Beyond 2015: Long-term development and the Millennium Development Goals

Netherlands Environmental Assessment Agency

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Preface

Unfolding global trends and dynamics, and linking policy domains including development cooperation to produce more coherent and effective policies have become integral components of the work of the Netherlands Environmental Assessment Agency (PBL). Our focus is to examine development in terms of sustainable quality of life for all, now and for future generations. In this study, medium-term policy challenges and opportunities are considered in achieving long-term development goals within the framework of environmental sustainability. This study builds on the people-oriented approach of our Sustainability Outlooks (published in 2004 and 2007) which analyse interlinkages between social-cultural (people), ecological (planet) and economic (profit) domains. This approach brings a new dimension to our traditional stronghold of environmental issues in the context of development enabling all people worldwide to have sustainable access to sufficient food, water, energy and clean air.

Our study is appropriate now as the world is half-way to the target year for the Millennium Development Goals (MDGs); the commitment of the international community to eradicate extreme poverty and hunger, to improve education and health, and to ensure gender equality and environmental sustainability. Despite considerable progress, the largely unforeseen global economic crisis will inevitably have major consequences particularly for the Least Developed Countries and could seriously jeopardise MDG achievement. While too premature to assess the far reaching consequences of the current economic crisis, our study has identified challenges and opportunities for long-term development that continue to be determining factors in MDG achievement. By providing information on long-term human development, and identifying entry points for development policies we aim to contribute to policy development in the broader context.

Director, Netherlands Environmental Assessment Agency

Prof. Dr. M. A. Hajer

Contents

Executive summary

Millennium Development Goals leading framework for development policies

The Millennium Development Goals (MDGs) are the leading agenda for international policy efforts on development and sustainable poverty reduction. This series of quantitative and time-bound targets are directed to reducing extreme poverty and hunger, to improving basic services for people such as health, education and a healthy environment, and to creating a global partnership to enable these goals to be achieved. The international community made a commitment to the MDGs.

An integrated, long-term perspective capturing development dynamics

The MDGs have 2015 as a target year. However, underlying long-term dynamics of human development including feedbacks and trade-offs with the environment require targeting beyond 2015. Global environmental changes, demographic transition and income gaps especially have strong implications for MDG achievement in 2015 and beyond. Unlike previous MDG assessments, this study adopted an integrated approach (People-Planet-Profit) in which a long-term perspective is taken in exploring short- and medium-term implications and possible actions.

Towards 2015, progress can be observed, but not everywhere, and not enough

Analyses with the GISMO model, developed to address long-term human development, show progress on many of the MDGs up to and beyond 2015, but this progress is not sufficient to achieve all goals in all regions (Figure E.1). By far the most progress is expected in East Asia, where high economic growth facilitates rapid development and poverty will almost be eradicated by 2015. Considerable progress is also expected in Latin America, the Middle East and North Africa. Poverty will become more concentrated in Sub-Saharan Africa and South Asia. In Sub-Saharan Africa, the MDG target of halving poverty will just be achieved in 2030. Nevertheless, with the relatively high population growth in poorer regions, some 600 million people will have less than one dollar per day in 2015, and this number will reduce to 400 million in 2030. The goal to halve hunger will not be achieved in most developing regions, though improvements are visible. The number of people suffering from hunger reduces only slightly and remains over 700 million until 2030. Furthermore, the largely unforeseen global economic crisis will inevitably have major consequences which could seriously jeopardise MDG achievement. As yet, it is too premature to analyse the effects in a long-term perspective.

Child mortality a difficult goal to achieve

Reduced health risks and improved health services are expected to reduce child mortality in all regions. From as high as 20% children dying before the five years of age, the level in 1990, child mortality in Sub-Saharan Africa is almost halved by

2030. This is a major achievement but far from the MDG target of a two-thirds reduction in 2015 on the 1990 level. Moreover, such a reduction is barely achieved in any developing region, not even in 2030, which indicates the difficulty of this target. Even in an optimistic scenario with high economic growth and agricultural productivity, this reduction is still far from sufficient to reduce the child mortality by two-thirds. A considerable proportion of these child deaths is related to hunger, lack of safe drinking water and sanitation and the use of traditional energy sources which are largely preventable. The lives of millions of children could be saved as a result of higher agricultural productivity, efficient water use and availability of clean and affordable energy. In practice, most of these technologies, including medical technology, are not available in developing countries because of inadequate infrastructure and energy supplies, patents on drugs, and high prices.

Environmental degradation will continue...

A sound natural resource base is one of the most valuable assets for the poor, providing ecosystem goods and services such as fertile soil for agriculture and clean water for drinking and irrigation. But the natural resource base is under constant pressure as population and economic development increase demand for food, water and energy. These trends result in land degradation, pollution of water, soil and air, growing competition for water, and decreasing forest cover and biodiversity. In addition, climate change puts further pressure on land productivity and water availability. As a result, most of the targets set to ensure environmental sustainability (MDG7) will be not met.

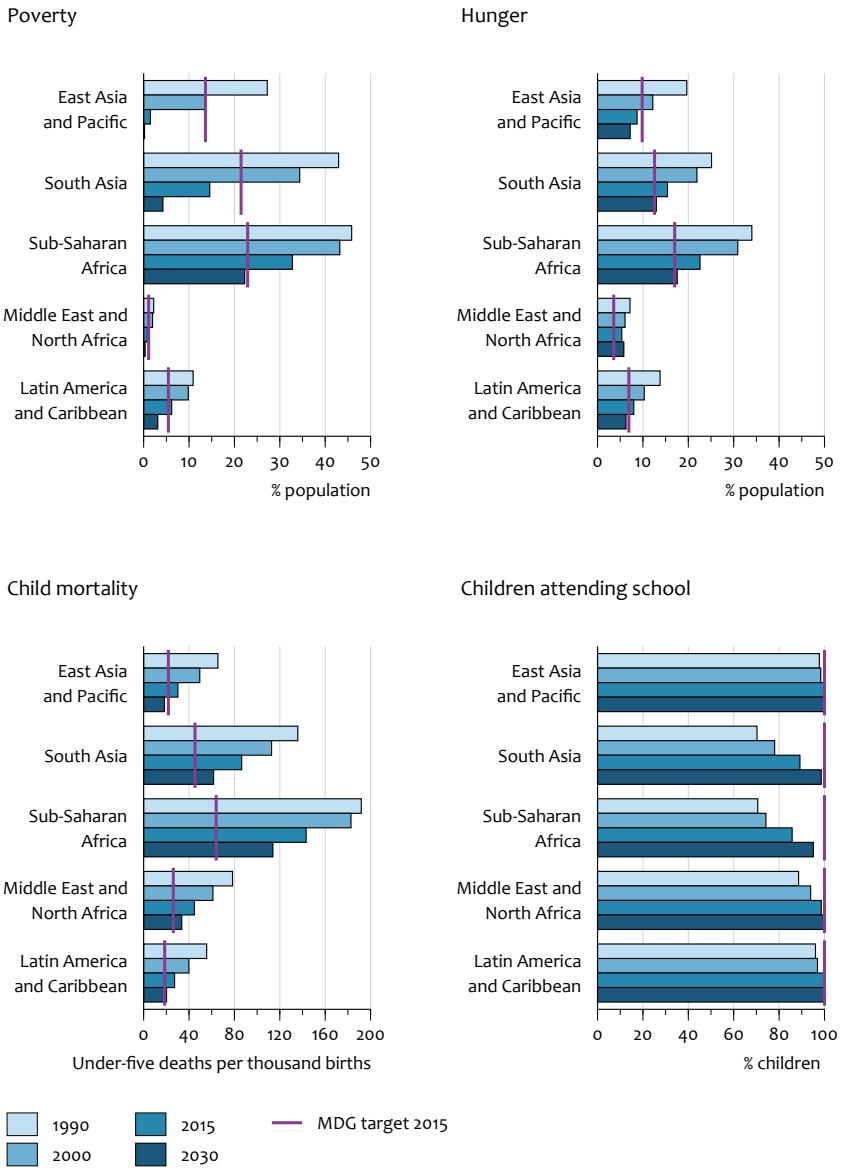
...increasing vulnerability and undermining development

Environmental pressures often coincide, putting already vulnerable groups under even more pressure. Analysis of drylands, for example, shows hot spots with respect to the challenges and trade-offs of improving human development in a fragile environment with limited natural resources and high risks of overexploitation. Together with current levels of severe poverty, drylands are a challenge in poverty alleviation and environmental sustainability. Local and national policies are, therefore, needed to reduce people's sensitivity to shocks in their livelihoods, and to strengthen their coping capacity. International policies need to be complementary in mitigating global environmental change, such as climate change, and in building a supportive international context for national and local implementation of a sustainable development agenda.

Development policies need to be differentiated by target group, phasing and time

Differences in national demography, natural resource base and socio-economics need to be incorporated into development policies. For instance, development policies need to take into account the increasing urban shift in poverty, as well as the continuing persistence of rural poverty. Furthermore, the impacts of development policies are not always instantly visible as in the case of education. It takes more than a generation to educate a population, and in doing so, the entire educational system needs to be scaled up to meet increased enrolment. The costs are felt directly even though the economic benefits of a more educated population only become apparent after several decades. Policy strategies should, therefore, clearly distinguish between medium and long-term objectives beyond 2015.

Figure E.1 **Millennium Development Goals**



Projected developments on four key indicators of the Millennium Development Goals.
Source: GISMO1.0

Policy coherence is important for successful development policies

While Official Development Assistance (ODA) might be the most direct instrument in development cooperation, it is not the only way to stimulate development. This

is recognised in MDG8 'global partnership for development'. For instance, trade and more liberalised world markets can bring additional economic growth to developing countries. But trade liberalisation also brings risks. Countries depending on exports are more susceptible to fluctuations in world markets, while without additional policy, vulnerable groups such as unskilled workers benefit far less from trade liberalisation. This calls for policy coherence that interlinks the various sustainability domains (People-Planet-Profit), connects different scales (from local, livelihood-oriented to international and global aspects), and links short-term actions with long-term effects.

Ending global poverty requires a development agenda beyond 2015

Getting closer to the MDG target year of 2015, the international community needs to start thinking about a post-MDG development agenda to guide long-term development policies and to end global poverty. In 2015, poverty and hunger, may be halved but will still exist, and elimination of health risks and environmental degradation will continue to be major concerns. Furthermore, new development challenges may arise because demographic, economic and environmental processes are slow moving and their impacts will only become evident after 2015. The GISMO model can help to identify these challenges, explore quantitative targets and thus support the process of creating a new phase in the development agenda beyond 2015.

1

Introduction: taking stock and looking into the future

In 2000, the international community made a commitment to the Millennium Development Goals (MDGs). This series of quantitative and time-bound targets are directed to reducing extreme poverty and hunger, to improving basic services for people such as health, education and a healthy environment, and to creating a global partnership to enable these goals to be achieved (Table 1.1). The MDGs are also the guiding principle for Dutch and European development policy.

We are now more than halfway to the target year of 2015 for achievement of these goals. This report considers the medium-term policy challenges and opportunities in achieving long-term development goals with a strong emphasis on the role of the environment.

The MDG mid-term review: some success, but not on track

Recent mid-term reviews (UN, 2008c; UN, 2008a) show some key successes, but greater effort is required to achieve the MDGs in all countries. Progress can be observed in reducing absolute poverty worldwide, although many countries remain off-track for meeting the goals by 2015 and inequities are increasing within many countries. This is particularly true for large parts of Africa and parts of Asia where, often in fragile states, a billion people are trapped in poverty (Collier, 2008). Significant gaps remain in meeting global commitments to provide the enabling environment to accelerate progress in reducing poverty (UN, 2008b).

Financial crisis hampers recent development progress

Africa is lagging behind on almost every goal despite encouraging economic growth over the last ten years, an overall improvement in the policy environment, and stronger macro-economic fundamentals (UN, 2008a). However, the recent financial and economic crisis will affect progress in all developing countries, trapping an additional 53 million people in poverty in 2009. This estimated number is in addition to the further 130-155 million people who became trapped in poverty in 2008 due to higher food and fuel prices (World Bank, 2009a). Development is expected to be affected either directly or indirectly by collapsing global trade, disappearing private capital flows, and lower development assistance (World Bank, 2008a; World Bank, 2009b). The impact of the crisis will strike the poor and most vulnerable hardest

and MDG achievement will be further jeopardised (World Bank, 2009b). However, it is difficult to assess all impacts of recent developments on long-term prospects.

Long-term dimensions of major development trends need to be taken into account

A stronger policy effort is required to substantially reduce poverty by 2015 and beyond. Thus in dealing with short-term crises, policies need to take a long-term perspective. If this is not done, then MDG achievements may not be sustainable beyond 2015 (Bourguignon et al., 2008). However, achievement of development goals is influenced by the closely related trends of demography, urbanisation, education and global environmental changes. As these are inert and slowly evolving changes, many of today's policies will only show results after many years or even decades. Thus, these slow changes need to be taken into account in current policies to ensure that development objectives are achieved beyond 2015. This merits an integrated analysis beyond 2015 that also addresses the implications for short- and medium-term policies.

Environment is vital for development

There is increasing recognition of the importance of the environment in development and human wellbeing (Millennium Ecosystem Assessment, 2005; UNEP, 2007; World Bank, 2008b). A healthy natural resource base and environment is one of the most valuable assets for the poor. In fact, those countries facing serious decline in goods and services provided by ecosystems are also making the slowest progress in achieving the MDGs (Millennium Ecosystem Assessment, 2005). Global and regional environmental changes are taking place at unprecedented rates including climate change, loss of natural resources, land degradation and water stress (UNEP, 2007). The relationship between development and environment, therefore, needs to be at the core of the development debate.

Integrated approach to address development dynamics

A simple trend analysis is not sufficient to capture long-term socio-economic dynamics and environmental change that determine development in terms of human wellbeing and MDG achievement. Trends from 1990 to 2008 do not provide a sound basis on which to extrapolate outcomes in 2015 and beyond. Therefore, this study has taken an integrated approach in which a long-term perspective is taken in exploring short- and medium-term implications and possible actions. This approach takes account of interactions between the human ('people'), economic ('profit') and environmental ('planet') domains. To capture feedbacks and trade-offs between these domains, system dynamics modelling is particularly suitable. Integrated analysis endeavours to bridge scales and to analyse how local outcomes are influenced by national and international policies and *vice versa*.

Using the GISMO model

The Global Integrated Sustainability Model (GISMO) has been used to make a comprehensive and consistent assessment of the long-term development dynamics and the implications for MDG achievement (Hilderink and Lucas, 2008). The GISMO model was developed by PBL to analyse human development and wellbeing in interaction with the environment. This model is used in assessing long-term and often inert changes, for example demographic transition and education dynamics,

Table 1.1 Millennium Development Goals and the targets

Goal	Target
1. *Eradicate extreme poverty and hunger*	**1a: Halve the proportion of people whose income is less than US$ 1 per day**
	1b: Achieve full and productive employment and decent work for all
	1c: Halve the proportion of people who suffer from hunger
2. *Achieve universal primary education*	**2a: Ensure that children will be able to complete a full course of primary schooling**
3. *Promote gender equality and empower women*	3a: Eliminate gender disparity in all levels of education
4. *Reduce child mortality*	**4a: Reduce by two-thirds the under-five mortality rate.**
5. *Improve maternal health*	5a: Reduce by three-quarters the maternal mortality ratio.
	5b: Achieve universal access to reproductive health
6. *Combat HIV/AIDS, malaria and other diseases*	6a: Have halted and begun to reverse the spread of HIV/AIDS.
	6b: Achieve universal access to treatment for HIV/ AIDS for all those who need it
	6c: Have halted and begun to reverse the incidence of malaria and other major diseases.
7. *Ensure environmental sustainability*	7a: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources.
	7b: Reduce biodiversity loss, achieving a significant reduction in the rate of loss
	7c: Halve the proportion of people without sustainable access to safe drinking water
	7d: Have achieved an improvement in the lives of at least 100 million slum dwellers
8. *Develop a global partnership for development*	8a: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
	8b: Address the special needs of the least developed countries
	8c: Address the special needs of landlocked countries and small island developing States
	8d: Deal comprehensively with the debt problems of developing countries through national and international measures to make debt sustainable in the long term.
	8e: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.
	8f: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.

The eight Millennium Development Goals and the targets, with the targets used in the analyses highlighted

and for analysing trade-offs between energy, agriculture and socio-economic development.

Such a modelling approach is always a simplification of the processes it addresses; people and places are represented by rather abstract and aggregated measures. We are aware of the importance of connecting the macro level represented by regional averages to national and local processes. Therefore, vulnerability analyses have been included using geographical outcomes from, for example, the IMAGE model (Integrated Model to Asses the Global Environment, MNP, 2006).

Issues addressed

The report identifies medium-term policy challenges and opportunities to address long-term development dynamics. The following issues are addressed:

- Long-term trends and dynamics relevant to human development;
- The implications of these trends for MDG achievement up to 2015 and beyond;
- Effects of environmental changes on sustainable poverty reduction and MDG achievement;
- Policy options in the short- and medium-term taking the long term into account.

2 Development, quality of life and sustainable poverty reduction

The MDGs are the leading policy framework for development policies that aim at sustainable poverty reduction and a decent standard of living for all. This chapter briefly elaborates the link between development and the MDGs. Building on recent reviews of progress in MDG achievement, various categories of countries are defined for analysis of the long-term dynamics and prospects for future development policies.

Development, quality of life and the MDGs

Improving quality of life – the extent to which individuals have the ability to live lives they value and the opportunities to do so – lies at the heart of development objectives. There are many ways to express quality of life (Robeyns and van der Veen, 2007). UNDP (2005b) refers to quality of life as the process of widening people's options through greater opportunities for education, health care, income and employment. The Millennium Ecosystem Assessment (2005) links quality of life to freedom and choices which rest on basic material opportunities, health, environmental and personal security, and good social relations. These four underlying components are interrelated and reinforcing. Improvements in health, for example, may require expanding livelihood options through more secure access to natural resources as well as security from natural disasters. The MDGs relate to most aspects of quality of life, but are not themselves a definition of wellbeing. Rather, they are a list of accepted priority public responsibilities for the medium term (Jaeger et al., 2007).

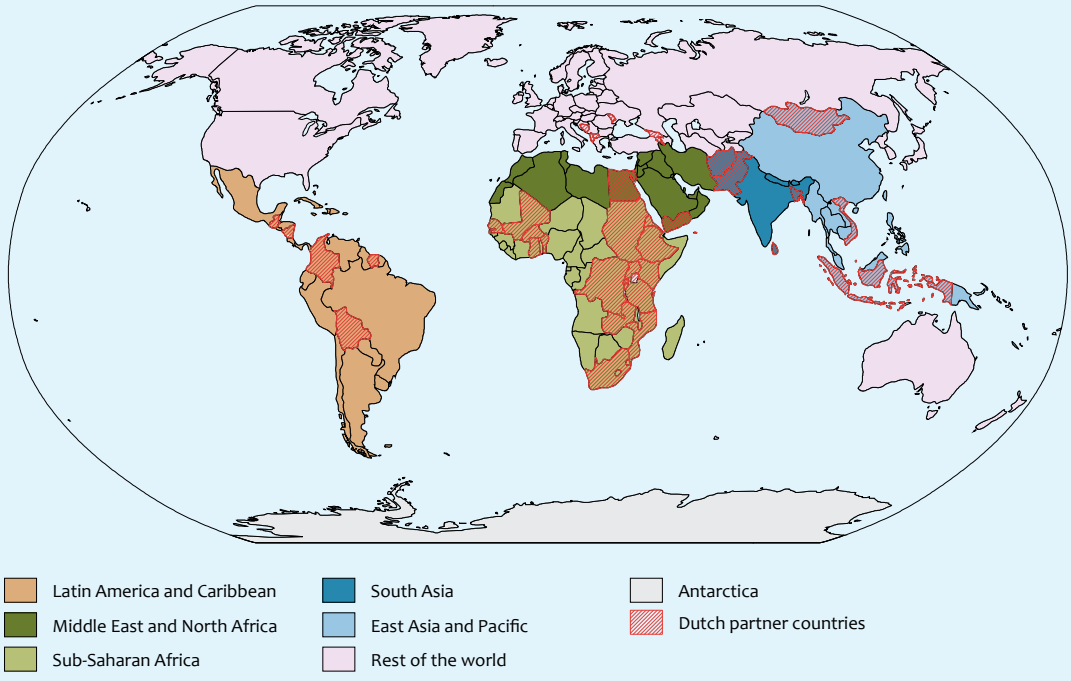
Broad support for MDGs but also some criticism

The MDGs as an overarching framework for development helps to focus international efforts on development and raise public awareness. But while there is broad support, there is also criticism. Bringing the development agenda back to a set of goals and targets might not reflect the complexity of development issues nor do justice to specific situations and characteristics of the countries at stake. Any selection also implies exclusion of topics that are also considered to be relevant. For example, reproductive health is not represented, yet neglecting chronic diseases is considered to be short sighted since such diseases are highly significant in the medium term (Fuster and Voûte, 2005). Further, the importance of environmental

Box 2.1: Global-regional-national aggregation levels

The analyses in this report are done with the Global Integrated Sustainability Model - GISMO (Hilderink and Lucas, 2008). This model distinguishes 27 major world regions, which are aggregated in this report to six main developing regions (Figure 2.1). The regions were aggregated on the basis of aspects such as homogeneity, data availability and practical feasibility. However, a regional breakdown is not always suitable for addressing country-specific characteristics. Other modelling approaches such as International Futures (Hughes and Hildebrand, 2006) and Threshold21 (Millennium Institute, 2004) analyse explicitly the country level. The International Futures model was, for example, used for country-specific poverty projections (Hughes et al., 2008) while the T21 model was used in an analysis of Ghana on the MDGs. While these models have other limitations with regard to applicability and comprehensiveness, they complement the GISMO model. In addition, grid-based outcomes of, for example, the IMAGE model (MNP, 2006) can be used to include a geographic-explicit and more detailed level of information. This provides better insights into local situations.

Developing world regions and Dutch partner countries **Figure 2.1**



Aggregated developing world regions and partner countries for Netherlands Development Cooperation.

issues is only partly reflected and there are no clear targets (MNP, 2007). Another issue that is flagged as missing is voice and accountability as an independent goal (Bourguignon et al., 2008). Nevertheless, the MDGs can be considered to be a broad set of goals and targets to reduce poverty in its many dimensions.

MDGs to be considered comprehensively

The main challenge for countries is which goals to prioritise and how to achieve these goals, taking into account structural relationships between underlying development processes. There will be trade-offs as countries prioritise their efforts. A highly relevant question in the context of sustainable development is: Can poverty and hunger be halved by 2015 (MDG1), while ensuring environmental sustainability (MDG7)? The positive interdependency of the various MDGs is illustrated by the goal to achieve universal primary education, which will also indirectly reduce child mortality. Such interrelationships and underlying mechanisms need to be considered in assessment of the MDGs. Thus, the MDGs should be considered as an integrated part of an overall sustainable development strategy, rather than as a partial policy focused on a single target or a selection of targets.

Sustainable poverty reduction strategies

To achieve a decent quality of life for current and future generations requires poverty reduction to be sustainable. One way of considering people who are potentially most vulnerable and how they cope and adapt is the sustainable livelihood approach (Chambers and Conway, 1992). A livelihood comprises a person's means of living which depends on having access to and use of resources and assets. These can include natural resources, technologies, skills, knowledge and capacity, education, sources of credit, and social support networks. Access to these assets is strongly influenced by their vulnerability context. This concerns trends (such as economic, political, and technological), shocks (such as epidemics, natural disasters and civil strife) and seasonality (such as prices, production and employment opportunities). Access is also influenced by the prevailing social, institutional and political environment. The sustainable livelihood approach provides a way of thinking about sustainable poverty reduction strategies and can help to link local processes with higher level policy making.

Different countries, different progress, different policies

A general approach to development policy would not do justice to country-specific circumstances. A country's development potential is influenced by its geographical location, natural resource endowment as well as the socio-economic situation and culture. Nevertheless, countries do show similarities. In the last decade, several developing countries have achieved relatively high economic growth, and these countries have also made the greatest progress towards MDG achievement. In contrast, a number of other countries have made little economic progress and thus are behind in MDG achievement. These countries seem to be trapped in a vicious circle of poverty, political instability, or/and an environmental downward spiral (Collier, 2008). Looking ahead, it seems reasonable in long-term sustainable development strategies and policies to differentiate at least between those countries that have experienced economic growth for some time and those countries that have remained behind (Bourguignon et al., 2008; Chronic Poverty Research Centre, 2008; Collier, 2008).

Emerging economies and countries that stay behind

Progress in global poverty reduction is largely due to achievements in East Asia. Countries in this region have experienced relatively high economic growth over the last 20 years and have become a substantial part of the global economy. The main development challenges for this group of countries now include the distribution of increasing welfare, provision of social services such as improving health and educating the population, and environmental problems in relation to the rapid economic growth.

Contrary, MDG achievements are lowest in the poorest regions, such as Sub-Saharan Africa and South Asia, and are extremely low especially in fragile states. This group of countries have experienced hardly any significant economic growth for decades and only in the last five to ten years has there been some economic growth (World Bank, 2007b). The situation in these countries can be explained by various development traps including conflict, abundance of natural resources resulting in the 'resource curse', being landlocked, poorly governed and environmentally degraded. As these countries are relative latecomers in the globalisation process, they may have missed the economic opportunities of the last two decades (Collier, 2008). Countries may also face other development traps but the four mentioned above may well reflect the main challenges for these countries.

International policies taking local options into account

The country groupings could help with regard to international development policies. The eighth and last MDG (global partnership for development) refers to the international community and addresses the international conditions and external support needed for achievement of the other seven MDGs. MDG8 is not so much a goal for domestic development like the other MDGs, but a set of targets for the international community to provide the means for achieving domestic goals. Such international policies will only be effective if coherent and tuned with national and local policies. This is, for example, the case for the rural poor who depend on local environmental resources for their income, either for subsistence or for some form of enterprise, such as farming, tourism, and fishing (WRI, 2008). However, sustainable management of ecosystems that produce these goods and services can help them to gradually move beyond environmental income alone. Depending on the circumstances, successful local reforms that have captured such opportunities include a combination of factors such as strengthening participatory governance mechanisms and building capacities; adopting better governance, adopting good practices for sustainable production techniques and improving access to markets and credit (Turner et al., 2003). Many of these local reforms are directly related to national and international policies. The key, therefore, is coherence between the policy domains and between levels of policy making.

Different perspectives in the development debate

There is intense debate amongst practitioners and academics about the objectives approaches to international policy making and development cooperation. This is, for example, witnessed by the large number of publications reflecting a broad range of perspectives on development. These perspectives reflect fundamental uncertainties about how the world functions, different ideas about desired developments outcomes and on policies to be implemented. To address these uncertainties, PBL has developed a methodology which takes account of this plurality of ideas and depicts similarities and contrasts between different perspectives. This intermezzo is intended to give some structure to the development debate, without choosing side. All perspectives reflect aspects of the reality and as such are valuable.

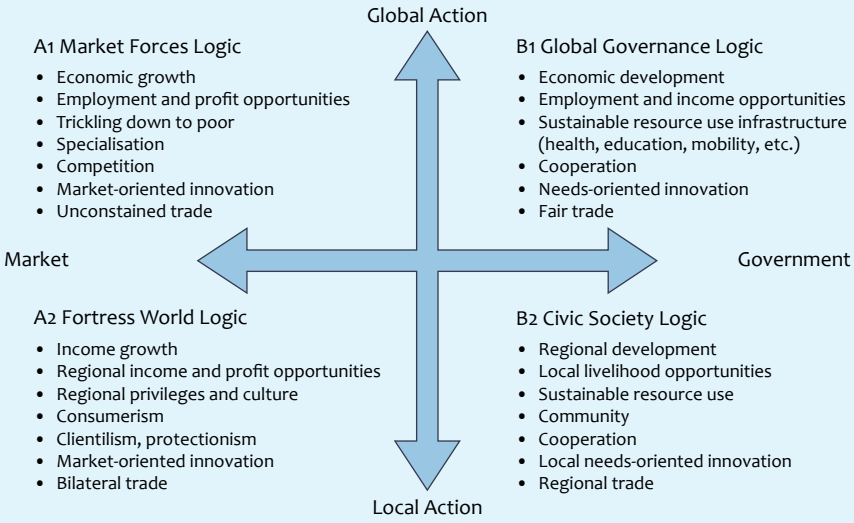
Sachs versus Easterly: top-down versus bottom-up

Some, such as Sachs (2005), consider that most countries might escape the poverty trap through a big push of aid and investment that brings economic growth which will trickle down to the poor. Collier (2008) argues that aid can be very helpful but will not be enough to help the bottom-billion, the poorest people caught in different traps that block their development process. In his view, development policies should prioritise this group of countries. The opposite is proposed by Easterly (2006) who concludes that higher economic growth and poverty reduction will only happen with changes from the bottom-up and that development aid has blocked rather than stimulated the development process. Others take a middle position that aid works, but aid provision could be improved and made more efficient (Banerjee, 2007; Riddell, 2007). Putting efficiency first, Lomborg (2004) assessed the most economical cost-benefit solutions for the world's ten major problems, including development issues and aid.

Dealing with fundamental uncertainties

The uncertainty concerning future trends is not only the result of statistical uncertainty; it is also the result of fundamental differences in the views of how the world functions or works as depicted in the various views described above. One approach to dealing with these different views or perspectives is to use the world view approach to identify different perspectives, for example on development policies (MNP-RIVM, 2004; MNP, 2007). This methodology can be very helpful in positioning and structuring different views on, for example, sustainability issues and has been applied in various scenario studies (de Vries and Petersen, 2009).

Dimensions of world views on development **Figure I.1**



Dimension and characteristics of the four world views.

Four resulting world views on development cooperation

The methodology clusters various lines of thought into four world views (Figure I.1) reflecting combinations of two main uncertainties. The four world views differ primarily on the extent to which activities have international interlinkages, that is globalisation versus more regional development, with a stronger bottom-up character (vertical axis), and whether the market or government is the dominant mechanism or player (horizontal axis). The varying ideas about development cooperation include similar uncertainties, bottom-up versus top-down, and different types of actors, more market-oriented or a strong role for government. The four world views can then be regarded as various extremes in the development debate.

Different motives for development cooperation in four world views

Support for international development cooperation can be argued along the lines of the four world views. Development can be seen as:

- *a way to create new markets and a more efficient world economy (A1);*
- *a moral obligation and to prevent long-term population growth (B1);*
- *a means to avoid a massive migration flow looking for better, basic living conditions and a more stable political situation at the border of current developed regions (A2);*
- *of intrinsic value but only worthwhile when safeguarding a developing country's own cultural, socio-economic identity (B2).*

Different world views have different risks attached

These world views represent stylised views of how the world functions and how the world could be managed. Reality, however, never completely matches these views and each of world views incorporates risks. These risks can also be related to the policy options described in this report. In the A1 world view, the main risk is that free markets and trade liberalisation may not be as beneficial for developing countries and/or particular vulnerable groups as thought. Also, the strong belief in technological fixes could undermine resource bases because a growing economy requires more inputs, will result in more environmental damage, and the availability of medical technology can be lower then expected. The most risky aspect in the B1 world view is the bureaucracy related to global governance and global institutions which undermine their effectiveness and credibility. In the A2 world view, the focus is on a region's own identity and development assistance will be downsized resulting in developing countries trapped in situations with no escape. In the B2 world view, there is no global connection to do something about global problems, and a strong regional focus may not provide developing countries with sufficient prospects to achieve economic growth.

3 Human development in a long-term perspective

A number of closely related long-term development trends are relevant to achievement of the MDGs. In this study, the GISMO1.0 model was used (Hilderink and Lucas, 2008, Appendix A) to analyse these trends and their consequences for MDG achievement in 2015, the target year for most MDGs, and for 2030 in order to provide a long-term perspective (Box 3.1). The focus is on economic development and poverty, education, access to food, improved drinking water and sanitation, improved energy sources, and reducing child mortality.

3.1 Major trends for the coming decades

In identifying medium-term policy challenges and opportunities related to long-term development dynamics, an analysis needs to be made of the long-term dynamics. Current policies targeting, for example, the MDG for education have a direct effect of providing adequate basic education for all children. However, the indirect effects on economic growth, and on health and fertility levels will mostly be visible in the longer term, beyond the MDG target year of 2015. Given these inertia, some policy actions have to be taken now but some of the benefits will only become apparent in the long term. The major trends and their inertia with respect to human development are addressed, focusing on the main underlying drivers, which are population dynamics (age structure and urbanisation) and economic developments (human capital and income distribution).

Population changes are the result of three components

The three basic processes of population change are fertility, mortality and migration. The profound transformation of decreasing fertility and mortality patterns is generally referred to as the demographic transition. It is part of a much broader process of increasing income levels and education levels, especially education of girls. Migration, however, is less well understood. It is caused by a mix of push and pull factors. The negative or push factors (such as, unemployment) in one place cause people to move elsewhere, while a number of positive or pull factors in other places (such as, economic opportunities) attract migrants.

An incomplete demographic transition results in continuing population increase

While many developing countries are completing the demographic transition, Sub-Saharan Africa and to a lesser extend South Asia are lagging behind. Fertility levels in these countries are currently around five children per woman, and have been declining in the last few decades. However, even if fertility levels drop instantly to the replacement level of 2.1 children per woman, the population of Sub-Saharan Africa will have grown 50% by 2050. Therefore, population growth will continue for decades to come in the most deprived parts of the world. With fertility expected to decline further and health to improve, the global population will increase from 6.5 billion now to approximately 8.0 billion people in 2030 (Figure 3.1). The highest growth will occur in Sub-Saharan Africa and South Asia.

Population is not only about numbers but also about structure

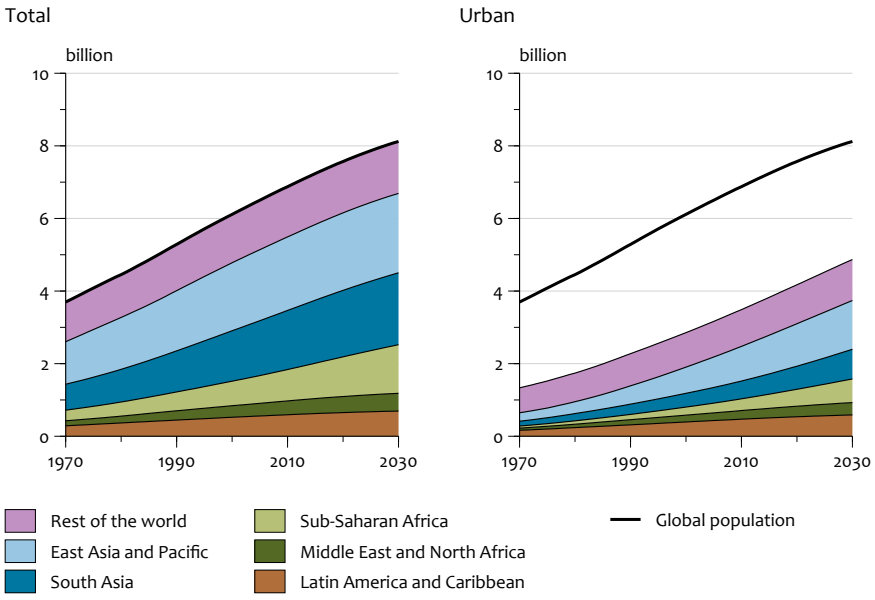
Changes in fertility, mortality and migration not only affect the total population but also the population structure. Declining mortality increases life expectancy and thus changes the age structure of the population in favour of the elderly. Decline in fertility rates alters the age structure of a population in favour of cohorts of working age, and later towards the elderly. The former can have significant positive impacts on economic growth due to a low dependency ratio - a larger working population compared to the inactive population (children and elderly). The latter, however, increases the dependency ratio, thus putting pressure on economic growth. A period with a relatively low dependency ratio - the demographic window of opportunity - lasted in Europe from 1950 to 2000. This period began in China in 1990 and

Box 3.1: Scenario used in this study

The analysis in this study uses the FAO scenario on food availability (FAO, 2006) and the World Bank scenario on economic growth (2005). Historic developments in regional inequality are taken from the World Bank (Chen and Ravaillon, 2007) and kept constant in our projections. Average food consumption will grow substantially in all developing regions, from 2650 kcal/cap/day in 2000 to 2960 kcal/cap/day in 2030. The largest increase will be in Sub-Saharan Africa and South Asia but in 2030 will lag behind at 2600 kcal/cap/day and 2790 kcal/cap/day, respectively. The relatively high economic growth results from improvements in macroeconomic conditions and investments, and reduction in trade barriers. With an average growth of more than 5% per year, the economy will also grow substantially in all developing regions in the coming decades (Figure 3.3). The highest growth will be in East Asia and Pacific and South Asia but growth in per capita terms will be much lower in Sub-Saharan Africa, the Middle East, and North Africa. These projections date from before the commodity price boom and the global economic crisis, developments that will have a significant effect on the projections but are not included in this report.

All of these developments drive population dynamics including fertility and mortality, but also education dynamics, demand for food, water and energy and thus the health status of the population. The resulting population projection is comparable to the UN medium scenario (UN, 2006) used in the FAO and World Bank scenarios.

Figure 3.1 **Population**



Projected increase in global and urban population by region. Source: GISMO1.0

is expected to continue until 2015, while India is expected to enter the demographic window in 2010, which may last until 2050. Unfortunately, changes are taking place slowly in Sub-Saharan Africa. This region will not enter the demographic window of opportunity before 2045, making well-needed strong economic growth more difficult.

...and about the place where they live: an increasingly urbanising world

Globally in 2008, the urban population was larger than the rural population for the first time in history. While only 29% of the population was urban in 1950, the global urban population is expected to increase to 60% of the total population in 2030 (Box 3.2). Most of this growth will occur in East Asia and Pacific, South Asia and Sub-Saharan Africa. All of these regions had an urbanisation rate of around 20% in 1970 that is projected to grow by 2030 to 60%, 40% and 50% respectively.

This rapid growth of the urban population has both negative and positive consequences (Box 3.2). Today, globally, one in every three city dwellers lives in a slum, totalling about one billion people (UN-Habitat, 2006). Most of these slum dwellers (94%) live in developing regions. People in slums not only lack adequate housing, but also adequate drinking water and sanitation, and sufficient living space with the result that health levels are substantial lower. If current trends continue, the global slum population will reach 1.4 billion in 2020, almost all living in developing regions.

Human capital is essential for economic growth

The main determinants of long-term economic growth are capital and labour accumulation and productivity increase. Labour accumulation is dependent on demographic changes. Countries that enter the demographic window of opportunity have relatively low dependency ratios which give them the potential for higher economic growth. However, this 'demographic bonus' is only a potential advantage because low participation rates or high unemployment may limit the impact of a favourable age structure.

In addition to the demographic potential, education fuels economic growth (Lutz et al., 2008). Education enables countries to adapt technological improvements, thereby increasing both capital and labour productivity. However, children entering primary education take 10 to 20 years before they become economically active, and countries can fully gain from their education.

Not all countries and people profit evenly from global wealth increase

World income inequality has increased dramatically over the last two centuries (Bourguignon and Morisson, 2002). This evolution has been mainly due to a dramatic increase in inequality across countries and regions, with Western countries showing a much higher growth in per capita income than developing countries. However since the 1950s, several developing countries have experienced economic development. Some have experienced growth rates above 5% for 20 consecutive years. Most African countries have had zero growth in the last 30 years and have only recently shown improvement. The rise in world income inequality would now seem to be over, but this does not mean that a reversal will take place.

Poverty is increasingly urbanised

Cities are generally seen as the engine of economic growth, and therefore attract many people from poorer rural areas. One-quarter of the world's poor live in urban areas and that proportion has been rising over time (World Bank, 2007a). By fostering economic growth, urbanisation has helped to reduce absolute poverty in the

Box 3.2: Urbanisation and the MDGs

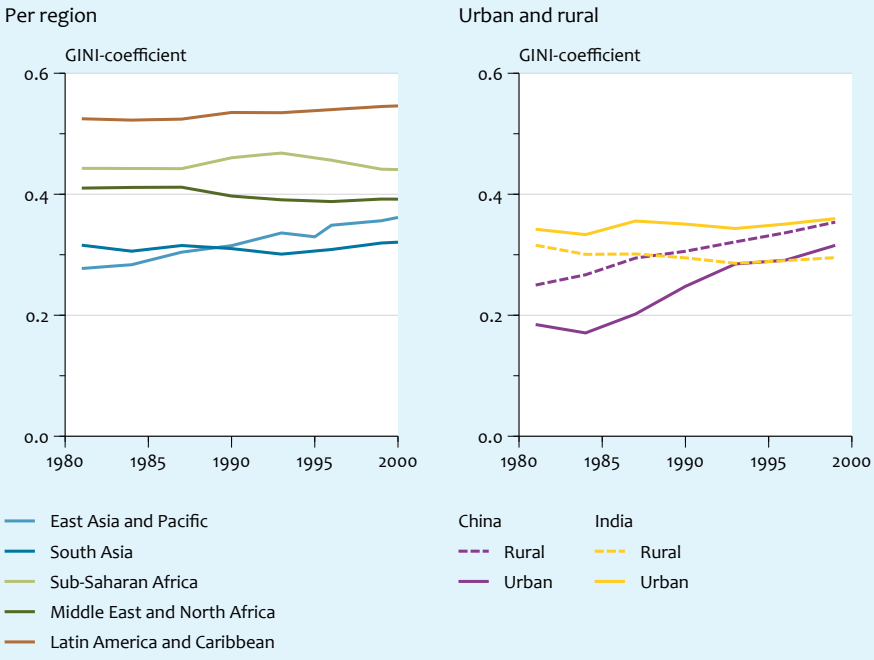
The urban-rural distinction in where people live is not only relevant for MDG7 for which drinking water and sanitation has an explicit rural-urban dimension. Other development aspects also have distinct characteristics for urban and rural populations. In general, overall development levels are higher in urban than in rural areas. The UNDP Human Development Index for China's urban population is 0.81 while for its rural population is 0.67 (UNDP, 2005a). Despite this, the locus of poverty is shifting to cities. In addition, poor urban populations are more prone to malnutrition, while traditionally hunger is most often associated with rural situations. Child mortality is on average lower in urban than in rural areas; yet is as high in urban slum children as in rural children. The contributing factors to the high child mortality are overcrowding, inadequate drinking water and sanitation, and lack of access to basic health services, while HIV/AIDS has higher impacts among urban adults.

Box 3.3: Income inequality

The Gini coefficient is one of the most commonly used indicators to describe income inequality, indicating income distribution over a country's population. The more equal a country's income distribution, the lower its Gini coefficient. The Gini would be zero with absolute equality, and one with absolute inequality. The World Bank has collected poverty and inequality data for most developing countries for the period 1981-2004 (Chen and Ravaillon, 2007; Figure 3.2). The Gini coefficient has increased significantly in East Asia, and also in Latin America and the Caribbean (where it was already the highest in world by far). In China, inequality has increased in both urban and rural areas, although the urban increase has been much larger (Ravallion et al., 2007).

Regional Gini coefficients are used in GISMO to determine the income distribution and the population with less than $1 per day and $2 per day (Hilderink and Lucas, 2008). The Gini coefficients for future projections are kept constant at 2000 values because of the lack of future projections and insights to link inequality change to other determinants in the model. This has major implications for those regions showing increasing inequalities, such as East Asia and Pacific, where further increase in inequality could slow down poverty reduction.

Figure 3.2 **Income inequality**



Regional income inequality and urban-rural inequality for China and India. Source: Chen and Ravaillon, 2007

aggregate but has done little for urban poverty. The poor have been urbanising even more rapidly than the population as a whole, with large regional differences. Latin America has the most urbanised poverty problem, and East Asia the least. In contrast to other regions, Africa's urbanisation process has not been associated with falling overall poverty, both in absolute and relative terms. Together with the reality that rural areas generally remain behind, income distribution within countries has also become more unequal (Box 3.3).

3.2 Implications for the MDGs

The implications of major socio-economic trends and their inertia have been assessed in relation to MDG achievement. In order to better address the underlying determinants and interrelations, the MDGs have been grouped into four clusters: poverty and economic development; education; food, water and energy; and child mortality.

3.2.1 Poverty and economic development

Developing countries are expected to have strong economic growth

Developing countries are projected to have relatively high economic growth (Figure 3.3). For example, the overall economy of China is projected to grow 6% per year between 2000 and 2015, and Sub-Saharan Africa by 4.5% per year. However, per capita income growth is substantially lower given the simultaneous high population growth rates. Taking population growth into account would reduce per capita growth in Sub-Saharan Africa to approximately 2 to 3%. Even with high growth rates, gaps remain. China will take around 50 years of 6% annual growth to reach the per capita income levels that developed countries had in 2000. For Sub-Saharan Africa, this would take around 200 years at annual growth of 4.5%. However, the global economic crisis has already affected all growth rates and thus alters this picture.

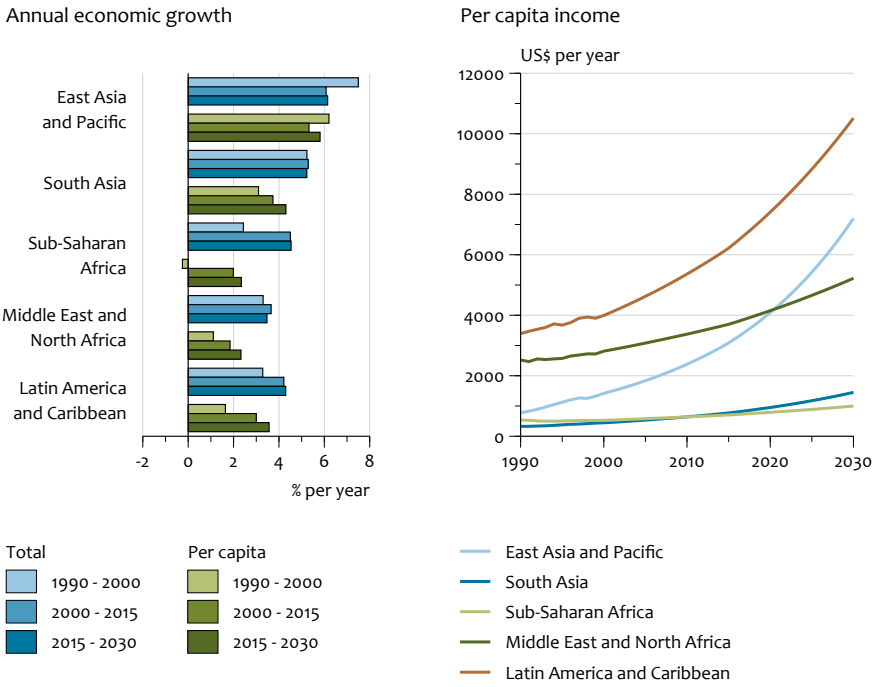
Extreme poverty is expected to decrease

Enormous progress in poverty reduction is expected especially in East Asia, (mostly China) and to a lesser extent in South Asia. The picture is slightly different for Sub-Saharan Africa. The much lower economic growth combined with high population growth indicates that extreme poverty (people with less than $1 per day) will increase in that region until 2015, and then decreases slowly after that time. Furthermore, lifting people out of extreme poverty implies that the population living on between $1 and $2 per day, which is still far from an adequate income level, will increase. In 2030, 1.6 billion will still be living on less than $2 per day, including 400 million people on less than $1 per day (Figure 3.4).

Economic growth is not per se pro-poor growth

Reducing poverty not only depends on economic developments, but also on the distribution of economic growth over the population. In the projections, economic growth is considered to be distribution-neutral, which implies that the incomes of the poorest people increase at the same rate as average income. However, this widens the income gap between rich and poor. As a result, the division of power,

Figure 3.3 **Economic growth and income**



Projected annual total and per capita economic growth, and per capita income.
Source: World Bank, 2005

possessions and access to markets and services may become more unequal, worsening the position of the lowest income groups in the long term. This calls for specific policies targeted to the poorest people.

3.2.2 Education

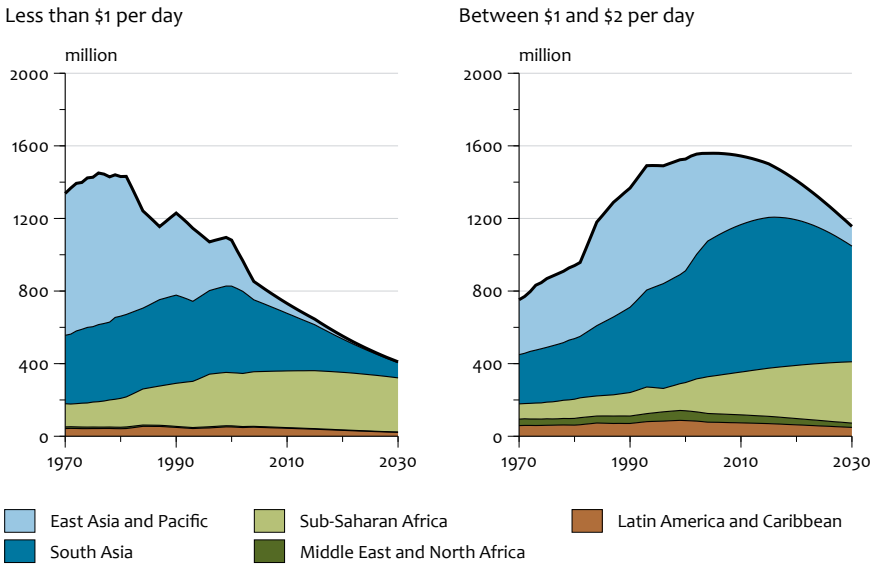
Enrolment increases significantly; still 100 million children out-of-school in 2015

The MDG goal of universal enrolment in primary education and all children completing primary education is far from being achieved in most regions. In 2000, almost 150 million children were not attending school. Some progress is expected in the coming decade - with enrolment ratios slightly higher but still with more than 100 million children out of school in 2015. Substantial progress will be made towards 2030, when the enrolment ratios approach 100% and the proportion of children in the total population stabilises.

Educating a population takes more than a generation...

Achieving universal primary education is not equal to achieving an educated population mainly because of the large inertia in the system. As people who have never had adequate education mostly remain illiterate throughout their lives, it takes a

Population in poverty **Figure 3.4**



Projected population living on less than $1 (PPP) per day and between $1 and $2 per day. Source: GISMO1.0

long time to fully educate a population (Figure 3.5). The average years of schooling increase significantly towards 2030. However, the global population without formal education only starts to decline after 2010 and in Sub-Saharan Africa after 2030.

...and a better educated population takes more than universal primary education

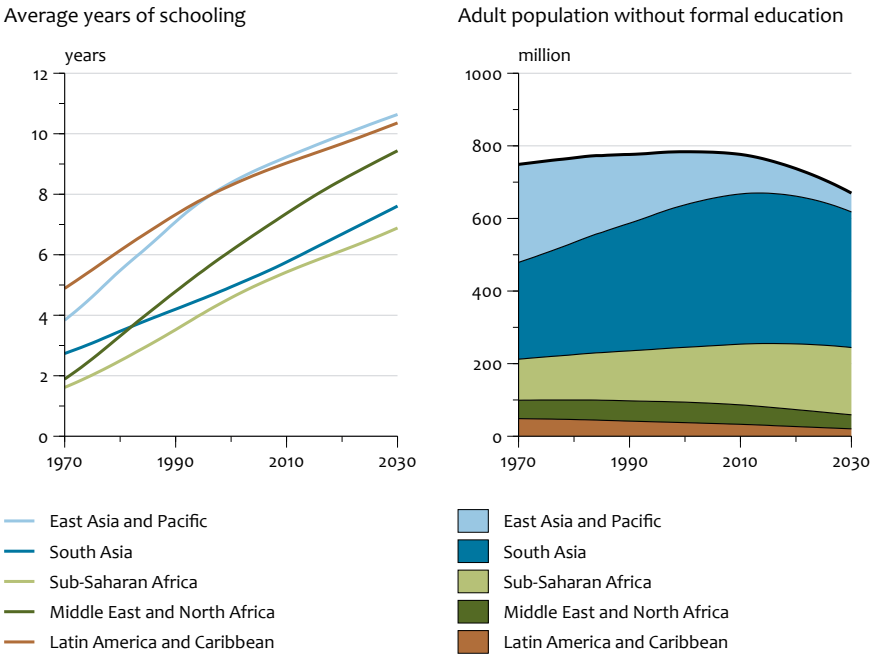
Striving for universal primary education will also lead to other matters that need to be considered. Firstly, achieving universal primary education will increase demand for secondary and tertiary education with a delay of five to ten years (Dickson et al., forthcoming). This demands additional education infrastructure. Another aspect requiring more attention is the quality of education. The goal should not only be to have every child attending school, but should also include school conditions in terms of pupil-teacher ratio and teacher skills. Without investing in teachers and the quality of education, universal enrolment might not necessarily result in a better educated population.

3.2.3 Food, water and energy

Many people lack adequate access to food, water and energy

People need the natural environment to provide essential goods and services for their subsistence, such as food, drinking water and sanitation, and energy. In 2000, some 800 million people worldwide were undernourished, 2.5 billion people were dependent on traditional fuels such as wood and coal, around 1 billion people did not have improved drinking water, and 2.5 billion lacked sanitation facilities. In most

Figure 3.5 **Education**



Projected average years of schooling and population without formal education.
Source: GISMO1.0

cases, it is the same people who lack access to these basic goods and services, contributing negatively to their wellbeing, with consequences for their health status as one of the testifying factors.

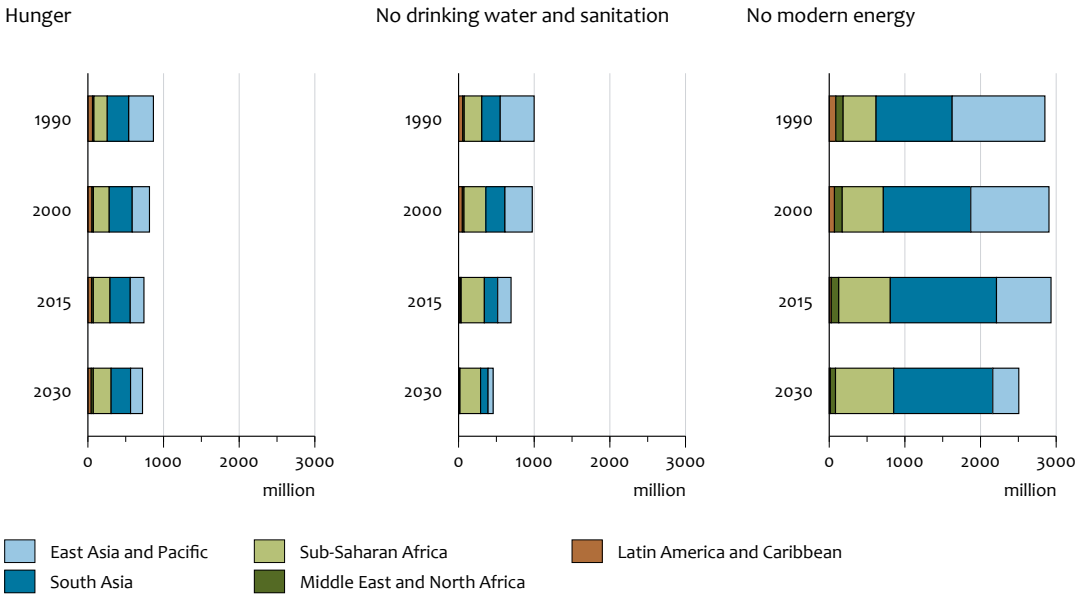
...but significant improvements can be made

Access to food, drinking water and sanitation and improved energy sources is expected to increase significantly. The main improvements are expected in East Asia and Pacific. Yet, the large increase will still leave a significant proportion of the population without adequate services in Sub-Saharan Africa and South Asia, and especially with respect to improved energy sources. In 2015, 700 million people will be undernourished, 2.5 billion people will depend on solid fuels, and 450 million people will be without improved drinking water and sanitation facilities (Figure 3.6).

Increased development at the expense of environment

Over the last 100 years, global human development has been at the expense of the environment, with ecosystems and climate affected most (MNP, 2007). Two-thirds of the world's productive land has already been brought into use, which, in turn, has caused high levels of biodiversity loss (CBD/MNP, 2007). More than 1.2 billion people live in areas where more than 75% of the river flow is withdrawn, leading to environmental degradation and competition for water (UN, 2008c). Increasing use

People without adequate access to food, water and energy **Figure 3.6**



Projected people without adequate access to food, safe drinking water and sanitation, and improved energy sources. Source: GISMO1.0

of modern energy sources is increasing greenhouse gas emissions, which are considered to be responsible for climate change (IPCC, 2007b). In the long term, these global environmental changes can also have repercussions on human development (Millennium Ecosystem Assessment, 2005).

3.2.4 Child mortality

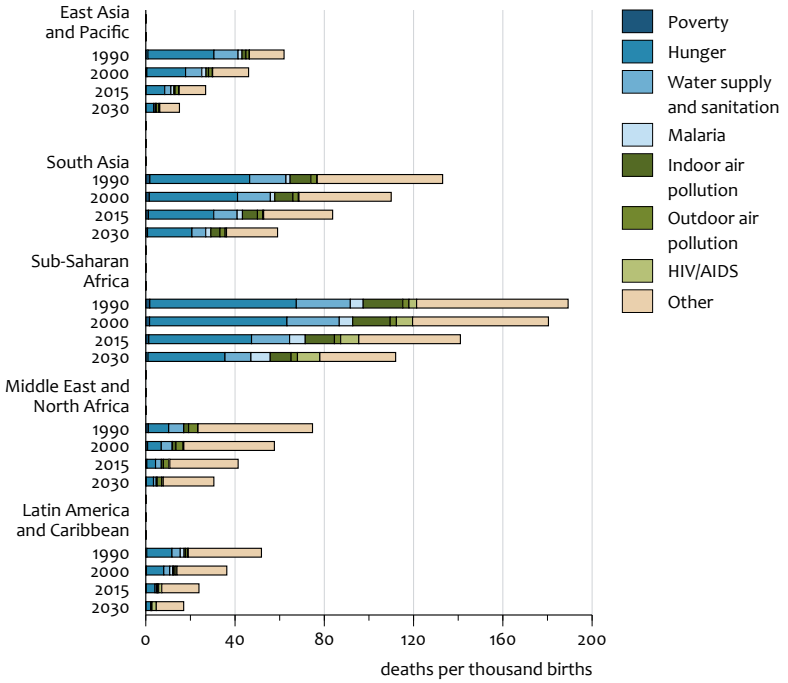
Substantial progress on child mortality can be made

Considerable decreases in child mortality are projected in all regions (Figure 3.7), but are far from sufficient to reduce the mortality rate in children under five by two-thirds, the MDG target. The major health gains are achieved by decreasing traditional health risks, such as lack of adequate access to food, improved drinking water and sanitation, and improved energy sources. Furthermore, improved health services have reduced other health risks such as perinatal conditions and measles. However, these gains will be partly undone by the impacts of HIV/AIDS and urban air pollution.

Environmental health risks remain prominent...

Although projected to gradually decrease over time, in 2015 traditional risk factors – mostly associated with infectious diseases – will still cause considerable health loss in Sub-Saharan Africa and South Asia. The contribution of lack of adequate access to food, improved drinking water and sanitation, and improved energy

Figure 3.7 **Child mortality rates by risk factor**



Projected child mortality rates by risk factor. Source: GISMO1.0

sources is especially large. In 1990, these traditional risks accounted for 60% of all child deaths. In Sub-Saharan Africa, their contribution reduces to 54% in 2015 and 50% by 2030. The trend is similar in South Asia, where the traditional health risks account for 55% in 2015 and 51% in 2030. However, these improvements are expected to be partly negated by the devastating effects of HIV/AIDS.

...while decreasing traditional health risks make way for chronic health risks

Fewer people living in poverty, a better educated population and improved access to food, improved drinking water and sanitation, and modern energy sources all have positive effects on health. Traditionally, environmental health risks are strongly related to child mortality, while chronic, lifestyle-related health risks relate more to mortality of older people. With decreasing environmental health risks and an aging population, chronic diseases become more prominent with a shift towards the more chronic, lifestyle-related health loss. The challenge may be even greater because infectious and chronic diseases often occur simultaneously. This is also known as the 'double burden of disease' (Gaziano, 2007).

Considerable investments in health services are needed

Currently, health expenditure is as low as $20-30 per person per year in South Asia and Sub-Saharan Africa, and around $50 per person per year in East Asia. Average health expenditure will increase with increasing incomes. Combined with a growing population, overall spending on health will increase ten times by 2030. This implies an enormous expansion of current health system infrastructure. Thus, it is not only a question of whether such a health system is feasible, it is also essential that people in need of these services have access to them.

3.2.5 MDG achievement

A selection of four indicators is taken as core MDG indicators (Figure 3.8). These indicators include the proportion of population living on less than $1 per day (MDG1), the proportion of population below minimum level of dietary energy consumption (MDG1), net enrolment ratios in primary education (MDG2) and under-five mortality rates (MDG4).

Some regions are catching up, others follow but remain behind

Most regions seem to have found a pathway to economic development, showing rapid progress in meeting most targets. Significant progress can be observed in East Asia, where high economic growth rates facilitate rapid development. In addition, Latin America, the Middle East and North Africa have made substantial progress in achieving the MDGs. Although their economic development is projected to be much lower than that of East Asia, these regions started in 1990 with a much higher development level. Finally, Sub-Saharan Africa and South Asia are showing progress on all of the four MDGs, although reaching the targets by 2015 (or even by 2030) appears to be extremely difficult.

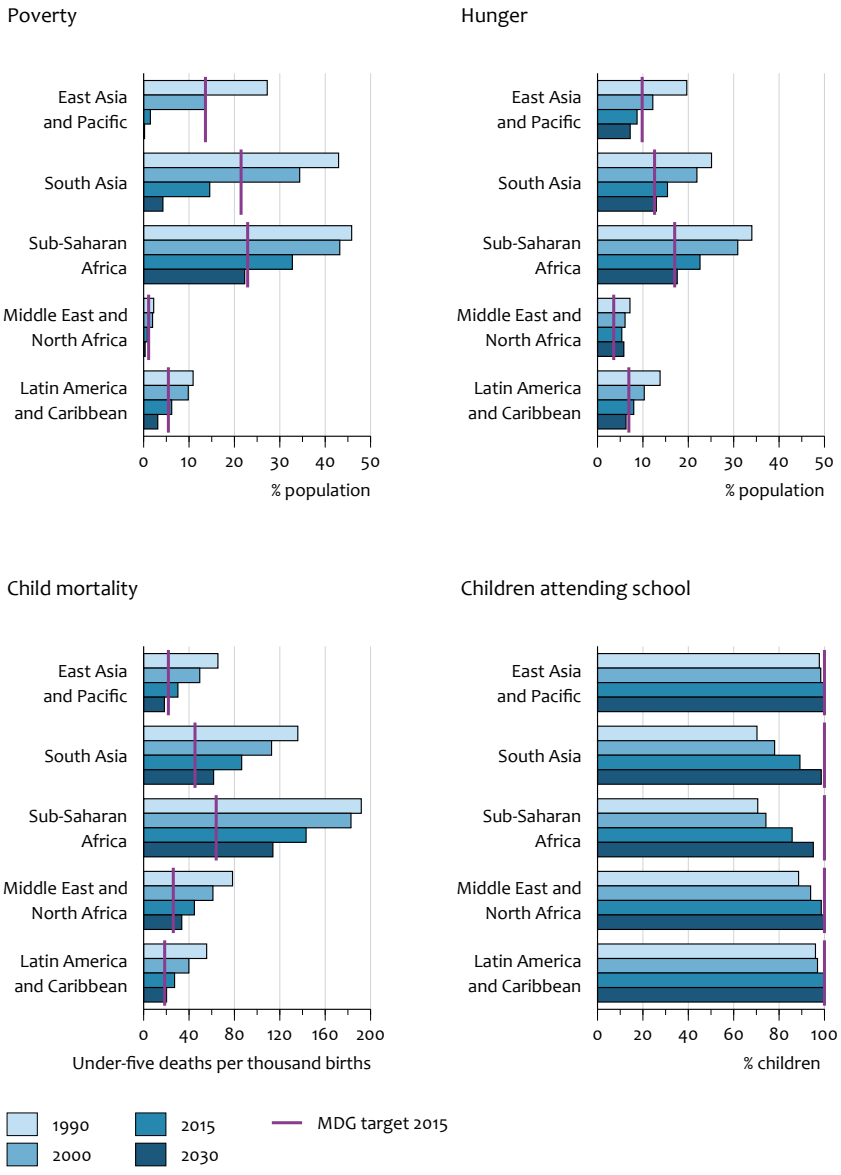
Halving poverty and hunger globally just achieved

The world as a whole may just manage to halve poverty and hunger by 2015. This will largely be determined by the enormous progress in China, if the strong economic growth of the last 20 years is maintained. The poverty target could be achieved in most regions, except Sub-Saharan Africa, but the hunger target is more difficult to achieve, and is only met in China. Sub-Saharan Africa will certainly not achieve either of these goals without additional policies and will only come close in 2030 with strong economic growth. However, the results presented are regional averages and developments may be slightly different due to possible changes in future inequalities which have not been taken into account.

Achieving universal primary education is difficult, but trends are promising

While the goal of universal primary education seems difficult to achieve, significant progress has been made over the last few decades. This is especially the case in Sub-Saharan Africa and South Asia, and to a lesser extent also in the Middle East and North Africa. Globally, over 80% of all children now attend school, and this percentage is projected to increase. If current trends prevail, East Asia and the Pacific, and Latin America and the Caribbean will reach the target by 2015, and the other regions will come close by 2030.

Figure 3.8 **Millennium Development Goals**



Projected developments on four key indicators of the Millennium Development Goals.
Source: GISMO1.0

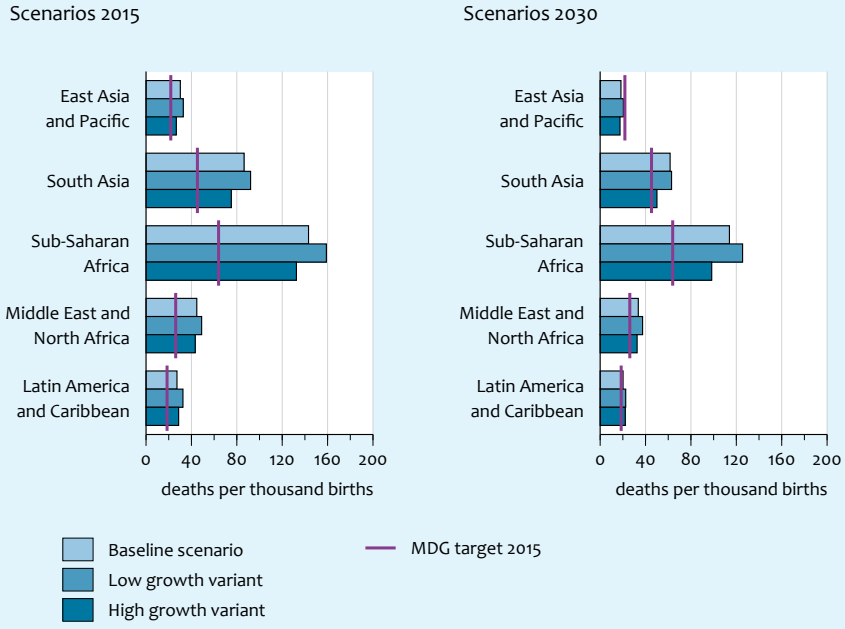
Child mortality goal still has a long way to go...

Of the four goals discussed, reducing the under-five mortality rate by two-thirds is the farthest from being achieved (Box 3.4). The only region projected to achieve

Box 3.4: Uncertainties and robust developments

The projections of economic development, fertility levels and food production are based on a range of related developments, including labour productivity, market developments, and behaviour of people and technological improvements. Long-term projections encompass major uncertainties. Therefore, two variants are used to address the uncertainties and robustness of the baseline scenario results (Figure 3.9). These variants differ in economic growth and food availability. Compared to these two new variants, the baseline scenario used in this study can be considered as a middle-of-the-road scenario. Variant I is based on the OECD Environmental Outlook (MNP/OECD, 2008), which can be considered as an optimistic scenario with respect to economic growth and per capita food availability. The latter is due to the assumed high economic growth in combination with substantial increase in agricultural productivity. Variant II is based on the International Assessment of Agricultural Science and Technology for Development (IAASTD, 2009). This scenario can be considered as pessimistic with respect to economic growth and food availability. The latter is mainly due to assumed lower technology growth, resulting in increasing food prices.

Child mortality **Figure 3.9**



Projected child mortality levels for the baseline scenario and the two variants, 2015 and 2030. Source: GISMO1.0

None of the scenarios seem to come close to a two-thirds reduction in the mortality rate of children under five in 2015 (Figure 3.9). Furthermore, only a few regions seem to reach the 2015 target by 2030. The higher food prices in the low growth variant have a huge impact on child mortality, especially in Sub-Saharan Africa. The strong economic growth in the high growth variant is still insufficient to reduce child mortality in 2030 by two-thirds of 1990 levels.

this is East Asia, but not before 2015. Again Sub-Saharan Africa and South Asia are the furthest off and still have a long way to go. Achieving this goal largely depends on progress on the other MDGs, including overall poverty reduction, education status, access to food, improved drinking water and sanitation, and improved energy sources.

3.3 Conclusions

- The analysis with the GISMO1.0 model shows substantial progress on all MDGs in the coming years, but this progress may not be sufficient to achieve all goals in all regions. The underlying trends reveal that part of the causes is the inertia involved in population and economic dynamics. Due to the population momentum, demographic changes take place at a very slow pace, while simultaneously closing the enormous economic gaps takes decades of high growth rates.
- Major progress can be observed in East Asia and the Pacific, where high economic growth rates facilitate rapid development. In addition, Latin America, the Middle East and North Africa show substantial progress towards reaching most MDGs. Their risks related to food, drinking water and sanitation and energy are projected to decrease rapidly, making these regions less dependent on their natural environment. However, reaching the targets by 2015 (or even by 2030) seems extremely difficult for Sub-Saharan Africa and South Asia. Of the four MDGs analysed in more detail, reducing child mortality by two-thirds may be most difficult for all regions. This target seems far out of reach, even with high economic growth and high agricultural productivity.
- In general, people become less vulnerable when they are better educated. They are more aware of possible risks and can cope better with modern technology. However, educating a population takes more than a generation and the benefits only become apparent after several decades. Furthermore, achieving a better educated population requires more than universal primary education. The entire education system, including teachers and schools, needs to be scaled up in order to fully benefit from increased school enrolment.
- Special attention should also be given to the distribution of development gains, so that the poorest benefit from aggregate growth and are not disproportionally hit by economic downturn. The recent financial crisis and also the preceding commodity price boom have negatively affected development by increasing poverty and decreasing access to goods and services, with direct negative impacts on health.

- People in Sub-Saharan Africa and South Asia are highly dependent on their natural environment. Environment-related health risks still demand a high toll on child mortality. Increasing pressures on the natural environment may negatively effect human development in the future, and thus call for specific attention to sustainable use of these resources.

Environment and the MDGs

4

In 2000, approximately 1 in 10 children born in developing countries died before the age of five. Approximately 55% of child deaths where related to hunger, no access to safe drinking water and sanitation facilities, and the use of traditional energy sources, all related to the environment. Countries facing the most serious environmental degradation are also making the slowest progress towards achieving the MDGs (Millennium Ecosystem Assessment, 2005). In discussing how environmental changes affect sustainable poverty reduction and MDG achievement, the concept of sustainable livelihoods is used, focusing on the relation of food, water and energy to child mortality.

4.1 Sustainable livelihoods and the environment

Environmental resources provide opportunities for livelihood diversification

People's livelihoods are based on the quantity and quality of their resources. The environment provides sources that allow diversification of livelihoods. Forests, for example, provide fuel wood, material for fencing and housing, as well as berries, nuts and resin to sell in markets. Grasslands and rangelands are essential for grazing animals, while fertile soil is needed for agriculture. Clean drinking water is essential for good health and water is needed for irrigation. Investment in the natural resource base can increase its productivity and can extend livelihood diversity. For example, investing in cattle provides milk and other by-products such as dung that can be used for cooking fuel.

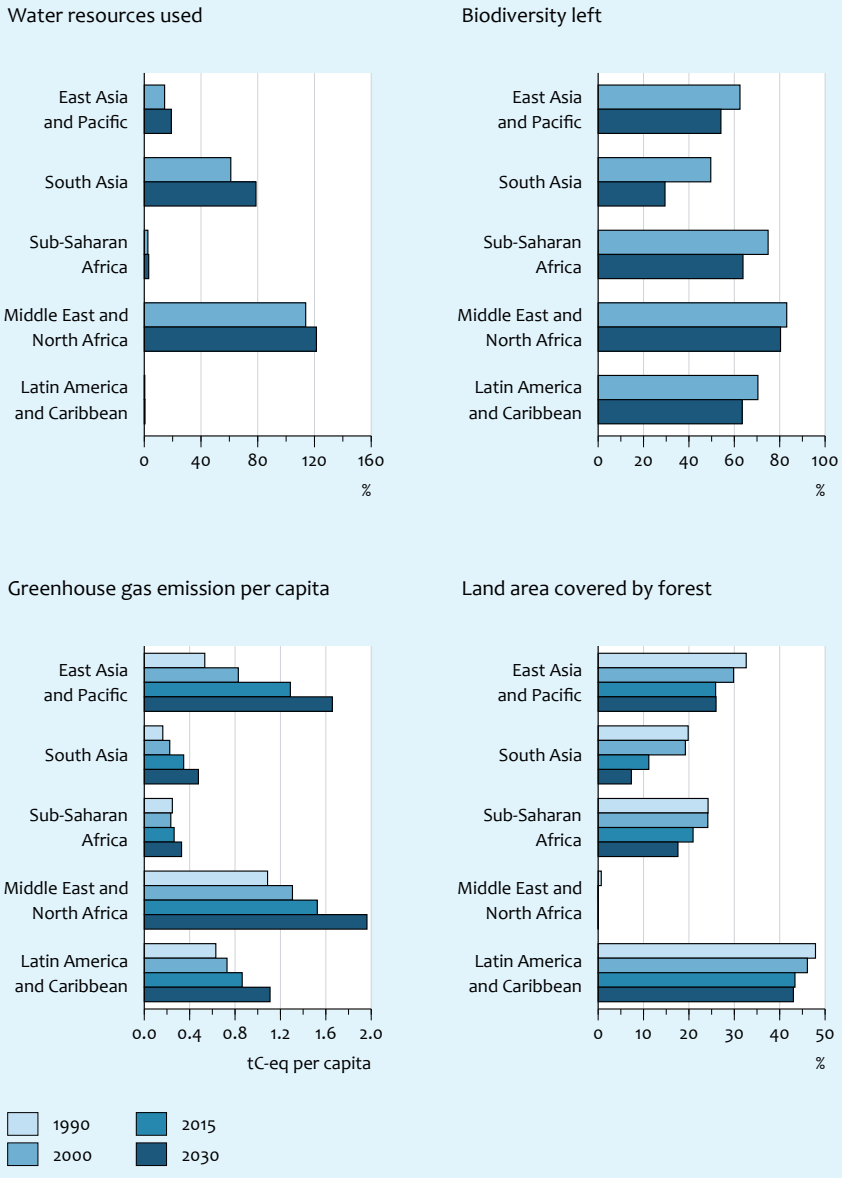
Degraded natural resource base affects livelihoods and increases vulnerability

Unsustainable use degrades the natural resource base through either pollution or excessive use. This is substantiated by current trends in biodiversity, forest cover, water resources and greenhouse gas emissions, which all show further degradation (Box 4.1). Deteriorating conditions can lead to fewer opportunities to generate income, and exhaust survival strategies for households (Oxfam, 2006). In these circumstances, people have to resort to distress coping means that can be more damaging or even irreversible, such as crop and livestock adjustment, diet change, depletion or selling of assets (including land), taking loans, labour migration and out-migration (Chambers and Conway, 1992; Maxwell and Frankenberger, 1992). The loss of resources means that with every step taken, people loose the flexibility to create alternative livelihoods and thus become trapped in poverty.

Box 4.1: MDG7 - Ensuring environmental sustainability

Millennium Development Goals environmental sustainability

Figure 4.1



Indicators for MDG7 ensuring environmental sustainability. Source: MNP/OECD, 2008

MDG7 addresses Ensuring Environmental Sustainability and includes the following targets:

1. *Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources;*
2. *Reduce biodiversity loss, achieving by 2010 a significant reduction in the rate of loss;*
3. *Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation;*
4. *Achieve significant improvement in the lives of at least 100 million slum dwellers, by 2020.*

Although target 1) and 2) are not quantified, indicators are selected to track progress on these targets (Figure 4.1). In the coming decades, water stress will increase in all regions. Furthermore, biodiversity and forest cover will continue to decrease with losses highest in Sub-Saharan Africa and South Asia where agricultural expansion is expected to be highest. In Latin America, East Asia and the Pacific, forest cover will stabilise and biodiversity will decrease mainly due to further intensification of agriculture. Alongside economic development and population growth, CO_2 emissions are increasing everywhere. However, in 2030 all regions are still below 50% of levels in industrialised countries in 2000.

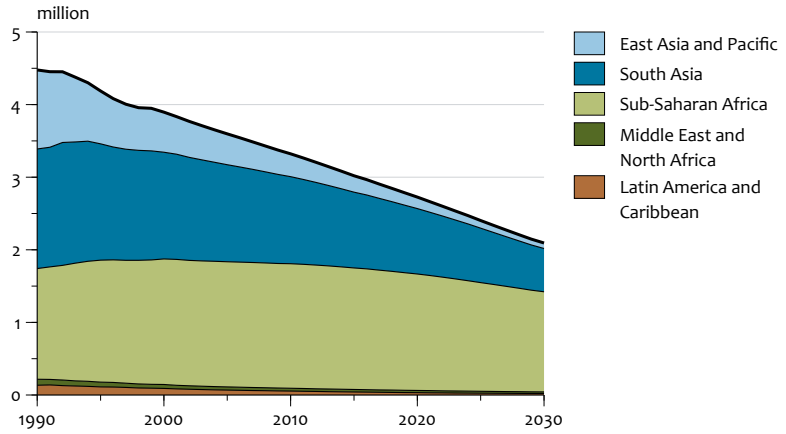
4.2 Food production and malnutrition

Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996). Large aid and safety net programmes have almost completely eliminated widespread starvation. Furthermore, increased agricultural productivity has contributed to a net increase in per capita food availability. However, people have benefited unevenly across the world. In 2003-2005, over 848 million people were undernourished, including 170 million in Sub-Saharan Africa, 277 million in East Asia, and 291 million in South Asia. This number increased to 923 million people in 2007 (40 million more in Asia and 27 million more in Sub-Saharan Africa), with much of the increase attributed to increased food prices (FAO, 2008). Due to the current global economic crisis, this number might increase even further.

Half of all child mortality is related to undernutrition

People's dietary needs depend on gender, age, workload and health. Health status not only determines nutritional needs but also whether nutrients can actually be absorbed. Malnourishment of pregnant mothers affects the unborn child, leading to stunting and diminished mental development (Sanchez and Swaminathan, 2005). Globally, almost 4 million children a year die due to underweight, with half of these deaths occurring in Sub-Saharan Africa (Figure 4.2). Underweight leads to higher incidence of diseases, such as diarrhoea, pneumonia and malaria. Furthermore, underweight increases the risk of dying from these diseases. In addition to malnutrition, zinc, iron and vitamin deficiency account for another 2.4 million child deaths.

Child deaths due to hunger **Figure 4.2**



Projected child deaths related to hunger. Source: GISMO1.0

Increasing agricultural production increases pressure on the environment

Global agricultural production has to increase to keep pace with a much larger and wealthier population. Even with significant increase in agricultural productivity, the total area under agricultural production has to expand to meet increasing demand. Most of the production growth is expected to take place in developing countries due to faster economic growth, faster population growth and availability of new agricultural areas (OECD, 2008).

The main environmental concerns related to increasing food production are greater pressure on land (including biodiversity loss) and water (for irrigation), increased pollution from agricultural inputs (including greenhouse gas emissions) and soil loss due to poor management (Box 4.1). Agriculture expansion will be at the cost of forest and grassland cover and biodiversity. A considerable part of the expansion will occur in arid areas, especially in Sub-Saharan Africa and South Asia, contributing to risk of desertification. Environmental shortcomings of agricultural practices associated with poor socio-economic conditions can create a vicious cycle in which poor smallholder farmers have to clear and use new and often marginal lands, thus increasing deforestation and overall degradation (IAASTD, 2009). Finally, increasing irrigation practices puts further pressure on stressed water availability.

Climate change increases environmental stress and affects agricultural productivity

Agriculture contributes to and is affected by climate change. Climate impacts on food production are mixed and regionally very different (IPCC, 2007a). Climate change induces changes in rainfall and temperature patterns and thus water availability for crops and cattle. The most vulnerable to climate variability and to climate change are poor and food-insecure countries that largely depend on rain-fed farming.

Globally, the potential for food production is projected to increase with increases in average local temperatures in a range of 1 to 3°C, but above this temperature increase, food production is projected to decrease. However at lower latitudes, especially in seasonally dry and tropical regions, crop productivity is projected to decrease even at small increases in local temperature of 1 to 2°C. This is especially so in Sub-Saharan Africa and South Asia, where food systems are already under pressure. In addition, climate induced increases in the frequency of droughts and floods are projected to affect local crop production negatively, especially in subsistence sectors at low latitudes (IPCC, 2007a).

Global food prices are increasingly under pressure and negatively impact the poor

Historically, productivity gains and increasing trade have overtaken stronger demand, resulting in a price decline over the last 100 years. Recent increases in food prices have been driven by a combination of rising fuel costs, biofuel production, and unfavourable weather conditions, with trade policies boosting upward price pressures (FAO, 2008; World Bank, 2008a). In the short term, the vast majority of the poor will be hit by higher prices, as they spend on average more than half of their household incomes on food (World Bank, 2008a). However, the relative impact is not uniform, and depends on the extend to which households produce their own food compared to what they buy on the market, consumption of local versus internationally traded staples, and access to production assets, especially land.

In general, commercial producers benefit directly from higher prices, as in many cases do the people they employ. Livestock producers are squeezed by higher feed and energy costs and by relatively flat prices for their livestock. Farm households who mainly produce for their own consumption or local markets are insulated to some extent from international price fluctuations. The highest impacts can be expected on the urban poor, whose expenditure patron is harmed without being compensated by an income increase (FAO, 2008).

Challenge and opportunities

Although global food production has increased significantly in the last few decades, still 923 million people are undernourished, with almost 4 million children dying annually due to underweight. The traditional response to malnutrition has been to increase agricultural production. However, global agricultural production is increasingly under pressure due to environmental changes, such as climate change, land degradation and competition for available water. Together with increasing global demand for agricultural products, food prices have increased, with the poorest, landless and female-headed households being the hardest hit (FAO, 2008).

An increase in Agricultural Knowledge, Science and Technology (AKST) can contribute to achieving environmental sustainability while maintaining agricultural productivity (IAASTD, 2009). Due to its complexity, AKST must be integrated with place-based and context-relevant factors to address the multiple functions of agriculture. For instance, new genotypes of crops could facilitate a wider range of habitats; resolving conflict over the free use of genetic resources broadens access; decreasing agricultural reliance on fossil fuels could lower production costs

alongside mitigating climate change; and increasing water efficiency could decrease water stress.

Furthermore, there is substantial evidence that food security and malnutrition are related to land entitlement and access. Opening markets to international competition can offer economic benefits for some, but mostly smallholder farmers do not benefit. Therefore, strengthening regional markets and improving access to credit for smallholder farmers could overcome some of the problems (IAASTD, 2009).

4.3 Energy and development

The issues of energy, development and environment are closely interlinked. In 2000, about 2.9 billion people relied on tradition fuels (fuelwood, dung and charcoal) for cooking, mainly in Asia and Sub-Saharan Africa. However, use of traditional fuels affects health through indoor air pollution, and in some cases, contributes to degrading the environment through deforestation. With access to modern energy sources, people are better able to control their environment through, for example, cleaner cooking and lighting, and the use of irrigation for higher agricultural productivity. However, fossil energy sources are finite, contribute to outdoor air pollution and are important contributors to climate change and thus have a negative impact on environmental quality.

Energy is vital but not sufficient for development

Modern energy sources alone, such as electricity and LPG, are not sufficient to stimulate development. However, if integrated into broader development policies, energy is a key input for rural development. The benefits and restrictions of electricity access differ for communities, households and enterprises.

At community level, electricity supply supports health services, safety and schools, and also helps to attract educated personnel to rural areas (Alcazar, 2006; Modi et al., 2006). In addition, pumps and pipes for water provision close to houses saves time in water collection, a major obstruction to school attendance by girls (Reddy et al., 1997). At the household level, electricity access enables reading and working during the hours of darkness and the use of modern communications and appliances. However, cultural and economic obstructions remain important. For instance, electricity does not replace traditional fuels for cooking and appliances are unaffordable for poor households. For business enterprises, access to modern energy increases productivity and working hours. However, market access and knowledge are at least as important for successful business development (Kooijman-van Dijk, 2008). These issues are better provided in larger towns with road access and better education (Adenikinju, 2003). For farmers, electricity access brings benefits through irrigation and the use of machinery, although other infrastructure, knowledge and market access are required to be successful (Pinstrup-Andersen and Shimokawa, 2006). At all levels, electricity supply has to be adequate and reliable to be effective for development.

Energy, a missing MDG

Although no MDG target has been set for energy, it plays both a direct and indirect role in achieving the MDGs (DFID, 2002). The UN Millennium Project group (Modi et al., 2006) developed three energy targets that compliment the MDGs:

1. Enable the use of modern fuels for 50% of those who at present use traditional biomass for cooking. In addition, support (a) efforts to develop and adopt the use of improved cook stoves, (b) measures to reduce the adverse health impacts from cooking with biomass, and (c) measures to increase sustainable biomass production.
2. Ensure reliable access to electricity in all urban and peri-urban areas.
3. Provide access to modern energy services (in the form of mechanical power and electricity) at community level for all rural communities.

Many people around the world have no access to electricity...

The main problem in current programmes to provide electricity to the poor is high up-front connection costs (Gaunt, 2005). Barriers to electricity connections could be lowered by spread of payment, cross-subsidising tariffs, and clarity about tariffs and subsidies. Community level electrification is well on the way in Asia, but household access is lagging behind (Modi et al., 2006). The challenge is greater in Sub-Saharan Africa. With access levels of only 5 to 7% in for example Ethiopia and Congo (IEA, 2002), community electrification is the first objective (World Bank, 2008c). This is a costly phase compared to expanding access in villages already connected. IEA (2002) estimated that about 200 billion dollars would be needed to supply electricity to another 500 million people.

...and many children die due to indoor air pollution

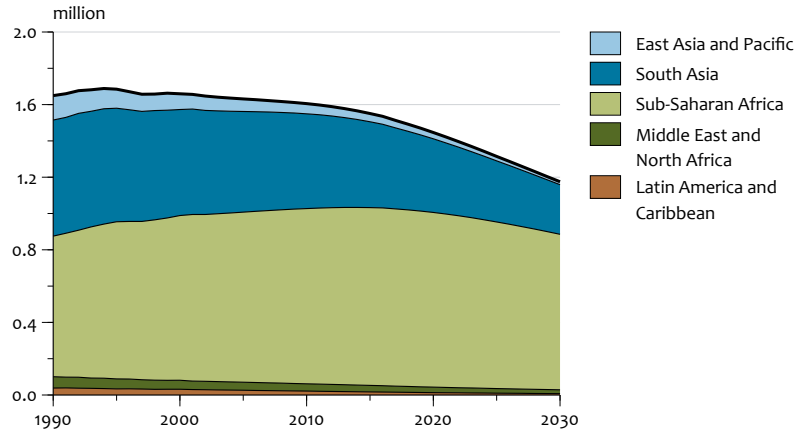
Indoor air pollution is a major health risk (Section 3.2.3) that is directly related to the use of traditional energy sources. Use of biomass and coal (solid fuels) in traditional stoves exposes women and children to decreased indoor air quality and is a major cause of respiratory diseases (WHO, 2006). In 2000, more than 1.6 million children died because of the use of traditional biomass for cooking and heating (Figure 4.3). Future projections show a decrease in child mortality in Asia, although progress is rather slow in South Asia. In Sub-Saharan Africa, the combination of high population growth and low penetration of modern energy sources leads to an increase in child deaths due to pneumonia the coming decades. This setback in Sub-Saharan Africa results in only a small global decrease in pneumonia deaths to 1.6 million children in 2015 and 1.2 million in 2030, respectively. In 2030, approximately two-thirds of all these child deaths occur in Sub-Saharan Africa.

Challenge and opportunities

There are two strategies to prevent indoor air pollution from traditional biomass use. The first strategy is a switch to kerosene and LPG, which appears to occur autonomously with increasing income levels, but can be reinforced with subsidies on cleaner fuels and/or related equipment. A second strategy is the distribution of improved wood stoves with higher efficiencies (hence, less wood per meal preparation) and often combined with chimneys to improve indoor air quality.

Switching fuels for cooking requires a major policy effort, additional investments and higher fuel costs. To reduce the 2.9 billion people who relied on solid fuels for

Child deaths due to pneumonia **Figure 4.3**



Projected child deaths due to pneumonia as a consequence of indoor air pollution.
Source: GISMO1.0

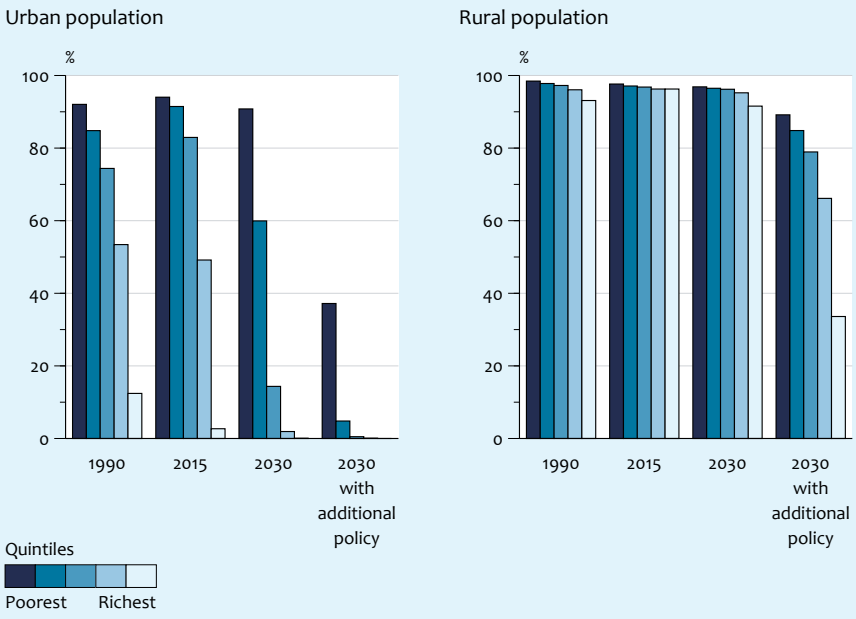
cooking in 2000 by 50% in 2015 requires a fuel switch for 1.45 billion people or 325 million households. This leads to about 3 EJ/yr of additional LPG use (about 30% of the current total energy consumption of all households in Western Europe), but saves more than 17 EJ/yr of fuel wood. Such a fuel switch would require about 285 billion dollars, of which 16 billion dollars is capital investment in LPG stoves and 269 billion is fuel cost (for method and price assumptions, see Modi et al., 2006).

Renewable energy-based electrification projects, such as solar powered (PV) village electrification, are attractive options from the perspective of development, energy provision and emission mitigation. However, evaluations show that these stand-alone systems are often a first step to grid electrification, once communities are aware of the limitations of PV systems. Because simple malfunctions often lead to disuse of PV systems, maintenance and hence longer-term involvement of financiers is crucial for the success of these projects (Mulugetta et al., 2000; Klunne et al., 2002).

Box 4.2: Reducing use of traditional biomass in India

To assess the MDG target for cooking fuel proposed by Modi et al. (2006), a model was used that was developed to assess residential energy use for different income categories in India (van Ruijven, 2008). Without additional policy, the proportion of the population relying on traditional biomass in 1990 cannot be halved in 2015 nor in 2030 (Figure 4.4). The target can be reached by 2030 only by simulating explicit policy measures, such as a capital subsidy of $20 per LPG stove (80% of the capital cost) and $3 / GJ subsidy on LPG fuel (about 40% of the 2005 fuel price). Even then, the rural poor are expected to remain dependent on traditional fuels for the next few decades (Figure 4.4). This emphasises the need to support sustainable biomass production and more efficient stoves (Modi et al., 2006). Total subsidies for such transition increase from about $1 billion per year in 2010 to about $5 billion annually in 2030, suggesting a doubling of the current energy subsidies of $2.6 billion per year (IEA, 2002). Most of these subsidies are needed to decrease the fuel price. The policy measure reduces the percentage of the population depending on solid fuels in 2030 from 71 to 46%, resulting in a 17% reduction in child mortality due to pneumonia.

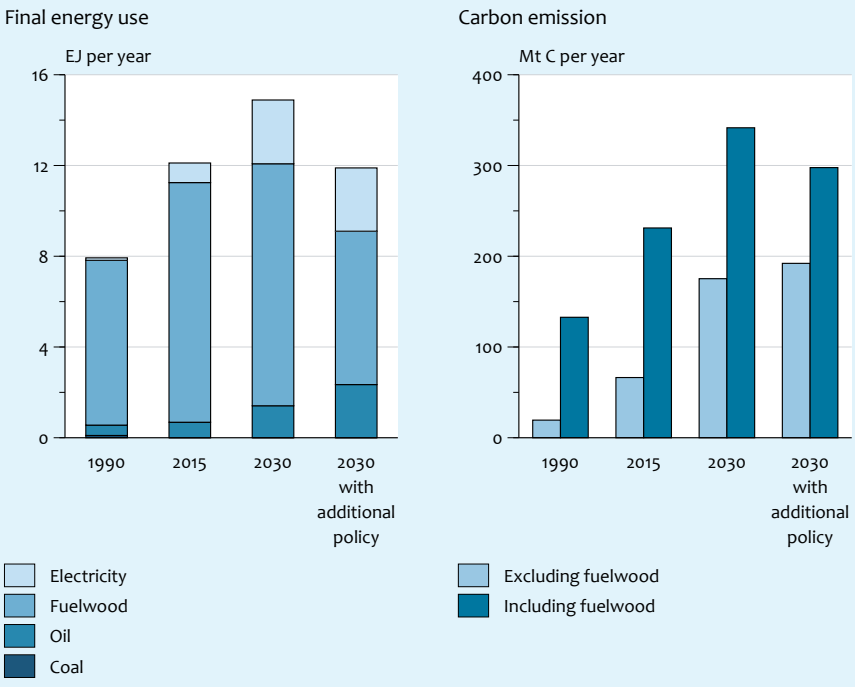
Figure 4.4 **Solid fuel use India**



Percentage of Indian urban and rural population using solid fuel for cooking and water heating in the OECD scenario and with additional policy. Source: van Ruijven, 2008

Such policy effort would shift final energy use from fuel wood to oil and, due to the higher efficiency of LPG also decrease total residential energy use (Figure 4.5, left graph). The impact on carbon emissions depends on the system boundaries. If carbon emissions from fuel wood are not taken into account, residential carbon emissions increase by about 20 MtC/yr (2% of the projected total energy related Indian carbon emissions for 2030) as a result of increased oil use. However, assuming that 60% of the fuelwood is harvested unsustainably, about 40 MtC/yr can be saved by switching to LPG (Figure 4.5, right graph).

Residential energy use and emission India **Figure 4.5**

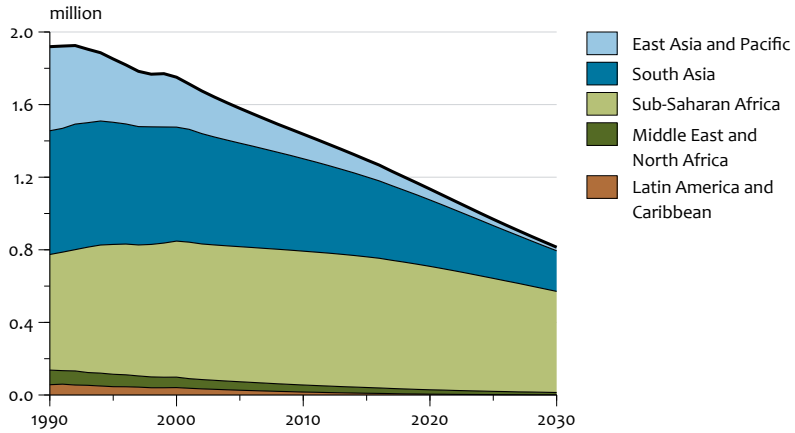


Energy use and carbon emissions from the residential sector in India in the OECD scenario and with policies to stimulate fuel switch. Source: van Ruijven, 2008

4.4 Drinking water and sanitation

Adequate drinking water and sanitation are central to human health and development. In 2000, more than 1 billion people did not have access to safe water supply and 2.6 billion people lacked basic sanitation, with the vast majority living in Sub-Saharan Africa and Asia. As a result, disease, loss of earnings and indignity

Figure 4.6 **Child deaths due to diarrhoea**



Projected child deaths due to diarrhoea. Source: GISMO1.0

lock huge numbers of people into poverty. In most developing countries, water use has increased over the last few decades due to population and economic growth, changes in lifestyle, and expanded water supply systems, with irrigation being by far the major reason for the increase in water use. Increasing demand in water scarce areas puts the local population under greater pressure.

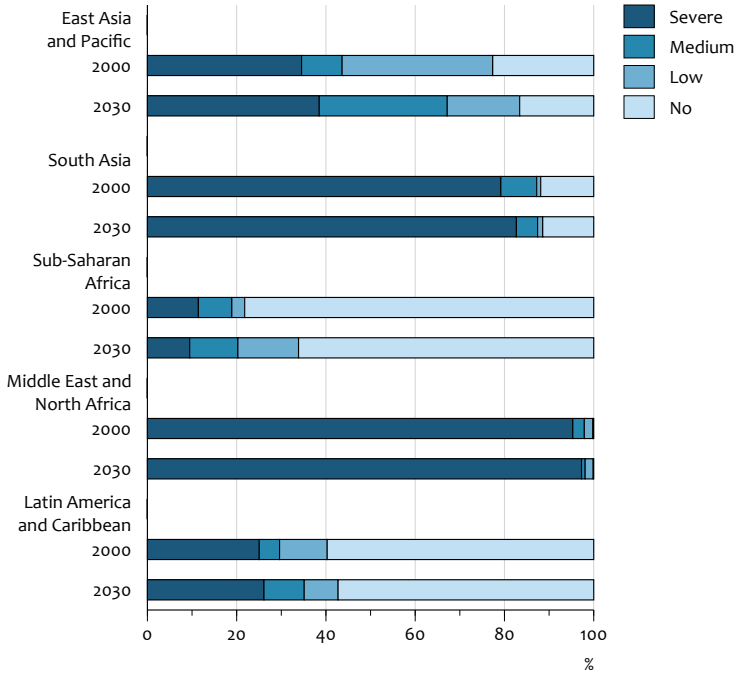
Poor drinking water and lack of sanitation facilities increase child mortality

In 2000, approximately 1.7 million children died because of inadequate water supply and sanitation facilities, with the vast majority living in Asia and Sub-Saharan Africa. Unsafe water supply and sanitation is responsible for approximately 13% of child mortality in developing countries, mainly due to diarrhoeal diseases. Substantial improvements are expected in the coming decades due to higher incomes and urbanisation ratios, but also due to improved nutritional status. Although off-set by a growing population, water-related child mortality is projected to decrease to 1.3 million in 2015 and 0.8 million in 2030 (Figure 4.6).

Water scarcity puts many livelihoods under pressure

Water use has grown at more than twice the growth rate of the world's population over the past century (WHO/UNICEF, 2008). However, global water shortage is not a meaningful indicator as there is more than enough water available globally. The UN (2008c) concluded that in 2006 about 2.8 billion people live in river basins with water scarcity. More than 1.2 billion of them experienced physical water scarcity (when more than 75 % of the river flow was withdrawn), mainly in the Middle East and North Africa, and parts of South Asia, and East Asia and the Pacific. The impacts of physical water scarcity include environmental degradation and competition for water by agriculture, households and industry. Another 1.6 billion people live in areas of economic water scarcity, where human, institutional and financial capital limit access to water, even though enough water is available to meet demand,

Population in water stressed areas **Figure 4.7**



Water stressed population in 2000 and 2030. Source: MNP/OECD, 2008

mainly in parts of South Asia and Sub-Saharan Africa. The impacts of economic water scarcity include underdeveloped water infrastructure with high vulnerability to droughts. Often, access to reliable water sources is especially difficult for rural people (WHO/UNICEF, 2008).

Global environmental change increases water stress...

Physical water scarcity will increase due to changes in run-off patterns resulting from land use changes, water uses upstream and climate change induced changes in rainfall patterns. Several countries in highly water-stressed regions could experience substantial losses in water availability. Furthermore, due to climate change, many regions face immense vulnerabilities associated with glacier retreat (at a rate of 10 to 15 m per year in the Himalayas). Seven of Asia's great river systems will have increased flows and flood frequencies in the short-term followed by a decline as glaciers melt, with an increase in drought frequency in the long-term. Also, the Andean region faces imminent threats to water security with the collapse of tropical glaciers. All these changes will add to ecological stress, compromising water flows for hydropower, irrigation and human settlements. Water stress in already stressed river basins is intensified with growing water demand, increasing drought frequency and changing rainfall patterns (MNP/OECD, 2008). In addition, popula-

tion growth further increases the proportion of people living in water stressed areas, mainly in Asia and Sub-Saharan Africa (Figure 4.7).

...and puts improved drinking water sources and sanitation facilities under pressure

Access to safe drinking water depends more on the water supply infrastructure than on the quantity of runoff. However, the goal of improved access to safe drinking water will be more difficult to achieve in regions where runoff and/or groundwater recharge decrease as a result of climate change. In addition, climate change leads to additional costs because changing water levels affect water supply infrastructure and may hamper extension of water supply services to more people. This leads, in turn, to higher socio-economic impacts and follow-up costs (IPCC, 2008).

Challenge and opportunities

In 2015, more than 700 million people will not have access to safe drinking water and more than 2.2 billion people will not have access to basic sanitation facilities. Taking the average annual cost of $2.8 for an improved water supply and $7.1 for basic sanitation (Hutton and Haller, 2004), this implies that in the period 2000 to 2015, an additional $6 billion annually is needed to achieve the MDG target. This is only valid assuming that current costs are applicable to the remaining unserved population. Furthermore, these costs are most likely underestimated since the relative cost in rural areas where many of the unserved live are generally higher (Bos et al., 2004).

Providing access to safe drinking water will lead to a substantial increase of domestic water use thus increasing the policy challenge. Alternative water sources, including reuse of wastewater, have to be tapped in water scarce regions. Unfortunately, this will increase energy use for water supply thus adding to the energy challenge. Also, competition for water in water-stressed areas might increase the average annual costs and even put current achievements under pressure.

To achieve the MDGs, technical measures alone will not solve the remaining and probably increasing problems due to climate change in several areas. Integrated water resources management (supply and demand management) will be necessary, together with good governance at regional (river basin), national and local levels. A range of water resources management problems are recognised that could become worse because of climate change. The two most often mentioned are increased pollution of water supplies as a result of increased and more frequent flooding; and reduced water supplies and increased costs associated with silting resulting from lower flows and higher evaporation rates.

4.5 Conclusions

- Although child mortality in developing countries is expected to reduce considerably, in 2030 still around 65 in every 1000 children will die before the age of five, with more than 45% of these deaths related to hunger, no access to safe drinking water and improved sanitation, and the use of traditional energy sources. However, increased access to food, water and energy together with population growth increase global demand for these essential goods. As their provision

is interrelated and largely dependent on the natural environment, increasing demand increases the pressure on the natural environment, including land degradation, pollution (including CO_2 emissions), growing competition for water, and decreasing forest cover and biodiversity.

- Climate change as a result of increasing greenhouse gas emissions puts further pressure on land productivity and water availability. Although climate change mostly originates from greenhouse gas emissions in the industrialised world, emissions are increasing in developing countries. Population and economic growth induce increased energy consumption and deforestation. Nevertheless, poor and food-insecure countries that largely depend on rain-fed farming, mainly in Sub-Saharan Africa and South Asia, are the most vulnerable to climate variability and climate change.
- World regions are in different stages of development, with Sub-Saharan Africa and South Asia showing the lowest socio-economic development levels. People in these regions depend most on the natural resource base and are disproportionately affected by environmental changes. As many environmental changes only become apparent in the long-term (after 2015 or with climate change even after 2030), these changes might have a backlash on progress made towards the MDG in 2015. Therefore, policies addressing increased access to food, water and energy should take these environmental changes into account.

5 Patterns of Vulnerability

The vulnerability of people to socio-economic and environmental changes has been analysed in order to identify those groups for whom MDG achievement is at risk, and to identify the type of risks. The analysis also provides directions for specific policies to reduce vulnerability, contributing to increasing the likelihood of MDG achievement. The analysis goes beyond regional averages and provides insights into the accumulation and distribution of specific risks within and between countries. Furthermore, it addresses the trade-offs between human development and the environment. Patterns of vulnerability have been analysed for smallholder farms in dryland areas, and for local populations due to competition between food and biofuel crop production.

5.1 A vulnerability approach to development and environment

To achieve the MDGs, local conditions need to be taken into account in developing poverty reduction policies. In this respect, vulnerability analysis contributes to better understanding of local conditions by examining the sensitivity of people to socio-economic and environmental changes, and their ability to cope with or adapt to these changes.

Analysing patterns of vulnerability

Many vulnerability analyses are in the form of local case studies. A methodology developed by UNEP (2007) generalises the outcomes of such studies by identifying patterns of vulnerability, which is a specific representative pattern of the interactions between environmental change and human wellbeing. This approach is based on recognition that vulnerability is similar in different places, thus creating conditions and mechanisms that can be characterised as archetypical (Jaeger et al., 2007).

The methodology looks for common risk factors in a multitude of cases. It flags the most vulnerable groups, and provides regional perspectives and connections between regions in a global context. Building on UNEP (2007), a more quantitative analysis of patterns of vulnerability was carried out. The basic mechanisms that constitute vulnerability for smallholder farming in drylands, and vulnerability as a consequence of competition between food and biofuels were analysed. For both situations, a core set of biophysical and socio-economic indicators was identified. A

cluster analysis of these indicators distinguished specific patterns of vulnerability. Each cluster represents a specific constellation of risks, which is also referred to as a risk profile (for details on the methodology, see PBL/PIK/NUST, forthcoming).

5.2 Vulnerability of smallholder farmers in dryland areas

Drylands are home to 2 billion people who depend largely on agriculture

Characterised by low rainfall and high rates of evaporation, drylands include cultivated lands, scrublands, grasslands, savannahs, semi-deserts, and deserts. They occupy 41% of Earth's land area and are home to more than 2 billion people. These people have to cultivate often sensitive and low quality soils making them particularly vulnerable to land-use degradation and declining agricultural production. Global estimates suggest that about 70% of all agricultural land in drylands is now degraded to some extent (FAO, 2007).

Vulnerability in drylands and the MDGs

Half of all people in poverty live in drylands (Dobie, 2001). Most countries in these areas have a high proportion of their labour force working in the agricultural sector and show low levels of human development (UNDP, 2002). Dryland regions are thus a priority area for eradication of poverty and hunger, and reduction of child mortality. The poor in these areas are highly dependent on environmental services

Box 5.1: Biodiversity and poverty

PBL was commissioned by the Netherlands Directorate-General of Development Cooperation to perform case studies in developing countries on the relationship between biodiversity loss and poverty (Tekelenburg et al., forthcoming). An interdisciplinary research team carried out 11 in-depth studies in ten countries within specific geographical areas and time periods, considering the environmental, social and economic domains. These case studies reveal the complex relationship between biodiversity and poverty. In understanding this relationship, additional indicators need to be identified, such as human wellbeing and ecosystems goods and services. As a result, two key mechanisms in the biodiversity and poverty complex have been identified:

1. *Poverty-driven mechanism: Subsistence-based poverty-driven situations. Poverty-driven is based on human labour inputs and aims to cover subsistence needs. Associated case studies are smallholder agriculture in Ecuador and Mexico, and rice production in mountainous areas in Vietnam;*
2. *Capital-driven mechanism: Large-scale, export-oriented and capital-driven commodity development. Capital-driven is based on capital inputs and aims at making high profits. The associated case studies are large-scale soy production in Brazil and cotton production in Mali.*

In some case studies, such as marine fisheries in Ghana, capital- and poverty-driven mechanisms co-exist although one usually dominates. The two patterns of vulnerability described in this chapter are representatives of both mechanisms.

for their basic needs and increased land-use degradation endangers environmental sustainability and agricultural production.

Specific mechanisms generate vulnerability in drylands

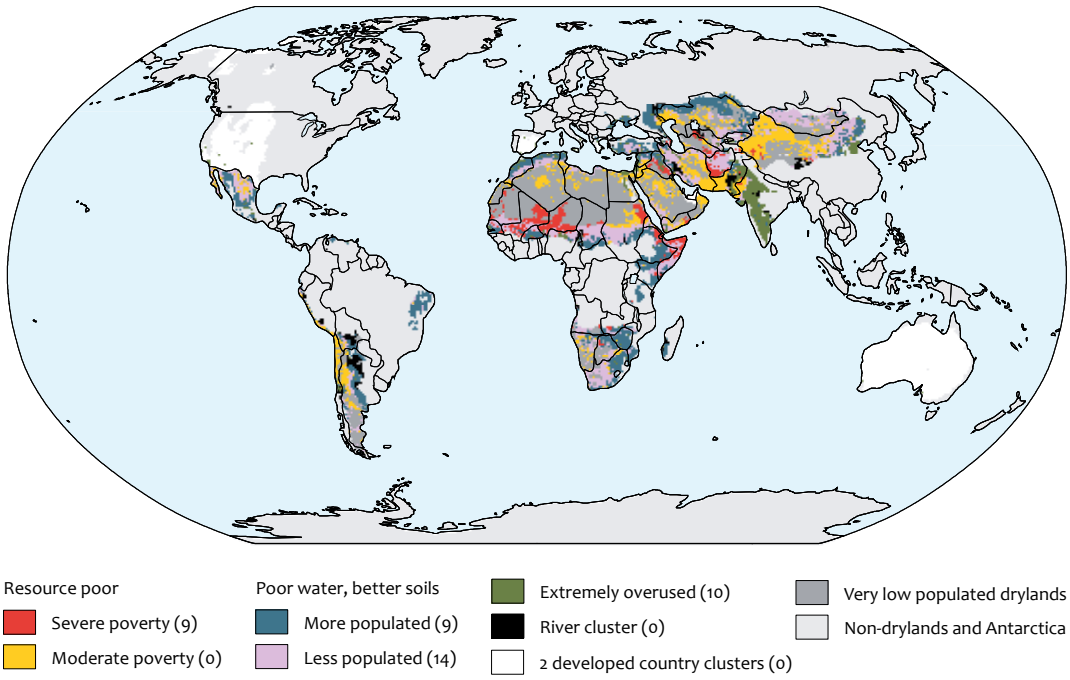
The fragile equilibrium of human-environment interactions that has developed in the drylands is increasingly being disturbed (Reynolds et al., 2007). The pattern of vulnerability is about the increased pressure on natural resources in drylands by a growing population. This is combined with the breakdown of traditional coping mechanisms of smallholder farmers such as migration to available water and pastures, or herd splitting as buffer against risks. Other significant aspects are barriers to alternative livelihoods, including limited voice, political conditions (including conflict, Box 5.2) and detrimental trade impacts. Additional critical exposure includes limited and insecure availability and access to water and soil degradation due to overuse of these sparse resources (Geist and Lambin, 2004). Poor infrastructure impedes market access and thus the ability to obtain knowledge and inputs to enhance agricultural productivity. These factors lead to situations in which rural households become enmeshed in poverty traps (e.g., UNEP, 2007).

Analysis shows six risk profiles in drylands in developing countries

Eight vulnerability clusters or risk profiles have been identified, of which six are in developing countries (Figure 5.1). These clusters are based on a set of seven global indicators which have been used to analyse current vulnerabilities (Figure 5.2). The six clusters in developing countries are as follows:

- Two *resource poor* clusters emerge, with low levels of water availability, agriculture potential, population density and soil erosion. They differ mainly in the level of human wellbeing, varying from severe to moderate poverty. These risk profiles occur in the arid regions of Sub-Saharan Africa and Asia which are dominated by pastoral land use.
- Two *poor water, better soils* clusters emerge with low levels of human wellbeing but differing mainly in the level of water and soil resources and population density. A higher level of resources is combined with a higher population density and vice versa. This hints at some sort of Malthusian behaviour with population density and exploitation of sparse resources increasing with decreasing human wellbeing. The profiles constitute parallel bands neighbouring desert areas with the less populated closer to the desert corresponding with a land-use gradient from pastoral to agro-pastoral uses.
- The *overuse* cluster is resource rich with a low level of human wellbeing. The relatively good natural resources are critically overstretched, with the very dense population in great danger of loosing their resource base as an important pillar for livelihood diversification. This risk profile dominates the arid areas of India, but is also found in North-East China and on the African Mediterranean Coast.
- The *river* cluster combines relatively good income with relatively high infant mortality. This suggests very uneven distribution of income opportunities among farmers and herders, probably due to access to irrigation and grassland. This risk profile occurs around the lower reaches of the Indus, Euphrates, Tigris and Volga rivers, and in other irrigation areas such as the Aral Sea area.

Global distribution risk profile of dryland vulnerability 2000 **Figure 5.1**



Numbers in brackets indicate the number of armed conflicts between 1990 and 2007 per cluster with at least 25 annual battle-related deaths and one party being the government of a state (UCDP/PRIO 2008).

Global distribution of the eight risk profiles of dryland vulnerability in the year 2000.

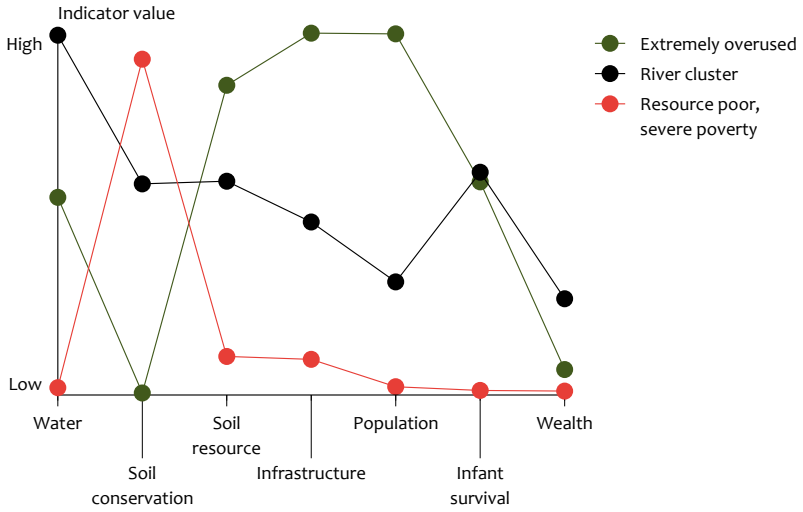
MDGs and drylands

The patterns of vulnerability in drylands denote hot spots with respect to the challenges and trade-offs of improving human development and ensuring environmental sustainability. Within the *resource poor* clusters, soil degradation is relatively low (Figure 5.2), but the very low renewable water resource poses the risk of groundwater overuse. Together with current levels of severe poverty, these factors constitute a challenge for poverty alleviation and environmental sustainability. The high conflict density generates a further severe challenge to improving human wellbeing within the *resource poor*, *severe poverty* cluster (Box 5.2). The *overuse* cluster shows another problematic situation. Although resources are less sparse, they are severely overused by a very dense population.

Opportunities: institutional reform

The most promising situation with respect to the vulnerability of smallholders in dryland areas in developing countries is in the *river* cluster, where the resource situation is relatively good, population density and soil degradation rate intermediate, and the level of human wellbeing moderate. Poverty due to unequal access to

Figure 5.2 **Risk profile of dryland vulnerability 2000**



Selected risk profiles of dryland vulnerability.

resources can be tackled by institutional processes such as land reform and with measures to improve the position of smallholder farmers.

Opportunities: improved resource management and out-migration

The complex situation in the *poor water, better soils* clusters, with high soil degradation endangering future yields, could be overcome with more sustainable resource management. For an extensive list of measures, see for example Dixon et al. (2001). The critical resource situation is reflected by the almost entirely pastoral use, leaving few opportunities for improvement with innovative agricultural techniques. This makes MDG achievement less probable on the basis of agricultural production alone. As a consequence, when no opportunities for non-agriculture, off-farm income are provided, an exodus from these areas may be expected with implications for the destination areas of the migration.

Compared to the *less populated* cluster, the *more populated* cluster has better agro-potential and at present a lower soil degradation rate. Here, the chance of improving human wellbeing by more sustainable resource management is more realistic if growth in population density is limited. This opportunity would be clearly endangered by in-migration from adjacent less endowed areas.

Opportunities: sectoral change and provision of off-farm options

The natural resource base provides few opportunities in the two *resource poor* clusters. Comparison of these two clusters reveals that even a somewhat better agro-potential does not necessarily generate more wealth. Other national economic conditions might be more important. Therefore, moving away from agriculture would seem to be the only economically and environmentally sustainable solution.

The same is the case for the *overuse* cluster. Due to high population density, only a very small income can be generated from the relatively good natural resources. The critical state of agriculture overuse cannot be stabilised by new agricultural practices only. However, reducing pressure on the land can convert the natural conditions into an opportunity for sustainable livelihoods and contribute to achieving the MDGs.

5.3 Vulnerability due to competition between food and biofuels

Increasing demand for biofuels poses considerable risks for people and environment

The rise in global demand for biofuels results in increasing competition between food and biofuels. Increasing demand may generate higher incomes for farmers, but could also lead to considerable risks. This is especially the case for first generation liquid biofuels, as they are largely derived from food crops. Where demands for

Box 5.2: Are there dryland clusters that are particularly prone to conflict

Patterns of vulnerability in drylands are also about barriers to achieving alternative livelihoods and one of these barriers is armed conflict. This broader picture of poverty and vulnerability helps to identify groups who are more vulnerable than others and the reason for this.

Income poverty is found to be one of the most powerful predictors of conflict, whereas the connection between scarcity of natural resources and conflict has received only patchy support (Salehyan, 2008). Our analysis integrated the concept of vulnerability into a broader context in order to capture how poverty, conflict, and vulnerability to adverse environmental conditions are part of a 'vicious cycle'. The Armed Conflict Dataset (Gleditsch et al., 2002) which includes geographic coordinates for armed conflict with at least 25 annual battle-related deaths was used in this analysis. The year 1990 was taken as a starting point for this study because this year marks the end of the Cold War (Harbom and Wallensteen, 2007).

The occurrence of conflicts between drylands and non-drylands is proportional to the respective land masses, yet the opposite is the case with regard to conflict distribution within the drylands clusters. There are no armed conflicts in four of the eight clusters. The other four clusters, making up 40% of the total area, are wracked by virtually all 42 conflicts in drylands and 36% of all armed conflicts worldwide. Half of all dryland conflicts flared up in the poor water, better soils clusters alone, and with 22%, the overuse cluster is also disproportionately prone to armed conflict, despite occupying a mere 5% of all drylands area. Only 2% of the drylands population lives in the most vulnerable cluster resource poor, severe poverty, yet with 20% of all dryland conflicts it is also hit severely by conflicts. Thus, drylands reveal an internal heterogeneity in the location of conflicts, yet none of the indicators for vulnerability-creating mechanisms directly explain conflicts. Therefore, the constellations of indicators in the different clusters have significant explanatory power for conflicts.

food and biofuel production converge and competition increases, food prices might increase. Furthermore, increasing biofuel production could lead to changes in land cultivation patterns including deforestation and biodiversity loss, and to increased competition for cultivated land and water for irrigation.

Competition between food and biofuels and the MDGs

Global demand for biofuels induces local changes which could increase rural income from these new cash crops but also poses considerable risks. Especially developing countries that are net importers of food suffer from increased food prices (Rajagopal and Zilberman, 2007). Furthermore, dependency on food and energy imports subjects people to increasingly volatile prices for these commodities. The effects are most adverse for those economies and livelihoods least capable of absorbing shocks and price volatility (UN Energy, 2007), especially if unable to compensate for possible food and/or energy import dependencies (Schmidhuber, 2006). People who are most likely to be hit are the poor and undernourished populations in rural areas, often smallholder farmers and the urban poor.

Mechanisms generating vulnerability due to competition between food and biofuels

At the core of this pattern are the impacts of land use competition on the local population due to increasing demand for liquid biofuels. Emerging global markets for biofuels are driven by the need to improve energy security through diversification of energy sources and by the need to mitigate climate change. Local opportunities for biofuel production are largely determined by how a country is linked to the global market and its position as an importer or exporter of food and energy. What is grown where determines whether food security and environmental risks are induced or exacerbated, and how these factors can impede biofuel crop production as an opportunity to increase local human wellbeing.

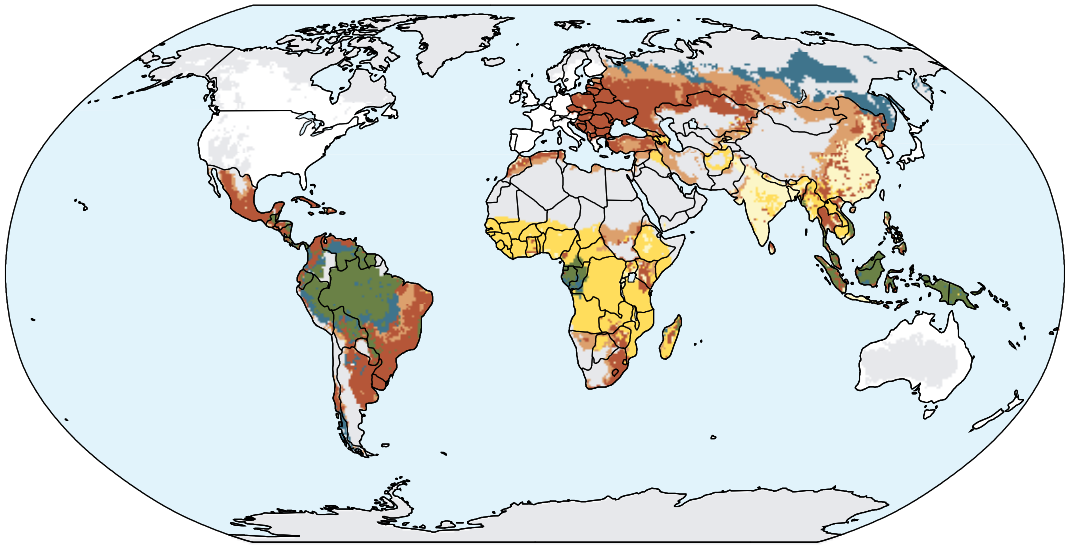
Biofuel crops that are water-resource intensive may affect drinking water availability. Furthermore, biofuel crops can impede environmental sustainability on arable land or encroach on uncultivated areas of high biodiversity. Expansion of biofuel crop production may lead to loss of the natural environment that sustains the livelihood of indigenous people and may not benefit these people (Kok and Hilderink, 2007). However, well-tailored biofuel crop production without reducing food production may offer additional income to those most in need. Furthermore, biofuels cultivation may present opportunities for marginal lands unfit for food production.

Analysis shows six risk profiles in developing countries

Cluster analysis of these indicators has distinguished nine clusters or risk profiles, of which six are in developing countries (Figure 5.3). The analysis is based on a set of ten global indicators (Figure 5.4). The six clusters in developing countries are:

- Poor people in the *most severe food security risk* cluster are most vulnerable to increasing food and energy prices, due to net food and energy imports and low income. There is high availability of high biodiverse, uncultivated areas. Massively promoting biofuel crop production can pose risks to biodiversity and human development, due to expanding agricultural land and increasing local food prices. A shift to biofuel production increases dependency on food imports, while benefits from energy independency are not yet clear. This cluster covers the largest part of Sub-Saharan Africa and the most food-insecure areas of Asia.

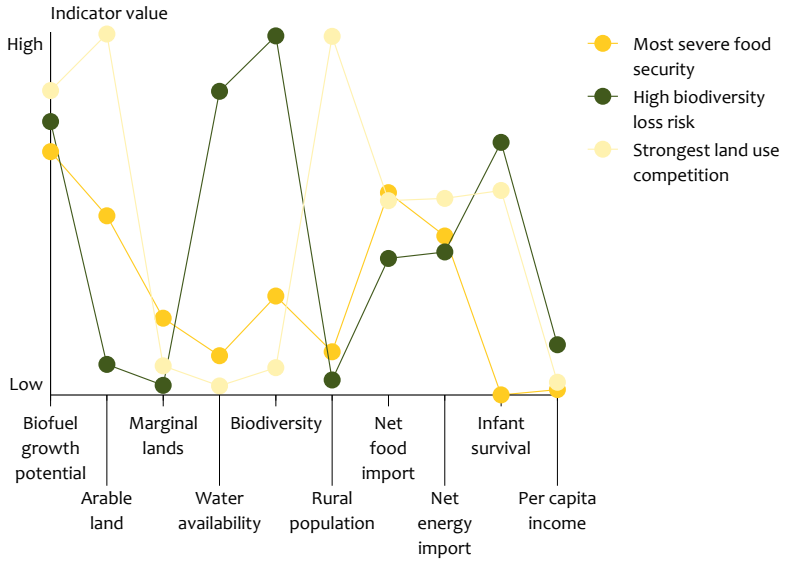
Global distribution risk profile of vulnerability of food security due to biofuel production **Figure 5.3**



Global distribution of the risk profiles of vulnerability due to competition between food and biofuel crop production, 2000.

- The *strongest land use competition* cluster comprises the most densely populated rural regions in the world with intense competition of land in the widespread cultivated areas. The core vulnerability is the highly pressurised land and water resources combined with low human wellbeing. Biofuel crop cultivation is likely to pose a risk to poor smallholders, especially those sensitive to changes in food prices. Furthermore, people in these areas depend on food and energy imports, making diversion from food crops to biofuel crops more risky than in exporting areas. This cluster covers the densely populated rural, agriculture-intensive areas in India, China, Indonesia, and the Philippines.
- The *high biodiversity loss risk* cluster is made up of highly biodiverse, uncultivated land in net food and energy exporting areas. These areas are lucrative for biofuel production because of their moderate biofuel crop potential and abundant water resources. Indigenous people and biodiversity are highly sensitive to large-scale alterations in these potential expansion areas. Among the countries largely attributed to this cluster are the large liquid biofuel crop producers of Brazil, Indonesia, and Malaysia.

Figure 5.4 **Risk profile of vulnerability of food security to biofuel crop growth increase 2000**



Selected risk profiles of vulnerability due to competition between food and biofuel crop production.

- The *competition for land and water* cluster covers net food and energy exporting areas with a high potential for biofuel crop cultivation. In these areas, market integration and human wellbeing are relatively high, and agriculture production is well established on some of the most fertile arable lands in the world. Cultivation of biofuel crops could greatly reduce food production and the limited water resources. While competition drives the vulnerability of the natural systems, food security risk through local competition is less affected than in other clusters. This cluster covers large parts of central Europe, Russia and Latin America, as well as pockets in East Asia and Africa.
- The *pockets of land-use competition* cluster shows net food imports and large uncultivated areas with marginal potential for biofuel crop production. Expanding biofuel crop production to marginal lands would inevitably conflict with the fragile ecosystems occupying boreal forests, savannahs, and drylands. Yet, in some areas, cultivating non-food biofuel crops could prevent competition with the local food production. Areas in this cluster include boreal forests in Russia, Steppe in central Asia, the Fertile Crescent in the Middle East, and savannah pockets in South America and Africa.
- The *high water availability, uncultivated land* cluster is largely uncultivated, but also has the lowest overall growth potential for biofuel production. Due to its marginality and high water availability, potential use for extensive farming seems lucrative but would require large inputs. Expanding biofuel crop production to marginal lands would also conflict with ecosystems, especially in tropical rainforest areas. Areas in this cluster include pockets of the tropics with low

biodiversity and potential for biofuel production, as well as the northern most boreal forests in Russia.

MDGs and competition between food and biofuels

The two clusters with *low human wellbeing* have high potential for biofuel crop production with very little marginal or degraded lands to evade (Figure 5.4). Despite low dependencies on imports, food insecurity is highest in these clusters. These situations are problematic because of high dependencies on local resources with low means to absorb fluctuations in food and energy prices. In the light of food security affected by rising demand for food and liquid biofuels, possible trade-offs between human development and environmental sustainability can have negative effects, particularly in two cases. The first is high local resource dependency in densely populated, poorer regions with intense competition for widespread cultivated areas (*strongest land-use competition* cluster). The second is moderate potential for biofuel crop production combined with vast areas of biodiverse vegetation adjacent to arable land (*high biodiversity loss risk* cluster). In both cases, there are incentives and pressures to cultivate or extend biofuel crop production. The more food insecure, and the less non-arable land available to expand cultivation, the more import dependencies and food insecurity are likely to establish or increase.

Opportunities: establish ground rules based on local contexts

Uncontrolled biofuel crop production may provide opportunities for others than smallholder farmers and urban poor but at the cost of constraining livelihoods dependent on natural resources. However, better outcomes can be achieved by taking the local context into account, for example by governing and creating sustainable access to natural resources required for biofuel crop production. This requires reforming or building institutions that consider these local contexts, and support equitable distribution of the benefits. When in place and accepted, such institutions could reap the opportunity of cultivating non-food biofuel crops on marginal lands unsuitable for food crops, and promote domestic use of biofuels.

Opportunities: conservation alongside environmentally sustainable expansion

In biodiversity rich areas, opportunities for ensuring environmental sustainability may lie in conservation measures and sustainable resource management to get an environmental income from these ecosystems. This would need to have the twofold purpose of retaining high biodiversity and contributing to the coping capacity of those whose livelihoods depend on these ecosystems such as indigenous people.

Global market access and a certain required level of development are in place in some areas, and visible through massive export of biofuel crops and food. Sustainable expansion of biofuel crop cultivation would include a mix of preventing external stresses (through a network of 'no-go areas' for crop expansion, for example) and improving the access of resource dependent livelihoods to decision making processes regarding biofuel crops and resource conservation.

Opportunities: low intensity farming on marginal lands

In ensuring beneficial trade-offs, the *marginal land, mixed growth potential* clusters reconciles risks and opportunities. This is primarily the case for the *pockets of land*

use competition cluster, as it offers more areas where growth potential is feasible enough to profit from without dire cost to the local environment. Biofuel crops attuned to local conditions could provide an additional income source on degraded land unsuitable for food production, if used only by the farmers themselves or for the local market. In theory, this also applies to marginal lands in the *low human wellbeing* clusters where non-food biofuel crops such as yatropha can be cultivated. However, greater competition with local food production is expected.

5.4 Conclusions

- Unmitigated global environmental change will have a huge impact on the poor and increase the vulnerability of many more people (Chapter 4). Long-term socio-economic development can increase wealth and hence contribute to reducing vulnerability. However, increased wealth might go hand in hand with less equitable distribution (Chapter 3). Furthermore, some countries have not been able to achieve economic growth, thus leaving many people in poverty and vulnerable to external stresses.
- Drylands are hot spots with respect to the challenges and trade-offs of improving human development in a fragile environment with limited natural resources and high risks of overexploitation. Together with current levels of severe poverty, drylands are a challenge for poverty alleviation and environmental sustainability. Opportunities include improved natural resource management and agricultural practices, diversification of livelihoods to more off-farm income potential, and strengthening institutions to increase equality and broaden access to markets.
- Reconciling improved food security with environmentally sustainable production of biofuel crops is inevitable in order to achieve progress in development. Often closely linked, biofuel production and food production currently function as substitutes, while extension of agricultural lands is at the cost of biodiversity. Stimulating large-scale production of liquid biofuel crops may severely conflict with other development targets, including environmental sustainability. Therefore, biofuel production will only contribute to MDG achievement when socio-economic and environmental sustainable measures are taken that fit the local context.
- Local and national policies need to be directed to reducing the sensitivity of people to global change, as well as to strengthening their coping capacity. International policies need to be directed to mitigating problems created at the global level and to building a supportive international context for national and local implementation of a sustainable development agenda.

6 Challenges and opportunities for development policies

Long-term development trends and dynamics and the implications for MDG achievement in 2015 and beyond have been analysed. The analysis shows that the MDGs are difficult to achieve and that additional policies are required. Based on the analysis, policy challenges and opportunities have been identified that need to be taken into account in thinking about development policies.

6.1 Main findings of the analyses

Human development in a long term perspective

The results of the analysis using the GISMO1.0 model show that progress on many of the MDGs can be expected in the coming decades. Nevertheless, progress might not be sufficient to achieve all goals in all regions, and some goals may not even be achieved in 2030. Analysis of underlying trends reveal that this may be partly due to the slow processes of change in population dynamics, the economy, and global environment. Demographic changes occur at a very slow pace, while it will take decades of high growth rates to close the enormous economic gaps between and within countries. Since economic development varies between and within regions, the location of poverty will also change. Poverty will be more concentrated in Sub-Saharan Africa and South Asia and increasingly become an urban problem. If unmitigated, global environmental change including climate change, land degradation and water scarcity will hit the poor most severely and will undermine development progress and hamper MDG achievement.

Regional development of the MDGs to 2015 and beyond

Major progress can be observed in East Asia and the Pacific, Latin America, and the Middle East and North Africa. In these regions, the rapid development process is facilitated by high economic growth. Risks related to food, water and energy are expected to decrease rapidly. However, Sub-Saharan Africa and South Asia have difficulties in achieving most MDGs. Environmental health risks will still be substantial, even in 2030, while modern chronic diseases will gradually gain momentum. Reducing child mortality by two-thirds may be the most difficult MDG to achieve in all regions. This target seems far out of reach, even with high economic growth and greatly improved agricultural productivity. The picture may even be less positive due to possible increases in inequalities resulting from the current global economic crisis. But it is too premature to assess these effects.

Environmental degradation undermines development

Population growth and economic development increase global demand for food, energy and water. Together with these trends, CO_2 emissions and water stress are increasing, while biodiversity and forest cover are decreasing. These trends will adversely affect ecosystem goods and services, with climate change putting further pressure on land productivity and water availability. Environmental problems often coincide, placing the impoverished population under even more pressure. Since the poor are most dependent on natural resources, this will undermine MDG achievement also beyond 2015 because various environmental problems including climate change will become more apparent after 2015, and even more so after 2030.

Vulnerability analysis shows directions for local, national and international policies

Vulnerability analysis identifies those at risk and thus goes beyond regional averages. It provides insights into the accumulation and distribution of specific risks within and between countries. Drylands, for example, are hot spots for the combined challenges of improving human development in a fragile environment with limited natural resources, and high risks of over-exploitation. Furthermore, stimulating large-scale production of liquid biofuel crops may conflict with other development targets, including environmental sustainability.

6.2 Local and national policy options: strengthening livelihoods

The sustainable livelihood approach brings together various facets of development from a local perspective (Chapter 2). This includes the assets and resources (natural resources) which shape ability to cope and adapt to different risks (vulnerability context), and policies and institutions at different levels that contribute to sustainable poverty reduction. This section addresses directions for policy making at local and national level to strengthen livelihoods through improved natural resource management for the delivery of relevant ecosystem goods and services.

Local reform to improve natural resource management

Environmental resources provide the rural poor with an income, either for subsistence or for some form of enterprise, such as farming, tourism and fishing. Sustainable management of ecosystems that produce these goods and services can help people to gradually move beyond depending entirely on environmental income. The analysis of the patterns of vulnerability (Chapter 5) has revealed some of the challenges and opportunities to reduce the vulnerability of people in different situations, while maintaining their natural resource base. Opportunities include diversification of livelihoods to more off-farm income and strengthening institutions to increase equality and broader access to markets. Furthermore, biofuel production can only contribute to MDG achievement if socio-economic and environmentally sustainable measures are taken that fit within the local context.

The changing nature of poverty from rural to urban

Traditionally, many poverty reduction strategies aim at poor people living in rural areas. However, poverty is gradually shifting from rural to urban areas (Chapter 3) with almost half of all world's poor living in urban areas in the coming decade (UN-Habitat, 2006). Since the urban poor are characterised by vulnerabilities such

as fluctuating food prices, pollution and inadequate housing, poverty reduction strategies need to be developed that differentiate between rural and urban areas. At the same time, rural and urban populations are related through migration flows that are often interlinked with poverty, and flows of natural resources, waste and pollution (UN-HABITAT, 2008).

National policies can support local practices in many ways

Vulnerability issues are often still a low priority in domestic policies because the populations affected are already socially, economically and politically marginalised. Furthermore, many degradation processes are gradual. Good practices and local reforms that strengthen natural resource management can be fostered by national policy choices. Agricultural production, for example, can be successfully supported with technology packages made readily available and affordable, as well as by extension services that can help introduce best practices. National policies can help improve livelihoods by supporting up-scaling of local initiatives, rapid improvement in hard and soft infrastructure, establishment of safety net programmes and diversification of rural livelihoods, rather than over-reliance on a small portfolio of cash crops. In the long-term, improvements are necessary in creating an enabling economic, social and political environment for the most vulnerable. This requires coordination between policy domains, long-term donor commitment and a participatory approach to institutional improvements. It concerns not only the governance of and access to natural resources but also includes, for example, health and education (UNEP, 2007; Tyler et al., 2008; WRI, 2008).

6.3 International policy options

Local and national policies need to reduce the sensitivity of people to socio-economic and environmental changes, and to strengthen their coping capacity. International policies need to mitigate problems created at the global level and build a supportive international context for national and local implementation of a sustainable development agenda. MDG8 is about this 'global partnership for development' and focuses on facets of international collaboration, which collectively needs to lead to a supportive international context for national implementation of the development agenda. The options as part of MDG8 are complemented here with two adjacent facets, international environmental policies, and governance and institutions, which are clearly relevant for MDG achievement.

6.3.1 Official development assistance (ODA)

Donors are not allocating the ODA they agreed upon

Official development assistance (ODA) is the most direct form of development policy and international donor countries have agreed to allocate at least 0.7% of their total GDP to development cooperation. However, this monetary agreement is entirely voluntary. In 2005, ODA from all donor countries totalled only 0.33% of their GDP, and in 2007 this was reduced in both relative and absolute terms (OECD, 2007a). In 2007, ODA was 0.28% of donor GDP which equals around US$ 100 billion. This amount of ODA is rather substantial for many receiving countries in comparison with their economic output.

Is more aid better aid

The key question is whether more ODA will improve development outcomes. Crucial here is how to interpret *better* development assistance. Is it the big aid push advocated by Sachs (2005), or is aid blocking rather than helping development as expressed by Easterly (2006; see also Perspectives in the development debate, page 21). More effective aid is not per se achieved by increasing ODA budgets; aid has to be systematically structured and reviewed with clear objectives, whether it is general budget support to countries or support to specific sectors.

Health and education targeted by ODA

Assuming that ODA is important, what aspects of the MDGs need to be targeted. One of the major challenges identified is setting up and maintaining effective education and health systems with well-trained professionals and adequate equipment serving the whole population. In striving for universal primary education, quality facets of the education offered should not be overlooked. It also brings the responsibility to offer a further perspective for children completing primary education, providing jobs in the labour market or opportunities for secondary and tertiary education. In the health system, substantial extra investments are required (Chapter 3).

In addition, several health risks demand special attention. Most child mortality is caused by diseases that can be considered to be preventable with relatively low investment. Efforts should be directed to reducing child mortality quite independently of achieving MDG4 which proves to be one of the most difficult to achieve. One side-effect of reducing child mortality is a higher demand for education and may well put more pressure on achieving the education targets that are also difficult to achieve. The effect of a better educated and healthier population will be potentially higher economic growth through human capital. However, such an effect is mostly visible 10 to 15 years after the policy efforts when these children enter the labour market.

Other financial flows are also important for development

ODA is not the only financial flow influencing development processes. Over the past few decades, private finances such as foreign direct investments (FDI) and money transferred by migrants have increased significantly and currently amount to more than ODA. The increasingly large FDI by China and India in Africa has given a boost to economic growth (Broadman, 2007), although there are also concerns that this growth is not sustainable (DGIS, 2006). Money transfer by migrants generally contributes to poverty alleviation and boosts investments in education because it directly funds households.

6.3.2 Access to world markets and trade

Trade patterns are changing; new players are entering the world stage

Trade is seen as an important lever for development policies and since the early 1960s, international trade has increased significantly. World exports have increased tenfold and have became more diverse (World Bank, 2007a). The share of agricultural commodities, fuels and minerals has dropped, making room for industrial goods and services. Developing countries are also participating more in trade (World Bank, 2007a), although when oil is disregarded, the share of the least devel-

oped countries in export remains more or less constant and very small. By opening their markets, especially India and China have contributed to the acceleration of global trade expansion.

Trade can have a positive effect on poverty reduction

Trade enhances economic growth. Thus, if trade barriers are lowered everyone could profit in theory, including the poorest segments of the population (World Bank, 2007a). Higher economic growth can lift another 100-200 million people out of poverty by 2015, although the inertia involved also shows that the gap between poor and rich countries will remain in the coming decades (Chapter 3). In general, economic growth is considered to be distribution-neutral, which means that inequality does not change as the average income rises (Dollar and Kraay, 2002). This implies that all incomes increase in proportion to the average income. However, this would widen the gap between rich and poor in absolute terms. The division of power, possessions and access to markets and services might become more unequal, which can worsen the position of the lowest income groups in the longer term. This calls for specific policies targeted to the poorest people.

But a contrary vision exists and accompanying policies might be put in place

Pro-poor growth is not always supported by empirical studies. For example, Dollar and Kraay (2002) claim that there are many instances where growth might even harm the poor. While trade liberalisation increases employment opportunities, it does not necessarily result in better working conditions for all. Generally, skilled workers profit most, with possible wage increases, while vulnerable groups, such as unskilled workers, will profit far less from liberalisation (FAO, 2005; World Bank, 2007). This results in a widening of the income gap between skilled and unskilled workers.

In addition, trade reforms can create or destroy markets and thus can have either pro or adverse effects on income generation. Differences in the financial status of households or the degree of change can play a role as well, for example, with small cuts in protectionism richer households tend to reap greater benefits (Chen and Ravallion, 2004). This requires a holistic approach to access world markets in which trade liberalisation policies are accompanied by policies aiming at the vulnerable groups, for example education policies.

6.3.3 Technology transfer

Technology has a high potential

Technology has the potential to make production more efficient, to reduce environmental damage, and to benefit people directly through, for example, medical technology. In practice, most of these technologies are not available globally because of a wide range of barriers and obstacles. For example, technology transfer of best practices to developing countries can be hampered by inadequate infrastructure and energy supply, patents on drugs, and high prices. Crucial for the MDGs is the transfer of agricultural technologies that increase the productivity of food-insecure farmers. Developing countries do not have the resources to make high investments in research, development and innovation. They thus depend on international policies, foreign investors and trade for new technological developments.

Trade is important for technology transfer, but requires a basic level of development

Low trade tariffs make technology more easily accessible for developing countries. While trade liberalisation has a particularly positive effect on the price of technologies, current patent restrictions are huge obstacles to the transfer of medical technologies (WHO, 2005). Furthermore, in order to transfer technologies efficiently, people in the receiving country must be able to work with the new technology. A necessary condition is that education levels improve (World Bank, 2007a). In addition, the receiving region must be stable (so that the business community will invest), there must be sufficient numbers of skilled workers available, and the infrastructure must be sufficiently developed. A country, therefore, needs to have achieved a certain level of structural development in many different areas.

But will technology deliver at the end of the day

The right technology can provide a solution to do more with less. Proven agricultural technologies have the potential to double or triple yields, even on remote smallholder farms on marginal lands (UN Millennium Project, 2005). Increasing food production levels by applying better technologies and by targeting hunger, brings achievement of some of the MDGs closer (Chapter 3). However, opinions deviate about the extent to which this potential can be converted to practice, and in the way that developing countries will benefit.

6.3.4 International environmental policies

International environmental policies need to be linked to the development agenda

Starting from development objectives, environmental concerns can be mainstreamed in development processes to create mutual benefits. The benefits of such an integrated approach have been demonstrated in policies on development and climate change in developing countries including reducing poverty, creating employment opportunities, health benefits and improving energy and food security. These policies are primarily taken for reasons of economic development or energy security and not because of international climate policies, but reflect a possible win-win situation (Kok et al., 2008; Winkler et al., 2008). Such an approach could also be further explored for the mainstreaming of other international environmental policies, for example concerning the environment and trade agenda.

Options for combined development and climate policy

Energy use is a major contributor to greenhouse gas emissions and climate change (IPCC, 2007a). However, developing countries have no obligations to mitigate greenhouse gas emissions under the Kyoto protocol. Many emission reduction measures involve expensive technologies that could hamper economic development. Nevertheless, many emission reduction projects take place in developing regions and are financed by industrialised regions (via CDM). This does not mean that developing countries themselves cannot act on climate change. Many policies directed primarily to economic development or independence have the co-benefit of decreasing energy use and greenhouse gas emissions (Winkler et al., 2008). For instance, efficiency standards for appliances and vehicles decrease energy use and household expenditure on energy. Also, energy efficient cooking stoves decrease expenditure on fuelwood and indoor air pollution, while reducing the use of

unsustainably harvested wood. Use of locally produced biofuels or renewable energy might be more expensive but decreases dependency on imported oil.

6.3.5 Governance and institutions

Policy coherence in global governance

National and international development policies can be made more effective in a coherent international policy context. Policy coherence refers to mutually reinforcing policies, in this context for sustainable poverty reduction. This includes coherence between international policy domains and institutions, taking account of impacts of industrialised country policies on developing countries and a long enough time horizon. Sustainable development is helped by focusing in international policies on the consequences for the most vulnerable and on increasing human wellbeing.

International partnerships of various stakeholders

A global partnership requires stakeholders at various levels to play their role. These stakeholders include the governments of developing countries and donor countries via bilateral aid programmes or multilateral institutions including the United Nations, World Bank, World Trade Organisation (WTO) and the European Union. The business community has an important role to play via public-private cooperation projects and Foreign Direct Investment. Non-governmental organisations (NGOs) often play a supporting financial role through Western governments and as advisors and advocacy groups. Finally, migrants living abroad and sending a considerable amount of private money to their families back home are important for development.

Good governance as a criterion for development cooperation

A hindrance to access to education, health services and ecosystems goods is inadequate or bad governance. Moreover, bad governance can hit twice since one of the criteria for development cooperation is good governance. Restricting development cooperation to countries with good governance could increase effectiveness (IBO, 2003), but would most likely exclude many people in need of it. This is especially true for people living in conflict-prone areas. As well as suffering from a poorly governed country, they also have to deal with conflicts that directly undermine their livelihoods.

6.4 Different country groups, different policies

There is no recipe for development. The underlying processes are highly complex, thus leaving ample room for uncertainty about how to influence impacts. The development of a country cannot generally be attributed to one single factor, but depends on a mix of socio-economic, demographic, infrastructure, geographic and climate factors. While these factors can also play different roles in different countries, the analyses revealed similar patterns in development. Development in Sub-Saharan Africa and South Asia remains behind, showing gaps in basic aspects such as health and education, while substantial progress is shown in Latin America,

South Asia and particularly East Asia and Pacific. For these different phases in the development process, different policies might be relevant to further development.

Development dilemmas

Most of the policy options contain value-laden ideas or beliefs about development, which reflects different perspectives in the development debate (see also page 21). These perspectives might present certain dilemmas for policy makers in formulating and deciding on policy directions. Some of the dilemmas that need to be taken into account in the development debate are:

- The results of ODA are not always seen instantly but it takes many years for an overall positive effect to become apparent such as in education. The risk is that this might undermine general support for development cooperation. Therefore, policy strategies might be distinguished for medium- and long-term objectives, beyond 2015.
- Since environmental problems can be increasingly seen as development problems, international environmental policies need to be designed to support both development and the environment. For example, the energy system could result in a win-win situation which tackles both health loss related to air pollution and unsustainable use of traditional biofuels. Also, the status quo in climate negotiations could be changed by making it more supportive for developing countries. The downside of linking the two policy arenas is that both might become even more complex because more and difficult to compare interests are introduced.
- Trade and a more liberalised world market can bring additional economic growth for developing countries. Nevertheless, trade liberalisation also brings risks and cannot be regarded as the only route to development. Countries depending on exports are more sensitive to fluctuations in the world market. In addition, vulnerable groups such as unskilled workers will profit far less from trade liberalisation and additional policies are needed. Also, it needs to be taken into account that higher economic growth in developing countries will do little to reduce the gap between rich and poor.
- Technology has potentially the capacity to increase production with the same means. However, obstacles such as patents are not easily overcome. A major condition for successful technology transfer is a certain level of development. This causes a mutual dependency which brings the dilemma of which to prioritise first.
- Most global problems are best addressed by a global partnership with stakeholders at various levels working together. This is illustrated by multilateral organisations such as the EU and the UN which do not have yet a fully-tuned and integrated approach to development issues. The dilemma, however, is whether it is preferable to organise development cooperation at a multilateral level or whether international governmental steering would only result in more bureaucracy.
- Having the MDGs as the leading framework for development policies has clearly focused policies. However, using a set of indicators might not do justice to the development process. Next, the focus should not only be on single indicators but rather the interconnection of various themes should be considered in order to anticipate possible side-effects and consequences. For instance, improving child mortality will increase inflow into education; aiming at universal primary education will increase the demand for secondary education; living on more than

one dollar a day but less than two is still not a decent standard of living. These issues demand broad, integrated development strategies.

Policy coherence to improve policy making

The development dilemmas can be dealt with through more coherent policies. Such policy coherence is required for sustainable poverty reduction not only in development assistance, but also in many other policy areas including trade, agriculture, migration, peace and security, environment and food security. Policy coherence for development is advocated by many institutions and organisations (DGIS, 2003; OECD, 2007b; Bourguignon et al., 2008) and can be achieved by interlinking the following dimensions covered in this report:

- Interlinking sustainability domains, by using people-planet-profit; for instance, development policies have consequences for climate change and biodiversity, and vice versa. Policies for energy, agriculture, trade, biodiversity and development cooperation need to be integrated;
- Interlinking different scales, for example from local, livelihood-related to international and global aspects;
- Connecting actions now with longer-term effects, for example taking into account underlying socio-economic and environmental dynamics, and looking beyond 2015.

Ending global poverty requires a development agenda beyond 2015

Getting closer to the MDG target year of 2015, the international community needs to consider a post-MDG development agenda to guide long-term development policies and to end global poverty. In 2015, poverty and hunger may be halved but will still exist and various health risks will still be a major concern. Furthermore, new development challenges may arise because demographic, economic and environmental processes are slow moving and their impacts will only become evident after 2015. The GISMO model can help to identify these challenges, explore quantitative targets. This could support the process of creating a new phase in the development agenda beyond 2015.

Appendix 1 GISMO1.0 model

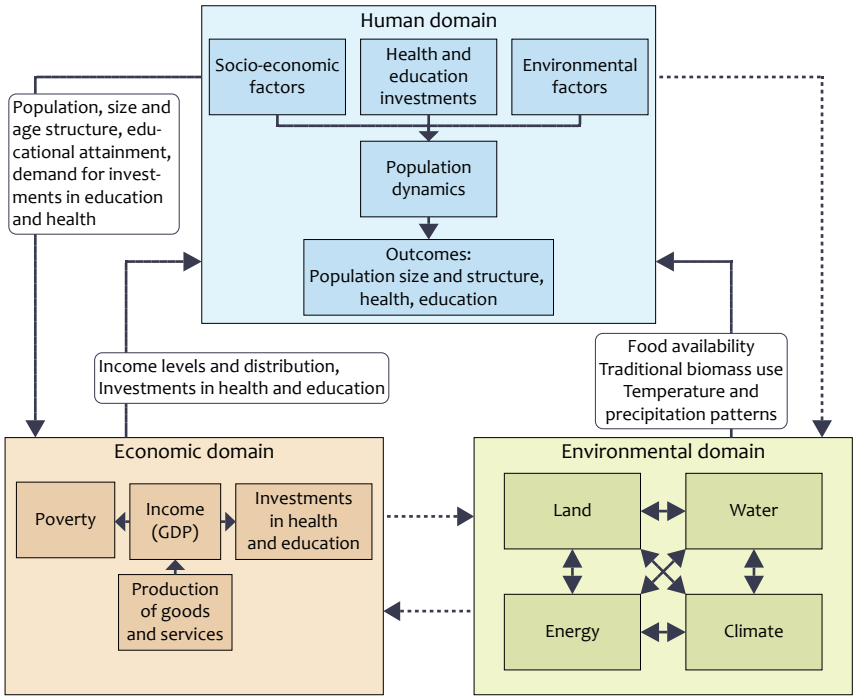
The GISMO1.0 model operationalises the concept of sustainable development by interlinking global environmental change and human development (Hilderink and Lucas, 2008). It addresses quality of life as a result of changes in the three sustainability domains (people, planet and profit). GISMO1.0 builds on a strong history of PBL's integrated assessment modelling, with the IMAGE framework (MNP, 2006) as one of the most advanced methods of exploring broad environmental issues.

For population and health issues, the PHOENIX model is used (Hilderink, 2000). This model has been refined with a better epidemiological foundation, the inclusion of diseases as well as deaths, and an education module capturing the dynamics of the education process. The health model covers socio-economic and environment-related health risks such as hunger, lack of improved drinking water and sanitation, indoor and outdoor air pollution and malaria.

To describe economic developments and poverty, the International Futures (IFs) Economy model is used (Hughes and Hildebrand, 2006). This model uses a system dynamics approach and describes different actors, including a government that allocates expenditures for education and health services.

The PHOENIX model and IFs Economy are fully integrated in GISMO1.0 and cover the human/social and economic domain, respectively. For the environmental domain, pre-run scenarios from IMAGE and TIMER are used. Simple dynamics and the interlinkages of GISMO1.0 are presented in Figure A.1.

Figure A.1 **Sustainability domains GISMO 1.0 model**



Interlinkages between the three sustainability domains in the GISMO1.0 model. The dark blue lines are established links, accompanied by the shared variables. The light blue lines represent links not yet included, establishing the full integration the environmental domain into the framework.

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A development agenda beyond 2015 to end global poverty

Coming closer to the target year of 2015 for the Millennium Development Goals (MDGs), more than one billion people are still living in poverty, without adequate food, safe drinking water and clean energy. Directed to providing basic quality of life, the MDGs are the leading agenda for international policy on development and sustainable poverty reduction. Undoubtedly, progress has been made but our study has also shown that progress is not sufficient to achieve all goals in all regions by 2015. Many of the goals will not even be achieved by 2030. The most difficult target to achieve is reducing child mortality by two-thirds and requires substantial additional development policy efforts.

It is time for the international community to consider a post-MDG development agenda to guide long-term development policies and to end global poverty. In 2015, poverty and hunger may be halved but will still exist, and eliminating health risks and environmental degradation will require additional policy action. Furthermore, new development challenges may arise because demographic, economic and environmental processes are slow moving and their impacts will only become evident after 2015. This report helps to identify these challenges, to explore quantitative targets and thus to support the process of creating a development agenda beyond 2015.

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