty and hunger
Goal 2: Achieve universal primary education
Goal 3: Promote gender equality and empower women
Goal 4: Reduce child mortality
Goal 5: Improve maternal health
Goal 6: Combat HIV/AIDS, malaria and other diseases
Goal 7: Ensure environmental sustainability
Goal 8: Develop a global partnership for development

Source: UN MDG 2000

We need to keep in mind that single measurement, like the MDGs, has its limits in capturing poverty and its geographical distribution. For the LCD debate, inequality measures also matter, besides poverty. In developing countries with high inequality figures like the MICs, relatively high poverty levels continue to prevail despite economic advance. Economic development is still energy consuming and carbon based. Therefore, measures for reducing emissions are often perceived as harmful to economic development, growth and employment by these countries.

The MDGs target poverty eradication (MDG 1) as well as environmental sustainability (MDG 7). One of the main challenges for MICs is to link their efforts in poverty eradication with strategies for less carbon intensive economic development, as the next section will demonstrate.

2.2 Poverty and climate change

To address the dual challenge of poverty and climate change, adaptation and mitigation efforts need to be aligned, and international goals such as the MDGs need to support national development goals, aligning and making use of synergies as much as possible. The following section summarises strategies from the literature, mainly through international environmental and developmental organisations.

Mitigation efforts in developing countries need to be aligned with developmental goals and policies. Countries cannot afford to waste scarce resources and ignore possible synergies, especially when it comes to the livelihood of people. Potential interactions for benefits and risks need to be studied and well understood in order to allow policy-makers to make informed decisions. Currently there is not enough knowledge available on how poverty and mitigation can be linked efficiently (CDKN 2011).

The international community has in the past engaged, and is presently engaging, with mitigation and adaptation efforts with varying success. While adaptation, as earlier mentioned, is widely accepted for having a strong developmental contribution, mitigation only recently emerged in the literature as a serious issue for development. With a rapidly growing

body of literature as which is covered in this paper, certain theoretical assumptions manifest when it comes to the identification of synergies between mitigation and development policies.

The notion is growing that development advances need to be decoupled from fossil fuel to prevent increasing emissions (Germanwatch, 2010; UNEP, 2011a; Christian Aid, 2011). Some argue that energy access is the most crucial issue to tackle in this context. The provision of clean, safe, reliable and affordable energy services to the poor is on the one hand fundamental for the achievement of the MDGs and on the other a great opportunity for LCD if drawn upon renewable resources (REN21, 2005; OECD/EIA, 2010; GNESD, 2007; Christian Aid, 2011).

In the grey 'donor' literature, the idea of triple-win situations appeared. The Human Development Report (2011) lists global winning strategies including 'off-grid renewable energy provision for poor households, expanding reproductive choice including access to reproductive health services, community forest management designed and implemented in a participatory and gender sensitive manner, equitable and adaptive disaster responses including community-based risk mapping, innovative social protection schemes' (HDR, 2011). The World Bank presented similar approaches (WB 2011).

Michaelowa and Michaelowa (2007) argue in the same direction. In their opinion linkages between climate change activities and MDGs can be found for almost every goal. While goal 7 (ensure environmental sustainability) is directly linked to climate change activities, attention is paid more to adaptation which is viewed as the more immediate link between climate change and poverty alleviation. Mitigation through improvement of indoor air quality and therefore respiratory health, through mainly the CDM, remains in their view the most prominent measure. The authors, however, appreciate that emerging economies are more likely to attract funding for projects whereby other developing countries require specific attention through official development aid (ODA) (Michaelowa and Michaelowa 2007).

MICs might attract more funding. Given the absolute number of poor people living in MICs, these countries will continue to need foreign assistance through ODA. Michaelowa and Michaelowa state that despite the general idea that HDI and GHG are not correlated strongly for least developed countries, the progress made towards the achievement of the MDGs in India and China is beyond the 'tipping point'(HDR 2011) and came with increased emissions.

Current research literature suggests linkages (compiled in Table 3 below) according to the ways they contribute to achieving the MDGs. We compiled the key findings from the DFID and the Germanwatch reports (Germanwatch 2010, DFID 2011) in relation to their contribution to the Millennium Development Goals. These linkages will be further explored in selected mitigation activities in five middle income countries in the following section.

Table 3: Importance of LCD to the achievement of the Millennium Development Goals

Potential of LCD to contribute to the achievement of the Millennium Development Goals		
MDG	Steps towards goal	Low carbon development measures contribute to the MDGs through …
1. Cutting extreme poverty and hunger	Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day Achieve full and productive employment and decent work for all, including women and young people Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Job creation/enterprise development utilising locally available resources, decentralised renewable energy solutions, manufacturing industry in low-carbon economy, biofuel and land management, sustainable agriculture, fisheries and forest management including REDD Income poverty/ energy access and security through clean energy services (lighting, cooking, heating, mechanic power), energy expenditure saving energy efficiency technologies, carbon revenues
2. Universal primary education	Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	Improved learning conditions/access to low carbon light and heat sources Further contribution through/curricula and campaigns including climate change, renewable energy and mitigation content.
3. Gender Equality and women's empower-ment	Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education, no later than 2015	Women's empowerment/ women as agents of change for mitigation efforts Further contribution through/ transfer of lessons learnt from mainstreaming gender issues into design of gender-sensitive climate change and mitigation measures
4., 5., 6. Health	4. Reduce child mortality Reduce by two thirds, between 1990 and 2015, the mortality rate of children under five 5. Improve maternal health Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio Achieve, by 2015, universal access to reproductive health 6. Combat HIV/AIDS, malaria and other disease Halt and begin to reverse, by 2015, the spread of HIV/AIDS Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it Halt and begin to reverse, by 2015, the incidence of malaria and other major disease	Child mortality, maternal health/Reduction of indoor air pollution through improved access to clean energy services in poor households, especially through improved cook stoves, prevention of low birth weight and early infant deaths through same measures Malaria and other diseases/Global emission reductions preventing temperature increase benefits efforts to combat malaria and other diseases Further contribution through/ Improved indoor air quality reduces eye infections, improved cook stoves decrease fuel wood consumption which has potential to reduce associated orthopaedic health issues and gender specific risks (abuse, rape, crime), improved health situation from reduced GHG emissions increases human capacity worldwide to implement further mitigation efforts.

7. Environ-mental sustain-ability	Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation Achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers	Environmental resources, ecosystems and biodiversity/ Sustainable land management, agriculture, fisheries and forestry, avoided deforestation Greenhouse gas emissions/Mitigation of greenhouse gas emissions, sustainable fuel wood management and harvesting, reduce erosion and desertification, benefits from reduced impact of climate change. Water access/Less water intense electricity generation relives stress on water resources, renewable energy opportunities for water pumping and purification in rural areas. Urban settlements/Improved thermal performance, alternative designs and materials in buildings, increased access to clean energy services through decentralised systems
8. Global partnership	Develop further an open, rule-based, predictable, non-discriminatory trading and financial system Address the special needs of least developed countries, landlocked countries and small island developing states Deal comprehensively with developing countries' debt In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries In cooperation with the private sector, make available benefits of new technologies, especially ICT	Global partnership/ carbon market including sustainable, pro-poor CDM Financial system/Global reallocation of wealth. Least developed countries, landlocked countries and small island developing states/Decentralised renewable energy solutions for increased access to clean energy services

Sources: own analysis, based on data from DFID (2011), Germanwatch (2010)

Furthermore, the Human Development Report (HDR 2011) identifies five countries outstanding when it comes to achievements to promote equity, raising/increasing their HDI, reducing household indoor air pollution and increasing access to clean water while performing well in terms of environmental sustainability (HDR, 2011). Such detailed and concrete analysis is, however, rare in the literature at this stage. The recommendations given by organisations in the field on how to tackle the dual challenge of poverty and climate change are rather general. For example, they call for funding for analysis of impacts and implementation of strategies through facilities, which are monitored and verified and for a the consideration of the national

context taking into account a country's political reality, emission reduction potential, developmental challenges, available financial means when assessing policy choices (CDKN 2011).

CDKN on the other hands risks a recommendation to prioritise development over mitigation by stating that 'where climate change threatens development, mitigation actions should only be pursued where there are clear adaptation and poverty reduction co-benefits' (CDKN, 2010). Other initiatives, like the low-emission climate-resilient development strategies try to identify combinations of mitigation and adaptation and development (UNDP 2011a).

In sum, the literature gives some ideas of how low carbon development measures can contribute to poverty alleviation in the wider context of the MDGs. Yet it lacks concrete studies on mitigation actions and its impacts on poverty from a bottom-up perspective. Anderson (2011) rightly indicates that this connection requires a future research agenda. This paper aims to contribute to this research agenda with initial thinking towards a conceptual framework and the analysis of mitigation actions in five countries: Chile, Brazil, Columbia, Peru and South Africa.

3 Poverty alleviating mitigation action: a typology

This section develops a typology for the analysis of poverty-alleviating mitigation actions (PAMAs). The concept of PAMAs provides a lens with which to look at mitigation actions from a poverty perspective. This should not be understood as a suggestion for PAMAs to become a separate category in the international climate negotiations.

The typology for PAMAs presented below serves as a framework for the analysis of mitigation actions below. Table 4 presents four types of mitigation actions and measures for poverty alleviation placed in a two-by-two matrix with high and low potential for alleviating poverty on the one axis, and reducing emission on the other.

Table 4: Ideal types of mitigation actions and measures for poverty alleviation

	Typology	Poverty alleviation potential →	
		High	Low
GHG reduction potential ↓	High	Type 1: Poverty alleviating mitigation action Poverty driven mitigation action?	Type 2: Conventional mitigation action, with no explicit focus on poverty (and possible opportunity cost) Climate driven mitigation action?
	Low	Type 3: Conventional action for poverty alleviation, with no explicit focus on reducing emissions (and possible increase in emissions) Non-climate driven poverty action?	Type 4: Failed/low impact mitigation action, failed poverty action, conventional industrial/economic/ environmental policy without explicit focus on mitigation and poverty (this will surely partly depend on the scale and cost of the action in terms of what impact it can achieve?)

Source: own compilation

The main purpose of mitigation action is to reduce emissions, but how can it also contribute to development and poverty alleviation? Mitigation actions (MAs) can be defined as activities that contribute to emission reductions, comprising policies, strategies, scenarios, targets, voluntary agreements, regulation, standards, economic instruments, financial

mechanisms, subsidies, programmes, projects, pilots, market activities, capacity development, information generation, innovation, institution-building, centres of excellence, partnerships, training, skills development and more. These activities and statements are very diverse (ERC 2011). Poverty and inequality are main constraints to sustainable development.

Type 1: *Poverty alleviating mitigation actions* are those interventions that have the objective to reduce emissions and address poverty at the same time. These interventions may use the same technologies as other types, but they are implemented in a pro-poor way (e.g. participative waste management, household biogas, low-cost housing with efficiency and solar water heating).

Type 2: *Conventional mitigation actions* focus on reducing and avoiding emissions without considering poverty reduction. Examples for type 2 interventions are energy efficiency measures in industry, large-scale biogas, expensive public transport, REDD (if exclusive), safe carbon capture and storage, carbon tax (if revenues are not reallocated for poverty-related issues), cap-and trade systems.

Type 3: *Conventional actions for poverty alleviation* focus primarily on poverty reduction and do not have significant mitigation potential. Emissions reductions might be a side effect. Examples here are sustainable forest management, social housing, and electrification in centralised energy systems that do not explore the potential of job creation that renewable energy sources have and are based on centralised coal and nuclear power sources that create labour for a few specialised workers, sustainable farming, biofuels depending on their implementation.

Type 4: *Failed (mitigation) action* without an explicit focus on poverty and limited mitigation effects. Examples are unsafe carbon capture and storage, projects reducing emissions of fluorinated gases, main stream industrial incentives that do not consider poverty or mitigation.

Many mitigation actions can have poverty alleviating effects. The concept of PAMAs is not intended as a separate category (certainly not for the negotiations) to NAMAs, but rather as a tool to analyse mitigation actions for poverty-alleviating potential. Other dimensions of development are also 'nationally appropriate', but poverty does have a particular place as an overriding priority of developing countries. Indeed, it makes the meaning of 'development' in developing countries different to its meaning in developed countries. The existence, or magnitude, of these effects will depend, in part, in most cases on the implementation of the action. A carbon tax, for example, can reduce emissions by putting a price on carbon. If the revenue generated is made available for example for training, skills development, research and development as well as small industrial development for (renewable) energy technology, the mitigation action creates jobs that relieve many families from poverty.

Obviously, there is not only one solution to poverty-alleviating measures. Development models that worked in one place might fail in another. The poverty-alleviating effects of MA cannot be taken for granted. Developing climate policy is in itself a challenging task, let alone integrating poverty reduction objectives into these policies. A critical element to be anticipated is the relevance of national circumstances. Therefore, the classification of actions according to this typology requires a profound analysis of the national context including the approach to development, economic growth and capabilities of the state.

The conventional mitigation action type, focused on mitigation, seems to clearly dominate current climate policy. As the literature review shows, mitigation has been conceived in the past as an industrialised countries' affair. As mitigation becomes relevant for developing countries, the linking issue requires more informed consideration.

The emerging debate around NAMAs is an illustration of this argument. The term emerged from the desire to scale-up mitigation action in developing countries beyond project-based actions. Countries agreed in the context of the negotiations that mitigation action in these countries must be understood in the context of sustainable development. The 'appropriate' element in the NAMA concept is an indication for aligning mitigation efforts to the national priorities.

Countries have actively started developing NAMAs, in parallel to the negotiations. From the emerging pilot NAMAs the diversity of desired and planned actions becomes clear. Co-benefits in NAMAs are also treated differently from country to country, especially the extent to which these need to be integrated, measured and reported. Some countries prefer to talk about integral benefits of NAMAs rather than co-benefits. In existing pilot NAMAs, poverty alleviation is not often cited, but if so it is referred to very generally with terms like sustainable development, job creation or economic growth.

Another important element to take into account is the fact that the impacts of mitigation actions on reducing emissions in developing countries are not always obvious or easy to measure. International-driven actions may certainly require a monitoring, reporting and verification system. When this rationale is applied to possible PAMAs, new challenges, as well as controversy, may arise when accounting for the poverty alleviation element. Benefits from such an accounting should carefully be analysed. This necessary assessment is outside the scope of this research, and further work would be needed.

4 LCD, mitigation and poverty alleviation in the MAPS countries: the research process

The paper has presented a review of existing literature on poverty and climate change, including definitions and a conceptual framework. Next, these concepts are analysed at country level for Chile, Brazil, Peru, Colombia and South Africa. This section briefly explains the methodology used for the preliminary country-level assessment.

The desktop study helps to gain a better understanding of the linkages between mitigation and poverty alleviation policies and actions in the MAPS countries based exclusively on the review of the MAPS Mitigation Action country studies. Two important elements require some additional explanation: the MAPS context and the interpretation of the term 'mitigation action' in the MAPS context. The country studies by MAPS researchers form part of an emerging research base for understanding how mitigation actions are approached and conceptualised in that particular country. They also consider the suite of MAs identified in that country, with particular reference to an example or examples, against issues and characteristics of MAs, including stage of development, planning, policy and regulatory context, institutional and technical capacity to design and domestically monitor and verify MAs, financing and ownership. Poverty considerations were not included in the terms of reference for the studies, and therefore identifying links between mitigation and poverty can be a subtle, and even challenging, exercise. However, following this approach for the assessment enables for genuine and out-of-the-box findings.

The MAPS country studies analyse a limited number of mitigation examples, as does the country-level assessment. The examples, which represent mitigation actions under consideration, design or implementation in a particular country, provide insights into the motivations behind the selection and prioritisation of domestic MAs. The examples selected in this assessment do not attempt to represent the overall approach towards reducing GHG emissions in a specific country. Examples selected are those ones included in the MAPS Mitigation Action country studies. In line with our interpretation of MA, the nature of the examples is diverse, including actions, measures, and policies, group of actions or plans.

The analysis approaches mitigation from a poverty perspective. In other words, the analysis seeks understanding on how poverty alleviation's objective is reflected in the mitigation framework and whether mitigation actions are prioritised according to socio-economic variables. The analysis of poverty policies at country level in terms of their consistency with climate objectives is beyond the scope of the paper.

The analysis should be able to conclude on current main drivers to bundle mitigation activity and a better understanding of the current state-of-the-art of the linkage between mitigation and poverty reduction in policy-making for selected developing countries.[6]

[6] The findings from the literature review were presented at a public side event to the COP 17 on poverty and mitigation in Durban. In a further meeting the authors and the MAPS researchers discussed findings and further research in more detail.

5 Interrogating mitigation action from a poverty perspective

This section presents an initial exploration of the interaction between mitigation and poverty at country-level based on the recent MAPS papers. These papers focus on mitigation actions and, thus, linkages are solely assessed at action level. In addition, the chapter provides a preliminary discussion on how each of the country approaches towards climate change takes in poverty alleviation, also based on the above-mentioned MAPS papers.

As expressed earlier, this intends to advance the understanding of the implications of mitigation on poverty alleviation and vice versa, by exploring specific examples of MAs in each of the four MAPS countries (Brazil, Chile, Colombia and Peru) plus South Africa, where the MAPS support team is based. Substantive additional research, both regarding the conceptual framework and in particular the country-level research, would be needed to make conclusions about the extent to which poverty alleviation has been integrated into climate policy – let alone the potential for further integration.

Colombia, Brazil and Peru have similar HDI rank level and life expectancy. However, differences are notable regarding other variables: Colombia has the lowest inequality rate, Peru the highest education and poverty index, while Brazil counts with the highest gross national income (GNI) per capita. Chilean HDI rank and GNI per capita sets the country apart from the rest, although inequality remains very high. South Africa falls behind in terms of HDI and life expectancy due to the high index of HIV/AIDS among the population.

Table 5: Country poverty profiles

Indicator	***Details***	***Colombia***	***Brazil***	***Peru***	***Chile***	***S Africa***
HDI	Rank	87	84	80	44	123
Health	Life expectancy at birth (years)	73.7	73.5	74.0	79.1	52.8
Education	Education index, expected and means of schooling	0.667	0.663	0.704	0.797	0.705
Income	GNI per capita in PPP terms, constant 2005 international $	8 315	10 162	8 389	13 329	9 469
Inequality	Inequality-adjusted HDI	0.479	0.519	0.557	0.652	n.a.
Poverty	Multidimensional Poverty Index (%)	0.022	0.011	0.086	n.a.	0.057

Source: own compilation based on *Human Development Indicators, 2011, http://hdrstats.undp.org*

5.1 Mitigation actions

This section presents a selection of mitigation actions from the MAPS MA country studies. Most of these actions are under planning or in design phase. Mitigation potential, motivating forces in priorising the action, and whether these forces include socio-economic variables is explored, based on the information available in the studies. Next, we identify the theoretical linkages of the proposed mitigation action with poverty alleviation. Assessed are mitigation actions, some countries, however, referring to these as NAMA's others as mitigation actions. For the purpose of this assessment, we therefore do not differentiate between these terms. A table presents the results for Peru, Colombia, Chile, Brazil and South Africa respectively.

Peru

The Peruvian country study analyses in detail a NAMA on efficient lighting (Postigo Takahashi, Zevallos et al. 2011). The selection of this action comes as a result from a previous study undertaken by the Ministry of Environment in Peru for prioritisation and formulation of mitigation action. Energy efficiency was ranked as number one priority, having taken into account no just abatement potential, but also considerations on effectiveness and efficiency associated to the implementation of the action.

The efficient lighting NAMA is a package of support and mitigation actions. Support actions include education and awareness, funding and MRV. Focus on mitigation is on reducing the energy consumption by using efficient technologies in three sectors: industrial, residential and public services.

Although social co-benefits of this action have been taken into account, the main drivers are costs and effectiveness in the implementation. The cost of reducing a ton of CO_2 by efficient lighting is relatively low and there is an important cost saving in the energy sector infrastructure by reducing peaking energy demand. More important, there is a policy package in place to address this action. The NAMA package would bring along extra resources aiming at overcome traditional barriers associated to the implementation of energy efficiency actions. The NAMA actions are aligned and complementary with existing policy. If the NAMA were designed appropriately, it has a potential to reduce poverty, in particular when addressing the residential sector. Table 7 in the appendix illustrates the characteristics of the efficient lighting NAMA, drivers and possible poverty implications.

Colombia

The authors of the Colombian country study analysed in detail two MAs: electric vehicles and potato crops (Cadena and Rosales 2011). Both actions are considered appropriate given the national circumstances and development needs of the country. The first one is strategic in promoting new clean technologies and aligned with the National Development Plan 2010-2014. The research group goes beyond existing initiatives and analyses the potential of

replacing gasoline cars in urban areas nationwide. The potato crops action is about sustainable crop management measures. In spite of the significant share of GHG emissions in the agriculture sector, mitigation initiatives are scarce and limited to rice crops, sugar cane and pastureland. The researched MA aims at combining potato crops with other forestry and farming activities in order to structure silvopastural and agroforestry systems. The authors identify as benefits increased crop productivity, reduction of runoff and increase of the carbon sequestration potential.

The analysis reveals that electric or hybrid technology is more expensive than traditional means of transportation, except with large fleets (e.g. taxis or public mass transport). It also notes that the transport sector has a limited contribution to the national GDP (0,5%). Overall, this action is designed with a primarily mitigation objective. It addresses the concern of raising energy consumption, and associated emissions, generated by road transportation. Potential positive poverty implications are not directly derived from the mitigation action, but from its air pollution co-benefits.

Potato crops, as opposite to the electric vehicles NAMA, could have a direct impact on poor communities, including job creation in rural areas, food security and income generation, and direct impact on the environment sustainability.

Chile

The Chilean country study explores the NAMAs that are currently being designed by the government, which include actions in the transport, energy and agriculture sectors (Sanhueza 2011). As outlined there, selected actions lie in sectors contributing importantly to the total GHG emissions and complement existing mitigation actions. Therefore, proposed actions have a generally well established regulatory and institutional framework.

Table 8 shows analysed actions seeking economic development, energy security and reduction of local air pollution. Direct poverty implications are limited to the reduction of health problems associated with air pollution. Diversification of energy supply and ultimately energy security are key drivers for prioritisation of mitigation action in the energy sector.

Brazil

Brazil has a number of MAs in place, along with the nationwide voluntary emission targets. The Brazilian study reveals in detail the different actions that have been regulated in the country (Lèbre La Rovere 2011). It also explains that sectoral mitigation plans are currently being developed. These plans are expected to propose a set of mitigation actions to meet the national target. We have selected two MAs in the forestry and agriculture sectors. Both MAs are still under development.

The first one is the reduction of 80% of the annual deforestation surface in the Amazon, compared to the historical average in the period 1996-2005, as well as the reduction of 40% in the savannahs compared to the 1999-2008 period. In the agriculture sector, we selected the

integration of mitigation actions as part of the eligibility requirements for farmers to get credit from governmental development banks, and of economic incentives to access softer loans from these public bodies.

Mitigation efforts are triggered by the overall goal of sustainable development have the potential to generate to create jobs. Therefore, significant positive implications on poverty alleviation could occur if appropriately designed.

South Africa

The four MAs described in the South African paper were chosen with an emphasis on their scale and emission reduction impact, but also to include diversity of actors, mitigation area and type of mitigation initiative (Tyler 2011). Therefore all actions have significant relevance in mitigation policy although climate might not always be the driver.

The National Sustainable Settlements Facility is about financing solar water heaters and thermal efficiency measures in one million new low-income houses in South Africa by 2020. This is a uniquely pro-poor action among the MAs analysed in this paper. A large number of co-benefits have also been identified for the rest of initiatives in the South African MAPS paper. These include manufacturing air quality, balance of payment benefits, FDI attraction, skills development for the Renewable Energy initiative, and improved air quality, reduction in transport costs, avoided fuel consumption, development of a local construction skills base, and formalise and grow taxi industry for the BRT project. No direct co-benefits are identified for the carbon tax yet.

5.2 National approaches

Mitigation had little relevance for the selected countries until about five years ago. Brazil was an early mover in setting up institutional arrangements. Brazil's attention was given to avoiding deforestation in the Amazon, and this still constitutes the largest mitigation potential. Chile and Colombia started to think of mitigation in the context of CDM. Peru's focus was clearly on adaptation.

We have picked the elements that are helpful to understand driving forces, and thus, potential linkages with poverty alleviation efforts. Table 6 presents an overview of national climate change approaches in Peru, Chile, Colombia, Brazil and South Africa, aiming to capture the vision of the governments on mitigation, based on the information provided in the MAPS country studies.

Table 6: Overview of national climate change approaches and motivations

Historic approach		Recent developments	
Approach	Context, motivations	Approach	Context, motivations
PERU			
Focus on Adaptation	Very small share of world-wide emissions High vulnerability of the country	Attention also given to mitigation Sectoral plans under development under national regulation	Interest in increasing/securing competitiveness and sustainable economic growth Interest in decreasing environmental degradation and conflicts Interest in generating opportunities associated to the development of low carbon technologies Mitigation seen as an opportunity to sum efforts in reducing poverty Mitigation finance seen as an opportunity to reinforce and strengthen existing policies
Initially: international-driven approach, in particular, strong engagement with CDM. Gradual evolution towards a country-driven approach to climate change, including mitigation	Commitment to move to a Low Carbon Economy Commitment to contribute (voluntarily) to the global mitigation efforts HDI and other indicators getting closer to developed country figures	Focus on national climate policy, discussion on national-wide target and development of NAMAs per sector	Positive experience from CDM NAMA as an opportunity to scale up mitigation action, while aiming at making a change in sectoral policies Climate finance (e.g. supported NAMAs) as an opportunity to cover incremental costs of national policies (e.g. in energy sector: more efficient use of energy and penetration of non-conventional renewable energies sources in the energy matrix of the country) Rapidly growing economy raises sustainability concerns High vulnerability of energy supply
COLOMBIA			

Historic approach		Recent developments	
Approach	Context, motivations	Approach	Context, motivations
Focus on CDM activities	General interest in market-based mechanisms	Climate change integrated in the regulation and national planning, mainly based on 4 pillars: adaptation, LCDS, REDD and Financial Protection against Disasters	Sustainable growth and competitiveness, social prosperity, security, justice and human rights are the objectives of the current National Development Plan The key sectors for the Colombian economy development have a direct impact on GHG emissions (mining and energy, housing, transport infrastructure, innovation and agriculture) NAMA as an opportunity to scale-up CDM, and now, improve alignment with national priorities
BRAZIL			
Focus on combating the Amazon deforestation (although not driven by climate policy). Early institutional arrangements to respond to climate change	Difficult to enforce laws and regulation to reduce deforestation in the Amazon International pressure Interest in directing international mitigation-related opportunities towards national development priorities	Climate change moving into legislation, including national-wide targets and sectoral plans. Mitigation generally seen as the country development path	Alignment of CC policy with national sustainable development objectives, including: economic growth, eradication of poverty and reduction of inequalities Hand-by-hand with efforts to reduce deforestation Alignment with energy sector policy objectives: increase the role of renewables, nuclear and energy efficiency Implications for competitiveness important
SOUTH AFRICA			
Non-existing climate mitigation discourse Engagement with CDM.	Dependence on coal-based energy economy and entrenched minerals-energy sector Relatively slow share of world-wide GHG emissions (1.19%)	Debating mitigation strategy in the context of developing a Green and White Paper for climate change. Commitment to mitigate below BAU	Concerns about the sustainability of the economy growth, given its high carbon intensity Concerns regarding capacity of the current energy supply Seeking opportunities for the overriding national priorities of creating jobs and alleviating poverty

Source: own compilation

The CDM has played an important role in mitigation policy in Colombia and Chile, as in South Africa. Brazil has the third largest number of registered projects. One of the objectives of this mechanism is to contribute to sustainable development, and therefore, poverty alleviation

could theoretically be one of the triggers to implement a CDM project. Brazil's portfolio of projects is dominated by methane-avoiding projects, such as manure management, followed by hydropower and biomass to energy projects. In Chile, most of the registered projects are about small hydro, landfill gas, and biomass to energy. CDM in Colombia is, at present, mainly about generating certified emission reductions with energy efficiency measures in industry and landfill projects. Colombia has seen relatively few projects in less profitable and more volatile sectors, such as forestry, and has learnt that not all implemented CDM projects contribute to sustainable development in the country (Cadena and Rosales 2011). Along the same lines, CDM implementation in Chile is regarded as successful. Notwithstanding, attempts to link these developments to the implementation of national policies in the energy sector showed marginal progress (Sanhueza 2011). Deepening the understanding of social benefits generated by CDM projects in these countries would be a very valuable input to comprehending the potential of poverty-alleviating mitigation action at project level.

More recently there has been a shift in climate policy in these countries from internationally-driven to country-driven policy. Climate policy and regulatory frameworks have evolved. All analysed countries are currently engaged with defining national low carbon strategies and/or developing NAMAs. While international policy remains important, addressing national priorities is more pertinent. This change offers ampler opportunities to integrate poverty alleviation, if we recognise countries national priorities.

The objectives of the current Colombian government, according to the statement by Juan Manuel Santos when was sworn in as President of the Republic, are 'moving towards social development, more employment, less poverty and prosperity, in general, for the whole population'' (Cadena and Rosales 2011). When it comes to policy-making, Colombia's national development plans are pivotal. Therefore, alignment between development plans and climate policy is expected, as is the consistency of mitigation strategies with national priorities.

Since the Colombian economy is strongly market-oriented, climate market-based solutions such as credited NAMAs or REDD are popular. More research would be needed to diagnose the impact of these market-based solutions on the poor, although experts are warning about their potential negative impacts on poor communities. For Colombia, REDD activities are expected to enable the economic development of indigenous communities through access to the international carbon market. The government is also committed to stimulate the growth of biofuels production (ethanol and biodiesel). To date, progress on the agriculture and forestry sectors seem to be lower than achievements in the energy and transport sectors.

The National Climate Change Policy Law from 2009 in Brazil has the objective of making the economic and social development compatible with the protection of the climate system. In particular, it states the objectives should be consistent with sustainable development, in order to seek the economic growth, the eradication of the poverty and the reduction of the social inequalities. The main goal in successfully reducing deforestation is to guarantee that remaining forest becomes more economically and socially attractive than deforesting for cattle-raising and farming purposes.

Peru is the fastest growing nation in Latin America and at the same time it faces persistent poverty, increasing threats due to events such as El Niño, problems with water resources distribution, a low level of resources and institutional and organisational capacity to face climate change impacts (Postigo Takahashi, Zevallos et al. 2011). Recently, national awareness around the issue of the sustainability of the Peruvian economic model has increased. The reason is an evident link between the continuous economic growth (2001-2010 annual economic growth average rates of 5.3 %), the GHG emissions growth and the increase of social-environmental conflicts (Postigo Takahashi, Zevallos et al. 2011). Sustained growth and competitiveness are main triggers for mitigation. In Peru, the National Guidelines for Climate Change Mitigation suggest prioritising areas where there are co-benefits in terms of economic growth and social development as a strategic line to follow.

Climate-oriented action in Chile seems to have better receptivity than in other countries. This might be associated with the fact that Chile's growing economy raises sustainability concerns in a carbon-constrained future, and the synergies with an outstanding concern on the vulnerability of the energy supply. All NAMAs identified to date in Chile have a clear national motivation (Sanhueza 2011), but poverty reduction has not been part of the picture. Chilean NAMAs have not been integrated into a national strategy. This integration may create more space for linkages with other national priorities and further discussion on the inclusion of co-benefits (Sanhueza 2011). Social benefits have been part of the criteria set for selecting NAMAs in the energy sector, but the relative weight is limited and definition remains vague.

As opposite to Chile, mitigation policy in South Africa has some receptivity challenges, especially from the industry and energy sectors. The current high carbon-intensity of the economy and entrenched energy and mineral complex are the principal reasons. Labour, civil society and faith communities are expected to support and encourage mitigation action (Tyler 2011). The Climate Change Response Green Paper in South Africa suggests that mitigation actions should be urgent and decisive, and that those which significantly contribute to a peak, plateau and decline emission trajectory, and those that have a potential positive job creation, poverty alleviation and/or general economic impacts should be prioritised (Tyler 2011).

5.3 Synthesis

A commonality between countries is the fact that they are building their mitigation action on non-climate-driven policies that were already in place or under development. Chilean plans for development of NAMAs in the energy sector is a good example of this: pursuing more efficient use of energy and penetration of non-conventional renewable energies sources in the energy matrix of the country. Brazil's focus on avoided deforestation is another example. Peru is prioritising NAMAs which can be successfully and effectively implemented. In practice, this means that actions with a well-established regulatory and institutional framework are prioritised. In all these cases, climate finance is seen as an opportunity to cover incremental

costs or to reinforce existing regulation, for instance by putting in place support actions that overcome traditional implementation barriers.

Brazil, Chile and Peru have clearly a sectoral approach towards mitigation. Such an approach allows for aligning the interests of each of the relevant ministries with the climate objective (Sanhueza 2011). Colombia and South Africa also have a hand in national planning and defining nationwide mitigation strategy. The different approaches would have advantages and disadvantages with regards to integrating poverty, and it is anticipated that they would vary from country to country.

Summing up, all five countries share similar poverty profiles and comparable challenges in terms of pursuing development, equality and poverty eradication and decoupling the economic growth from the GHG emissions; but their mitigation vision and motivation varies significantly from country to country. All five countries have paid greater attention to mitigation in recent years. Yet, the mitigation approach barely recognises poverty as a problem or concentrates mostly on general alignment with a set of national priorities.

From a bottom-up perspective, the set of analysed MAs holds a number of overlaps between mitigation and poverty efforts. Most of these overlaps exist in a theoretical sphere. Thus, the poverty-alleviating potential is not a given but would depend on the comprehensive design of the mitigation initiative, from the concept to its implementation. Some of the selected actions are highly likely to generate positive impacts on poverty: improvement of potato crops (Colombia), increase mini hydraulic, biomass and wind capacities (Chile), selective promotion of credit access for farmers (Brazil), or the National Sustainable Settlements Facility (South Africa). However, poverty alleviation is not perceived as the principal driver of the above initiatives, or the only driver as in the South Africa example. On the other hand, we found actions with an unprovable direct impact on poverty reduction at micro-level, such as promoting electric vehicles or energy efficiency in the industrial sector. Again, a pro-poor design could change this. Notwithstanding, it is important to note that any of the MAs could have negative impacts on poverty. Design and implementation are indispensable elements to determine the actual impacts. In this micro-perspective assessment no irreparable competition or tension between mitigation and poverty objectives has been identified.

Table 7 is an attempt to classify the MAs according to the typology discussed above. Judgements are based on the interpretations of drivers steering the mitigation actions, as described above. These are no judgements on the actual impacts. Impact analysis require further careful research. The impact differs depending on the composition of the PAMA.

Table 7: Categorisation of analysed MA according to the PAMA typology

Poverty alleviation - Emissions reductions	High	Low
High	Renewable energy program: increase mini hydraulic, biomass and wind capacities (Chile) Potato crops (Colombia) Reduced deforestation (Brazil) Renewable initiative (South Africa)	Carbon tax (South Africa) Electric Vehicles (Colombia) Energy efficiency for transport (Chile) Energy efficiency in the copper mining (Chile) Geothermal energy (Chile)
Low	Efficient Lighting NAMA (Peru) National Sustainable Settlements Facility (South Africa) BRT in Cape Town (South Africa) Promotion of forestation of soils (Chile) Access to credit for sustainable farming (Brazil)	Promotion of zero-emissions vehicles (Chile) Integral improvement of transit management (Chile)

6 Conclusion and further research

This paper reviewed the emerging body of literature for concepts, definitions and policy recommendations regarding the inclusion of poverty alleviation objectives and measures in LCD and, in particular in this regard, mitigation activities.

Mitigation action is necessary in all countries, just as LCD needs to be on the political agendas in both developed and developing countries. Yet, the realities and policy problems differ amongst these groups of countries. Poverty and inequality remain the most pressing problems in the developing world and will further increase through the impacts of climate change. We argue that the changing demographics in regional distribution of poverty in the world need to be acknowledged to effectively address the dual challenge of poverty and climate change. Mitigation is a significant task for developing countries, too. It could also provide an opportunity to combat poverty, but this has not been recognised as such.

The paper presents a preview of preliminary desktop research applying an initial conceptual framework including a typology and so-called PAMAs to the MAPS countries. The findings of this pilot study indicate that very few of the MAs described in the MAPS country study reports are perceived to be embedded in poverty alleviation efforts. Theoretical potential for integrating poverty reduction benefits is found in all the cases. Moreover, recent national approaches towards mitigation appear to be more consistent with existing policies and contextualised in a national development context and objectives.

This exploratory work needs, however, to be extended in order to allow for robust results. The mitigation actions need to be carefully assessed regarding the risks and potential benefits for poverty; synergies and trade-offs need to be identified and decided upon. The macroeconomic perspective of the impact of LCD paths on poverty also needs to be researched. Only understanding the dynamics of both bottom-up mitigation action and top-down low-carbon strategies and their interaction will be able to resolve the poverty and mitigation equation.

Such refinement of the study needs to be informed by the countries themselves, in the MAPS context, by the MAPS country researchers. Elements like the implementation design of mitigation actions is crucial, as the most promising proposal can lose its poverty-alleviating potential, depending on the implementation. On the other hand, the most straightforward mitigation action can carry socio-economic benefits if its implementation is designed with care and knowledge.

Mitigation has become a national task in the MAPS countries. There is an urgent need to deepen understanding of the opportunities and risks that LCD and mitigation activities raise in terms of fighting poverty.

7 References

Anderson, S. (2011). Climate change and poverty reduction. *Policy Brief*. CDKN. London, Climate & Development Knowledge Network.

Barbier, E. (2005). *Natural resources and economic development.* Cambridge, Cambridge University Press.

Beg, N., J. C. Morlot, et al. (2002). 'Linkages between climate change and sustainable development.' *Climate policy* **2**: 129-144.

Bleischwitz, R., P. Welfens, et al. (2011). International Economics of Resource Efficiency, Eco Innovation Policies for a Green Economy, Physica-Verlag.

Brundtland, G. H. (1987). Our common future, from one earth to one world. Oslo, World Commission on Environment and Development.

Cadena, A. and R. Rosales (2011). Mitigation Action in Developing Countries: Country Study for Colombia. MAPS Working Paper. Bogota, Cape Town, MAPS, Universidad de los Andes.

Christian Aid (2011). Low-carbon Africa: Leapfrogging to a Green Future.

Daly, H. (1990). 'Toward some operational principles of sustainable development.' *Ecological Economics* **2**(1): 1-6.

DFID (2011). Poverty reduction in a low carbon economy. Summary sheet.

Ellis, K., B. Baker, et al. (2009). Policies for Low Carbon Growth, Overseas Development Institute.

Eriksen, S., P. Aldunce, et al. (2011). 'When not every response to climate change is a good one: Identifying principles for sustainable adaptation.' *Climate and development* **3**: 7-20.

GGGI (2011). Green Growth in Motion. Seoul, Global Green Growth Institute, Presidential Committee on Green Growth of Republic of Korea. This book is a collection of condensed, English translation of selected articles from Kim Hyung Kook (Ed.). (2010). The Right Way to Know about Green Growth, Nanam: Seoul.

GNESD (2007). Global Network on Energy for Sustainable Development. Reaching the Millennium Development Goals and beyond: access to modern forms of energy as a prerequisite.

Grunewald, N., S. Klasen, et al. (2011). Income inequality and carbon emissions. Working Papers. C. R. Centre. Goettingen, University Goettingen.

Halsnaes, K. and P. R. Shukla (2008). 'Sustainable development as a framework for developing country participation in international climate change policies.' *Mitigation Adaptation Strategy Global Change* **2008**(13): 105-130.

Halsnaes, K., P. R. Shukla, et al. (2008). 'Sustainable development and climate change: lessons from country studies.' *Climate policy* **8**: 201-219.

IBRD (2009) Low Carbon Development for Mexico: Low carbon development six country studies, Washington DC.

Lèbre La Rovere, E. (2011). Mitigation Action in Developing Countries: Country Study for Brazil. MAPS Working Paper. Cape Town, Rio de Janeiro, MAPS, CENTROCLIMA/PPE/COPPE/UFRJ.

Martinez-Alier Guha, R. and J. Martinez-Alier (1997). Varieties of environmentalism: Essays North and South London, Earthscan.

Mertz, O., K. Halsnaes, et al. (2009). 'Adaptation to climate change in developing countries.' *Environmental Management* **43**: 743-752.

Michaelowa, A. and K. Michaelowa (2007). 'Climate or development: is ODA diverted from its original purpose?' *Climatic Change* **84**: 5-21.

Milani, B. (2000). *Designing the green economy: the postindustrial alternative to corporate globalisation.* Maryland, Oxford, Rowman & Littlefield Publishers Inc.

Mocarquer, S. and H. Rudnick (2011). Achieving a low carbon economy in a fast developing country. *Power and Energy Society General Meeting, 2011 IEEE* Santiago de Chile, Potnificia Univresidad Catolica de Chile.

OECD (2010). Transition to a Low-carbon Economy: Public goals and corporate practises, OECD Publishing.

OECD/EIA (2010). Energy Poverty How to make modern energy access universal? Special early excerpt of the World Energy Outlook 2010 for the UN General Assembly on the Millennium Development Goals.

Olsen, K. (2007). 'The clean development mechanism, Its contribution to sustainable development: a review of the literature.' *Climatic Change* **84**(1): 59-73.

Padma, T. (2011) Poor nations 'need to find own path to green economy'. *Science and Development Network* 6 October 2011.

Pearce, D. (1992). 'Green Economics.' *Environmental Values* **1**: 3-13.

Pearce, D., E. Barbier, et al. (1990). *Sustainable development: economics and environment in the Third World*. London, Edward Elgar.

Pearce, D., A. Markandya, et al. (1989). *Blueprint for a green economy.* London, Earthscan Publications Ltd

Pezzoli, K. (1997). 'Sustainable development: A transdisciplinary overview of the literature.' Journal of Environmental Planning and Management 40(5): 459-574.

Postigo Takahashi, T. a., P. a. Zevallos, et al. (2011). Mitigation Action in Developing Countries: Country Study for Peru. MAPS Working Paper. Lima, Cape Town, MAPS, Libelula.

Project Catalyst (2009). Low Carbon Growth Plans Advancing Good Practice, Working Draft.

REN21 (2005). Renewable Energy Policy Network. "Energy for Development: The Potential Role of Renewable Energy in Meeting the Millennium Development Goals."Washington, DC: Worldwatch Institute.

Robinson, J. (2004). 'Squaring the circle? Some thoughts on the idea of sustainable development.' Ecological Economics 48: 369-384.

Sanhueza, E. J. (2011). Mitigation Action in Developing Countries: Country Study for Chile. MAPS Working Paper. Santiago de Chile, Cape Town, MAPS.

Schipper, L. (2007). Climate change adaptation and development: exploring the linkages. Working Paper 107. Norwich, Tyndall Centre for Climate Change Research.

Sen, A. (1999). Development as Freedom. New York, Random House.

Sharachchandra M, L. (1991). 'Sustainable development: A critical review.' World Development 19(6): 607-621.

Stern, D. (1996). 'Economic growth and environmental degradation: The environmental kuznets curve and sustainable development.' *World Development* **24**(7): 1151-1160.

Sumner, A. (2010). Global Poverty and the New Bottom Billion: What if Three-Quarters of the World's Poor Live in Middle-Income Countries? IDS Working Paper. Brighton, Institute for Development Studies, Sussex University.

Tyler, E., A. Boyd, et al. (2011). Mitigation Action in Developing Countries: Country Study for South Africa. MAPS Working Paper. Cape Town, MAPS, University of Cape Town.

UNDP (2007). Measuring Human Development. A Primer. Guidelines and tools for statistical research, analysis and advocacy. Ney York, United Nations.

UNDP (2010). Millennium development goals and climate change adaptation: The contribution of UNDP-GEF adaptation initiatives towards MDG3. New York, United Nations Development Programme.

UNDP (2011). Executive Summary Preparing Low-Emission Climate-Resilient Development Strategies. A UNDP Guidebook- Version 1. United Nations, New York.

UNEP (2011). *Towards a green economy: pathways to sustainable development and poverty* eradication. United Nations Environment Programme.

UNEP (2011a) Decoupling natural resource use and environmental impacts from economic growth, A Report of the Working Group on Decoupling to the International Resource Panel. Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A.

UNFCCC (1992). *United Nations Framework Convention on Climate Change.* New York, United Nations.

Urban, F. (2010). The MDGs and Beyond: Can low carbon development be pro-poor? *IDS Bulletin*. Oxford, Institute of Development Studies. **41**.

Winkler, H., N. Hoehne, et al. (2008). 'Methods for quantifying the benefits of sustainable development policies and measures (SD-PAMs).' *Climate Policy* **8**(2): 119-134.

World Commission on Environment and Development (1987): Our Common Future, "Brundtland Report", Oxford, Oxford University Press.

8 Appendix

PERU: Mitigation actions from a poverty perspective

Table 6: Peruvian MAs, characteristics and theoretical poverty implications

Examples	**Mitigation potential***	**Motivation** *(Based on the information of the Country studies)*	**Socio-economic variables taken into account in selecting the MA** *(Based on the information of the Country studies)*	**Possible poverty implications** *(According to the authors of this paper)*
Efficient lighting NAMA: includes 3 support actions (Information and Educational campaign, funding programme and MRV system) and 3 mitigation actions (reduce energy consumption & implement the use of more efficient lighting technologies in the residential, industrial, and public services sectors)	+	1. Reduction of demanded power electricity, which avoids need for extra power capacity for peak hours in the short term. 2. Potential efficiency in implementing the MA, as it is aligned with existing policy, has a low abatement cost and capacity to implement it exists.	Social co-benefits and adaptation potential are explicitly included as part of the criteria set for prioritisation. There is also a reference to [WB, 2009] which identifies positive poverty impacts from implementing energy efficiency measures. There is no definition of social co-benefits.	MDG1: Cutting extreme poverty and hunger: Reduced energy cost in households with electricity access

**Mitigation potential (roughly estimation based on available information and expert judgment): +++: very significant, ++: significant, +: medium, -: low or very low*

COLOMBIA: Mitigation actions from a poverty perspective

Table 7: Colombian MAs, characteristics and theoretical poverty implications

Examples	Mitigation potential*	Motivation *(Based on the information of the Country studies)*	Socio-economic variables taken into account in selecting the MA *(Based on the information of the country studies)*	Theoretical poverty implications *(According to the authors of this paper)*
Electric vehicles (substition of gasoline cars by electric vehicules for urban transportation nationwide)	++	1. The promotion of electric vehicles are mentioned in the National Development Plan 2010-2014. 2. Transport emission contribute significantly in the total GHG emissions and expected to grow considerably.	Local air pollution	MDG 6: Combat HIV/AIDS and other disease: Reduced health problems associated to air pollution MDG 7: Environmental Sustainability Improvement of local air quality
Potato crops: combining potato crops with other forestry and farming activities in order to structure silvopastoral and agroforestry systems. Expected impacts are: reduced use of fertilizer, reduced soil erosion, and thus potato production costs are reduced, and increased intake	unknown	1. The importance of fostering sustainable crops, given the role of the agriculture sector in the economic and social development in Colombia[7]. 2. GHG emissions in the agriculture sector is the largest source of the country emissions (2004 -38.1% of the total emissions)	Sustainable development, job creation: The agricultural and rural sector is considered an engine for the future because it is expected to achieve a sustainable growth in output above the national average. It is also expected to generate wealth, jobs and quality benefits to the	MDG 1: Cutting extreme poverty and hunger: Job creation: About 110 000 families are directly involved in potato production. This represents more than 20 million daily wages per year. It generates more than 100,000 direct jobs, and generates other jobs indirectly created by the input distribution processes, packaging, machinery, seeds, processing and marketing. Small producers are up nearly 90% of the farmers in

[7] Potato cultivation in Colombia took fourth place in national agricultural production in the 2003 with 2.9 million tons, was ninth with 165,294 hectares in crop extension and sixth in value of production. In real terms, the value of production in the period 1990-2002 grew at a rate of 1.2%

of carbon as a sink).			economy in terms of productive linkages with other sectors, market deepening, reduction of poverty, food security and welfare for the population.	potato farming industry and produce about 45% of the total production potato in the country. Food security and Income poverty: Because the potato is a high consumption product, it has an important share in the family consumption basket, resulting in an important role in the general price index of the economy and a huge impact on the Colombian families' budget. Income generation: Increase profits of farms through improve negative effects of crop mishandling (e.g soil degradation and reduction of the water availability) MDG 7: Environmental Sustainability: Agroforestry systems reduce soil erosion.

**Mitigation potential (roughly estimation based on available information and expert judgment): +++: very significant, ++: significant, +: medium, -: low or very low*

CHILE: Mitigation actions from a poverty perspective

Table 8: Chilean MAs, characteristics and theoretical poverty implications

Examples	**Mitigation potential***	**Motivation** *(Based on the information of the Country studies)*	**Socio-economic variables taken into account in selecting the MA** *(Based on the information of the Country studies)*	**Theoretical poverty implications** *(According to the authors of this paper)*
Energy efficiency program for transport: aerodynamic improvements, training in efficient driving, good maintenance practices, improvement in the management of fleets	++	Ensuring a sustainable balance of the current transport systems for freight and passengers	Local air pollution	MDG 7: Environmental sustainability Improvement of local air quality
Promotion of zero and low-emission vehicles	+	*(Information not available)*	Local air pollution, Job creation Investing in a new technology in the country	MDG 1: Cutting extreme poverty and hunger Job creation
Integral improvement of transit management	-	Optimisation of the road operation for transport	Local air pollution	MDG 7: Environmental sustainability Improvement of local air quality
Promotion of forestation of soils with preferably forestry aptitude and/or degraded soils	-	*(Information not available)*	Economic development, Job creation	MDG 1:Cutting extreme poverty and hunger Job creation

Energy efficiency in copper mining	++	Alignment with national objectives in energy policy. Encouragement of energy efficiency in one of the most important productive activities in the country	Economic development	
Renewable energy program: increase mini hydraulic, biomass and wind capacities	+++	Diversify country's energy matrix, mainly for energy-security purposes, via promoting renewable sources that have not been developed due to barriers other than economic ones	Competitiveness	MDG 1: Cutting extreme poverty and hunger Job creation
Geothermal energy development policy	+++	Alignment with national objectives in energy policy.	Economic development Support new deployment of a new technology in the country	

**Mitigation potential (roughly estimation based on available information and expert judgment): +++: very significant, ++: significant, +: medium, -: low or very low*

BRAZIL: Mitigations actions from a poverty perspective

Table 9: Brazilian MAs, its characteristics and theoretical poverty implications

Examples	**Mitigation potential***	**Motivation** *(Based on the information of the Country studies)*	**Socio-economic variables taken into account in selecting the MA** *(Based on the information of the Country studies)*	**Theoretical poverty implications** *(According to the authors of this paper)*
80% reduction in annual deforestation surface in the Amazon, and 40% in the savannahs	+++	Reduce deforestation rates to preserve the ecosystem and its environmental value.	Sustainable development	MDG 1: Cutting extreme poverty and hunger • Income generation/ Carbon revenue • Job creation/Sustainable forest management
Integrating mitigation action as part of the eligibility requirements for farmers to get credit from governmental development banks, and of economic incentives to access softer loans from these public bodies.	++	Promote sustainable practices in the agriculture and raising cattle activities.	Sustainable development	MDG 1: Cutting extreme poverty and hunger • Income generation/Improved access to credit facilities by poor farmers • Job creation/Better productivity – enhance job creation

**Mitigation potential (roughly estimation based on available information and expert judgment): +++: very significant, ++: significant, +: medium, -: low or very low*

SOUTH AFRICA: Mitigations actions from a poverty perspective

Table 10: South African MAs, its characteristics and theoretical poverty implications

Examples	**Mitigation potential***	**Motivation** *(Based on the information of the Country studies)*	**Socio-economic variables taken into account in selecting the MA** *(Based on the information of the Country studies)*	**Theoretical poverty implications** *(According to the authors of this paper)*
Bus Rapid Transport (BRT) in Cape Town: energy efficiency and modal shift.	++	Not a climate driven activity but a public transport project Drivers were World Cup and supportive allocation of national grants.	Improvement of public transport, considered an important development element.	
South African Renewables Initiative (SARi)	+++	Scale-up green economy, in particular, to secure financial and institutional arrangements to facilitate mass of renewable development.	Job creation: proposed scale up of renewables would produce 35,000 – 50,000 jobs.	MDG 1:Cutting extreme poverty and hunger • Job creation
The carbon tax	+++	Economic policy instrument to achieve GHG mitigation, and thus, to achieve international climate commitments.	A preliminary analysis of the socio-economic implications of a tax has been conducted: GDP will be only slightly affected, the effect on employment will be neutral and there will be a small reduction in inequality. The final design of the allocation of revenues will have major implications on social variables (*currently there is no information, as the design is at a very early stage of*	

			development).	
National Sustainable Settlements Facility	++	Increase mandatory 'green' specifications of all new subsidised housing, with enabling finance Play a role on education and awareness-raising around clean energy issues in a sector of population anticipated to drive emissions growth into the future	Significant health, safety and energy service delivery co-benefits through the delivery of improved quality housing to poor households.	MDG 1/Cutting extreme poverty and hunger • Job creation • Household energy expenditure savings

**Mitigation potential (roughly estimation based on available information and expert judgment): +++: very significant, ++: significant, +: medium, -: low or very low*