Millennium Development Goals Needs Assessments

Country Case Studies of
Bangladesh, Cambodia, Ghana, Tanzania and Uganda

Working Paper

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Unless otherwise stated, all financial estimates presented in this document are in constant 2000 US$

Abbreviations

ASDS	Agricultural Sector Development Strategy
AGOA	African Growth and Opportunity Act
ARV	Anti-Retroviral
ASEAN	Association of South East Asian Nations
ATEM	Access to Essential Medicines
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CMH	Commission on Macroeconomic Health
CRS	Creditor Reporting System
DAC	Donor Assistance Committee
DHS	Demographic and Health Surveys
DOTS	Directly-Observed Treatment Short Course
ECD	Early Childhood Development
EFA	Education For All
FAO	Food and Agriculture Organization
FCCC	Framework Convention on Climate Change
FCUBE	Free Compulsory Universal Basic Education
GDP	Gross Domestic Product
GPRS	Ghana Poverty Reduction Strategy
GSP	Generalized System of Preferences
HBS	Household Budget Survey
HDR	Human Development Report
HIPC	Highly Indebted Poor Countries
ICT	Information and Communication Technology
IMCI	Integrated Management of Childhood Illness
ITN	Insecticide Treated Nets
IWRM	Integrated Water Resources Management
JMP	WHO/UNICEF Joint Monitoring Program
LDC	Least Developed Countries
LEAP	Long-range Enery Planning model
MDG	Millennium Development Goals
MFA	Multi Fiber Agreement
MTEF	Medium Term Expenditure Framework
NBSAP	National Biodiversity Strategy Action Plans
NEMA	National Environment Management Authority
NER	Net Enrolment Rate
NPES	National Poverty Eradication Strategy
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
PCR	Primary Completion Rate
PEAP	Poverty Eradication Action Plan
PEDP	Primary Education Development Plan
PPP	Purchasing Power Parity
PRGF	Poverty Reduction and Growth Facility
PRSP	Poverty Reduction Strategy Paper
PTR	Pupil Teacher Ratio
SAGQ	South Asian Growth Quadrangle
STD	Sexually Transmitted Diseases
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPE	Universal Primary Education
VIP	Ventilated Improved Pit latrine
WHO	World Health Organisation

1. Executive Summary

1.1. Motivation

The Millennium Development Goals (MDGs) are a set of quantified and time-bound goals for dramatically improving the human condition by 2015. They have been agreed by all member states of the United Nations and were reaffirmed at the Monterrey Conference on Financing for Development and the World Summit on Sustainable Development in Johannesburg. While many countries have made significant progress towards the Goals, dozens are far off track from achieving them unless progress is accelerated dramatically. These "Priority" MDG countries are concentrated in sub-Saharan Africa, Central America and the Andes, Central Asia, and parts of Southeast Asia.

In attempt to identify the range of interventions and investments required to achieve the MDGs in a cross-section of countries, this paper presents five country case studies for Bangladesh, Cambodia, Ghana, Tanzania and Uganda. The ambition of these country studies is to outline how countries could identify their MDG needs and to inform long term plans for achieving the MDGs. To this end, the paper proposes a template for conducting needs assessments with as much rigor as possible. The importance of such needs assessments is driven by the following considerations:

A. The MDGs need to form the core ambition of national poverty reduction planning processes, including PRSPs

As the international community's quantified and time-bound targets for the reduction of income and non-income poverty, the MDGs should be central to development planning in low-income countries and guide the formulation of national planning documents, including the PRSPs. At present this is not systematically the case, since planning horizons are frequently too short and targets are not set in a manner consistent with the Goals. To plan effectively for the Goals, countries need to adopt a mid- to long-term approach through 2015 to identify all the necessary steps that need to be undertaken by working backwards from the Goals themselves. Based on a long-term needs assessment countries can identify the trajectory they need to follow in order meet the Goals. This trajectory can then form the basis for making the PRSP, medium-term expenditure frameworks, and other core frameworks and processes consistent with achieving the MDGs.

While the country studies do not aim to develop a definitive investment plan, they seek to provide a methodology together with a preliminary answer to the question of what it would take over 11 years to achieve the MDGs in five countries. This paper thus aims to provide a technical template to begin the process of planning for MDG success at the country-level.

B. The Millennium Development Compact needs to be operationalized

Achieving the Goals is possible in low-income countries that are well governed relative to their level of income and that develop sound plans, but success will also require

increased support from developed countries. As outlined in the *Human Development Report 2003 (HDR)* many countries are caught in poverty traps that they cannot escape on their own. It is for this reason that the international system needs to provide assistance on the basis of long-term development plans developed by poor countries that are technically rigorous and can be transparently evaluated for progress.

These mutual responsibilities of rich and poor countries form the core of the Monterrey Consensus and the Millennium Development Compact published in the HDR[1]. Operationalizing this compact requires a clear approach to assessing countries' needs for meeting the MDGs. The case studies presented in this paper attempt to provide a first answer to the question of how this can be done transparently and with technical rigor.

C. Countries need to plan comprehensively across <u>all</u> sectors

No 'magic bullets' exist for achieving the MDGs as no single set of interventions will be sufficient to make the necessary progress towards all the Goals. Mutually reinforcing investments need to be made across all sectors. For example, investments in education will not yield adequate results without investments in health, which in turn require investments in clean water, which in turn increase educational enrolments. We have therefore developed a comprehensive set of interventions that can serve as a first template for guiding national planning processes.

D. An improve understanding of 'absorptive capacity constraints' is needed

'Absorptive capacity' constraints, defined as limited human resources, managerial skills, monitoring and evaluation systems, infrastructure, and so forth, are real and pose binding constraints on countries' ability to scale up interventions in the short term. However, each of these constraints can be relaxed substantially over the medium term through systematic investments in human resources, administrative capacity, or infrastructure. Our country case studies attempt to take a first step towards systematically thinking through the question of how absorptive capacity can be built up.

Indeed it is only through the long-term planning approach advocated here that critical absorptive capacity constraints can be addressed and resolved. The significantly shorter timeframe of the PRSP and medium-term expenditure frameworks of 3-4 years tends to prevent many of these questions to be even addressed in the planning processes.

E. Public investments need to form the core of long-term MDG plans in Priority countries

In low-income countries many infrastructure investments and social services cannot be privately financed and therefore fall under the responsibility of the government. Therefore, our MDG needs assessments focus on *public* investments and services. This is part of a broader strategy proposed in the Millennium Development Compact to strengthen the role of governments in conjunction with continuing reforms to improve their accountability and quality of service delivery.

[1] Available at http://www.undp.org/hdr2003/pdf/hdr03_MDC.pdf.

F. MDG needs assessments require transparent assumptions and shared results
Many sectoral and country-specific MDG needs assessments have been carried out in the past for low-income countries, though none are as comprehensive as the analysis presented in this paper. However, their underlying assumptions, methodology and models are rarely shared publicly. This makes it extremely difficult, if not impossible, for countries and organizations to use and build on existing work for their own long-term planning towards achieving the MDGs. To advance the technical debate on just how such planning can be carried out we develop a transparent 'open-source' approach to MDG planning.

1.2. Methodology

The five countries investigated in this paper were chosen based on their low per capita incomes, their geographic and political diversity, and their sound levels of governance relative to gross domestic product (GDP) per capita. Each country case study builds on sectorally-oriented work carried out by the Millennium Project Task Forces and existing sectoral costing studies prepared by UN agencies, the World Bank and other organizations. These sectoral estimates were then applied to each case study country in collaboration with the following respective research institutes:

- Bangladesh Institute of Development Studies;
- Cambodian Institute of Cooperation and Peace, in cooperation with the University of Cambodia;
- Institute of Statistical, Social and Economic Research (Ghana);
- Economic and Social Research Foundation (Tanzania); and
- Economic Policy Research Center (Uganda).

Our needs assessment methodology entails five basic steps, as outlined in Figure 1. The focus of the analysis is on identifying the range of *interventions* – defined broadly as the provision of goods and services as well as infrastructure – required for achieving the MDGs. It is important to note the distinction between interventions and *policies* or *institutions*. Whereas technical interventions, such as the provision of anti-retroviral drugs to treat HIV/AIDS or the construction of new schools to achieve the primary education goal, are crucial for developing an MDG investment plan, they are quite distinct from the policies or institutions that need to be used to deliver them. Since many different policies and institutions can conceivably deliver a specific intervention and differ significantly across countries, they can only be addressed in the context of detailed national planning processes and are thus not included here.

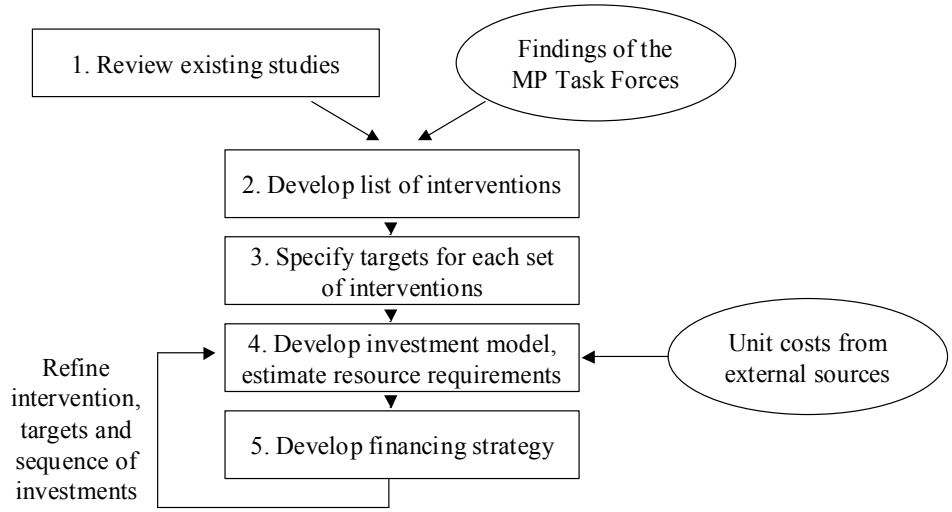

Figure 1: Summary of country-study methodology

A critical advantage of our intervention-based approach over alternative costing methodologies is that it allows us to identify underlying gaps and overlaps between different 'sectors' to ensure a comprehensive analysis while avoiding any double counting.

In close consultation with the Millennium Project Task Forces we have developed detailed lists of interventions for Target that serve as a basis for estimating resource needs for meeting the MDGs. Table 1 summarizes key interventions for primary education, which form a subset of the full list of interventions for achieving Target 3, 'Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling'.

Category	Intervention
Primary Education	
	Build classrooms
Infrastructure	Construct girls' toilets
	Install furniture (blackboards, desks, chairs)
	Build teachers' houses
Teachers	Provide transportation facilities
	Recruit teachers
	Recruit female teachers
	Provide pre-service training
Materials	Provide in-service training
	Provide textbooks
	Provide other learning materials (stationery, chalk etc.)
Demand side incentives	Provide uniforms
	Provide subsidies to girls
	Provide school meals
	Provide take-home rations
	Provide subsidies for vulnerable populations
Curriculum Reform	Keep HIV/AIDS orphans in school (*)
	Design new textbooks
	Provide learning aids
	Provide teacher training for new curriculum
Distance Education	Improve a communication strategy to disseminate the curriculum changes
	Introduce distance education for hard-to-reach, out of school children
	Provide IT equipment and radio
	Hire teachers/instructors
	Train teachers/instructors
	Provide learning material

Table 1: Subset of list of interventions for achieving MDG Target 3 on education.

These comprehensive sets interventions are considered inputs to achieving the MDGs, going beyond the finite set of outcome targets defined by the Goals to include other input targets necessary to achieve the Goals. For example, while no concrete MDG Targets exist for sexual and reproductive health, sanitation and wastewater treatment, health systems, energy services, and transport infrastructure, the corresponding interventions are critical inputs for achieving the MDGs. For this reason our country case studies identify interventions across the following 14 areas:

- Hunger,
- Gender equality,
- Education,
- Health systems,
- Child health,
- Maternal and reproductive health,
- Infectious diseases (HIV/AIDS, TB and malaria),
- Access to essential medicines,
- Environmental sustainability,
- Water and sanitation,
- Improving the lives of slum dwellers,
- Science and technology,
- Energy services and energy infrastructure, and

- Transport infrastructure.

Wherever possible, intervention targets are based on the MDGs as well as other internationally agreed-upon targets such as the sanitation target established at the Johannesburg World Summit on Sustainable Development in 2002. In cases where no agreed targets exist, the Millennium Project secretariat worked with the Task Forces to derive targets and key parameters analytically. For example, based on best practice norms we have adopted concrete targets for primary-school completion rates and pupil-teacher ratios.

The needs assessment addresses capital as well as recurrent costs since both need to be properly financed to ensure adequate service delivery. In contrast to other methodologies we calculate total as opposed to incremental resource needs since the former is required for developing the financing strategy described towards the end of the paper.

Several of the interventions exhibit synergies or trade-offs with one another. While a comprehensive treatment of these critical interactions is beyond the scope of this paper, we identify those synergies, which we believe will generate the greatest cost savings. These tend to accrue in the health sector and have been accounted for in our resource estimates.

On the basis of the calculated total resource requirements for meeting the MDGs, we estimate a highly simplified financing strategy for each country, distinguishing between three sources of funding: (i) private out-of-pocket expenditure by households, (ii) government resources, and (iii) international transfers to fill the remaining financing gap.

Household contributions are estimated based on two considerations: (i) the incentive effects of user fees, and (ii) households' overall ability to pay. Since user fees can play a critical role in preventing the poor from accessing basic services we preclude households from contributing to some sectors, such as basic healthcare and primary education. In turn we propose private out-of-pocket contributions towards the following sectors: energy, agriculture, secondary education, water and sanitation.

To account for increased government resource mobilization, we project that domestically-financed spending on MDG-related interventions will rise by 4 percentage points of GDP between 2005 and 2015 in addition to the increase in domestic resource availability resulting from GDP growth. As laid out in the Monterrey Consensus and the Millennium Development Compact, if the MDGs are to be achieved in all low-income countries, increased external finance will be required for interventions that cannot be financed through domestic resources alone.

1.3. Key findings from the country studies

By developing comprehensive lists of interventions, we have been able to make preliminary estimates of the human, infrastructure and financial resources required to achieve the MDGs in each of the five countries. Table 2 summarizes the financial component of these results. For each country the table reports average annual investment

needs in million 2000 US$ during the period from 2005 to 2015 as well per capita equivalents obtained by dividing investment needs by the country's population.

Our preliminary estimates suggest that annual investment needs average between $1.5 billion for Ghana and $14.1 billion for Bangladesh during the period from 2005 to 2015. On a per capita basis, total average needs vary between $80 in Ghana and $96 in Tanzania. It is important to note that per capita investment needs merely provide an abstract, but convenient presentation of total needs that facilitates cross-country comparisons. Finally, expressed as a share of gross domestic product, average resource needs vary from 15 percent of GDP in Bangladesh to 22 percent in Tanzania.

It is critical to note that these resource estimates are preliminary and exclude a number of important interventions that are likely to increase overall investment needs. Some of the most cost-intensive interventions that have so far not been addressed in the analysis include:

- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions to ensure environmental sustainability,
- New infrastructure for health systems, such as hospitals and clinics,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

Importantly, country-level planning towards the MDGs will need to specify the corresponding interventions as well.

Summary of projected financial resources required for meeting the MDGs in Bangladesh, Cambodia, Ghana, Tanzania and Uganda (2005-2015)

	Bangladesh		Cambodia		Ghana		Tanzania		Uganda	
Total Cost (Sum of A+B+C below)	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*
Hunger	844	5.1	145	8.7	117	4.9	304	7.2	272	8.2
Education	2,358	14.1	280	16.8	427	17.7	507	12.1	461	13.9
Gender Equality	336	2.0	37	2.2	51	2.1	99	2.4	78	2.3
Health	3,440	20.6	372	22.4	598	24.8	1,461	34.8	1,069	32.2
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	957	5.7	80	4.8	178	7.4	226	5.4	124	3.7
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	2,948	17.6	272	16.4	345	14.3	604	14.4	431	13.0
Roads	3,172	19.0	315	19.0	223	9.2	815	19.4	612	18.4
Total	**14,056**	**84.1**	**1,501**	**90.3**	**1,939**	**80.4**	**4,015**	**95.5**	**3,046**	**91.8**

Summary of projected sources of financing in Bangladesh, Cambodia, Ghana, Tanzania and Uganda (2005-2015)

	Bangladesh		Cambodia		Ghana		Tanzania		Uganda	
A. Household Contributions	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*
Hunger	-	-	-	-	-	-	-	-	-	-
Education	316	1.9	54	3.3	23	0.9	29	0.7	67	2.0
Gender Equality	-	-	-	-	-	-	-	-	-	-
Health	-	-	-	-	-	-	-	-	-	-
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	375	2.2	36	2.2	81	3.4	107	2.6	57	1.7
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	669	4.0	78	4.7	112	4.7	216	5.1	143	4.3
Roads	-	-	-	-	-	-	-	-	-	-
Total	**1,360**	**8.1**	**168**	**10.1**	**216**	**9.0**	**353**	**8.4**	**268**	**8.1**

	Bangladesh		Cambodia		Ghana		Tanzania		Uganda	
B. Domestically Financed Government Expenditures ***	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*
Hunger	314	1.9	43	2.6	34	1.4	96	2.3	101	3.0
Education	876	5.2	83	5.0	124	5.2	160	3.8	171	5.2
Gender Equality	125	0.7	11	0.7	15	0.6	31	0.7	29	0.9
Health	1,278	7.6	110	6.6	174	7.2	462	11.0	397	12.0
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	355	2.1	24	1.4	52	2.2	71	1.7	46	1.4
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	1,095	6.6	81	4.9	100	4.2	191	4.5	160	4.8
Roads	1,178	7.1	93	5.6	65	2.7	257	6.1	227	6.9
Total	**5,220**	**31.2**	**444**	**26.7**	**565**	**23.5**	**1,269**	**30.2**	**1,132**	**34.1**

	Bangladesh		Cambodia		Ghana		Tanzania		Uganda	
C. Required Total External Budget Support	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*	*Average per year ($m)*	*Average per capita ($)*
Hunger	531	3.2	102	6.2	83	3.4	208	4.9	171	5.1
Education	1,167	7.0	143	8.6	280	11.6	317	7.6	222	6.7
Gender Equality	211	1.3	26	1.6	36	1.5	68	1.6	49	1.5
Health	2,163	12.9	262	15.8	424	17.6	999	23.8	672	20.2
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	227	1.4	20	1.2	46	1.9	47	1.1	20	0.6
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	1,184	7.1	113	6.8	132	5.5	197	4.7	128	3.9
Roads	1,994	11.9	222	13.3	158	6.5	557	13.3	384	11.6
Total	**7,476**	**44.7**	**888**	**53.4**	**1,158**	**48.0**	**2,393**	**57.0**	**1,646**	**49.6**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above

Table 2: Summary results of country case studies (see text for explanation)

Our simple financing analysis calculates the scope for domestic resource mobilization through government expenditures and private out-of-pocket contributions. While these results require refinement, they suggest that the five countries will be able to finance roughly 40 to 50 percent of total investment needs through domestic sources. This translates into an average total need for external development assistance equivalent to $44 to $57 per capita.

Critically, external development assistance will need to be provided as grants and in the form of direct budget support. Our analysis suggests, however, that the required external finance will be significantly below the equivalent of 0.7 percent of rich countries' GDP – the international ODA target which is part of MDG 8 and to which donors have committed themselves repeatedly. Future extensions of the Millennium Project MDG

case studies will provide more detailed estimates of global resource needs for meeting the MDGs.

Overall, the variation in projected per capita investment needs and domestic resource mobilization potential is relatively low across the five countries since Bangladesh, Cambodia, Ghana, Tanzania, and Uganda face broadly similar development challenges. Nevertheless, important differences can be identified across the countries, which are described in more detail below.

Bangladesh

As a result of its large and growing population, the country faces by far the highest absolute investment needs (including domestically and internationally financed) in our sample, averaging $14.5 billion per year between 2005 and 2015. On a per capita basis, however, Bangladesh requires significantly less investment to meet the MDGs than does Cambodia, Tanzania or Uganda. It is noticeable that the country's household contributions to meeting the MDGs are the lowest of the five countries, since national survey data suggests that close to 50 percent of the population live below the basic needs poverty line – the highest share among the five countries. In contrast, Bangladesh's level of GDP per capita and rate of economic growth will permit the government to mobilize more incremental resources than many other poor countries. In terms of total ODA required for the MDGs, approximately $45 per capita will be required, or $7.5 billion per year.

The country faces tremendous human resource challenges. We estimate that the combined number of teachers for both primary and secondary schools will need to be increased from 350,000 in 2005 to 815,000 in 2015. Similarly, the demand for doctors will nearly double to 58,000 while the number of nurses and midwives has to be increased by a factor of four from 33,000 to 145,000.

The key cost drivers in per capita terms are the health sector followed closely by energy and roads. The investment need in the energy sector is high due to low existing generation capacity. Overall, though, per capita needs in Bangladesh tend to be lower than in the other four countries.

In addition to the gaps in our analysis listed above, we have so far not been able to include interventions for preventing and treating arsenic poisoning in our analysis. This is possibly the single largest health challenge faced by the country and will require important resources – particularly in the health and water sectors. However, at this point no consensus exists on how best to address the problem, so assessing the corresponding investment needs remains a challenge.

Cambodia

The country will require total average annual investments of $1.5 billion to meet the MDGs, which is equivalent to $90 on a per capita basis. This is substantially higher than for Bangladesh and in line with the resource needs of the East African countries. At the same time the potential for government resource mobilization is more limited in Cambodia at approximately $444 million per year or $27 per capita. This preliminary

analysis suggests that the country requires particularly high per capita levels of external finance to meet the MDGs at $53 per person or a total of $888 million in aggregate per year.

In comparison to the other countries, Cambodia is projected to require particularly high investments to halve hunger, reach the education Goal and to ensure access to improved energy services. In particular the need to increase the number of secondary schools stands out as we project the need to triple the number of existing classrooms. Overall, these three sectors drive the high need for investments relative to the other countries.

So far our analysis does not include an assessment of the human and financial resources required to continue the process of demining the country after decades of armed conflict. As emphasized by the Government of Cambodia and UNDP demining is essential for the country to achieve the MDGs. At this point, though, we have not been able to carry out a detailed analysis of the required investments due to data limitations.

Ghana

In comparison to the two other African countries, Ghana's total investment needs for meeting the MDGs are significantly lower in aggregate and per capita terms, averaging $1.9 billion per year or $80 per capita. At $1.1 billion the country is projected to require lower levels of annual external finance than Tanzania or Uganda. However, this need remains significantly above the $758 million in ODA that donors committed to Ghana in 2001 for MDG and non-MDG-related activities. In addition to increasing aid levels, the nature and quality of external finance will need to shift towards budget support in the form of grants if the country is to meet the MDGs.

Relative to Tanzania and Uganda, Ghana requires substantially lower investments in the health sector, which are largely driven by the lower HIV/AIDS prevalence. Our projections are contingent upon maintaining HIV/AIDS prevalence at levels which are high by international standards, but relatively low for Sub-Saharan Africa. A second major reason for the relatively low per capita needs in Ghana is the fact that the country has a relatively extensive road network. While important investments in the sector will still be necessary to maintain the road system, no major extensions are projected at the level required for example in Tanzania and Uganda. In the latter two countries the current per capita density of paved roads is one sixth to one third of the density reported for Ghana.

The case of Ghana illustrates the dramatic investments required in many African countries to maintain current levels of service provision in cities that are growing at the fastest rates observed anywhere in the world. For example, while Ghana has extremely high rates of urban electrification in comparison to Tanzania or Uganda, the per capita resource requirements in the sector are about as high as in the latter two countries. This is driven largely by the need to invest substantially into extending the urban grid and providing fuel inputs just to maintain coverage rates in step with rapid urban population growth.

Tanzania

Among the countries in our sample, Tanzania faces the biggest challenges in meeting the MDGs. The country is one of the poorest in the world, although with good governance relative to its level of per capita GDP. We consequently project that the country requires the highest per capita levels of average investment and external finance to meet the MDGs at $96 and $57, respectively. These figures are equivalent to aggregate investment of $4 billion per year and external finance of $2.3 billion per year.

Approximately one third of Tanzania's total investments are required for achieving the health MDGs. HIV/AIDS and malaria stand out as the two critical diseases that require high levels of investments. In addition, infant mortality rates remain extremely high and have been rising during the past decade. To address its health needs, the country will need to dramatically scale up the number of doctors employed in the health system. In addition Tanzania requires urgent investments in the water and sanitation sector, where progress has been inadequate during the 1990s. We project that approximately 6.4 and 8.6 million people will need to be provided with improved access to water supply and sanitation, respectively, in order to meet the MDGs.

Similarly, meeting the education Goals will require a dramatic acceleration in progress. The country has one of the lowest enrolment rates for secondary education in the world, which will need to be raised. Otherwise it will be impossible to train sufficient numbers of adolescents to satisfy projected the increase in demand from public and private sector workforce required to meet the MDGs. Perhaps surprisingly, however, we project relatively low resource needs for secondary schools, but these estimates are driven by the fact that current levels of enrolment and therefore operating costs are extremely low. Since the gradual scaling up of secondary education will take time, total education resource needs are lower than in other countries.

Uganda

Uganda has made significant progress towards meeting the MDGs over the past decade. However, the country still remains off track to meeting the Goals in several areas, including hunger, health, water and sanitation. We project that the country will need to spend an average $3 billion per year to meet the Goals. More than half of these investments will likely need to be financed externally, requiring an average of $1.6 billion (or $50 per capita) annually from 2005 through 2015.

The areas furthest off-track from the MDGs are those requiring relatively high levels of investment. Even though the needs of the health sector remain low in comparison to other countries in Sub-Saharan Africa, they continue to be high in absolute terms. Despite Uganda's remarkable progress in containing the HIV/AIDS epidemic, the country will need to substantially increase resources to fight this disease by stepping up the provision of anti-retroviral treatment.

As in the case with the other countries, Uganda faces a critical challenge in extending access to improved water and sanitation as 10 and 13 million people, respectively, will need to be provided with access before 2015. With rapid increases in the rates of

urbanization, a key focus of the corresponding investments will need to be on urban areas.

An important gap in our Uganda study is the transport and communication infrastructure required to provide the landlocked country with improved access to world markets. Critically, the Northern Corridor highway to Mombassa, Kenya is in urgent need of upgrading as is the rail infrastructure. Without these investments Uganda is unlikely to be able to maintain high rates of private-sector led economic growth.

2. Purpose of the MDG Country Case Studies

The MDGs and the Millennium Project

The MDGs are a set of quantified and time-bound goals for dramatically improving the human condition by 2015.[2] They emanate from the Millennium Declaration, adopted in September 2000 by the governments of all 189 members states of the United Nations (UN 2000) and subsequently reaffirmed by the international community at the International Conference on Financing for Development in Monterrey and at the World Summit on Sustainable Development in Johannesburg in 2002.

The Millennium Project was commissioned in 2002 by UN Secretary-General Kofi Annan to recommend, by June 2005, the best strategies for achieving the MDGs. It brings together nearly 300 experts from around the world under 10 thematically-oriented Task Forces to make integrated and sector-specific proposals for how the MDGs can be achieved at a global scale with country-level specificity. The Project is directed by Professor Jeffrey Sachs, who leads a secretariat that helps to facilitate and integrate the work of the 10 Task Forces. Before the Millennium Project's final recommendations will be presented to the Secretary-General in June 2005, a draft synthesis report will be disseminated in mid-2004. Draft Task Force reports have been completed at the end of 2003 and are available at www.unmillenniumproject.org together with a detailed description of the Project and its Task Forces.

The Millennium Development Compact

In early 2003, the Millennium Project Task Force Coordinators collaborated with the UNDP Human Development Report Office and other UN colleagues to produce the "Millennium Development Compact," which outlines a framework for how all stakeholders involved with international development policy could work together to ensure that countries achieve the MDGs. Two points are central to this document. First, the MDGs and the agreements of the *Financing for Development Conference* in Monterrey have established a compact among nations to achieve the MDGs. From the side of the developing countries, this includes a commitment to good governance and the sound use of resources for human development. For the donor countries, this includes a commitment to increase financial assistance for developing countries and to support a development-friendly international economic system. Second, the Millennium Development Compact calls for all development stakeholders to adopt a goal-oriented approach to policy and practice, with the MDGs at the core. In practice, this means changing the critical question from "How close can a country come to achieving the MDGs under current constraints?" to "What needs to be done for each country to achieve the MDGs, and what constraints need to be loosened?" This requires all actors to address the question of how to plan for MDG success and how to overcome current institutional and resource constraints by developing long-term plans for achieving the Goals at the country level.

[2] Detailed information on the Millennium Project and a list of the MDGs can be found in the Appendix.

Planning for MDG Success at the Country Level

To operationalize this central notion of planning for MDG success, the Millennium Project is conducting detailed country-level case studies that identify specific public policy interventions and investments for achieving the MDGs in a small number of resource-constrained countries and calculate the necessary resource requirements. We have undertaken preliminary case studies for five countries: Bangladesh, Cambodia, Ghana, Tanzania and Uganda. These countries were chosen based on their low per capita incomes, their geographic and political diversity, and their sound levels of governance relative to gross domestic product (GDP) per capita (c.f. Section 3.2).

The case studies aim to identify the full range of *interventions* – defined broadly as the provision of goods and services as well as infrastructure – required for achieving the MDGs. It is important to note that whereas technical interventions, such as the provision of anti-retroviral drugs to treat HIV/AIDS or the construction of new schools to achieve the primary education goal, are crucial for developing an MDG investment plan, they are quite distinct from the *policies* or *institutions* that deliver them. Since many different policies and institutions can conceivably deliver a specific intervention, and these policies and institutions differ significantly across countries, these can only be addressed in the context of detailed national planning processes and are thus not included here.

Moreover, the case studies do not directly address questions of private sector development or international trade. Further to the arguments on poverty traps developed in the Millennium Development Compact, the case studies aim to map out the public sector investments necessary to permit a market-based private sector development, but they do not address *all* of the important institutional conditions necessary for achieving economic growth and meeting the MDGs. The lists of interventions and investment models produced by these case studies could form a necessary basis for a national MDG plan, but they are not sufficient from the viewpoint of organizational or comprehensive policy design.

Thus far, the MDG country case studies have four specific objectives:

1. To identify a set of integrated interventions that will enable a country to meet the MDGs over the medium- to long-term horizon through to 2015. Achieving the Goals in any country will require simultaneous investments and progress across all areas. For example, universal primary education and gender equality in schools cannot be achieved without addressing issues of access to water and sanitation and the corresponding impacts on young girls. Nor can water investments be planned independently of the agricultural sector, which links closely to the MDGs for hunger and the environment.
2. To adopt a long-term approach in order to identify the necessary infrastructure, human, and financial resources required to support a scale-up of interventions through to 2015, and to think through how these resources (or what is often referred to as 'absorptive capacity') could be built up over time.
3. To develop a transparent 'open-source' approach to MDG planning that countries and organizations can use and adapt for their own long-term planning towards

achieving the MDGs. We aim to develop a set of tools that others can use, modify, and improve upon for their own MDG planning activities.

4. To outline a simple financing strategy for achieving the MDGs in a particular country, including an assessment of the resources that can be mobilized domestically by governments and households. As discussed in Section 5.3 our methodology explicitly assumes that developing countries significantly increase domestic resource mobilization for achieving the MDGs. Donor countries will need to finance the remaining costs that cannot be covered through domestic resource mobilization alone.

It is important to note that these case studies do not aim to provide a definitive MDG investment plan for particular countries. Instead, they aim to provide an approach together with a preliminary answer, for the first time, to the question of what it would take over the remaining 12 years to achieve the MDGs in low-income countries that are comparatively well governed and have a strong commitment to achieving the MDGs. They also aim to demonstrate how one can answer such a question with some technical rigor and begin to plan for MDG success at the country-level.

The country studies are a work in progress, so this paper includes only preliminary results for Bangladesh, Cambodia, Ghana, Tanzania and Uganda.

3. Methodology

Our MDG country case studies build upon the contributions of a large number of individuals and organizations. First, they build on the ongoing work of the Project's 10 Task Forces and their respective Task Force Coordinators. These Task Forces have played a critical role in developing the lists of interventions and investment models used to project resource requirements.

Second, the Millennium Project secretariat has been collaborating closely with leading research institutions in each case-study country. These institutions are co-authors for the case studies and play a central role in ensuring that the intervention models are suited to local needs. The respective local partners are:

- Bangladesh Institute of Development Studies;
- Cambodian Institute of Cooperation and Peace, in cooperation with the University of Cambodia;
- Institute of Statistical, Social and Economic Research (Ghana);
- Economic and Social Research Foundation (Tanzania); and
- Economic Policy Research Center (Uganda).

Third, following the Millennium Project's guiding principle to build as much as possible on existing studies and research, we are working closely with specialized UN agencies, the World Bank, NGOs and research institutions that have conducted similar sector-specific investment studies. These collaborations are crucial in understanding the driving assumptions in past studies, identifying data sources and existing investment models, and learning from general experience in developing intervention frameworks.

Due to the large volume of material used for this study, it was not possible to present all details of our assumptions and analyses. We will be happy to provide additional information to the interested reader.

3.1. Building the Country Models

Bringing together the inputs from all of the experts listed above, the Millennium Project secretariat has been coordinating a multi-step process to develop the actual case studies. While the process of developing multi-sectoral, country-specific MDG investment models is inevitably complex and non-linear, it can be described as having five basic steps, as outlined in Figure 2.

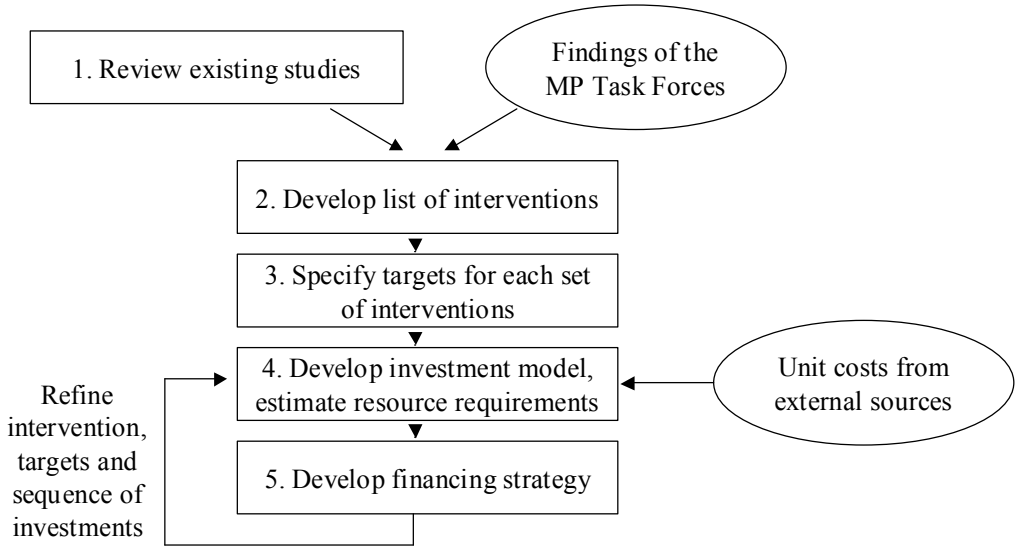

Figure 2: Summary of country-study methodology

Step 1: Review existing studies

The first step in our analysis is to identify relevant previous studies. These come under two main categories: macro-level global MDG costing estimates and sector-specific intervention models. These latter models have been developed in recent years by various UN agencies and research organizations and are more directly relevant to the MDG country case studies.

A. Global MDG Costing Estimates

In advance of the Financing for Development Conference in 2002, two major studies on how to achieve the MDGs were published. The Report of the High-Level Panel on Financing for Development (UN 2001), chaired by former President of Mexico (and current co-Coordinator of the Millennium Project Task Force on Trade) Ernesto Zedillo, estimated that approximately $50 billion in additional official development assistance (ODA) would be required each year to meet the MDGs. Meanwhile, a World Bank study used two different approaches to estimate resource requirements (Devarajan et al. 2002). The first approach estimated the cost of meeting MDG Target 1, which calls for halving income poverty by 2015, while the second assesses the costs of achieving the health, education and environment MDGs. According to the Bank, both methods will yield similar results since halving poverty will lead to the achievement of many of the other Goals, while investments in health, education and the environment will help achieve Target 1. The study estimated that an additional $40-60 billion in ODA are needed each year to meet the goals in 2015, but did not include a detailed assessment of how these resources would translate into country-level investments.

In September 2003, the World Bank published the results of 18 country case studies undertaken to estimate the resources required to make progress towards the MDGs (World Bank 2003a). Although the paper does not include a detailed discussion of how its results were calculated, it concludes that at least $30 billion in additional aid will be required to help developing countries achieve the MDGs.

More recently, in October 2003, a joint commission of World Bank and UN experts published the "United Nations/World Bank Joint Iraq Needs Assessment" (United Nations, World Bank 2003). The assessment concluded that over the four-year period 2004-2007 Iraq requires $35 billion in donor financing, or $364 per Iraqi per year, to meet investment needs across a set of 12 areas[3]. Interestingly, this figure is about ten times higher than per capita aid given to countries in Sub-Saharan Africa.

In addition, several UNDP country offices have developed resource estimates for meeting the MDGs in specific countries. Their methodologies vary considerably, but tend to follow an approach that is similar to Devarajan et al. (2000).

B. Sector-Specific Estimates

Our MDG country case studies draw extensively from a large number of sectoral studies that have mapped out interventions for achieving sectoral targets and the corresponding resources required. Many of these models were developed before the MDGs became the global standard for development. Hence they are not all based around the same targets, but their detailed approach still provides a very useful foundation that can be applied to the case studies. Important examples include the World Bank's work on achieving Education for All (Bruns et al. 2002, 2003), UNICEF (Delamonica 2001), the FAO Anti-Hunger Program (FAO 2002), the WHO's Commission on Macroeconomics and Health (CMH 2001), and the Global Water Partnership Framework for Action (Global Water Partnership 2000). Details regarding how the various studies have been incorporated into our analysis are discussed briefly in Section 4 below.

Step 2: Develop list of interventions

The case studies focus on all areas where significant improvements need to occur for the country to achieve the MDGs. Based on the work of the Task Forces and existing studies, we have created lists of interventions covering the provision of goods, services and infrastructure required to meet the Goals. Since the MDGs are outcome indicators they do not cover the full range of required inputs. We have therefore included interventions and corresponding input targets that are not specifically listed under the MDG Goals, Targets or Indicators. For example, countries require a basic minimum level of transport infrastructure and improved access to energy services to achieve the sustained economic growth that is necessary for meeting the MDG 1 on halving the incidence of extreme income poverty and hunger. To this end, interventions relating to road infrastructure and energy are included in the case studies even though no MDG addresses them explicitly. Similarly, interventions relating to reproductive health are included in the analysis since they are instrumental for meeting many of the other Goals.

We stress that concurrent investments are needed *across* many sectors and areas in order to achieve any particular Goal. To structure our analysis we have grouped our lists of interventions under the following 14 areas:

[3] The areas addressed in the Iraq needs assessment are Agriculture, Water Resources and Food Security; Education Electricity; Financial Sector; Government Institutions, Rule of Law and Media; Health, Water and Sanitation (including wastewater treatment); Mine Action; Employment Creation; Housing and Urban Management; Investment; State Enterprises; and Transport and Telecoms

- Hunger,
- Education,
- Gender equality,
- Health systems,
- Child health,
- Maternal and reproductive health,
- Infectious diseases (HIV/AIDS, TB and malaria),
- Access to essential medicines,
- Environmental sustainability,
- Water and sanitation,
- Improving the lives of slum dwellers,
- Science and technology,
- Energy services and energy infrastructure, and
- Transport infrastructure.

In developing detailed lists of interventions, we have aimed to fill gaps that might arise between different areas. Similarly, we have identified overlaps between areas that result from an intervention belonging in more than one category. For example, school meals can make an important contribution to improving school attendance to achieve the MDG 2 while also helping reduce hunger and malnutrition, which fall under MDG 1.

The country partners reviewed the lists of interventions to make sure that they were adapted to the country's specific needs. In cases where country partners identified locally relevant interventions not included in the original list, the list of interventions was extended accordingly. Examples include the prevention and treatment of arsenic poisoning in Bangladesh, mine-clearing in Cambodia, and distance education in Bangladesh. In general, however, at this preliminary stage in our analysis we worked with the same list of interventions for all five countries. For country level planning, these lists will need to be customized to the specific needs of each country.

The integrated and cross-cutting nature of the interventions further underlines the need to treat the case study analysis as one integrated investment package from which no section should be considered in isolation. At the same time, an important number of interventions have impacts across several sectors. For example, improving access to improved water supply and sanitation can reduce oral-fecal diseases leading to reduced health expenditures. We discuss the question of synergies, dependencies and trade-offs across interventions in more detail below.

Step 3: Specify targets for each set of interventions

Wherever possible, targets for each set of interventions are based on the MDGs as well as other internationally agreed-upon targets such as the sanitation target established at the Johannesburg World Summit on Sustainable Development in 2002. In cases where no international consensus on targets exists, the Millennium Project secretariat worked with the Task Forces to derive targets and key parameters analytically. For example, based on best practice norms based on previous empirical studies we have set concrete targets for

primary-school classroom size and pupil-teacher ratios as described in the education Section 4.3.

Where relevant, targets and the corresponding interventions have been disaggregated by age and gender as well as by urban and rural areas. To account for population growth and other changes in a country's demographic profile, the UN Population Division's 2002 revision (UN 2003) median population forecasts have been used. In cases where more recent data is available at the country level, this has been used in lieu of the UN estimates.

Step 4: Develop investment model and estimate resource requirements
Using the country-specific intervention lists and targets, we have constructed spreadsheet-based models to project the gradual scaling up of investments and resource requirements. Whenever possible we have used and extended existing models – notably in the health sector where we build on frameworks created by the WHO and UNAIDS. Critically, in addition to human resource and infrastructure targets, our models include capital as well as operating costs.

To estimate total resource requirements we identify local unit costs wherever possible and use them to cost interventions. Many of these unit costs have been derived from existing national planning documents, although in several instances we have identified cases where unit cost estimates (*e.g.*, doctors' salaries) are much lower than would be needed to achieve actual intervention targets. Other sources for estimating unit costs that have been used for the MDG country case studies are project budgets, national expenditure reviews and planning documents. In some instances we have not been able to calculate the resources required for each individual intervention. In such cases more aggregate estimates from other studies have been used.

The scaling up of interventions to achieve the MDGs is assumed to start in 2005 and will cover the 11-year period through to the end of 2015. Generally we have made the very preliminary assumption of a linear scale-up of interventions during the course of the 11 years.

Step 5: Develop financing strategy
On the basis of the calculated resource requirements for meeting the MDGs, we estimate a highly simplified financing strategy for each country, distinguishing between three sources of funding: (i) out-of-pocket expenditure by households, (ii) domestic government resources, and (iii) external finance. As described in more detail in Section 5, a critical question is to what extent domestic resource mobilization can be increased until 2015 to contribute to the cost of achieving the goals. We currently project that domestically-financed spending on MDG-related interventions will rise by 4 percentage points of GDP between 2005 and 2015 in addition to the increase in domestic resource availability resulting from GDP growth alone.

Household contributions are estimated based on two considerations: (i) the incentive effects of user fees, and (ii) households' overall ability to pay. User fees can play a

critical role in preventing the poor from accessing basic services. For example, the WHO's Commission on Macroeconomics and Health[4], and the Education for All initiative lead by UNESCO[5] have established a consensus that households should bear no direct cost for access to basic healthcare and primary education. The reason is that even modest user fees have been shown to have a strong impact on reducing effective access to these basic services – particularly for women, young girls and other vulnerable groups.

In some cases, however, user fees may be necessary to avoid wasting scarce resources. For example, a strong case can be made that users should pay the marginal cost of providing water and energy services beyond satisfying the most basic minimum needs. Lifeline tariffs, which ensure the free provision of water up to the minimum daily requirements for personal hygiene and cooking, but charge for higher consumption, have been used successfully in many parts of the world to avoid wastage, while simultaneously improving access to clean drinking water.

In addition to the incentive (or disincentive) effects of user fees and other private out-of-pocket expenditures, households' overall ability to pay for the bundle of services they require needs to be considered in developing a sound financing strategy. As discussed in Section 5.2, we have based our analysis of households' ability to pay on national poverty lines and income distributions.

3.2. Guiding principles, assumptions & limitations

In comparing our work with other attempts at calculating resource requirements for meeting the MDGs it is worth noting guiding principles, key methodological assumptions, and limitations of our approach, as summarized below.

The critical importance of governance

Good governance is a central requirement for countries to make progress towards meeting the MDGs. As emphasized in the Millennium Development Compact (UNDP 2003a), without sound governance – in terms of economic policies, human rights, well-functioning institutions, political participation and accountability – countries cannot expect long-term success in their development efforts. Good governance is necessary but not sufficient for achieving the MDGs. For this reason our initial needs assessment focuses on countries that are soundly governed relative to their level of income.

Figure 3 shows the relationship between 2000 GDP PPP per capita and the average of five governance indicators measuring control of corruption, government effectiveness, quality of institutions, regulatory quality, and the rule of law (Kaufmann et al. 2003). The graph underscores the strong relationship between income and governance indicators and

[4] "Experience has taught repeatedly that user fees end up excluding the poor from essential health services, while at the same tim recovering only a tiny fraction of costs", p. 61 CMH (2001)

[5] C.f. Dakar Framework for Action 2000, Education for All Dakar Goal 2: "Ensuring that by 2015 all children, particularly girls, children in difficult circumstances, and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality." www.unesco.org/education/efa/ed_for_all/dakfram_eng.shtml

shows that Bangladesh, Cambodia, Ghana, Tanzania, and Uganda all rate average or better for their level of per capita income.

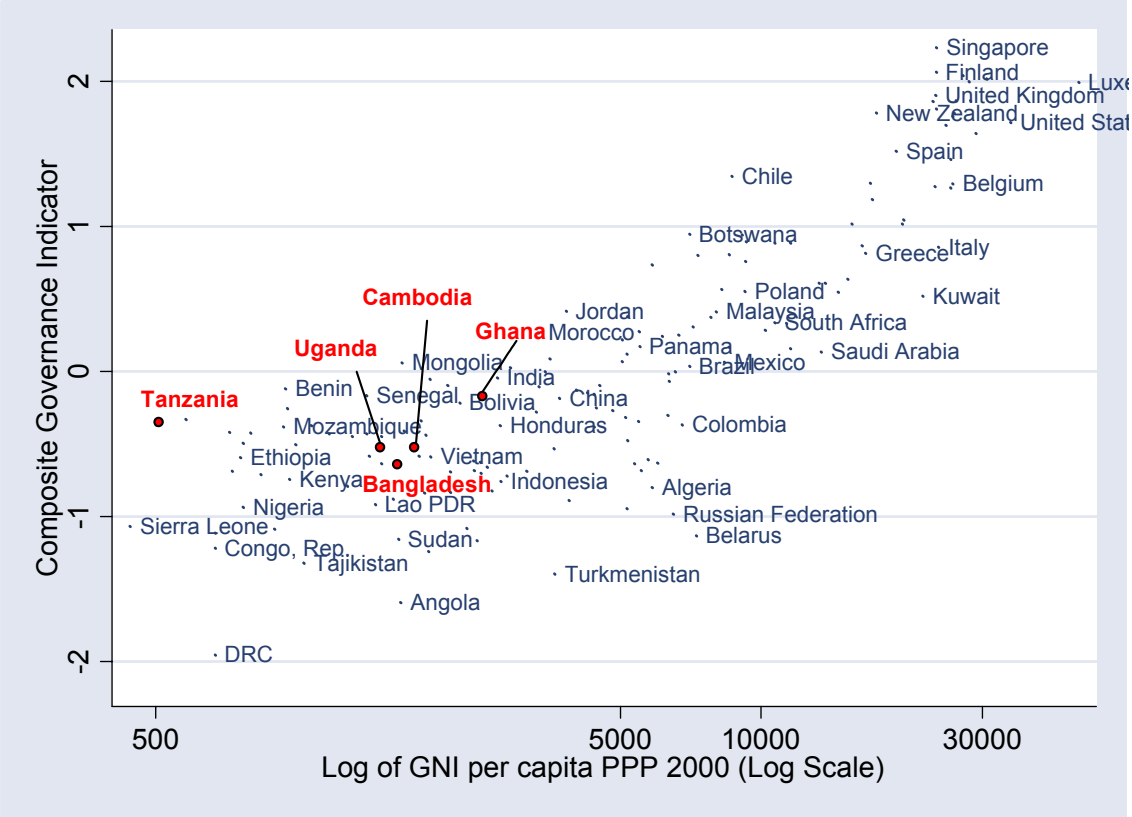

Figure 3: Relationship between p.c. GDP PPP and a composite governance indicator defined as the mean of indicators on control of corruption, government effectiveness, quality of institutions, regulatory quality, and rule of law (Source: based on data from Kaufmann et al. (2003)).

Absorptive capacity constraints

Each of the five countries studied in this paper currently faces severe constraints in terms of human resources, managerial skills, monitoring and evaluation systems, infrastructure, and so forth that limit its ability to rapidly scale up interventions towards meeting the MDGs. Such constraints are often loosely described as limited 'absorptive capacity.' It is important to note that insufficient absorptive capacity is distinct from poor governance since even well governed countries may not have the ability to immediately make productive use of increased resources. For this reason good governance is a necessary, but not sufficient condition for improving absorptive capacity.

Several resource estimates for meeting the MDGs in low-income countries have focused on absorptive capacity constraints. For example, the recent World Bank country studies (World Bank 2003a) conclude that insufficient absorptive capacity constitutes a binding constraint in many countries that will prevent them from achieving the MDGs even if substantially increased resources are made available to them.

We maintain that the constraints currently imposed by limited absorptive capacity can be significantly loosened through a consistent set of long-term policies designed to build and improve human and managerial capacity, promote institutional reform, rehabilitate and extend infrastructure, etc. Rather than treating existing constraints as fixed and exogenous, as some analyses appear to do, a strategy for achieving the MDGs should have at its center a systematic approach to building capacity over time. Concretely, countries must be encouraged to and assisted in developing mid- to long-term plans for scaling up human resources in health, education and other areas; providing ARV treatment and other health interventions to protect their public sector employees; improving the management skill of administrative staff; strengthening mechanisms of financial control and reporting; rehabilitating and extending physical infrastructure; and so forth. The 12 years remaining until 2015 provide adequate time to relax current absorptive capacity constraints sufficiently to permit a scaling up of interventions to meet the MDGs in low-income countries.

Public vs. private investments

To meet the MDGs in low-income countries, governments need to assume responsibility to ensure that the Goals are met. Our analysis therefore focuses on publicly as opposed to privately financed investments or services. Financing is of course distinct from service delivery, which can be carried out by public organizations or private companies and entrepreneurs. The focus on public investments is motivated by several principal considerations. First, as shown in the *Human Development Report 2003* (UNDP 2003a) and further elaborated in the interim report of Millennium Project Task Force 1,[6] low levels of educational attainment, health outcomes, access to basic infrastructure, and rapid environmental degradation are barriers to growth. They need to be overcome as a precondition for a country to be able to grow at high and sustained rates and to use the benefits from economic growth to further reduce human poverty. Due to extreme levels of income poverty in these countries, where as much as 40 percent of the population can be below the national poverty line,[7] the poor could not possibly finance the required investments across the full range of MDGs, which can require a multiple of a poor person's annual income. As a result, private sector financing will not allow these countries to achieve the MDGs and publicly financed investments in human capabilities, social services, infrastructure and environmental sustainability become necessary.

The need for public investments is further accentuated by the fact that many of the interventions proposed in this paper exhibit strong externalities so their public benefits may exceed the private benefits for the user. For example, insecticide-treated bednets, HIV/AIDS treatment, improved access to sanitation, improved girls' education, or increased access to modern cooking fuels are beneficial even for those who do not directly benefit from the interventions. As a result, the public incentive for promoting these interventions may be higher than the privately perceived need, thus further strengthening the case for public investments in the MDGs.

[6] This Interim Report will be available at www.unmillenniumproject.org

[7] National poverty lines should not be confused with the international one-dollar-a-day poverty line. In the five countries considered here, national poverty lines are significantly lower than $365 per year.

It is important to clarify that the approach underlying the public sector analysis in this study is *not* (and should not be) extended to planning the productive sector of the economy. Instead, this study aims to identify the public sector investments that lay the foundation for market-based economic growth.

Synergies and cost savings across interventions

The sets of interventions presented in this document are interrelated and part of an integrated multi-sectoral approach. While a detailed assessment of the dependencies, synergies and trade-offs within and across sectors is beyond the scope of this paper, it is important to note that some of the relationships can have a substantial impact on the total resources required for meeting the MDGs. In fact it is likely that over time several interventions will result in savings for their sector and in some cases other sectors as well. The resulting cost savings can occur through reductions in the population in need (e.g. increased use of insecticide-treated bednets will reduce the number of malaria patients) or the lowering of unit costs (e.g. improved rural roads will reduce the cost of providing essential services in rural areas).

While the qualitative link between two sets of interventions may be clear, the quantification of impact is often difficult, especially for the interventions that have indirect effects such as improved girls' education. Even where there is clear data, the magnitude of impact may not be known for different settings or for different delivery mechanisms. Further, interventions can have multiple feedback loops, which further complicate the analysis.

Despite these data limitations we feel it important to include potential cost savings resulting from synergies across interventions. We have therefore identified those links across and within sectors, which in our assessment are likely to have a particularly substantial impact on the costs of meeting the MDGs. These are:

- Reduction in diarrhea morbidity through expanded access to improved water supply and sanitation including improved hygiene behavior,
- Reduced acute respiratory infections through increased use of improved cooking fuels,
- Reduction of HIV/AIDS incidence through increased condom use,
- Reduced malaria incidence through increased use of insecticide-treated bednets, and
- Reduced rates of malnutrition resulting from interventions designed to reduce hunger.

Based on this list and with the exception of the nutrition-related interventions, the most important direct cost savings are projected to occur within the health sector. Our assessment of the health sector addresses these synergies directly and accounts for the resulting cost savings in the resource estimates. Details of this analysis are presented in Section 4.5 on health.

While our treatment of cost savings related to synergies within and across sectors is neither complete nor final, we believe that the results contained in this paper capture

some of the most important savings. They show that these effects are substantial, but do not change the order of magnitude of resources required to meet the MDGs. A critical factor is that apart from the direct health and nutrition benefits, many cost savings will take a long time – often more than the 11-year period covered in this paper – to materialize and to have a substantial impact on total resource requirements.

Unit cost vs. elasticity estimates

Our approach of identifying and costing individual interventions differs markedly from the methodologies adopted by other assessments of resources required for meeting the MDGs. For example, Devarajan et al. (2002) and several costing studies carried out by UNDP country offices use aggregate expenditure-outcome elasticities to project funding needs for meeting the Goals. The use of such approaches for calculating resource requirements suffers from several major limitations. First, very little time-series data exists for most low-income countries to calculate robust elasticity estimates. Second, estimated elasticities apply only to relatively small *marginal* changes in inputs, while the MDGs require a substantial scaling up of most interventions. Hence the estimated input-output relationships may not be valid. Third, such costings only yield one aggregate cost estimate that does not provide any direct guidance to policymakers on how spending should be allocated and monitored within sectors. Fourth, approaches based on elasticity estimates offer no means of identifying gaps and overlaps in interventions between different areas or sectors and therefore yield results that may be either incomplete or double-count some interventions.

Attempts to cost MDG Target 1 on halving income poverty tend to run into a major conceptual problem. The question "How much growth does a country need to achieve the MDGs?" misses a critical point since so many of the countries deemed "Top Priority" and "High Priority" for the MDGs in this year's HDR (based on low levels of development and slow or no progress) require major investments in health, education, infrastructure, environmental sustainability and other areas to reach the minimum thresholds that form a precondition for achieving sustained economic growth. In many of the poorest countries, meeting the other MDG Targets is a necessary condition for achieving Target 1 on halving poverty. These threshold dynamics are not captured by traditional growth accounting analyses. Moreover, we know that economic growth may not automatically lead to achievement of all the other MDG targets, even though it is a powerful supporting force.

Scope of interventions

As discussed above, any strategy for achieving the MDGs must address the full range of interventions required for achieving the Goals. These go beyond the set of outcome targets provided by the Goals and need to include interventions relating to sexual and reproductive health, sanitation and wastewater treatment, health systems, energy services, and transport infrastructure that are not explicitly listed in the MDGs. Without accompanying investments in these areas other MDGs cannot conceivably be met. We have therefore assessed a much more comprehensive range of interventions than most other resource estimates for meeting the MDGs.

Capital vs. recurrent costs

Traditionally, public investments in services and infrastructure have focused on capital investments based on the assumption that users should pay for the operating costs. In low-income countries this approach often does not work since users do not have the financial resources required to pay the full operating costs, which in some areas, such as education and health, make up the majority of total resource needs. Partly as a result, infrastructure has fallen into disrepair and the provision of services had to be discontinued. For this reason we have included the full operating costs in our analysis.

Average vs. marginal costs

Ideally, any bottom-up needs assessment should focus on the marginal cost of providing specific interventions to the currently unserved population. These marginal costs would be expected to differ from average costs due to a number of factors. In most cases, it is likely that the unserved population will be progressively harder to reach as coverage increases. For example, to reach 100 percent primary school enrolment will require the construction and operation of schools in remote rural areas, where the 'unit cost' of providing education is likely to be higher than in denser urban and peri-urban settings. However, at the same time the gradual scaling up of interventions as required for meeting the MDGs will lead to improvements in delivery mechanisms, technologies, operational management, etc. Such innovations can result in significant reductions in the unit cost of interventions, as evidenced by the example of the South African rural electrification program. Here major reductions in the cost of extending electricity infrastructure and services were achieved despite the fact that the unserved population became progressively harder to reach.

On balance it is extremely difficult to predict the direction, let alone the magnitude, of the net impact of extending the coverage of interventions on marginal costs. Unfortunately, the empirical basis for answering this question is extremely thin, since there are only very few successful examples of large-scale scaling up of interventions in low-income countries.

We have accounted for differential marginal costs in two ways: (i) by disaggregating target populations based on relative unit costs (e.g. urban vs. rural populations), and (ii) including interventions that specifically target hard-to-reach population, such as subsidies for girls' education. In many cases, however, the paucity of data has forced us to use average unit costs instead of marginal costs.

Total vs. incremental costs

Several studies, such as CMH (2001), Delamonica et al. (2000), and Devarajan et al. (2002), focus on the *incremental* resources needed to ensure that countries, which meet appropriate economic and political governance standards, can meet the Goals. Instead, our approach focuses on the *total* costs required for meeting the MDGs. Hence we estimate total needs for achieving the MDGs, including the resources required to sustain current coverage levels.

In contrast to the incremental cost approach, which treats current expenditure as fixed, we assume that all investments and service delivery for the MDGs are made according to best practice. As a result, our estimates of resources required to maintain current service and investment levels may differ from actual expenditure. For example, if current government expenditure is wasteful our unit costs may be lower than current expenditure would suggest.

It is therefore possible that our projected needs for meeting a particular MDG are equivalent or even below current expenditure levels in the sector. In most cases this is not the result of efficiency gains but rather a reflection of the fact that current expenditure covers a set of interventions that is much broader than required for meeting the MDGs. For example, in some countries large shares of public health expenditure are directed to fighting chronic diseases and providing advanced diagnostics that are not central to the MDGs.

We have primarily opted for this total cost approach since it is required for developing a financing strategy for meeting the MDGs. Only by knowing total outlays can available domestic resources be allocated to spending needs. Section 5 on financing discusses these issues in more detail.

Financial vs. economic costs

Our needs assessments are based on financial cost estimates that focus on cash flow requirements without discounting or annualizing future expenditures. In contrast, economic cost estimates assess the full cost of providing interventions, including non-cash components, such as the opportunity cost of time. Our preference for the financial cost approach is motivated our focus on estimating total outlays required for meeting the MDGs.

Disaggregation between urban and rural populations

UN projections suggest that urban populations are growing so much faster than rural populations that 95 percent of the growth in the world's population between 2000 and 2010 will occur in urban areas (UN 2002). Virtually all or this growth will take place in Africa, Asia and Latin America. As a result, developing countries will need to devote increasing resources to maintain coverage levels of interventions and to serve the incremental urban population.

Urban areas often require interventions and technologies that are distinct from those applicable in rural areas. In addition, the resources required for delivering these interventions can vary between urban and rural areas due to two competing trends. On the one hand, urban areas offer economies of scale due to their larger populations and densities, which lower per capita costs. At the same time, however, salaries and other operating costs tend to be higher in urban areas, even though in cases such as healthcare and education professionals may need to be paid higher salaries to be prepared to move to rural areas. The net effect of these competing trends on the relative cost of delivering interventions to urban and rural populations may be difficult to predict.

To the extent possible, we have disaggregated our analyses by urban and rural areas. At this stage, this distinction is made for the following sectors: water and sanitation, transport infrastructure and energy services.

4. Sectoral analysis

4.1. Poverty

While the Millennium Development Goals aim to reduce all forms of poverty, Goal 1 specifies a target for reducing income poverty (UN 2000):

> Goal 1: Eradicate extreme poverty and hunger
> Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day

Our MDG country case studies focus on interventions that create the conditions for sustained economic growth and long-term reductions in income poverty rather than interventions that might reduce income poverty directly. For example, we present detailed intervention models for health and disease control, both of which have a tremendous impact on productivity and individuals' capacity to generate incomes. Likewise the interventions across all other sectors are critical to achieving the income poverty MDG.

In addition, we include a few specific sets of interventions – access to energy services and core transport infrastructure – that are crucial inputs for achieving the income poverty target. The energy and transport infrastructure interventions are discussed in Section 4.10 and 4.11, respectively.

As with the other sectors and areas addressed in this study, halving income poverty will require not only appropriate interventions, but also improved policies and institutions. The fact that the latter two are not assessed in this paper should not be interpreted as implying that they are not central to achieving the poverty or any of the other Goals.

4.2. Hunger

The assessment of interventions required to combat hunger is based on the following Millennium Development Goals and Targets (UN 2000):

> Goal 1: Eradicate extreme poverty and hunger
> Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger'.

Based on the recommendations of the Millennium Project's Hunger Task Force[8], three broad sets of actions to reduce hunger are considered: (i) increasing agricultural productivity, (ii) supporting other rural income generation and (iii) promoting nutrition. Given that these broad sets of actions do not have specific targets, we apply the following

[8] The Millennium Project is extremely grateful to guidance provided by Hunger Task Force Co-Coordinator Pedro Sanchez and members of the Hunger Task Force. In particular we thank Rolando Bunch, Sara Scherr, Peter Matlon, Meera Shekar, and Kostas Stamoulis for their guidance and assistance . We are also grateful to Glenn Denning for his guidance. We want to acknowledge assistance from members of the Standing Committee on Nutrition, Eileen Kennedy, Rainer Gross, and Richard Deckelbaum

targets to these sets of interventions, each based on the MDG Target, and taking 1990 levels as the starting point:

- Increasing agricultural productivity: Achieve food security of at least half of the food-insecure rural households by 2015.
- Supporting rural income generation: Provide at least half the food-insecure households with access to storage facilities, credit, value added food processing services and marketing organizations (such as cooperatives) by 2015.
- Promoting nutrition: Provide targeted interventions to at least half the proportion of malnourished children and women by 2015.

Box 1: Interventions currently missing from the resource estimates for Hunger

- Investments in large-scale irrigation systems
- Investments in large, mechanized implements
- Provision of micro credit to rural households
- Investments for enabling households depending on forests and fisheries to manage their environment and become food secure in a sustainable manner
- Investments for improving access to food in urban areas
- Investments in rural communications systems, as well as facilities for quality testing and control
- Direct food assistance and public works programs for people in emergency situations

The FAO Anti-Hunger Program (FAO 2002) estimates the cost of meeting the hunger goal at $24 billion in incremental spending until 2015. We have been in contact with FAO and benefited from the analysis undertaken in the Anti-Hunger Program.[9]

4.2.1. Agricultural Productivity

Interventions to increase agricultural production include:[10]

- Investments in livestock production,
- Soil conservation activities (e.g. vegetative contour farming),
- Increasing soil fertility (e.g. chemical fertilizers, manure, agroforestry),
- Improving and increasing inputs (e.g. mechanized farm implements),
- Promoting effective and environmentally-friendly methods of pest management,
- Water management for agriculture (e.g. traditional water conservation, pumps, drip irrigation),
- Agriculture and irrigation extension services and farmer training institutes, and
- Research in agriculture.

[9] The underlying analysis of the FAO Anti-Hunger Programme is however, not available publicly, and we have relied on the information provided in the Second Draft of the Anti-Hunger Programme 2002, available at http://www.fao.org/docrep/004/Y7151e/y7151e10.htm#P0_0

[10] The full list of interventions can be found in Section 11.

The set of interventions designed to raise agricultural production is based on the needs of small-scale subsistence farmers in the African countries (Tanzania, Uganda and Ghana), and the rice-based farm households in Bangladesh and Cambodia. In the African countries, the primary focus is on a set of synergistic interventions which include improving soil fertility, increasing agricultural productivity, improved access to agricultural inputs, small-scale water management, and enhanced extension services. In the Asian countries, the focus of the interventions is both on improving productivity (Cambodia) and creating income opportunities for landless laborers (Bangladesh).

It is assumed that these interventions need to be provided to each food-insecure household over a period of at least three years for agricultural production to increase approximately two-fold. Thereafter, the operating costs are assumed to incur annually for the entire 11-year period and are included in the analysis. It is also assumed that the consequent increases in food production are adequate to make the households food secure. As a result the target population for the agricultural interventions declines as the interventions make households more food secure.

The number of food-insecure households is calculated for each year, and used to estimate the total costs of providing the multiple interventions identified above, using per household unit costs derived from local sources, country level projects and from the Millennium Project Task Force on Hunger.

The analysis also indicates that the human resource requirements are especially critical in reaching the hunger Goal, particularly for the interventions relating to agricultural productivity. Extension workers and trainers, who are able to assist small-scale farmers adapt to new technologies and techniques, are imperative for the success of the interventions. This requires sustained investments to create a cadre of extension workers that are able to provide expertise to farmers on a regular and continued basis. In the case of Africa, this also requires an increased focus on training female extension to work with women farmers – the majority of the smallholder farmers in those countries.

4.2.2. Developing Markets and Supporting Income Generation

A large proportion of food-insecure households depend only partially on agriculture to support themselves. For these households hunger is a consequence of insufficient incomes to purchase the requisite amount of food combined with an inability to increase food production due to lack of resources. In order to increase incomes for this category of households, interventions are needed to support other means of rural income generation, as well as increasing access to local, national and international markets. The interventions covered in this section include

- Infrastructure-based interventions (e.g. building feeder roads, providing rural energy and rural communications systems). These infrastructure-based interventions are analyzed in the sections on transport infrastructure, energy, and science and technology.
- Interventions to support commercial activities (e.g. value-added food processing services, increased access to storage infrastructure and improved access to markets through cooperatives),

- Increased access to assets (e.g. access to credit through micro-finance).

It is assumed that interventions for developing markets will need to cover at least half of the currently food-insecure households by 2015. They are understood to be complementary to the set of interventions designed to increase food production since both are necessary to increase incomes from food production, as well as to ensure adequate investments for increasing food production.

As in the case of agricultural interventions we estimate that the interventions target food insecure households with coverage rising to 80 percent of all food insecure households by 2015. The total resources needed are estimated by multiplying the per-household cost of providing these interventions with the population in need. Unit costs have been calculated on the basis of recommendations from the Millennium Project Task Force on Hunger.

4.2.3. Providing Nutrition

Nutrition-related interventions addressed under MDG Target 2 focus on four specific groups: (i) infants between 7-24 months of age, (ii) women and girls of childbearing age, (iii) vulnerable populations in need of special interventions (e.g. highly malnourished children), and (iv) populations in need of short term emergency food assistance, such as refugees and victims of natural disasters. In addition, some nutrition interventions apply to the entire population (e.g., iodization of salt).

All interventions, which are delivered through the health system, such as iron and vitamin supplementation for pregnant and lactating mothers, are covered in the health Section 4.5 of this paper. The remaining nutrition interventions are addressed in this section and fall under seven broad categories:

- Complementary feeding program for infants (7-24 months),
- Population-wide fortification programs for iron, iodine and Vitamin A,
- Community-based nutrition programs for adolescent girls and women,
- Micronutrient supplementation for special population groups,
- School meals for children and adolescents,
- Public awareness campaigns focusing on improving the nutritional status of adolescent girls and women, and
- Emergency food assistance through direct food assistance and food-for-work programs.

The nutrition interventions are based on the assumption that malnourishment and low birth weights are directly linked to inadequate nutrition provided to children and women during their adolescence and childbearing age. This implies that nutrition interventions have to be provided systematically and over a long time period – in particular to adolescent girls in the childbearing age group.

Targeting these interventions to households may not sufficient, as this may not ensure that the women and girls in need of them actually benefit from the interventions. To overcome this problem it is critical to target the interventions directly towards women and girls rather than to the households per se. This can be achieved through large-scale

community based nutrition programs, which include significant investment in creating awareness of the need for adequate nutrition, and its benefits for children and mothers.

Nutrition interventions are assumed to be scaled up to ensure that at least half of all school-going children will receive school meals by 2015, and at least half of all women in the 15-24 year age group will have access to a nutrition program. In line with the MDG targets, it is further assumed that at least half the adolescent female population, and at least half of all underweight children will have effective access to micronutrient supplementation. To this end, the corresponding interventions will target at least half the total target population by 2015, assuming a linear scaling up. Unit costs for this analysis have largely been obtained from country and regional level data.

School Meals

Providing school meals serves multiple purposes: in rural areas, school meals sourced from locally produced foods can increase local demand for agricultural crops, leading to higher incomes for local farmers. They can become part of a synergistic set of interventions aiming to increase agricultural productivity, create markets and improve nutritional outcomes. Particularly in the case of adolescent girls, school meals can provide essential nutrients supplementing the girls' daily food intake. Unit costs for providing school meals have been calculated based on program budgets. To calculate overall resource requirements it is assumed that school meals will be provided to 50 percent of all primary and secondary school students.

4.3. Education

The assessment of interventions for the education sector is based on the following Millennium Development Goal (UN 2000) and target:[11]

> Goal 2: Achieve universal primary education
>
> Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

Provision of universal primary education (UPE) requires, both the physical infrastructure needed in terms of classrooms, furniture, textbooks and other learning material, as well the presence of trained teachers, and more importantly, the components of a successful school management system in terms of the appropriate curriculum, pedagogical tools and learning processes. In this context, it is important to note that our analysis is restricted to understanding the basic physical input needs for the 5 countries in terms of teachers, classrooms, textbooks etc. We build in quality parameters to the extent possible but do not focus on these equally important contributors to successful attainment of UPE.

In addition to primary education, the country studies also address the provision of secondary school education and adult-literacy programs. Four sets of reasons explain why

[11] The Millennium Project is extremely grateful for guidance from the Task Force on Education and Gender Equality, especially Task Force Coordinator, Nancy Birdsall and TF associates Ruth Levine and Maria Beatriz Orlando, and members Gene Sperling and Tamara Fox. The Project is also especially grateful to Joel Cohen from Rockefeller University for his inputs.

secondary education needs to be included in an MDG needs assessment. First, the returns from the provision of UPE are likely to take longer to accrue amongst student populations where there is more impoverishment and/or higher gender-based disparities. Second, experience shows that primary school completion rates for girls are likely to be higher if they have the option of continuing to secondary school, since the returns to schooling in secondary school are higher than primary school (Psacharopoulos and Patrinos 2002). Third, the number of secondary school graduates in each country needs to be increased significantly to satisfy rising demand for teachers, healthcare workers, engineers and other public as well as private sector professionals required to meet the MDGs. Fourth, increasing girls' enrollment in secondary education can have a strong impact on reducing fertility rates, which is required to meet the Goals in countries that still experience high population growth rates (Subbarao and Rainey 1995). Consequently, we have included limited provision of secondary education. The exact number of school years for both primary and secondary education in our set of 5 countries is based on years of schooling as defined by the countries themselves.

We include adult-literacy programs in our analysis of the education MDG since increased adult literacy is required for achieving many of the other MDGs. Especially in the case of women, literacy has an important impact on their access to information and opportunities and consequently on their health and education outcomes, though the extent of that impact is variable.[12] In addition, adult literacy is explicitly addressed as MDG indicator 8.

The provision of Early Childhood Development (ECD) and pre-primary school programs has been included in the interventions identified as important for meeting the education goals (c.f. Section 12). These programs are important because they assist in cognitive development and enhance school preparedness among young children. They also play an important role in increasing the enrolment and retention rates of young girls thus freeing them from household childcare responsibilities. However, we have not yet estimated the resources required to provide these resources.

The study by Bruns et. al. 2003 forms the benchmark for our resource estimates and many of our assumptions are based on the best practice guidelines identified by the authors. However, our analysis departs from Bruns et al. in a number of important ways:

- We build in quality improvement by using target parameters (such as pupil-teacher ratios), but do not separately estimate the differences in resource requirements from increased efficiency and management.
- Our analysis undertakes a year-by-year estimation based on projections of the school age population over the 11 year period (2005-15)
- We calculate total costs rather than incremental spending needed to attain UPE.

[12] The Millennium Project Task Force on Education and Gender Equality has emphasized the importance of provision of education beyond primary school through the early adolescent period (adolescence being defined as the years between attaining puberty and adulthood-WHO defines adolescence as between 10-19 years), but has not as yet endorsed the provision of formal secondary education and adult literacy programs. For all of the reasons given above however, we include limited secondary education and adult literacy in this analysis.

Box 2: Interventions currently missing from the resource estimates for Education

- Provision of Early Childhood Development Programs
- Capital costs of providing adult literacy
- Increased demand for teachers due to higher attrition rates due to HIV/AIDS

4.3.1. Primary Education

As required by the MDGs, we project net enrollment ratios (NER)[13] to increase from 2000 levels to reach 100 percent by 2015. In addition to raising enrolment countries need to increase primary completion rates (PCR) to ensure UPE. Based on recommendations by the Millennium Project Task Force our analysis requires that PCR reach 100 percent by 2015. At this stage we project these changes to occur linearly between 2005 and 2015.

The interventions for primary education, detailed in Section 12, focus on providing a full course of primary-school education to children at primary-school age. Key elements are:

- Provision of infrastructure (e.g. building classrooms, providing furniture, providing teacher housing to approximately 30 percent of teachers, building toilets and providing transportation facilities),
- Training and hiring of teachers (including pre-service and in-service training),
- Provision of learning materials (e.g. textbooks, stationery, writing materials),
- Provision of uniforms and school meals,
- Systemic interventions, including curriculum design, examinations, and management capacity at the ministerial level, and
- Demand-side interventions, including the provision of subsidies to girls to enable them to attend school.

Resources are estimated in Bangladesh, Cambodia, Tanzania and Uganda for the full course of primary education. In the case of Ghana, we follow the government model of Compulsory Basic Education (9 years), which includes Primary and Junior Secondary education. In addition, the following targets and parameters have been adopted from are to be met by 2015 in line with the recommendations by the Bruns et. al study:

- The pupil-classroom ratio and the pupil-teacher ratio (PTR) falls to 40, as recommended by Bruns et al. study;
- At least one textbook is provided to each student each year;
- All forms of gender disparity are eliminated at the primary school level through the provision of targeted subsidies, toilets for girls and other interventions by 2005;
- 100 percent of all teachers will be fully trained and qualified;
- One toilet is available per two classrooms (we assume separate toilets for boys and girls, so this translates into one toilet per 40 girls or boys);
- School meals are provided to 50 percent of all students;

[13] Defined as the number of students in a particular age group enrolled in school divided by the population of that same age group

- Teachers' salaries are maintained at existing levels if they exceed 3.6*GDP per capita (World Bank 2002a); if they are lower, we adjust them to this new level[14]; and
- Non-salary recurrent expenditure is estimated based on actual expenditures unless they are below the Bruns et al. norms of 33 percent of recurrent expenditure in which case the latter value is used.

At this stage our analysis does not factor in the increasing attrition of teachers due to HIV/AIDS. In the absence of robust data we make the imperfect assumption that current attrition rates remain constant. This is likely to understate the true number of new teachers that will need to be recruited each year and therefore the cost of achieving UPE.

While we do not provide a separate estimate of resources required to provide primary education to HIV/AIDS orphans the direct school-related costs to all students are addressed in our analysis. Separately, Section 4.5 addresses the additional cost of care facilities and non-school related expenses for HIV/AIDS orphans. Hence the resources required to deal with the growing number of orphans have been addressed in our estimates.

4.3.2. Secondary Education

Our projections of net enrollment rates, secondary school completion rates and transition rates from primary to secondary schools take levels in 2000 as starting points. To estimate the number of secondary school students we project the primary completion rate to rise to 100 percent and the transition rate from primary to secondary schools to rise to 80 percent by 2015[15]. The NER for secondary schools is then calculated by modeling the inflow from primary schools and outflow of secondary school students (based on graduation and drop-out rates). For example, the transition rate of students from primary to secondary schools in Uganda is targeted to increase from 39 percent to 80 percent by 2015. Based on the dropout rates, the proportion of these incoming students who complete secondary school is estimated to reach 84 percent, which translates into target NERs of approximately 28 percent by 2015.

The interventions focus on delivering a full course of secondary school education to children in the secondary school age group including any necessary accompanying interventions:

- Provision of infrastructure (e.g. classrooms, toilets, laboratories, libraries, sports facilities, and transportation facilities),
- Training and hiring of teachers,
- Provision of learning materials (e.g. textbooks, stationery, writing materials),
- Provision of uniforms and school meals,
- Subsidies for girls, and
- Curriculum reform and improved school management.

[14] This parameter is based on the analysis presented in World Bank 2002

[15] In the case of Tanzania we project the transition rate to rise only to 60 percent due to extremely low current levels of secondary school enrolment.

A full course of secondary education is based on the existing curriculum in each country. In addition, we assume that the following parameters are gradually met by 2015:

- The pupil–classroom ratio will go down to 40 or national targets in case the latter are lower,
- The pupil-teacher ratio will reach 40 or national targets in case the latter are lower,
- The pupil-textbook ratio will go down to 1,
- Gender disparity in NER will be eliminated at the secondary level by 2005,
- Teachers' salaries are estimated at 1.5 times primary school teachers' salaries,
- One toilet will be available for every two classrooms (i.e. one toilet per 40 girls or boys),
- The average school will have 500 students,
- Every schools will be equipped with a library, a laboratory and sports facilities (based on national targets for Uganda), and
- Non-salary recurrent expenditure is estimated to reach 50 percent of total recurrent expenditure.

4.3.3. Adult literacy

We project that by 2015 adult literacy is increased to 100 percent. Consequently, we assume that over the next 11 years every illiterate adult will undergo an adult literacy program, taking account of adult mortality and rising primary school completion rates.

The interventions for adult literacy include the provision of instruction materials, training of instructors as well as their salaries, and provision of personnel to manage the literacy programs. A complete part-time course of adult literacy is expected to last one year. We assume that literacy programs will be held in existing schools or other public buildings, thus obviating the need for additional infrastructure investments. In specific cases, mobile units may be required to reach dispersed populations, but these have so far not been included in our analysis.

Summary

Our preliminary results for the education sector highlight the critical importance of providing adequate human resources for achieving the education target. To achieve these ambitious goals, the number of primary and secondary school graduates will have to be raised quickly in order to satisfy the human-resource needs of the education (and other) sectors. In addition to human resources, schools and other physical education infrastructure need to be scaled up significantly. This is critical in parts to attract and retain sufficient numbers of new teachers – especially in rural areas – and to provide the necessary incentives for children – especially girls – to attend school. Critical with regards to the latter is the provision of toilets for girls, which acts as an important factor in ensuring girls' attendance, particularly among adolescents.

The variation in per capita resource requirements[16] for the education sector between the five countries is driven by differences in unit costs and differences in the relative size of the student target population. Due to the large share of resource needs that is accounted for by recurrent expenditure (in particular salaries) the education resource estimates are strongly correlated with GDP PPP.

In the case of primary education, the main cause of variation in the per capita costs are teachers' salaries (40 percent of total cost), classroom construction costs (32 percent of the total), and the size of the target population based on existing coverage and number of school years. In the case of Ghana, for example, we follow the government policy of providing Free and Compulsory Basic Education, which includes 6 years of Primary and 3 years of Junior Secondary Education. Consequently, the target population for primary education in Ghana is much higher than in the other countries, leading to higher per capita costs.

In the case of secondary education, the principal cost driver is the size of the target population, which is lowest in Ghana and Tanzania. The reason is that our Ghana analysis only includes 3 years of Senior Secondary Education, while in the case of Tanzania, the initial net enrolment rate and transition rate is low compared to the other countries, leading to a lower number of students in school. The adult literacy costs vary less across countries due to similar cost structures. In addition, total resource needs are low, which further narrows the absolute variation in costs on a per capita basis.

4.4. Gender

MDG 3 focuses on improving gender equality (UN 2000): [17]

> MDG 3: Promote gender equality and empower women
> Target 4: Eliminate gender disparity in primary and secondary education by 2005 and at all levels of education by 2015.'

The official indicators to measure gender equality are significantly narrower than the Goal itself. They include enrollment ratios at the primary and secondary level, the ratio of literate females to males, the share of women in wage employment in the non-agricultural sector, and the proportion of seats held by women in national parliaments.

Based on the approach of the Millennium Project Task Force, the case studies adopt a broad concept of gender equality, defining gender equality as gender-equitable outcomes for all the other MDGs as well as being an end in itself. While the analysis for other MDG Targets includes interventions to ensure gender equality in that particular area, a range of actions need to be taken across all sectors to address systemic discrimination by gender. Specifically, the country studies target the elimination of gender disparities among women by building capabilities, improving access to opportunities and enhancing

[16] Defined as total resource needs divided by the total population of a country.
[17] The Millennium Project is extremely grateful for inputs from the Task Force on Education and Gender Equality, and in particular for inputs from Task Force Coordinator Geeta Rao Gupta and intensive collaboration from TF associates/members Caren Grown and Diane Elson.

security by 2015. This set of actions is based on the recommendations of the Task Force sub-group on Gender Equality and constitutes a mix of policies and interventions needed to achieve gender equality.[18]

Box 3: Interventions currently missing from the resource estimates for Gender Equality

- Monitoring and implementation of laws protecting women's rights
- Provision of budgetary and human resources for gender focal points across all ministries in the governments
- Data collection on gender disaggregated statistics on health, education outcomes, access to assets and infrastructure and conditions of work and employment and political representation and gender specific violence
- Financial support to women's organizations
- Provision of legal assistance to enable women to demand and access basic rights for protection from violence and access to assets and work
- Ensuring that social protection schemes reach women with an equitable basis as men and access to independent sources of income

Capabilities

Building essential human capabilities is a necessary step towards eliminating gender disparities. These include access to health, improved nutrition and access to education. We address the corresponding interventions under the following categories:

- Increasing awareness and providing education about sexual and reproductive health and rights,
- Preventing practices that are harmful to sexual and reproductive health and promoting rights through legislation and community-based awareness programs,
- Strengthening of legislation to allow and decriminalize abortion and to allow women the right to plan their families,
- Effective monitoring and implementation of laws protecting women's rights, and
- Providing comprehensive sexuality education at the school and community level that promotes gender equality and human rights.

The interventions related to community-based awareness campaigns are assumed to reach 50 percent of women by 2015. Mass media campaigns are assumed to run two times each year to spread awareness about sexual and reproductive rights as well as other economic and legal rights. While enforcement of laws is not directly costed sensitization and training campaigns targeted at judges, civil servants, police force members and other administrators have been included in the analysis since they are the primary enforcers, interpreters and implementers of the law.

[18] The full list of interventions can be found in Section 11

Interventions related to women's health are covered in Section 4.5.3 on maternal and reproductive health, while the education-related interventions to keep girls in primary and secondary school are addressed in Section 4.3 on education. Nutrition-related interventions are covered in Section 4.2 on hunger, Section 4.5.2 on child health and Section 4.5.3 on maternal health.

Economic and Political Opportunities

Equal access to opportunity refers to equality in access to assets, work and infrastructure as well as in opportunities of political representation. Specific interventions falling under this category include

- Ensure access to the right to own and inherit property (e.g. legislation, land titling, registration, issuance of identity documentation, and enforcement),
- Promote access to credit and work (e.g. equal access to work and pay, recognition of women's responsibility to care for dependents, grievance redressal mechanisms),
- Provide access to infrastructure to reduce women's work burden (e.g. access to clean cooking fuel and access to safe drinking water). These interventions are covered in Sections 4.10 on energy and 4.7 on water and sanitation,
- Ensure ability to improve political representation.

Interventions designed to increase women's participation in the work place include vocational training that is targeted to reach 25 percent of the adolescent female population. Interventions that enhance women's ability to participate in political opportunities focus on training women candidates to contest and participate in national electoral seats, and increasing awareness around women's rights to contest elections. These interventions aim to reach all women candidates for national electoral seats by 2015.

Security

The third dimension of ensuring gender-equitable outcomes for all MDGs is the provision of security to women to ensure their ability to participate in the economic and political affairs of the country. Specific interventions to promote security include

- Preventing violence against women through legislation, awareness campaigns and education,
- Promoting awareness of women's rights to legal redress and state services,
- Protecting women from violence through enforcing legislation to prevent violence against women, and
- Improving state responsiveness to incidents of violence and rehabilitation of victims of gender-based violence.

The prevalence of violence against women is widespread; estimates suggest one in every five women has faced some form of violence in her lifetime. We assume that approximately 20 percent of all women are potential victims of domestic violence, since country-specific data is sparse and underreported. Interventions included in our analysis are provision of counseling services, shelters, rehabilitation services, services to seek redressal, and conciliation and mediation services. It is further assumed that 10 percent of

all potential victims will actually need the full range of shelter services at one time in their lives by 2015.

Systemic Issues

Addressing gender disparities at a systemic level requires capacity at various levels of the government to design policies, implement programs and monitor progress towards the Goal. These systemic sets of interventions include

- Strengthening ministries and government agencies,
- Implementing international agreements on ending gender discrimination such as CEDAW, and
- Supporting the set-up of data systems monitoring progress towards the gender equality goal

Women's National Machineries are severely under funded in all five countries studied for this paper. In response, the Task Force proposes to increases the budget of the Ministry for Women's Affairs. Additional financing needs are calculated using government budgets in select countries that are either on track to the meet the MDGs or have already met them. Since many of the required interventions consist of legislative and/or administrative changes, it may not be possible to estimate the required resources to implement them. This of course does not diminish their importance for meeting the MDGs in any way.

Summary

As can be seen in the country sections, our results suggest limited variation in the per capita resource needs across the five countries. A critical reason for this is that current coverage of the interventions proposed in this section is close to zero for most of the countries; hence the share of the population in need differs only marginally. In addition, our available data on unit costs for delivering the interventions is limited. For many interventions we had to approximate them with little variation across the countries.

4.5. Health

We assess the health interventions for meeting the following four MDGs over the eleven-year period from 2005 through to 2015 (UN 2000).

Goal 4: Reduce child mortality

Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.

Goal 5: Improve maternal health

Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio.

Goal 6: Combat HIV/AIDS, malaria and other diseases

Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS.

Target 8: Halve halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

Goal 8: Develop a Global Partnership for Development
Target 17: In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries.

Our analysis of the health sector is divided into seven components:

1. Health systems,
2. Child health,
3. Maternal and reproductive health,
4. HIV/AIDS,
5. Malaria,
6. Tuberculosis,
7. Access to essential medicines, and
8. Potential savings due to preventive and synergistic interventions

As described in more detail below, our needs assessment for the health sector builds on the very extensive work that has been carried out by many different organizations and individuals in costing essential health services.[19] The overall methodology is modeled on the approach of the Commission of Macroeconomics and Health in 2001 (CMH 2001), which assessed resources required to scale up priority health interventions.

A particularly important element of our country studies is the inclusion of interventions and resources necessary for expanding and improving health systems. Estimating costs for this has proved quite difficult since the complex and differing structures of health systems defy straightforward categorization. Further, there is little available information on what it would cost to improve the existing systems to enable them to carry out their essential functions effectively and efficiently. We suggest one formulation of health system interventions, which we hope will spark more work in this critical field. In terms of costs, we present an estimate of human resource needs for the five countries, and very broad estimates of other interventions required to enhance system capacity. We do not, however, include the costs of pre-service training for the newly trained health personnel, which we intend to do in the more detailed country planning work next year.

As much as possible, we use existing work in the health field as the basis of our needs estimates. Where possible, we attempt to refine and update these models in several ways. Refinements include:

- Changing the time frame to 11 years, from 2005 to 2015 to reflect the time left for reaching the MDGs,

[19] The Millennium Project is particularly grateful to the very generous support received from the following people: Stefano Bertozzi, Chris Curtis, Ingrid Cymina, Ernest Darkoh, David Evans, Katherine Floyd, Lynn Freedman, Juan Pablo Gutierrez, Eileen Kennedy, Lilani Kumaranayake, Christoph Kurowski, Paula Munderi, Jo Paluzzi, Elizabeth Ann Paxton, Burton Singer, Lara Stabinski, John Stover, Awash Teklehaimanot, Ron Waldman, Eva Weissman, Edward Wilson, Paul Wilson, and Meg Wirth.

- Increasing coverage targets to reflect consensus and/or Task Force opinion on what coverage would be required to reach the MDGs,
- Updating models to reflect changes in treatment protocols and unit costs (e.g., malaria, ARVs), and
- Accounting for synergistic effects of preventive interventions inside and outside the health sector (e.g., hygiene education).

In several areas, models for estimating resource requirements either do not exist or are not publicly accessible. Thus in the case of HIV/AIDS treatment, malaria, and to a limited extent in health systems we built our own intervention costing models.

There are several important limitations to our analysis:

- We assume linear scale-up of our coverage targets and therefore the requisite investments over time to 2015. The real investment plan will of course look different in each country.
- Due to limited availability and poor quality of country specific data (e.g., access to emergency obstetric care, malaria case morbidity), we use proxies and regional estimates where necessary. The lack of reliable country level epidemiological and health system data was striking, and clearly points to a need for improved monitoring and data collection.

The major drivers of health costs are the treatment of HIV/AIDS, which ranged from 14-22 percent of total costs by 2015, child health costs which ranged from 10-21 percent by 2015, followed by maternal health and additional health worker salaries. Below is a box outlining some of the elements not included in the cost estimates:

Box 4: Interventions currently missing from resource estimates for Health

- Pre-service health personnel training
- Education of traditional providers to improve treatment and referral
- Environmental interventions and epidemic control for malaria
- Investments in additional health infrastructure
- Costs of essential medicines for health conditions not included in the MDGs

4.5.1. Health Systems

A critical lesson from past experience with development programs in the health sector is that the successful delivery of a broad range of health interventions requires a functioning health system. In addition to disease-specific interventions, two types of interventions are required to strengthen and build health systems:

1. Scaling up system-wide health human resources (including clinical and administrative staff) and infrastructure.
2. Improving the system's ability to plan, finance, and deliver high-quality health services. This includes:

a. strengthening management capacity in the system
b. improving monitoring, evaluation, and quality assurance
c. enhancing community demand for and access to essential interventions
d. building capacity for health research and development

Since human resources may be the single most important constraint on scaling up health systems – particularly in Sub-Saharan Africa – this is a critical area for emphasis. It is also an area currently being explored by a number of organizations including the London School of Hygiene and Tropical Medicine, DFID, Rockefeller and Clinton Foundations, WHO, and others. Our contribution here is to present a rough estimate of the needed human resources for our five countries by 2015.

We used two methods to calculate the 2015 human resource projections. In the first, we extracted the human resources required to deliver the interventions from the Mother-Baby Package and the Integrated Management of Childhood Illnesses (IMCI) costing models to the full target population.[20] We adjusted these numbers to reflect additional disease areas that would need to be tackled, based on estimates of the ratio of time spent on maternal and child health. As a last step, we added the health human resources required to massively scale up provision of ARV and other care to people living with HIV/AIDS. The estimates for human resource requirements for ARV care are based on experiences of WHO and other organizations in the field. The second method was to use MD and nurse to population ratios as targets. For this, we used half the GP per capita ratio of the UK system (0.3/1000) and the associated nurse to physician ratio (4.4 nurses/physician) (King's Fund 2001). These numbers are somewhat higher than the ratios recommended in the WDR 1993 (MDs: 0.1-0.2/1000 and nurses: 0.2-0.4/1000) (WHO 1993). This yielded a similar result to the bottom-up method for the five countries. The basic findings were:

- The African countries in our sample will require a greater scale-up of health human resources than the Asian countries due to lower current levels and higher incidence of disease. For example, WHO estimates suggest that Tanzania's current doctor to population ratio is approximately one-fifth that of Bangladesh (WHO 2003a).
- A major bottleneck to rapidly increasing the number of physicians is the limited availability of medical education. In other words, assuming primary and secondary education scale-up, there should be adequate numbers of high school graduates in all countries to fulfill the physician, nurse, and teacher needs through to 2015. However, as one example, Tanzania currently graduates approximately 300 (Tanzania Guardian 2003) physicians per year whereas our model suggests that 1,300 may be required by 2005. This would imply the need for creative health worker policies such as accelerated training, role re-definition among health workers, and bringing in foreign-trained workers over the next 5-8 years.

[20] Targets for 2015 were: IMCI 99 percent, ARV 100 percent of people requiring treatment, maternal and neonatal interventions 90 percent.

We should note that this approach to estimating human resource needs has several limitations including poor quality data on current provider numbers, uncertainty surrounding future prevalence levels of child, maternal diseases and HIV/AIDS, and estimates about the ratio of health staff time spent on the three core conditions. Another important constraint to obtaining a realistic estimate of human resource needs is the choice of delivery systems for the key interventions, which will determine the number and type of health workers required. The ongoing efforts of the Global Health Trust and its partners will make an important and much overdue contribution to the discussion of health human resources.

We assess the other health system elements as follows:

- *Strengthening human resources:* Recognizing that low salaries are a major constraint to building adequate human resources capacity, we doubled the current salaries of health personnel. Given that salaries account for approximately 40 percent of total direct health costs, this added 40 percent to our cost estimates.
- *Operating existing infrastructure:* We use countries' own estimates of numbers of health posts, health centers, and assess the following recurrent costs: 5 percent of total capital stock for each of operations and maintenance, and administration, for an additional 10 percent of total capital stock. With the massive scaling of health services by 2015 there will be a need to build new infrastructure and to upgrade existing facilities. This was difficult to estimate given uncertainties about existing capacity and service delivery models that differ significantly for each of the countries. We plan to tackle this issue in the more detailed country level planning next year. At this point, using generic assumptions on the cost of building hospitals, health centers, and health posts, we estimated that for the five countries, doubling existing infrastructure by 2015 would cost in the range of $1.5 to $4.0 per capita annually, including operations and maintenance.
- *Strengthening management capacity in the system:* This includes improving the ability to plan, budget, supervise staff and manage supplies at Ministry of Health and district health office levels and ensuring transparency in accounting and financial management. We costed this at 20 percent of direct health costs (15 percent in annual administration and overhead and 5 percent annually to upgrade these functions).
- *Improving monitoring, evaluation, and quality assurance.* This includes data gathering, vital registries, epidemiological surveillance, regulation of service delivery, formulation of policy guidelines, and implementation of quality-assurance schemes. This was estimated to add 15 percent to direct health costs.
- *Enhancing community demand for and access to essential service.* This includes eliminating user fees, awareness campaigns, information, education and communications (IEC) programs for consumers and traditional providers, transportation to and communication with clinics and hospitals. Many of these elements are costed in other categories (e.g., transportation and communication under health infrastructure). Mass media campaigns and IEC program costs are itemized separately for each country.

- *Building capacity for research and development.* This includes enhancing the ability of countries to design and carry out clinical and operational research on health priority areas. We estimated this at 2 percent of direct health costs.

4.5.2. Child Health

The analysis of child health interventions is based on the WHO and UNICEF Integrated Management of Childhood Illnesses (IMCI) strategy and includes vaccination for the major childhood diseases. IMCI includes both prevention and treatment interventions. In our approach several essential preventive interventions such as hygiene education and the provision of insecticide treated nets together with other demand-side interventions are addressed in other sectors.

The planning model we developed is based on the WHO IMCI costing tool,[21] which has been updated and expanded to incorporate both primary and tertiary level health costs. In addition, the model now covers the full period from 2005 to 2015. We have further updated drug costs to 2002. The model now enables users to project a gradual scaling up of interventions to 2015.

The interventions required to meet the child health targets are largely based on the IMCI treatment guidelines. All interventions target children in the age group of 0-5 years. The model includes specific cost components for immunization and the treatment of the following conditions:

- Acute respiratory infections,
- Diarrhea and dehydration,
- Meningitis and sepsis,
- Malaria,
- Measles,
- Malnutrition,
- Anemia, and
- Ear infection.

While the underlying model takes into account demographic, epidemiological and behavioral information, the coverage target for each intervention is set to universal coverage, defined as 99 percent of sick children and infants for 2015. This is based on expert opinion in the recently published Child Survival series in the Lancet that suggest that universal coverage of primary interventions can prevent 63 percent of child deaths in the 42 selected countries (Jones 2003).

Due to limitations in the available data on the percentage of sick children taken for medical care, proxies have been used to estimate baseline coverage levels. In the case of Tanzania, for example, the 1999 Reproductive Health and Child Survey includes data on the percentage of children with fever or cough taken to a health facility or provider (68 percent) (Tanzania NBS 2000). We use this data as a proxy for the percentage of sick children provided with medical care. Coverage rates of immunization interventions and

[21] Personal communication Eva Weissman.

other country-specific epidemiological and demographic data were taken from the most recent DHS surveys.

All epidemiological and behavioral assumptions of the model are based on best medical practice and expert opinion. For example, it is assumed that 1 percent of all patients with diarrhea develop dysentery.

4.5.3. Maternal and Reproductive Health

The costing of interventions for reaching the maternal health goal is based on the WHO Mother-Baby Package. The accompanying models have been expanded to include contraception for all women requesting it aged 10-49 years, instead of postpartum women only. Contraceptive methods have been expanded to include the female condom and male sterilization. The provision of safe abortions and treatment, counseling of men, of obstetric fistula have also been included in the model. The original WHO model has also been updated to reflect changes in treatment protocols and drug prices. Similar to the changes made to the IMCI tool, the Mother-Baby Package has been made 'dynamic' to allow for the explicit modeling of a gradual multi-year scaling up of interventions.

The interventions assessed in the maternal model include

- Antenatal care (including treatment for malaria, anemia, and other intercurrent illness),
- Treatment of complications and sexually-transmitted diseases (STDs) during pregnancy,
- Clean and safe delivery by skilled birth attendants,
- Emergency obstetric care (management of eclampsia, hemorrhage, obstructed labor, and sepsis),
- Family planning and provision of safe abortions,
- Management of neonatal complications,
- General contraception (condoms, Depoprovera, intrauterine device, Norplant, oral contraceptives, male and female sterilization, female condoms), and
- Postpartum care (e.g., counseling on breastfeeding).

The target indicators for the maternal model are

- Percentage of women with access to emergency obstetric care,
- Percentage of women with access to antenatal care,
- Percent of deliveries performed by skilled attendant, and
- Contraceptive prevalence rate for women aged 10-49 years.

The targets for emergency obstetric care and antenatal care are set at 90 percent of the population in need. The required number of antenatal care visits per pregnancy is assumed to be four, as stipulated by the most recent WHO guidelines (WHO 2002). 61 percent of maternal deaths are caused by severe bleeding, infection, eclampsia, and obstructed labor—many of which occur in the intra- and peri-partum period. Another 13 percent are caused by unsafe abortion (WHO 1997). Given the low levels of current access to emergency obstetric care, assuming 80 percent effectiveness of the interventions on treating bleeding, infection, eclampsia and obstructed labor, we estimate

that the target provision of emergency obstetric care[22] can have a potential life savings of approximately 43 percent. Using the same effectiveness assumption, access to safe abortion and timely treatment of abortion complications can save approximately another 10 percent of deaths. When added to the impact of widely available contraception to prevent unwanted pregnancy and antenatal care, this integrated set of interventions has potential to reduce maternal mortality by three quarters.

Current coverage levels for antenatal care are difficult to estimate due to a lack of data and definitional problems. The case of Uganda helps to illustrate this point. While 94 percent of women are reported to receive at least some antenatal care, only 42 percent make four or more visits per pregnancy as recommended by (WHO 1994). Moreover, the quality of this coverage is often inadequate. For example, in Uganda less than 20 percent of women receiving antenatal care were informed of signs of pregnancy complications (Uganda Bureau of Statistics 2001). The baseline coverage of antenatal care is estimated by multiplying the reported coverage level for antenatal care by the ratio of the average number of antenatal visits to the recommended four visits per pregnancy.

Other country-specific epidemiological (e.g., STD prevalence) and demographic data (e.g., crude birth rate) are taken from the most recent DHS surveys and United Nations Population Division projections.

4.5.4. HIV/AIDS

The interventions for prevention, care and treatment of HIV/AIDS are based on the set in the UNAIDS (2002) costing study, which sets the standard in estimating resource needs for reversing the spread of HIV/AIDS:

Prevention

- Youth-focused interventions,
- Interventions focused on sex workers and their clients,
- Condom social marketing,
- Public and commercial sector condom provision,
- Improved management of sexually-transmitted infections,
- Voluntary Counseling and Testing,
- Workplace programs,
- Blood safety,
- Prevention of mother-to-child transmission,
- Mass media campaigns,
- Harm reduction programs, and
- Interventions focused on men who have sex with men.

[22] EOC includes specific interventions to manage "emergency" obstetric complications. Interventions may be intravenous antibiotics, oxytocics or anti-convulsants, management of abortion complications, management of postpartum bleeding, assisted delivery for prolonged labor such as vacuum or forceps delivery, blood transfusion, and/or cesarean section. See http://cpmcnet.columbia.edu/dept/sph/popfam/amdd/

Care

- Palliative care,
- Orphan support,
- Orphanage care,
- Community assistance, and
- Subsidies for school expenses (accounted for under education).

Treatment

- Treatment of opportunistic infections,
- Diagnostic HIV testing,
- Prophylaxis against opportunistic infections for symptomatic patients, and
- Highly active antiretroviral therapy and associated laboratory support.

Specific activities to support orphans are included in the UNAIDS study, since they are critical for achieving not only the HIV/AIDS and child-health Goals, but also the education Goals. It should be noted that all direct school-related costs are covered in the section on education.

There are a number of efforts under way to assess resources required to scale up HIV/AIDS prevention and treatment interventions. The Futures Group, in cooperation with UNAIDS, has developed comprehensive models for analyzing the resources required for preventing and treating HIV/AIDS (The Futures Group 2002). The three models (*Estimation and Projection Package (EPP)*, *Spectrum*, and the *AIDS Resource Needs Model*) project a country-specific profile of the HIV/AIDS epidemic, its consequences, and the costs of expanding the response to the epidemic. These final costs are based on local unit costs, current coverage, and the projected profile of the epidemic. Resource estimates based on these models are in the process of being vetted by governments and are not publicly available at this time.

In the absence of these country-level results, our analysis of costs of prevention and care (orphan support, treatment of opportunistic infections, and palliative care) is based on regional UNAIDS estimates (UNAIDS 2002), which we adjust using national prevalence and population data to obtain country-level estimates of the resource requirements.

For HIV/AIDS treatment, we built a model to predict the cost of achieving universal coverage by 2015. The costs include drugs, personnel, and laboratory time. It is assumed that the price of first line ARVs will decline to the level recently negotiated by the Clinton Foundation by 2007. A critical result of this model is the significantly increasing need for ARV treatment over the eleven-year period due to the accumulation of patients whose life expectancy increases thanks to the ARV treatment they receive. For example, it is estimated that in Uganda approximately six times more people will require ARV treatment in 2015 than in 2007, even though the disease prevalence is not projected to rise by much less.

We emphasize that our analysis of resource needs for HIV/AIDS remains extremely preliminary and will need to be replaced by detailed country-level assessments using local input data, as currently carried out by UNAIDS.

4.5.5. Malaria

The analysis of interventions to combat malaria is divided into prevention and treatment interventions.

Malaria prevention

The prevention interventions we considered fall into two broad categories:

- Insecticide Treated Nets (ITNs),
- Environmental Interventions.

The appropriate mix of these interventions is determined largely by local conditions, such as the rural/urban split, types of predominant malaria vectors, climatic, and geophysical conditions. At this preliminary stage of the analysis, only ITNs have been assessed in detail. Some environmental interventions such as improving sanitation are included in the water and sanitation sector. The target for ITN provision is set at 7 nets for every 10 people, based on Curtis et al. (1998).

Our projected unit costs for ITNs are derived from project studies in Kenya in which teams distributed and re-treated new nets as reported by UNICEF (at $1.40 and $0.40 per unit, respectively (Curtis et al. 1998)). In addition to the cost of ITNs our analysis includes the resources required for personnel, overhead, vehicles, maintenance and fuel.

Malaria treatment

The malaria treatment model includes both diagnostic testing and the treatment of complicated and uncomplicated malaria. While microscopy testing is currently practiced in few places, it is expected that rapid diagnostic tests (RDTs) will soon become more widely available. Pregnant women are especially vulnerable to the effects of malaria. Their preventive and treatment costs are included in the prenatal care model.

Our analysis of malaria treatment, provides for three lines of treatment and takes into account the increasing levels of drug resistance that are being observed across much of the developing world. We set the target for malaria treatment at 90 percent of all clinical episodes of malaria, which is estimated based on national reported incidence rates for malaria. We further assume that all malaria cases receive appropriate treatment that takes account of drug resistance. For our countries this means that all malaria episodes will be treated with artemisin-based combination therapy as first line.

The primary data source on current treatment coverage is the WHO-UNICEF 2003 Africa Malaria Report (WHO and UNICEF 2003), which contains country-specific coverage levels of treatment for children. The report also contains information on national anti-malarial treatment policies. For all countries, the model separately estimates the resources required for treating cases of complicated (hospital-based) and uncomplicated (community-based) malaria.

4.5.6. Tuberculosis

Our assessment of interventions and resources required to treat tuberculosis is taken directly from the recent analysis undertaken by the Stop TB Partnership (Floyd 2002), which was built on country-specific analyses and data.

In line with this report, all interventions are based on the internationally recommended Directly-Observed Treatment Short Course (DOTS) strategy. The five main components of DOTS, as described by WHO are (i) political commitment and resources, (ii) microscopy, (iii) treatment, (iv) medicines, and (v) monitoring (Stop TB Partnership 2002). This includes accurate diagnosis using sputum-smear microscopy for symptomatic patients, a standardized six to eight month regimen for patients with active TB, and directly observed treatment for the first 2 months of the regimen.

The targets are based on the WHO's control targets for tuberculosis: 1) Detect 70 percent of new smear-positive cases and 2) Cure 85 percent of detected smear-positive cases by 2005 (Stop TB Partnership 2002). We assume that these levels of coverage will be maintained through to 2015.

4.5.7. Access to essential medicines

We are not aware of any systematic analyses of the interventions required to build a national system to ensure access to essential medicines (ATEM). The Millennium Project Task Force on ATEM has outlined recommendations to ensure availability, affordability and appropriateness in use of essential medicines, which forms the basis of our analysis. Key elements of these interventions are listed below, the full list can be found in Section 12.

National level

- Translate principles of human rights relating to drug access into enforceable rights for the individual,
- Promote all effective supply channels (public, private, NGO) giving priority to sustainable, reliable supply systems,
- Strengthen drug regulatory authority with political support, financing, and staff,
- Increase public sector budget for essential medicines and ensure equity of access,
- Phase out user fees for essential medicines in favor of more equitable drug financing,
- Promote generic and therapeutic competition,
- Adapt and use national legislation to take advantage of TRIPs flexibilities and suspension of pharmaceutical patents for LDCs as per Doha declaration,
- Create essential medicines list based on evidence-based treatment guidelines for prevalent conditions,
- Ensure availability of independent and impartial information for households through culturally appropriate means,
- Ensure sufficient numbers of trained pharmacy workers of different levels, and
- Collect and disaggregate access and utilization data by gender to inform policy.

International level

- International organizations need to acknowledge access to essential medicines as a human right,
- Pre-qualify and monitor priority products and suppliers and share this information (e.g., white list),
- Increase total international financing for essential medicines targeting the poor,
- Develop strategies to ensure production and availability of generic medicines after 2005 beyond the options that are currently available, and
- Increase financing for health human resources in low-income countries.

We have added available estimates of the resources required to procure, distribute and test drugs to the international cost of the medicines, which have been incorporated into the cost of treatment of the core diseases. This additional cost was estimated at 30 percent of the total commodity price. Interventions to enhance community demand and to ensure appropriate drug use have been addressed as part of the health system resource estimates. The remaining interventions proposed by the ATEM Task Force are in the realm of policy and have not been costed.

4.5.8. Potential savings due to preventive and synergistic interventions

Most of our health cost estimates, along with much of the previous work in this field, assumes constant prevalence of key conditions in projecting future costs. Over an 11-year period, this assumption is likely inaccurate. For one, massive scaling-up of effectively delivered prevention interventions will reduce incidence. Second, interventions outside the health sector, like providing clean water, clean indoor stoves, and building roads from villages to cities with functioning emergency obstetric care facilities coupled with appropriate community education, can dramatically reduce the incidence of child diarrhea, acute respiratory infections and maternal deaths.

As described in Section 3.2, the synergies among the large number of interventions presented in this report are extremely complex. However, as a demonstration of the potential power of implementing a full range of interventions across sectors, we have accounted for the possible savings on treatment costs of several preventative interventions. For this analysis we assume effectiveness to be the median value for levels achieved in different settings (except HIV/AIDS where we use a modeled projection).

We use the following assumptions in this analysis:

- Condom use by all men in all short relationships and commercial contacts can reduce HIV/AIDS incidence by 80 percent (Van Vliet 2001).[23]
- Water and sanitation interventions including latrines, adequate water quantity and quality, and education on hand washing can together reduce diarrhea morbidity by up to 65 percent. In our country estimates we adjust this coverage to reflect the MDG coverage goal for the country for latrines, water quantity and quality

[23] Note: for the five case study countries, condom use at last high risk sex in the 15-24 age group (as reported by HDR 2003) is 40-50percent today, so we estimate the overall reduction in HIVincidence due to additional condom use to be in the range of approximately 40percent.

(halving the number of people without access to water and sanitation) (World Bank 2003b).

- Substituting clean cooking fuels for domestic biomass fuels can reduce acute respiratory infections by approximately 30 percent (IIPS 1997; Ezzati et al 2002).[24] In the country calculations this was included for half the number of people without access to clean cooking fuels in line with the water and sanitation targets.
- Insecticide treated nets distributed to 60-70 percent of the population can reduce malaria incidence by approximately 60 percent (Rowland et al 2002).

By 2015 these selected synergies have the potential to save 20-35 percent of the total health costs. These savings are included in our country health sector estimates, which have been reduced by the corresponding amount. The potential savings of lives and resources demonstrate the importance of implementing a full range of interventions, across multiple sectors to make significant progress in achieving the Millennium Development Goals.

4.6. Environmental sustainability

The interventions designed to achieve environmental sustainability are based on Millennium Development Goal 7 and Target 9 (UN 2000):

> Goal 7: Ensure environmental sustainability
>
> Target 9: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources.

Several interventions that are critical for achieving the Goal have been addressed in other 'sectors' of the MDG country case studies. These include:

- *Increasing access to improved fuels*, which will lower household demand for biomass and thereby contribute to the slowing of land degradation including deforestation. It will also reduce indoor and outdoor air pollution.
- *Significant investments in sewage and other wastewater treatment*, which will reduce pollution of surface water with pathogens, nutrients and chemicals. In turn this will slow the degradation of watersheds and freshwater ecosystems through eutrophication[25] and other processes.
- *Investments in improved water management for agriculture* (including irrigation), which have been included under the analysis of the hunger goal. They will help contain water logging, salinization and other processes of agricultural land degradation.
- *Investments in soil conservation and increased soil fertility*, which will further reduce the pressure to convert natural habitats into agricultural land.

[24] Range of 21-44 percent for acute lower respiratory infections and 24-64 percent for all acute respiratory infections in Ezzati and Kammen. Evaluating the health benefits of transitions in household energy technologies in Kenya. Energy Policy 30 (2002).

[25] Eutrophication refers to the process of increasing mineral and organic nutrients in surface water that promote a proliferation of plant life, especially algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms (Dictionary.com 2003).

Interventions for achieving Goal 7 that have not been addressed in other areas, fall into the following categories:

- Environmental monitoring systems,
- Forest management,
- Land use management,
- Management of watersheds and freshwater ecosystems,
- Management of coastal ecosystems and fisheries,
- Other biodiversity conservation (e.g. parks and protected areas),
- Industrial water pollution, and
- Industrial and transport-related air pollution.

For each of these areas, three critical components need to be considered:

1. Institutional resources for monitoring and evaluation, regulation and enforcement, environmental management,
2. Resources (human and financial) for education and training, and
3. Specific investment needs in addition to improvements in institutional capacity and policy reform, such as forestation measures.

Box 5: Interventions currently missing from the resource estimates for Target 9 on Environmental Sustainability

- No resource needs have been estimated beyond the interventions relating to environmental sustainability that have been addressed under other 'sectors' (i.e. switch away from biomass towards cleaner cooking fuels, wastewater treatment, environmentally sustainable water management for agriculture, and soil conservation)
- Particular needs that have so far not been quantified in our analysis are human and institutional resources for environmental management and for integrating the principles of environmental sustainability into sector policies.

Many countries have developed national action plans for the environment as part of their obligations as signatory to one of the big environmental conventions, such as the Convention to Combat Desertification (CCD), the Framework Convention on Climate Change (FCCC), the Convention on Biological Diversity (CBD), the Convention on Wetlands of International Importance (Ramsar). However, available national action plans tend not to spell out the resources required for their implementation or provide information about the 'unit cost' of a specific intervention. Similarly, other policy documents, like the PRSPs, tend to make references to environmental policies without allocating a significant budget to their implementation.

After consultation with the Task Force, country partners, government officials and other technical experts, we concluded that we did not have enough information available to develop robust estimates for the resources required for achieving Target 9 in the five countries considered here. This is not to suggest that meeting the Target will not require a significant scaling up of resources. On the contrary, countries will need to invest substantially – particularly in human resources to improve the management of their

ecosystems, pass and enforce environmental regulation, strengthen training, research and education of the general public.

To estimate corresponding resource requirements we suggest that governments use existing environmental strategies, such as the National Biodiversity Strategy Action Plans (NBSAP) developed under the CBD, and systematically assess the human and other resources required for their implementation. Such an analysis would require an extensive process of consultation with provincial and district authorities, as well as communities, which are often more directly involved in the management of natural resources than the central government. The process will therefore take a long time to complete and require significant human and financial resources. We do feel, however, that this is the most viable approach to formulating environmental policies that will be backed up by the resources necessary for their implementation.

4.7. Water and sanitation

This analysis is based on Millennium Development Goal Target 10 (UN 2000):

> Target 10: 'Halve, by 2015 the proportion of people living without sustainable access to safe drinking water,

and the sanitation target agreed at the 2002 World Summit on Sustainable Development (WSSD 2002):

> 'Halve, by 2015 the proportion of people who do not have access to basic sanitation'.

Both targets have the proportion of the population with access to improved facilities in 1990 as their base-line year.

The Millennium Project Task Force on Water and Sanitation defines access to improved sanitation as "the access to, and use of, a facility for excreta and sullage[26] disposal that provides privacy while at the same time ensuring a clean and healthful living environment both at home and in the immediate neighborhood of users." This definition does not yet include the treatment of sewage from public sewerage systems. However, in high-density slum areas on-site disposal of sullage with or without water-flushed excreta (combined to form sewage) may become necessary. In such situations, access to basic sanitation should include access to sewerage and sewage treatment plants. In other circumstances, the treatment of sewage from existing sewerage systems may be justified on economic, environmental and public health grounds.

To meet these two targets a holistic approach to water and sanitation is required. Building upon existing work in this area including studies carried out by the Cambridge Economic Policy Associates (Palmer 2003), the Global Water Partnership (GWP 2000), the Water Academy France (Smets 2003), WaterAid (Terry 2003), and the World Water Council (WWC 2000), and the Millennium Project Task Force on water and sanitation, we have

[26] Defined as domestic sewage resulting from bathing and the washing of dishes and clothes in house.

identified the following sets of interventions that need to be addressed to meet the water and sanitation Targets while minimizing any adverse impacts on country's ability to meet the other MDGs, such as the Goal on halving hunger:

- Provision of new water supply infrastructure to households, schools and hospitals,
- Provision of new sanitation facilities to households, schools and hospitals,
- Rehabilitation of existing defective water and sanitation infrastructure,
- Provision for ongoing maintenance and operation costs for new and existing infrastructure,
- Education and awareness raising for water use and sanitation,
- Supply of sufficient clean water, including interventions to manage and develop water resources to ensure such a supply, and
- Provision of new sewage treatment facilities.

Box 6: Interventions currently missing from the resource estimates for Water and Sanitation

- Soakway pits for treating and disposing of sullage
- Large-scale infrastructure for water storage and transport
- Infrastructure for flood management and control
- Upgrading of existing water and sanitation infrastructure
- Advanced wastewater treatment for industrial effluents and other chemicals
- Integrated Water Resources Management (IWRM), including hydrological monitoring systems

Our analysis below differentiates between rural and urban areas due to the major differences in existing coverage, applicable technologies and unit costs. To account for the need to gradually build up interventions and the human and organizational resources that deliver them, we tentatively project a linear scaling up of investments. The costs for O&M are applied to the full stock of infrastructure.

In addition to urban and rural households, hospitals and schools need to be provided with access to improved sanitation. In particular, sanitation facilities at schools can serve multiple purposes. They can act as a key entry point for other water and sanitation interventions at the community level, serve educational purposes to promote better hygiene, and increase incentives for girls to attend school (Forum for African Women Educationalists 2001, World Bank 2001b). Water supply and sanitation facilities for schools and hospitals have been included in the education and health sector analyses, respectively, with the exception of water supply for schools, which has been included in this section.

4.7.1. Water supply

Based on the WHO/UNICEF Joint Monitoring Program's (JMP) definition of improved access to water supply we consider six different technology options for providing access to improved water supply:

- Household connection,
- Public stand pipe,

- Borehole with hand pump,
- Rainwater collection,
- Protected dug well, and
- Protected spring.

Coverage data for access to water supply is based on preliminary estimates for 2002 that have kindly been provided for this study by the JMP. We have corroborated these revised estimates with national sources. We have also included estimates of the percent of existing infrastructure that is not functioning, assuming that these facilities will be gradually rehabilitated until 2015 at 50 percent of the replacement cost.

Data from the most recent DHS for each country is used to approximate the percentage of users having access to a particular technology. The data suggests considerable variation in coverage across countries and between urban and rural areas. We have applied simple rules to project which technologies will be used for increasing access to water and sanitation, respectively.

For rural water we have estimated the relative shares of each technology according to the following principles, which are based on the Task Force's work:[27]

1. Avoid increase in number of people depending on rainwater where unsustainable throughout the year
2. Limit growth in public standposts to the rate of population growth over the period to increase revenue collection;
3. Assume that the share of household connections will reach the same proportion of the population as public standposts by 2015;
4. Place the primary focus on water sources that require little or no treatment and impose minimal distribution costs, such as groundwater, spring water, upland water that reach consumers by gravity, and rainwater, and
5. To increase the share of boreholes to half the share of improved dug wells, as defined by the JMP, subject to technical feasibility.

In the case of urban water supply, we have used the following set of basic principles:

1. To improve revenues from user charges, shift from standposts to household connections; and
2. Limit growth in access to dug wells, boreholes and public standposts approximately to population growth rates.

Clearly, both sets of guidelines are very preliminary and will need to be critically reviewed for each country as a part of a more in-depth analysis.

Capital costs for each type of technology vary across countries and have been collected from a number of sources, including UNICEF/WHO (2000), national water ministries, project documentation from multilateral and bilateral organizations, and NGOs. Unfortunately, very little data on capital cost is systematically differentiated by urban and rural areas. The analysis is complicated by the fact that two competing trends are present.

[27] We are very grateful to Albert Wright, co-Coordinator of the Task Force, for providing us with these preliminary guidelines.

On the one side, capital costs and salaries tend to be much higher in urban areas. On the other, lower population densities and longer distances can imply a higher cost of providing rural populations with access to water. On balance, we assumed that rural capital costs for boreholes, rainwater collection and dug wells are about 40 percent of the urban cost, while household connections and public standposts are assumed to be twice as expensive as in denser urban areas.

So far our analysis does not include simple soakaway pits for treating and disposing of household sullage since we were unable to define appropriate design standards and corresponding financing needs.

In addition to the resources required for water supply infrastructure, we include the cost of water provision and general operation and maintenance expenses. While some data exists on the price of water, mainly in urban areas, we have not been able to identify reliable data on the cost of providing water. The high variation in the cost of providing water locally was a complicating factor. A second problem is that many countries provide direct and indirect subsidies to the cost of drinking water so that available cost data is insufficient for approximating the true cost of providing clean water. For these reasons we have included the cost of providing clean drinking water in overall O&M expenses.

Based on information provided by various members of the Task Force, the cost of maintenance and operation, including the cost of providing drinking water, ranges between 5 and 10 percent of the capital replacement cost.[28] Accordingly, this range has been applied to the different technologies depending on the complexity of their maintenance. This is clearly an area requiring further research and analysis in an effort to refine cost estimates.

4.7.2. Sanitation and sewerage treatment

In the case of sanitation, six technology options are considered, which are again based on the JMP classification (WHO/UNICEF 2000):

- Connection to a conventional sewerage,
- Connection to a simplified sewerage,[29]
- Connection to a septic tank,
- Pour flush toilet or latrine to a pit or soakaway,
- Ventilated Improved Pit latrine (VIP), and
- Improved single-pit latrine (provided with structurally safe squatting plate and superstructure).

[28] Estimating human resources, administrative capacity and related costs pertaining to the maintenance of water and sanitation is extremely difficult. For example, staff requirements for water and sanitation systems can vary between 2 and 10 employees per 10,000 users depending on the complexity of the system, its efficiency and the extent to which automation or labor-intensive approaches are used (personal communication Mike Muller).

[29] Sewerage systems using a simplified design standard, but with the same functionalities as traditional sewerage (e.g. condominial design used in countries like Bolivia and Brazil)

Coverage data for access to sanitation is based on preliminary JMP estimates for 2002. In contrast to water supply, no reliable data were available on the extent of sanitation infrastructure that is not functioning. Based on interviews with a number of experts, we assume conservatively that currently roughly 15 percent of sanitation infrastructure is defunct. Just as in the case of water supply infrastructure, we project that these facilities will be rehabilitated by 2015 at half the cost of construction.

In line with our analysis of water supply, the current coverage of sanitation technologies was derived from the most recent DHS data. The relative technology shares for rural sanitation were estimated based on the following set of preliminary assumptions, which have been kindly provided by Albert Wright:

1. Make no additional public investments in the extension of conventional sewerage, simplified sewerage, or in septic tanks, except where such sewerage can be linked to high density housing areas, residents from whom costs can be recovered, or to effluent use for agriculture; and
2. Split the remaining service gap equally between pour flush toilets, VIP, and pit latrines.

In the case of urban sanitation the applied set of assumptions is:

1. Limit increase in connections to conventional sewerage to connectable areas within the current sewerage boundaries, assuming that existing conventional sewerage has enough capacity for twice the current population coverage;
2. Provide simplified sewerage for at least 50 percent of those with house connection to public water supplies;
3. Discourage growth in septic tank use, and limit any such growth to no more than 10 percent of the current level;[30]
4. Distribute the rest of the coverage gap equally between the pour flush, VIP, and pit latrines, and
5. Provide properly attended and maintained public toilet facilities in congested public places, as done by Sulabh International in India.

Capital costs have been collected from the same sources as for the cost of water supply. We distinguish between two sets of operating costs for sanitation systems. First, the resources required for maintaining the physical infrastructure, including local treatment of the excreta, such as emptying of pit latrines, VIPs and septic tanks. Based on information provided by the Task Force we estimate total O&M costs to be between 5-10 percent of capital cost.

In addition, traditional and simplified sewerage systems require safe disposal of the excreta away from the neighborhood. In large and high-density cities this often requires some treatment of the effluent wastewater, which we cost separately. While sewerage and wastewater treatment will not be required in all situations, their strong links to improvements in health outcomes and environmental quality – particularly for downstream users – have been documented by the World Bank (World Bank 2003c) and

[30] The reason is that while septic tanks are a very good means of disposing of human excreta if properly maintained, experience has shown that systematic maintenance and regular emptying is difficult to ensure.

UNEP (UNEP 2001) [31]. These studies and recommendations by Task Force members have motivated our decision to include wastewater treatment as part of the country case studies.

Options for wastewater treatment can be broadly separated into primary, secondary and tertiary treatment. In the first case all forms of settleable and suspended solids are removed through simple sedimentation processes or other means, while the second adds biological treatment of the effluent. Tertiary treatment removes chemical pollutants like phosphates, nitrates, and volatile odor-causing substances from the water. In many instances – particularly in warmer climates – cost effective solutions, such as waste stabilization ponds, exist that combine primary and secondary treatment.

We currently exclude tertiary and advanced industrial wastewater treatment from this analysis assuming that these investments can and should be financed by the private sector, which generates the contaminated wastewater. It can, however, be argued that industrial wastewater treatment ought to be part of publicly provided infrastructure to facilitate the creation of urban employment opportunities while safeguarding the health of the population as did countries in Europe and North America. Evidence from India suggests that this may indeed be the case. The Indian government is struggling to enforce its wastewater treatment program without driving small industries that cannot afford to pay the cost out of business[32].

Our tentative target for wastewater treatment is to provide primary or secondary treatment to a total of approximately 60 percent of all household with access to conventional or simplified sewers.

4.7.3. Hygiene education and awareness-building programs

The Task Force emphasizes the need to combine the extension of water supply and sanitation infrastructure with adequate maintenance as well as appropriate 'software', including hygiene education and awareness programs. This is necessary to help ensure that infrastructure responds to the needs of the population, is used effectively by all users including young children, and is paid for and properly maintained. Evidence for linking behavior change programs in the water and sanitation field to effective use and maintenance of infrastructure as well as improved health outcomes is strong. Pruess et al. (2002) review the evidence for hygiene-health links, while Black (1998) summarizes the operational lessons learnt over the past 20 years.

In the case of sanitation, effective demand for access to improved facilities often lags behind demand for water supply despite the important health benefits accruing from the widespread use of improved sanitation. Among the many reasons for this are insufficient awareness of the importance of proper sanitation, the externalities inherent in the use of sanitation, and the cost of the facilities, which can be high. In such instances awareness-building programs can help increase effective demand for sanitation.

[31] Similarly, as part of the Iraq needs assessment, the UN and World Bank have recommended that donors finance major investments in wastewater treatment infrastructure (UN, World Bank 2003).
[32] Personal communication William Cosgrove.

Mass-media campaigns and primary school instruction have also been included in the assessment as part of a public education program to increase awareness of safe hygiene practices. In addition to proper use of sanitation facilities, improved hygiene practices include hand washing, as well as the safe on-site storage and handling of drinking water to prevent microbial contamination. Such behavior change programs can make a critical contribution towards reducing child mortality rates and improving other health outcomes. Without them, the effectiveness of improved water supply and sanitation infrastructure in reducing waterborne diseases is greatly reduced.[33]

As in other areas, public education and awareness programs can take a number of forms including community workers, mass media campaigns, formal integration of water and hygiene education into school curricula and so forth. The best approach typically comprises a mix of these interventions and will be extremely time and context specific. Many successful campaigns in the past have depended on the personal leadership of few individuals. Despite the diversity of approaches they all have in common a need for significant additional financial and above all human resources.

Given this complexity, our approach has been to address three components: (i) on-site education accompanying the rollout of infrastructure to promote proper use, operations and maintenance of sanitation facilities; (ii) mass media campaigns to promote hygienic behavior and to discourage wasteful consumption of water; and (iii) water and sanitation education at primary schools.

In the case of sanitation facilities for domestic households, cost estimates for on-site education range from below 10 percent (Académie de l'Eau 2003) of capital cost globally to 15 percent in South Africa[34] and 20 percent in India[35]. We have used the latter estimate for our calculations, which accounts for the full range of activities accompanying the installation of new sanitation facilities.

In the absence of specific estimates for the water and sanitation sector, resource estimates for mass media campaigns and education components at primary schools are based on budgets for equivalent awareness campaigns and prevention programs against HIV/AIDS (UNAIDS 2002). We assume conservatively, that each country runs a mass media campaign once every two years.

As can be seen from the country studies below, average per capita cost estimates over the period from 2005 to 2015 range from approximately $5-$8 per year for water, sanitation, and hygiene education. Operating costs make up a large share of the total cost. As a result, countries like Bangladesh that already have a high coverage rate can incur higher total costs than countries with a low starting point like Cambodia.

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[33] Experience from around the world shows that it typically takes a long time – sometimes up to five years – for behavior change programs to have an impact. For this reason it is necessary to implement long-term programs that systematically target the entire population in need.
[34] Personal communication Mike Muller.
[35] Personal communcation Susmita Shekar, Sulabh International.

4.8. Improving the lives of slum dwellers

The 'urban' MDG Target is (UN 2000):

> Target 11: 'By 2020, to have achieved a significant improvement in the lives of at least 100m slum dwellers.'

UN-Habitat has provided an operational definition of the term 'slum' according to which, around 900 million people – roughly one-third of the World's urban population of 3 billion people – are classified as "slum dwellers" (UN-Habitat 2003). If left unchecked, the number of slum dwellers is expected to double during the next generation.

The current formulation of Target 11 presents two critical problems. First, it only addresses approximately 5 percent of the expected slum population by 2020. Second, the Target is difficult to translate into concrete national targets and impossible to monitor rigorously due to the difficulty of accounting for natural migration into and out of slums. For this reason, the Millennium Project Task Force on Improving the Lives of Slum Dwellers proposes to revert to the original Cities Alliance Goal endorsed by UN Secretary General Kofi Annan in his April 2000 report "We the peoples" to the Millennium Summit (Annan 2000). This Goal calls for stopping the process of slum formation and significantly improving the lives of at least 100 million slum dwellers, which amounts to a net reduction of the total number of slum dwellers to 800 million by the year 2020.

In addition to deriving from the Secretary-General's original report, this interpretation of Target 11 is consistent with the other MDG Targets, including the Targets on halving poverty, reducing child mortality by two thirds, halving the number of people without access to water, and the Johannesburg sanitation goal. We base our analysis of the resource needs for meeting Target 11 on this ambitious interpretation that is consistent with the rest of the MDGs.

The Millennium Project Task Force proposes two parallel and concomitant sets of strategies for meeting the Target: Upgrading of existing slums and interventions designed to prevent the formation of new slums. Core elements of both are (i) provision of improved security of tenure, (ii) adequate housing, (iii) core infrastructure, and (iv) basic services, as well as (v) improved urban planning. To be successful, these sets of interventions need to be supported by a tripartite partnership involving communities, municipalities or local authorities, and the national government.

The work of the Task Force shows that slum dwellers typically do require improved security of tenure as a critical entry point for improving their lives. Importantly, 'secure' tenure describes a continuum of statuses that can range from formal title or leasehold to 'perceived' security of tenure through the enforcement of anti-eviction laws or a recognized address resulting from a billing relationship with a utility company. Slum dwellers' preferences for and the feasibility of a particular tenure regime can vary tremendously within cities, let alone countries or regions. Since each system requires a specific set of interventions, it is impossible to specify a generic list that could be

applicable throughout a given country. Nevertheless successful strategies for improving the security of tenure of slum dwellers may include some or all of these following elements:

- Passing and enforcement of anti-eviction legislation,
- Reform of tenure legislation,
- Interventions to provide slum dwellers with recognized addresses,
- Strengthening of land management systems, and
- Legal protection of slum dwellers and enforcement of their rights.

Inadequate housing is particularly pervasive in slums and a key determinant of ill health. Upgrading or reconstruction of housing typically requires improved security of tenure. While slum dwellers can often mobilize significant resources if they can get access to some form credit system (e.g. micro-credit or community saving schemes), experience shows that in many cases some targeted subsidies may be required to facilitate investments in housing.

In addition to housing, urban infrastructure needs to be extended and maintained through investments in:

- Local and trunk roads,
- Footpaths and kerbing,
- Community facilities, including local markets,
- Drainage, and
- Street lighting.

Other important components of urban infrastructure, such as electricity connections and improved access to water supply and sanitation, are addressed in the corresponding sections of this document.

A number of basic services need to be assured to improve the lives of slum dwellers and to ensure the appropriate management of cities. These include:

- Solid waste disposal,
- Fire protection services,
- Policing and security services,
- Adequate transportation services, and
- Improving access to credit for slum dwellers and their communities.

In addition, effective access to good education and health services is critical for improving the lives of slum dwellers. Both are included in the corresponding sections of this document.

Finally, the rapidly growing cities in the developing world require improved urban planning and management to prevent the emergence of new slums by providing adequate infrastructure and services to the growing population. This will necessitate important investments in the institutional and organizational capacity of local authorities as well as capacity building among community organizations.

Our estimates of the current number of slum dwellers in each country are based on UN-Habitat estimates (UN-Habitat 2003). To estimate the target number of slum dwellers by 2020, we first multiply the country's percentage share of the global number of slum dwellers by 100 million and subtract this figure from the current number of slum dwellers. For example, Tanzania is home to 11 million slum dwellers, which is equivalent to 1.2 percent of the world's total. Hence the target number of slum dwellers in Tanzania by 2020 becomes 11.0 m – 1.2m = 9.8m.

As a baseline scenario we assume that the proportion of slum dwellers as a share of the total urban population will remain constant until 2020. Based on UN Population Division data (UN 2002) this would imply a total of 22.6 million slum dwellers by 2020 in the case of Tanzania. Hence, interventions for stopping slum formation will need to be applied to 22.6 – 11.0m = 11.6m people in Tanzania in addition to the 1.2 million people whose slums will be upgraded.

In attempting to calculate the cost of interventions to improve the lives of slum dwellers, we extensively reviewed the existing literature, including project documentation on slum upgrading. The most commonly cited unit cost estimate for slum upgrading has been estimated by the Cities Alliance, based on work by Banes et al. (1996). The Cities Alliance has calculated that on average it costs $500 per person to upgrade slums. This figure includes investments in housing and infrastructure, such as roads, water and sanitation, as well as energy services. In addition, GHK Group (2000) and Kessides (1997) contain very helpful material.

We encountered several obstacles to calculating total costs. First, we were unable to locate specific unit cost data for each of the five countries. The available cost data suggests a very wide range in unit costs for a given level of service. Second, the extent to which some interventions, such as providing decent housing, are a public sector responsibility and therefore should be included in our analysis remains a matter of debate. Finally, it remains to be clarified, which set of interventions can be applied to stop the formation of new slums. In practice this is likely to involve a mix of upgrading existing slums as well as providing new green field developments. Since the costs of the former tend to be significantly higher, it is important to define the right policy mix.

Due to the high variation in the data and uncertainties about the precise nature of the interventions, we have decided not to present any quantitative estimates in this paper. This of course must not be interpreted as saying that little to no resources will be required to improve the lives of slum dwellers and to stop the process of slum formation. Indeed, it is likely that the full range of necessary interventions will require substantial investments in urban areas.

Box 7: Interventions currently missing from the resource estimates for Improving the Lives of Slum Dwellers

- Improving security of tenure
- Investments in the housing sector
- Upgrading and maintenance of urban infrastructure
- Provision of basic services
- Strengthening institutional capacity of local authorities

4.9. Science and Technology

Interventions relating to science and technology focus on (UN 2000):

> Target 18: In co-operation with the private sector, make available the benefits of new technologies, especially information and communications

This Target has two sets of components. First, it requires the improvement of policies and institutions for science and technology. Second, specific investments in information and communication technology (ICT) will need to be made to meet the MDGs.

As argued in the interim report of the Millennium Project Task Force on Science, Technology and Innovation, the first dimension of Target 18 consists of the following five components:

1. Improving the science and technology environment through integrating science and technology advice into decision-making processes;
2. Accelerated enterprise development;
3. Technology forecasting to establish national priorities in science and technology funding;
4. Investing in research and development to build national scientific and technical capabilities and to promote under-funded research; and
5. Building human capabilities through improved and expanded higher education.

These five components are critical for countries to reap the full benefits of science and technology and to be able to manage and respond to ongoing technological change. The latter two components – higher education as well as investments in national research and development – will both require significant additional investments and budgetary outlays. So far we have not calculated the resources – human and financial – required for promoting these two policy clusters. We intend to do so during the course of 2004.

The primary focus of the remaining components is on policies and national institutions that go beyond the scope of this needs assessment. These can only be addressed and formulated as part of existing national planning and policymaking processes.

In addition to these policy clusters, the Task Force is advocating a strengthened focus on infrastructure as a critical underpinning of development processes. Except for ICT, the corresponding interventions have been included in the other sections of this document.

Target 18 makes explicit reference to ICT, which is a critical input for achieving many of the MDGs. Specifically, ICT plays an integral role in poverty reduction by creating income-generating opportunities in addition to improving market efficiency and facilitating the communication necessary for an effective provision of public services such as healthcare and education.

At this point our country case studies do not explicitly address investment needs for ICT and required services. The Millennium Project does not have the specific expertise required to answer these questions and is therefore collaborating with the UN ICT Task

Force commissioned by the UN Secretary-General to explore ways in which ICT can be best put to use for the benefits of low-income countries.

Box 8: Interventions currently missing from the resource estimates for Science, Technology and Innovation

- Institutions for higher learning
- Research and development on under-funded research
- Information Communication Technology (ICT) needs

4.10. Energy

Modern energy services are critical for achieving the dignified life for which the MDGs aim.[36] Reducing the number of people without access to electricity, adequate cooking and lighting services is a necessary facilitating investment to ensure the achievement of the MDGs themselves and to enable a country to achieve sustained economic growth.

To estimate the resources required for improving access to energy, we have defined minimum adequate levels of access to energy services and developed targets for closing the energy services gaps. We have also identified the energy services that are "MDG compatible" —those services whose widespread use will facilitate the realization of the MDGs— and described a portfolio of possible energy interventions to improve access to energy services. Finally, we have outlined some of the criteria governments should consider in choosing country-specific intervention plans.

Box 9: Interventions currently missing from the resource estimates for Energy

- Electricity services for agriculture and other productive activities,
- Thermal energy for space heating and electricity for household ventilation,
- Policy interventions to support private sector participation in electricity and fuels sector,
- Repairs and maintenance to existing electricity grid system,
- Demand-side efficiency interventions (to reduce electricity wastage) at household, commercial, and industrial levels,
- Training and capacity building to support implementation of technology/end-use device interventions, and
- Training and capacity building to support electrification.

At the most basic level, energy, in the form of heat for cooking, is necessary to ensure adequate supply with food. Energy in the form of lighting is also necessary to "extend the day," by providing additional hours during which households can perform productive tasks and schools and clinics can offer services. Energy, especially electricity, is also a critical input for productive activities and income generation. Without adequate energy

[36] We gratefully acknowledge the analysis carried out by McKinsey & Co that formed the basis for this section. In particular we would like to thank Pepukaye Bardouille, Antony Bugg-Levine, and Lynn Taliento for their excellent work.

services investments, time wasted gathering fuel wood – particularly by women and young girls – will suppress income-generating opportunities. The obligation of children, especially girls, to assist in time consuming fuel-wood gathering will keep them from attending school. Lack of adequate lighting and power will reduce productivity of home-based enterprises. Air pollution from unhealthy cooking fires will debilitate the workforce and continue to kill more children each year than malaria (Warwick 2004). The inability to refrigerate medicines and vaccines or to keep clinics functioning at night will limit the impact of health systems investments (DFID 2002). These are only some examples underlining the critical importance of energy for achieving each MDG.

Determining adequate levels of energy supply

Clean and efficient energy for cooking and reading light are crucial to achieving the MDGs related to health, gender equality and education. Given the importance of communication for health and education improvements, electrified households should, in addition to electrical lighting, have enough electricity to power a radio and/or black and white television. Social services infrastructure—schools and health facilities—require sufficient energy to provide for basic lighting, cooking and communication, and additionally, in the case of health facilities, refrigeration and electrical equipment as necessary (see Table 3).

Annual consumption per	Lighting/electrification*	Cooking*
Household	75kWh[+] or equivalent	1 gigajoule useful energy
School	2,000kWh	7,000kg LPG
Hospital	50,000kWh	10,000kg LPG
Clinic	8,000kWh	1,000kg LPG**
Health post	2,000kWh	400kg LPG**
*For households, a range of energy services can provide adequate lighting and cooking. Schools and health [+] Sufficient to provide reading light in one room for 4 hours each day		

Table 3: Minimum levels of energy consumption

These minimum standards, however, exclude energy consumption for other important household activities that are associated with a dignified life but go beyond the immediate focus of the MDGs. For example these levels do not provide for household electrification, space heating, refrigeration, or even for light bulbs in additional rooms.[37] The importance of meeting these broader energy needs as a precursor to sustained economic development are discussed below, but have not been incorporated into our resource calculations that concentrate on strictly minimal requirements. In addition, while we anticipate that a successful development plan will include the widespread use of electricity for home-based productive activities, we have excluded these activities from our minimal costing, as the productive activities should be profitable enough to finance the incremental cost of additional electricity generation[38]. Finally, in the countries studied for this paper, industry typically accounts for up to 90 percent of total electricity

[37] In some countries, investment in MDG-compatible space heating will be a necessary investment for those populations living in especially extreme environments. The extent of this investment will need to be determined on a country-by-country level with consideration to climate, dwelling type and energy service alternatives. Space heating investments should not have to constitute a major part of any country's energy program.

[38] Note that we consider electricity transmission, which tends to account for the bulk of the necessary resources, to be a public investment priority.

consumption. We have separately estimated investment needs in terms of generation capacity for satisfying this growing demand. However, these resource needs are reported separately and have not been included in the summary results presented in the country chapters below.

Coverage targets and interventions

We define the coverage targets for energy in line with the gap-reduction approach adopted in the formation of most MDG Targets. Energy services interventions should aim to:

> "Reduce by half the number of households without access to MDG-compatible energy services by 2015"

More specific targets include:

> "Reduce by half, between 2005 and 2015, the proportion of urban and rural households without access to MDG-compatible lighting;
>
> "Reduce by half, between 2005 and 2015, the proportion of urban and rural households reliant on cooking methods that are not MDG-compatible; and
>
> "By 2015, provide adequate[39], clean and efficient energy services to all educational and health facilities"

A comprehensive national program to reach all the MDGs will need to include interventions aimed at disseminating "MDG-compatible" energy services. While electricity is an unmatched resource due to its low marginal cost, safety and productive capacity, MDG-compatible energy services take many other forms as well. In the context of the MDGs, a central consideration is which combinations of fuel and end-use devices provide for a minimally efficient, clean and sustainable energy service.

Approach

To develop an estimate of how much it would cost to deliver sufficient modern energy services to facilitate the realization of the MDGs, we have applied a simple gap analysis in the five case study countries. The analysis focuses on costing the interventions required to reach the coverage levels required by the energy target.

We applied the Long-range Energy Planning model—LEAP—to facilitate costing of the case studies. LEAP is an energy systems scenario planning and modeling tool designed by the Stockholm Environment Institute, specifically to address the needs of developing country planners. The model is available free of charge to developing country governments and non-governmental organizations.[40] LEAP enables users to undertake comprehensive accounting of a country or region's current energy situation and expected as well as desired future energy paths.

[39] With minimum consumption levels as defined above.
[40] Additional information on LEAP is available at http://forums.seib.org/leap/

Relatively detailed base case data on both cooking and lighting methods allowed us to undertake a more rigorous analysis in Ghana and Tanzania. These preliminary case studies contained a good overview of current energy accounts, notably at the household and industrial levels. Obtaining information on household energy use patterns is relatively difficult, particularly for cooking, and notably in rural areas. Indeed, while we found adequate data on overall national electricity consumption, as well as relatively detailed supply-side information on electricity generation capacity and characteristics for Cambodia, Bangladesh and Uganda (this data is typically available from national accounts or from international agencies), a lack of data on lighting and, in particular, cooking methods prevalent in these countries forced us to make broader assumptions.

Box 10: Interventions currently missing from the resource estimates for Energy

- Electricity services for agriculture and other productive activities,
- Thermal energy for space heating and electricity for household ventilation,
- Policy interventions to support private sector participation in electricity and fuels sector,
- Repairs and maintenance to existing electricity grid system,
- Demand-side efficiency interventions (to reduce electricity wastage) at household, commercial, and industrial levels,
- Training and capacity building to support implementation of technology/end-use device interventions, and
- Training and capacity building to support electrification.

Results

For each case study country, we estimated four sets of costs: end-use devices, fuel consumption, electrical connections, and power plants (see Table 4). Overall per capita energy program costs range from $13-18[41]. These per capita needs are in the same range as education and less than roads. We believe households will be able to pay 30-50 percent of the program costs, as many modern fuel interventions actually lower the recurrent fuel costs households need to pay. This is especially true in urban areas where biomass fuel sources are often more expensive than gas and kerosene alternatives. The relatively narrow range of per capita costs arises from a relative congruence in energy needs across the five countries. Especially in rural areas, almost all the case study countries require major interventions. While Ghana stands out with relatively good electrification coverage, the other countries also require almost uniformly ambitious electrification extension programs.

[41] These per capita values reflect total MDG-energy program costs divided by total population of the country, i.e. not solely the portion of population actually reached by the program.

Type of cost	Share of total program cost	Components
Fuels	40-53%	All fuels used for lighting and cooking (except electricity): wood, coal, charcoal, kerosene, LPG
Electrical Connections	20-33%	Central grid connections Mini-grid Solar home systems
End-Use Devices	12-19%	Light bulbs Kerosene lamps (hurricane and wick) Kerosene stoves Gas stoves
Power plants	3-22%	Additional generating capacity required for energy program

Table 4: Breakdown of Total Energy Program Costs

4.11. Transport infrastructure

There is no specific MDG target on improving the provision of transport infrastructure. However, transport infrastructure, which includes road networks, rail systems and ports, allows agricultural communities to access both domestic and international markets, facilitates school attendance by children in remote areas, enables the government to provide public services cheaply and effectively, and lowers the cost of private enterprise. It is therefore, a necessary input into multiple goals, including Target 1 on halving the number of people living in absolute poverty, and a precondition for economic growth itself.

At this point, our analysis focuses exclusively on road infrastructure since data on ports and railroads either do not exist or do not provide any guidance on setting appropriate coverage targets. A number of country-level and regional studies estimate the resources required for improving a country's transport infrastructure. Our extremely preliminary analysis has been informed by Fay and Yepes (2003) as well as the World Bank Roads Cost Knowledge System (World Bank 1999).

Box 11: Interventions currently missing from the resource estimates for Transport Infrastructure

- Capital cost and O&M for ports, container terminals and railroads
- Investment needs for airports

No internationally agreed targets for road infrastructure exist. In addition, there is no agreed-upon methodology for developing aggregate targets for transport infrastructure. Instead road targets need to be developed on the basis of relative population density, the location of centers of economic activity, the country's topography and relationships with neighboring countries, etc. Unfortunately, the necessary data is not readily available to carry out this analysis. In particular, existing road maps for African countries are notoriously unreliable and tend not to exist in a digital format that would make it possible to superimpose the data with other georeferenced variables, such as the gridded

population density map developed by the Center for Earth Science Information Networks (CIESIN) at Columbia University.[42] While most PRSPs and country plans include a section on transport infrastructure, we found them lacking in ambition and therefore did not use their targets.

In the absence of usable georeferenced road data we resorted to setting aggregate targets for road density in terms of kilometers of paved road per 1000 people. To this end we analyzed the relationship between per capita road density (taken from World Bank (2003d)) and a range of variables, including GDP per capita, poverty headcounts, population density, rates of urbanization, and agriculture output as percent of GDP. On the basis of this analysis we project that countries need to meet a minimum road density of 0.5 kilometers per 1000 persons in order to be able to meet the MDGs. This estimate is significantly lower than the FAO's target of 1.25 km of paved rural roads per capita (FAO 2002).

In two countries (Tanzania and Uganda) this target would require increasing the total length of paved roads my more than a factor of five. We believe that even if both countries could raise the necessary financial resources existing constraints in terms of human and administrative capacity would make it impossible to meet this target over the coming 11 years. For this reason we have limited the maximum increase in the paved road network to five times the existing length of the network.

We distinguish between three sets of design standards for roads: two-lane highways (national roads), two-lane roads (district roads and larger urban roads), and one-lane roads (rural community access and feeder roads). We assume that the current share of each road type remains unchanged as road coverage is increased. Current road coverage was derived from national road plans and sector assessments.

First results have been calculated using the following per kilometer costs from the World Bank Roads Cost Knowledge System: $1,386,000 for two-lane highways and $410,000 for two-lane roads (World Bank 2003d). We estimated that the cost of one-lane roads amounts to 70 percent of the cost of two-lane roads, i.e. $287,000. Operations and maintenance needs are estimated to be equivalent to 2 percent of the replacement cost (Fay and Yepes 2003). These O&M costs are applied to the entire existing road networks.

While these estimates provide the right order of magnitude of investments needs for each of the five countries studied here, we emphasize that the approach is ill suited to form the basis for national planning processes. As discussed above, a national road plan needs to build on a detailed analysis of local demand for roads in conjunction with constraints imposed by the country's topography.

The significant variation in per capita resource requirements for extending the road network derives mainly from differences in current road density. While Ghana already has a density of 0.62km per 1000 people, the road density in Uganda is roughly one tenth

[42] Available at http://sedac.ciesin.org/plue/gpw/index.html?main.html&2

of this (World Bank 2003d). Hence investment needs in the latter country are substantially higher.

5. Financing

As outlined in Sections 2 and 3 above, the case studies assume that the cost of meeting the MDGs be borne by national governments and private households. Additional resources required to meet the MDGs will need to be provided through increased external finance.

5.1. Economic growth projections

To calculate the government resources that can be mobilized domestically, we need to project per capita GDP growth until 2015 since GDP levels in part determine the scope for government resource mobilization. We do not use a macroeconomic model to calculate GDP growth using growth accounting frameworks. As discussed in some more detail in Section 3.2, one reason why we have not pursued standard growth-accounting or equivalent approaches is that in the face of the substantial scaling up of social and infrastructure investments required to meet the MDGs, input-output relationships that were estimated using historical data, and are only valid for small *marginal* changes, would no longer hold.

We do not attempt to estimate the impact of economic growth on the other dimensions of non-income poverty, or conversely how improvements in health, education, nutrition, access to water and sanitation etc. contribute to economic growth. Our approach to projecting future GDP is extremely straightforward. We estimate the 2015 level of GDP per capita that is consistent with halving the incidence of extreme poverty in the country based on an average elasticity of poverty reduction to income growth, estimated from existing literature at –1.4.[43] We refrain from using country specific elasticities of poverty reduction to income growth because we found tremendous variability in the values for a single country among different sources.

An elasticity of –1.4 implies that countries would need to grow by an average 2.0 percent per capita between 1990 and 2015 in order to halve income poverty. We compare this projected growth to the historic per capita growth rate in each country from 1990-2001, which ranged from 0.4 percent (Tanzania) to 3.2 percent (Uganda). For countries that have grown above the per capita growth rate needed to halve poverty, we assume that they will continue to grow at their historic rate. This set of countries includes Bangladesh (3 percent), Cambodia (2.6 percent) and Uganda (3.2 percent). For countries that have historically grown below the rate needed to halve poverty, we assume that they grow at this higher projected growth rate, which is 2.2 percent for Ghana and 3.3 percent for Tanzania.

[43] Several studies have estimated these elasticities for low-income countries. The Human Development Report 2003 uses a global average of –2 (as estimated in Bruno et al 1998) to estimate the increase in GDP needed to halve poverty. Besley and Burgess (2003) estimate elasticities for different regions in the range of -.49 and –1.14. The UN-ESCAP report (ESCAP 2003) estimates elasticities for Bangladesh to be –0.8. In the case of Uganda, the Economic Policy Research Center estimates a value of –1.39 (Okidi et al 2000), while Tanzania's elasticity has been estimated at –1.45 (Danielson 2001). Critically, though, many studies come up with conflicting estimates for the same country or region.

5.2. Private out-of-pocket spending

As discussed in Section 3, we restrict private out-of-pocket contributions to those areas where the incentive effects of well-designed user fees are compatible with the overall policy objectives. On this basis, user fees are not projected to contribute to the cost of primary school education, adult literacy programs, improving gender equality, basic healthcare, nutritional interventions, and transport infrastructure. In turn, we assume that households will bear some of the cost of agricultural interventions, secondary school education, energy provision, water supply and sanitation.

To calculate households' ability to pay for these interventions, we have divided the population into three segments using WDI 2003 quintile income shares in conjunction with data from national household budget surveys. The first segment (T1) consists of households whose per capita income is below the national poverty line defined as the income that is required to satisfy a minimum daily caloric intake per person and to meet some very basic non-food needs, such as clothing. We assume that these households are unable contribute to either capital or operating costs, because their incomes are already insufficient to meet food and other basic needs. In the five countries studied, between 35 and 50 percent of the population lives below the national poverty line.

The second segment of households (T2) has levels of per capita income that are above the poverty line but below twice the national poverty line. These households account for 31 to 38 percent of the population and are expected to partially cover operating costs as well as capital costs. The remainder of the population (T3) is assumed to be able to pay for a significant share of the operating and capital costs.

Table 5 summarizes our assumptions regarding the household contributions by sector. These shares are based on what we believe households in the five countries can realistically pay, but may need to be revised in the light of improved evidence. It should be noted that the richest part of the population is not expected to contribute to anti-hunger interventions since they are exclusively targeted to the food-insecure and poor parts of the population. Also, these out-of-pocket household contributions will of course be made in addition to government expenditures, which are largely financed through domestic tax receipts.

Shares of household contributions per income group

Hunger					
Capital cost rural	T1	0%	**Water supply**		
	T2	0%	Capital cost urban	T1	0%
	T3	0%		T2	40%
Operating cost rural	T1	0%		T3	90%
	T2	50%	Capital cost rural	T1	0%
	T3	0%		T2	40%
				T3	90%
Secondary Education			Operating cost urban	T1	10%
Total capital cost	T1	0%		T2	70%
	T2	25%		T3	100%
	T3	50%	Operating cost rural	T1	10%
Total operating cost	T1	0%		T2	70%
	T2	50%		T3	100%
	T3	100%			
			Sanitation & wastewater treatment		
Energy			Capital cost urban	T1	0%
Capital cost urban	T1	0%		T2	40%
	T2	0%		T3	90%
	T3	20%	Capital cost rural	T1	0%
Capital cost rural	T1	0%		T2	40%
	T2	0%		T3	90%
	T3	10%	Operating cost urban	T1	10%
Operating cost urban	T1	0%		T2	70%
	T2	50%		T3	100%
	T3	100%	Operating cost rural	T1	10%
Operating cost rural	T1	0%		T2	70%
	T2	40%		T3	100%
	T3	100%			

Table 5: Estimated household contributions by income group

5.3. Government spending

To estimate domestic government resource mobilization we use data from the International Financial Statistics (IFS 2003), IMF country reports, national budget documents and the PRSP documents. The analysis consists of the following three steps:

1. The share of government spending on the MDGs as a proportion of total spending is calculated by adding up national government expenditures on the following areas: health, education, gender, water and sanitation, environment, rural development, slum dwellers, science and technology, energy and transport infrastructure, and dividing by total expenditure. We exclude spending on public administration, law and order, and defense.
2. The domestically financed MDG expenditure is then calculated by multiplying the ratio of MDG expenditure to total expenditure with total government revenues.
3. The proportion of domestic spending on the MDG is then calculated as a percent of GDP.

Data for government revenue and total expenditures is taken from IFS (2003) and national budgets. Data for government spending on the MDGs is taken from the PRSP, budget and MTEF documents and IMF country reports. Current ODA commitments are based on data extracted from the OECD DAC CRS database.[44]

[44] We are extremely grateful to David Simon, Harvard University, for providing us with in-depth analysis of CRS data.

To calculate the extent by which domestic resource mobilization can be increased, we were guided by the approach of the Commission on Macroeconomics and Health (CMH 2001), which concluded that governments can mobilize an additional 2 percent of GDP for their health budget. We project that the GDP share of domestically financed spending on the MDGs will rise linearly by 4 percentage points between 2005 and 2015 in each of the five countries and that all of this increase will be directed towards expenditure on the MDGs[45]. In addition, national budgets will of course increase in line with GDP growth. This budget increase is assigned to MDG and non-MDG expenditures on a on a *pro-rata* basis.

The total amount of domestic government spending on the MDGs is calculated in constant 2000 dollars based on the GDP projections made above. On a *pro forma* basis future government spending is allocated to each MDG sectors in relation to its share of the total cost of achieving the MDGs.

5.4. External finance

As our analysis shows, even substantial increases in domestic resource mobilization by governments and households will not cover the full cost of interventions required to meet the MDGs. Hence even low-income countries that are well-governed in relation to their level of GDP, and have put forward sound and credible plans for scaling up interventions to reach the MDGs, will require increased external finance. Given the poverty of the countries investigated for this study and the long time it will take to generate a financial return on these investments, it is likely that the additional resources will need to be provided in the form of grants since countries would not be able to pay back loans.

While our analysis focuses on the *quantity* of external finance, we emphasize that improvements in the *quality* of aid disbursement are equally important to help poor countries achieve the MDGs. This includes improved donor coordination, less tied aid and increased focus on budget support. A detailed discussion of these issues is beyond the scope of this paper and has been addressed elsewhere[46]. For the purpose of this study we are assuming that incremental external finance will be made available in the form of direct budget support.

In the case of some countries, such as Bangladesh, Non Governmental Organizations (NGOs) are assuming a critical role in delivering social services. To the extent that these organizations require increased financial support that cannot be provided using domestic resources alone, funding mechanisms should be explored that would allow the NGOs to benefit directly from increased levels of ODA as part of the PRSP process.

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[45] The difficulty of estimating the potential for increasing resource mobilization by the government is reflected in conflicting comments received on an earlier version of this document, which analyzed Tanzania and Uganda in detail (Millennium Project 2003). The World Bank judged our projected increase in government revenues for Uganda as too low, while the IMF thought the same estimate was too high. (World Bank memo, October 31, 2003; IMF memo, October 24, 2003).

[46] See for example, World Bank 2003a and the Interim Report of the Millennium Project Task Force on Poverty and Economic Development, December 2003 available at www.unmillenniumproject.org.

To calculate the external finance required for each country we subtract domestic resources mobilized by households and governments from total financing needs. For each of the five countries we then estimate incremental donor support as the difference between total external finance needs and current donor assistance.

The administration of ODA and accompanying research, technical cooperation as well as monitoring and evaluation carried out by bilateral and multilateral donors, require additional resources. Our analysis of ODA data recorded in the DAC CRS database[47] shows that donors currently devote roughly 35 percent of their total ODA on these activities. We assume that this ratio can be halved to 17.5 percent of total external finance. Hence for every $1 million in budget support to a low-income country, we would expect that up to $175,000 in additional resources would be required to fund the operations of the donor. So far, however, our projections of external finance needs presented in this paper are net of any such mark-ups.

5.5. Real exchange rate appreciation

A frequently voiced concern about substantial increases in external finance flows to low-income countries is the negative impact of the resulting appreciation of the real exchange rate on the economy.[48] Since much of the externally financed government expenditure will be devoted to the non-tradable sector, an appreciation of the real exchange rate can indeed be expected to occur. This may be harmful to the economy by drawing resources away from the traded-goods sector towards the non-traded goods sector. Particularly in the case of low-income countries the shrinking export sector can have negative consequences for growth if one of the main areas of productivity growth is the traded sector.

A recent study by IMF economists suggests that while significant real exchange rate appreciation would indeed occur as the result of increased donor inflows, the effect may not be as large as often thought (Prati et al., 2003). The study shows that appropriate monetary sterilization can help contain real exchange rate appreciation and thereby limit the negative impact of increased resource flows into the country. While the economic impacts of real exchange rate appreciation on the economy appear to be outweighed by the benefits, an appreciation of the exchange rate will increase the real costs of non-tradable goods and services and thereby raise total funding needs for the MDGs.

Unfortunately, little quantitative empirical evidence exists on the extent by which currencies appreciate as a result of increased ODA flows to low-income countries. Using real black-market effective exchange rates, Prati et al. (2003) show the effect of increased aid on the real exchange rate to be significant but small. Their results suggest that a doubling of ODA would cause the real exchange rate to appreciate by 4 percent. In many countries this immediate effect can be followed by a gradual dynamic appreciation of the real exchange rate over the longer term, by as much as 30 percent over ten years. The

[47] We are indebted to David Simon, Harvard University, and Inge Kaul, UNDP, for guidance in this analysis.
[48] This phenomenon is often referred to as 'Dutch disease'

authors conclude that effective sterilization by the central bank can offset some of the predicted real exchange rate appreciation.

Given the limited empirical evidence, it is impossible to predict by how much real exchange rates are likely to increase as a result of the increases in foreign exchange inflows projected in this paper. To estimate the effect of real exchange rate appreciation on the overall resources required for meeting the MDGs, we have tentatively calculated the share of goods and services that will need to be imported to scale up interventions for meeting the MDGs. Based on a preliminary analysis of the likely expenditures for each of the sectors, we conclude that approximately 70 to 75 percent of total expenditures for meeting the MDGs will be spent on domestic goods and services, such as salaries or local construction material. The remaining 25 to 30 percent are likely to be devoted to imported goods, such as machinery or energy carriers.

To illustrate the potential impact of real exchange rate appreciation we have modeled a real exchange rate appreciation of 20 percent over the 11-year period from 2005 to 2015. Across the five countries investigated in this paper, the exchange rate appreciation would raise the real cost of interventions and therefore the need for external finance, by an additional 8-9 percent of projected external finance or ODA flows. Again, this mark-up has not yet been included in our analysis.

6. Conclusion & outlook on further analysis

The focus of this paper has been on presenting a rigorous methodology for carrying out MDG needs assessments as well as preliminary estimates of the resources required to meet the MDGs in Bangladesh, Cambodia, Ghana, Tanzania and Uganda. We emphasize the preliminary nature of the results presented here and will continue to refine them over the coming year. While the approach presented here is one of the most comprehensive and detailed attempts thus far at identifying the needs of individual low-income countries for meeting the full range of MDGs, the analysis has clear limitations as outlined in Section 3.2. For this reason we have strived for transparency in order to compare critical assumptions with those made in other studies and to be able to revise key parameters in the light of new evidence.

The preliminary results show that a long-term view towards planning for the MDGs is necessary and feasible. Based on our analysis we believe that all low-income countries with committed governments can meet the MDGs. Achieving the Goals will require a substantial scaling up public investments in goods, services and infrastructure – defined in this study as *interventions* - across the full range of MDGs. In the case of the five low-income countries studied here, this scaling-up can only be achieved if domestic public administration capacity continues to be expanded and external finance in the form of grants is increased. Our preliminary assessment suggests that the external finance necessary for achieving the MDGs in low-income countries will be significantly less than the MDG Target of 0.7 percent of rich countries' GDP, to which high-income countries have repeatedly committed themselves.

As next steps, we will refine the resource estimates for those sets of interventions that have only been partially addressed in this study, including expanding tertiary education, providing ICT infrastructure and services, improving the lives of slum dwellers or interventions related to environmental sustainability. In parallel we will continue to update the estimates and models on the basis of improved and new evidence.

In addition, we plan to estimate the external finance required globally to meet the MDGs based on the results of our country-level assessments. This analysis will focus exclusively on countries that cannot mobilize enough domestic resources to meet the MDGs – most likely the set of low-income countries as defined by the World Bank. Our approach will be to separately estimate investment needs as well as domestic resource mobilization by the government and private households over the next 12 years for each of these countries. Aggregating these estimates will permit us to calculate the external finance required globally for meeting the MDGs.

In addition to resources required to deliver country-level interventions, we will also consolidate available information on investment needs for global processes and public goods. These will include estimates of the resources required to monitor global progress towards achieving the MDGs; to intensify research into improved anti-retrovirals against HIV/AIDS or anti-malarials; to support multilateral agencies in providing technical advice and support to country governments; and so forth.

As discussed in Section 5.4 we recognize that multilateral and bilateral donors incur substantial costs to manage their aid disbursements and to provide advice and technical cooperation to recipient countries. These costs have so far not been included in our estimates of ODA requirements.

In 2004 the Millennium Project will work together with UN Country Teams in a number of low-income countries to help the governments develop long-term plans for achieving the MDGs as part of their ongoing planning processes, including the PRSP. We hope that the needs assessment presented in this paper will be helpful in providing some initial guidance on the critical variables that need to be planned for, the extent of resource requirements, as well as the financing strategy. We further expect that this work will provide critical information on how to improve our needs assessments.

The Millennium Project's country-level work will also provide a better understanding of the resources required for implementing policies and improving institutional capacity to ensure environmental sustainability, to exploit the full benefits of science and technology, or to achieve a sound management of rapidly growing cities. More generally, we hope to improve our understanding of the extent of human resources required for delivering the necessary interventions and ways in which they can be gradually scaled up to overcome current absorptive capacity constraints as discussed in Section 3.2. We also expect that our work with governments will further underscore the critical importance of good governance for achieving the MDGs. To the extent that generalized lessons can be learnt from this work we will make sure to include them in forthcoming revisions of our needs assessments.

Finally, this document includes a first assessment of synergies between interventions that are likely to have a strong impact on health. This analysis is preliminary and in need of extension and refinement. Our planned work with individual countries will put us in a better position to assess the extent of these synergies and the resulting potential for cost savings.

Bangladesh Country Study

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7. Bangladesh Country Study

MDG status

Bangladesh suffers from very high levels of poverty with 50 percent of the population living below the national poverty line in 2000. During the 1990s the prevalence of extreme income poverty was reduced by 1.8 percent per year (PRB 2003a) – a rate, which is insufficient for halving poverty by 2015. Similarly, Bangladesh suffers extremely high levels of malnutrition. The attainment of the hunger Goal will not be possible unless progress at reducing the incidence of underweight children is dramatically increased.

In the education sector, primary school enrollment has increased substantially during the 1990s at a rate that, if maintained until 2015, would ensure reaching the Goal. Literacy among adolescents in the 14-24 age group has also increased, but continues to lag behind primary school enrollment, indicating that primary school completion rates need to be increased further.

Bangladesh has also made progress towards improving gender equality in primary education, and remains on track for meeting the corresponding MDGs. The ratio of girls' enrollment to boys is currently at 0.99; drop-out rates for girls, however, are high, and more efforts are required to retain girls in school and to increase completion rates.

As the following table shows, progress has been made in improving health outcomes. In particular the significant reduction in maternal mortality rates is notable. However, child and infant mortality rates remain high and are unlikely to reach the MDG Targets in 2015 unless progress is accelerated. Of growing concern is the increasing prevalence of HIV/AIDS in the country.

Bangladesh has very high access to safe drinking water in both rural and urban areas. As a result the country has already reached the water MDG. However, access to improved sanitation, while increasing during the 1990s, remains too low. Urgent investments in this sector are required.

Indicator	Starting year value (1990)	Ending year value (2000)	Linearly projected 2015 value	MDG target value	Status
Proportion below poverty line	0.59	0.50	0.37	0.30	Off Track
Proportion of underweight children	0.67	0.51	0.27	.34	On Track
Primary enrollment	0.56	0.75	1.00	1.00	On Track
Literacy of 15-24 year olds	0.42 (1985)	0.64	.86		
Ratio Female enrollment primary	0.32	0.50	.77	1.00	Off Track
Ratio Female enrollment secondary	0.15	0.44	.88	1.00	Off Track
U5MR (per 1000)	108	94	73	36	Off Track
Infant mortality rate (IMR)	94	66	24		
Maternal mortality rate (MMR)	480	320	80	120	Off Track
Death per 100,000 people due to malaria	1.2 (1997)	0.64 (2001)			
Death per 100,000 people due to tuberculosis	21.9 (1996)	11.3			
% with access to improved water (urban)	99%	99%	99%	100%	Off Track
% with access to improved water (rural)	93%	97%	100%	98%	On Track
% with access to improved sanitation (urban)	71%	74%	79%	86%	Off Track
% with access to improved sanitation (urban)	11%	35%	71%	56%	On Track
% of population using adequate sanitation facilities	21% (1991)	48% (2003)	75%	61%	On Track
% of land area covered by forest	15% (1998)	18%			

Table 6: Status of progress towards the MDGs in Bangladesh[49]

Geography and Politics

Bangladesh covers an area of 147,570 sq. km bordering India and Myanmar with a coastline along the Bay of Bengal. Much of the country consists of fertile alluvial land overlain by a network of major rivers. To the northeast and the southeast lie the hilly regions, a continuation of the mighty Himalayan Ranges. The country has a rich flora and fauna; one of the two primeval forests which remain in the world, lies in the southeastern district, Chittagong. Due to its geography, Bangladesh is frequently plagued by floods resulting from prolonged rainfall in the catchment areas of its rivers, outside its territorial boundaries.

[49] Water and sanitation data personal communication WHO/UNICEF; all other data from Country Partner)

Bangladesh gained full independence as a sovereign nation in December 1971. She follows a policy of non-alignment and settlement of issues through peaceful negotiations, territorial integrity, sovereign equality, and renunciation of force and interference with neighboring countries. The South Asian Association for Regional Cooperation (SAARC) was formed, between 7 neighboring countries, by Bangladesh in 1985. Bangladesh is a member of the United Nations, the Organization of Islamic Countries, Commonwealth of Nations, and she also maintains diplomatic relations with 48 countries.

Bangladesh has good relations with the neighboring countries of India, Pakistan, Sri Lanka, Maldives, Nepal, Bhutan and Myanmar. Bangladesh has been described as a moderate, democratic country with a tolerant society, by the US Congressional delegation in March 2003. The delegation has recognized her need for support in terms of getting market access to the United States for its ready-made garments, arsenic mitigation, and more educational facilities for women.

The country has ratified six of the seven basic ("human rights") ILO Conventions and nine of the thirteen Principal Human Rights Instruments with two reservations in CEDAW (UN Dhaka 2000). The Government of Bangladesh had initially ratified the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), subject to four reservations, but in 1997 withdrew its reservations against the two Articles 13 (a) and 16 (1) (f). Efforts are underway to facilitate the withdrawal of the two remaining reservations. Bangladesh has also endorsed C87 Freedom of Association and Protection of the Right to Organize; C98 Right to Organize and Collective Bargaining and C 144 Tripartite Consultation (UN Dhaka 2000).

Population

The country has a population of 124 million and one of the highest population densities in the world at 840 people per km^2. The overwhelming majority of the population is Muslim followed by Hindu, Buddhist, Christian and other groups.

Bangladesh's fertility rate was 3.13 per woman in 2000, a steep decline from 6.12 in 1980 (World Bank 2003d). This is slightly lower than the rate in the South Asia region where average fertility in 2000 was 3.29. The population growth was 1.74 in 2000, which was similar to the regional rate of 1.80. Approximately 38 percent of Bangladesh's population is below 15 years of age – a share that has declined from 44 percent in 1980 (World Bank 2003d). The country is rapidly urbanizing with an urban population increase of 3.7 percent per annum. Life expectancy is 58 years for women and 59 years for men.

Economy

The Bangladeshi economy grew at an average rate of 3.1 percent per capita between 1990 and 2001 reaching a per capita GDP $350. It is estimated that this growth rate will need to be accelerated for the country to meet the MDGs by 2015 (PRB 2003b).

In 2001/02, agriculture contributed 16.5 percent to GDP, while manufacturing accounted for 15.3 percent. The share of community, social and personal services was 8.7 percent, while other economic services account for 11.4 percent of GDP. The structure of the

economy continues to shift towards services and manufacturing, while the share of agriculture has seen a net decline of –0.62 percent.

Many of Bangladesh's international policies are shaped by the challenge of retaining her comparative advantages in textiles and ready-made garments, manufactured goods, jute goods, shrimps, tea, vegetable products, machinery, plastic goods, wooden products, and leather products. In all of these product markets the country competes with similar products made in neighboring countries. This challenge is heightened with the entry of China into the WTO and the imminent phasing-out of the Multi-Fiber Agreement, which will increase the competition for Bangladesh especially in its core export group of textiles.

PRSP/PRGF

Bangladesh is in the process of completing its first full PRSP by the end of 2004. An interim PRSP was published in 2002. This IPRSP has identified the following key challenges for the country.

- Lack of physical infrastructure;
- Poor law and order situation with high incidence of organized crime, extortion and economic violence;
- Lack of effective local government and decentralization;
- Poor quality of education, health, safe water supply and environmental sanitation, and other social services;
- Lack of coordination among development agencies and institutions operating at the local level;
- Lack of remunerative employment and economic opportunities;
- Lack of social capital at the community level resulting in low-level of collective action; and
- Lack of democratization of political processes.

International environment

With the phasing out of the Multi Fiber Agreement (MFA) and the Generalized System of Preferences (GSP) in 2005 Bangladesh will be subjected to stiff competition from other exporting countries, which have so far been restricted from accessing the US and Canadian markets. The Preferential Trade Policy enjoyed by the MFA quota system (US) and the GSP facilities (EU) have been providing Bangladesh with an opportunity to emerge as an exporter of apparel in the global market.

Bangladesh has to address the following constraints in order to improve her future competitiveness.

- Improve quality by eliminating lack of competitiveness in spinning and weaving. This sector is characterized by inefficiency, wastefulness, antiquated machinery, low technology, low quality and dependency on imported fabrics. In addition, improved backward linkages to the local textile industry are required.
- Increase productivity: compared to competitors in Sri Lanka, South Korea and Hong Kong, the productivity of Bangladeshi producers is much lower. Efforts must be channeled towards enhancing productivity of the workers to supplement the low labor cost while retaining price competitiveness.

- Remove infrastructure bottlenecks and reduce the cost of doing business.
- Improve market access to developed and middle-income countries.

In addition to these generic challenges, the country is devoting considerable efforts to promoting regional economic integration with its neighboring countries.

Donor assistance

During 2001, Bangladesh received the equivalent of $8.42 per capita in aid. Bilateral donations make up the majority of aid to Bangladesh, with Japan leading the way with over $125.6m in 2001. Multilateral organizations also play a prominent role in assistance as the International Development Association and the Asian Development Bank contributed substantially (EIU 2003a). Much of the planned aid has yet to be disbursed due to bureaucratic delays and the inability of the government to raise matching funds. Over 90 percent of aid now takes the form of long-term loans with such benefits as low interest rates and ten year grace periods, which has led to a decrease in the debt/GDP ratio by over 3 percent from 36.1 percent in 1999 to 33 percent in 2000 (EIU 2002). As illustrated in the chart below over 70 percent of total ODA has been directed towards specific MDG targets, most notably trade, transport and hunger.

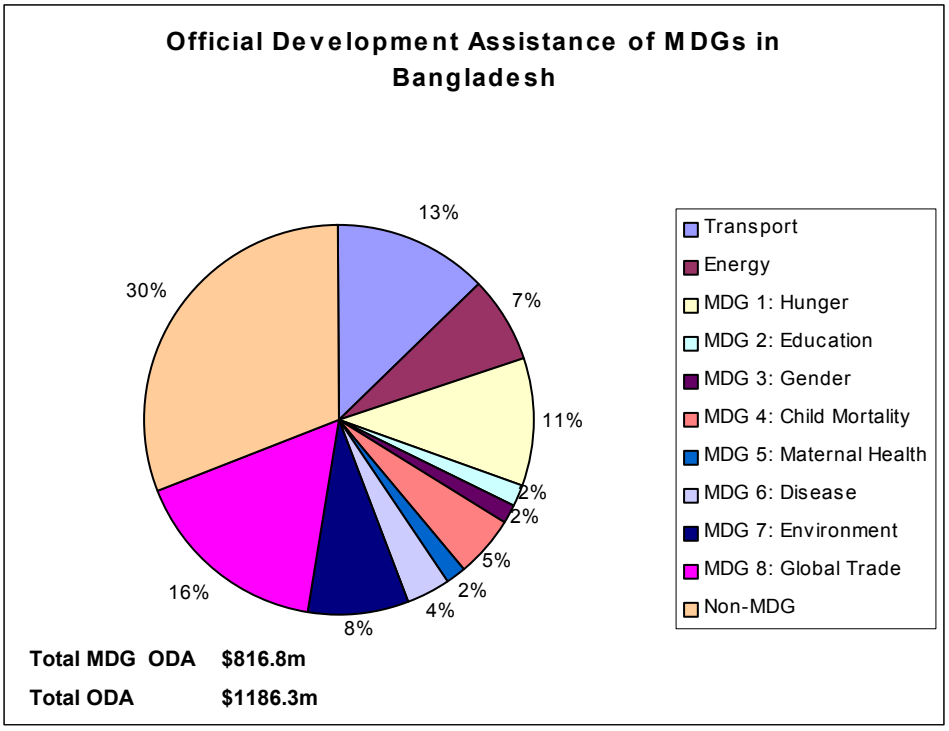

Figure 4 Gross Official Development Assistance to Bangladesh in 2001 (source: Simon 2003).

Key Sectoral Challenges for Meeting the MDGs

Poverty

Table 7 summarizes key poverty data for Bangladesh, underlining the improvements experienced during the 1990s. However, reaching the target of reducing income poverty by half will require a significant acceleration of poverty reduction from the average

annual rate of 1.8 percent experienced during the past decade. To achieve the Goal, Bangladesh needs to sustain a GDP growth rate of about 7 percent per year over the next 15 years (PRB 2003c).

	1991/92	2000	Change per year (%)
Headcount Rate			
National	58.8	49.8	-1.8
Urban	44.9	36.6	-2.2
Rural	61.2	53	-1.6
Poverty Gap			
National	17.2	12.9	-2.9
Urban	12	9.5	-2.5
Rural	18.1	13.8	-2.8
Squared Poverty Gap			
National	6.8	4.6	-3.8
Urban	4.4	3.4	-2.7
Rural	7.2	4.9	-3.8
Gini Index of Inequality			
National	0.259	0.306	2.1
Urban	0.307	0.368	2.3
Rural	0.243	0.271	1.4

Table 7: Bangladesh poverty data (source: BBS/World Bank 2003).

The data shows that progress in reducing rural poverty has been slowest. The IPRSP notes that while agricultural growth will continue to play a major role in rural poverty reduction process, its quantitative impact on poverty reduction will be contingent on diversifying to high-value added crops as well as animal husbandry and the fishery sectors. The same applies to the prospects for the non-farm economy in rural poverty reduction where the key challenge is to provide the poor producers with access to high value-added non-farm activities through improved transport infrastructure.

According to HIES data, the entire decrease in urban poverty during the nineties took place during the first half of the decade while the second half experienced a deterioration in urban poverty. This increase in urban poverty during the second half of the nineties was almost entirely driven by negative growth in real per capita consumption. As discussed in Section 4.1, the resource estimates for interventions relating to income poverty have been addressed as part of the analysis of the following categories.

Hunger

Bangladesh has one of the highest malnourishment rates in the world; 52 percent of children under 5 years and 50 percent of the female population is undernourished (SOFI 2003). As summarized in Table 8, large proportions of the Bangladeshi population continue to live in absolute poverty and suffer from hunger. While significant progress has been made in reducing the number of people who consume less than 1805 kcal per day, the number of absolute poor has not declined during the end of the 1990s. Many suffer from chronic hunger and are in need of nutrition and other anti-hunger interventions.

Per capita consumption in kilo calories	Population in million		Percent of Total	
	1995-96	2000	1995-1996	2000
Poverty line 1: Absolute poverty <2122 k. cal.	55.28	55.91	45%	43%
Poverty line 2: Hard core poverty <1805 k. cal.	29.2	25.2	24%	19%
Poverty line 3: Ultra poverty <1600 k. cal.	16.52	10.34	14%	8%

Table 8: Poverty Lines in Bangladesh (source: BBS 2003).

At the same time, Bangladesh has experienced significant increases in food production in the last few decades. However, growing population pressures and rising demand for food creates fresh challenges, given the limited cultivable land area in the country. The key agricultural interventions for Bangladesh concentrate on maintaining the progress made over the last decade in increasing production (such as introduction of crop varieties and associated practices to promote water use efficiency). Another set of interventions focus around developing markets and income generation by promoting value added food processing, improving connectivity to markets, and extending access to credit to target landless workers who depend only partially on agriculture for their livelihoods.

The cost estimates for Bangladesh focus on providing these interventions to 80 percent of the subsistence farmers (53 percent of total farm households). We assume that at least 10 percent of subsistence farmers are being reached currently. The costs also include reaching at least half the malnourished population among women and adolescent girls and children. The costs for 2005-2015 are summarized in Table 9.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production							
Capital costs	26	68	63	5%	638	58	17%
Operating costs	130	338	314	24%	3,192	290	83%
Total	***156***	***406***	***377***	***29%***	***3,831***	***348***	
Other Rural Income Generation				0%			
Capital costs	36	38	40	3%	416	38	23%
Operating costs	51	126	205	16%	1,394	127	77%
Total	***87***	***164***	***244***	***19%***	***1,810***	***165***	
Nutrition				0%			
Capital costs	**-**			0%	**-**		***0%***
Operating costs	75	299	691	53%	3,645	331	***100%***
Total	***75***	***299***	***691***	***53%***	***3,645***	***331***	
Total cost ($m)	**319**	**869**	**1,312**		**9,286**	**844**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production	1	2	2	29%	23	2.1	42%
Other Rural Income Generation	0.6	1	1	19%	11	1	20%
Nutrition	0	2	4	53%	21	2	39%
Total cost per capita ($)	**2**	**5**	**7**		**55**	**5**	

Table 10: Costs of key Hunger interventions in Bangladesh.

The Table shows that the cost of increasing agricultural productivity is $3.8 billion over the 11-year period. 70 percent of these costs are recurrent, reflecting Bangladesh's already high investments in infrastructure. The costs decline significantly from 2010 to 2015; this is a reflection of the fact that the agricultural interventions over a five-year time frame yield significant increases in food production, thus reducing the target group of food insecure households. The costs of developing markets and income generation are $1.8 billion over the 11-year period, which translates into $1 per capita on an annual basis. The costs for addressing nutrition issues include the cost of school meals, targeted nutrition programs, awareness and education and population-wide fortification programs. These add up to $2 per capita on an annual basis.

Education

Bangladesh is on track for meeting the education goal of 100 percent primary school enrollment by 2015 (PRB 2003b). An important challenge will be to increase gender equality in the education sector and to raise completion rates. The Millennium Development Goal 3 on gender aims at attaining gender parity in school enrolment by 2005. In order to reach this goal, the government needs to implement specific policies to attract and retain girls in school, such as subsidies to girls, provision of girls' toilets and women teachers. To this end the government has initiated different stipend programs to motivate and keep student attentive in study at both primary and secondary and higher secondary level. The government is also prioritizing the recruiting of women for teaching positions to further increase the impetus for achieving full gender equality in primary schools.

However, secondary school completion rates draw a gloomy picture of the education system of Bangladesh. Here one key challenge is to reduce absenteeism among teachers, which is the root cause for the disruption of classes. A second and closely related challenge is to raise completion rates from the current level of less than 20 percent of those who enroll in grade six (Alam and Salimullah, 1992). Some of the root causes that need to be addressed are poor curricula, teaching methods, as well as the lack of proper monitoring of the secondary school education system.

In addition, improved school management is a precondition for improving the performance of secondary school student. The institution of regular school committees, parent-teacher associations and other forms of community participation in management and financing of secondary schools should be encouraged. This challenge will need to be faced boldly to improve secondary school completion rates. Finally, the range of recreational and extra co-curricular activities within the school should be improved, since they attract students to school and also sustain them (Alam and Salimullah 1992).

In order to meet the education goal, Bangladesh would need to target 100 percent primary school enrolment as well as 100 percent primary completion rates by 2015. The costs are estimated based on the total school going population (as identified by calculations drawn from the UN Population Division Projections 2002), using local unit costs. We also estimate the human resource requirements and the number of classrooms needed by 2015 based on best practice norms as discussed in Section 4.3 and summarized in Table 11.

Human Resource and Infrastructure Needs	2005	2010	2015	Total 2005-2015	Average 2005-2015
Number of teachers					
Primary Education	**287,976**	**366,200**	**483,533**	**4,116,047**	**374,186**
Secondary Education	**60,464**	**129,334**	**331,749**	**1,706,613**	**155,147**
Total	***348,440***	***495,535***	***815,282***	***5,822,661***	***529,333***
Number of classrooms					
Primary Education	**197,036**	**287,164**	**483,533**	**3,385,089**	**307,735**
Secondary Education	**56,836**	**125,207**	**331,749**	**1,670,577**	**151,871**
Total	***253,872***	***412,371***	***815,282***	***5,055,666***	***459,606***

Table 11: Human resource and infrastructure needs of the education sector in Bangladesh

For secondary education, we calculate the number of incoming and outgoing students, based on primary school completion and transition rates and drop out rates; for Bangladesh, based on these parameters we estimate the net enrolment rate to rise to 75 percent by 2015. The costs are then calculated by scaling up unit costs. As in the case of primary education, we also calculate the number of teachers and classrooms needed for secondary education. Table 12 below presents these results for Bangladesh.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education							
Capital cost	150	214	409	10%	2,636	240	10%
Operating cost	781	967	1,263	30%	10,867	988	42%
Total	***931***	***1,181***	***1,672***	***39%***	***13,503***	***1,228***	***52%***
Cost per student($)	55	65	86		739	67	
Secondary Education							
Capital cost	51	232	718	17%	3,237	294	12%
Operating cost	241	602	1,781	42%	8,354	759	32%
Total	***291***	***834***	***2,499***	***59%***	***11,591***	***1,054***	***45%***
Cost per student($)	113	156	188		1,706	155	
Adult Literacy							
Capital cost				0%			0%
Operating cost	64	78	88	2%	845	77	3%
Total	***64***	***78***	***88***	***2%***	845	77	**3%**
Cost per student($)	***13***	***13***	***13***		***143***	***13***	
Total cost ($m)	**1,287**	**2,093**	**4,260**		**25,939**	**2,358**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education	6	7	9	39%	80	7	53%
Secondary Education	2	5	14	59%	67	6	44%
Adult Literacy	0.4	0.5	0.5	2%	5	0.5	3%
Total cost per capita ($)	**8.4**	**12.5**	**23.5**		**152.5**	**13.9**	

Table 12: Cost of key Education interventions in Bangladesh.

Table 12 shows that the average annual costs of Primary Education from 2005-2015 are $1.2 billion. Recurrent costs constitute 80 percent of these costs; within this, teachers' salaries approximate 44 percent of total costs. This translates into $55 per student in 2005, rising to $86 per student by 2015.

For secondary education, the costs per student are much higher due to higher teachers salaries, provisions for laboratories, libraries and sports facilities, and higher non-salary recurrent spending. This totals to $155 per student over the entire 11-year period.

Adult literacy costs are estimated at $13 per student, totaling to $77 million per year. This comprises only recurrent costs, since we assume no capital costs for literacy programs. The total cost of education is $25.9 billion for the 11-year period, or $13.9 per capita on an annual basis.

Gender Equality

Even though the pace of improvement in social indicators has been impressive in Bangladesh, this has not often been accompanied by equal improvements in gender equality. A significant gender disparity persists in both income and human poverty, especially at the lower end of the income distribution. The female disadvantage in child mortality has remained persistent, while the female-male gap in acute malnutrition (as measured by the incidence of severe stunting and wasting) has increased over the past decade. On average the incidence of severe malnutrition among girls under five is 2-4 percent higher than among boys (PRB 2003a).

Similarly, households living in extreme poverty are most likely to be headed by a female. Gender inequality is particularly evident in the context of severe malnutrition, mortality and morbidity. Discrimination in terms of sex, wages, hours of work exist. For example,

a female worker tends to receive 57 percent of the wage of a male worker (Alam and Begum 1996).

Gender inequality and violence are the main reasons for deaths of young women. There are increasing reports of violence against women, related to dowry, trafficking and acid throwing. It is estimated that twenty-two percent of female deaths in the10-40 age group can be attributed to violence (Financial Express, 2003).

While the government has undertaken steps to improve the rights of women and young girls, there is a need for stronger enforcement of laws such as the Child Marriage Restraint Act and the Dowry Prohibition Act (Pathey 1999). Under the government's three year Rolling Plan and Annual Development Programs, various initiatives are being taken to further the cause of women like ensuring self-employment, elimination of violence against women, introduction of informal and vocational training, establishment of day-care facilities, hostels for women, assistance for destitute women, food for education, compulsory primary education, free education for secondary girl students in rural areas, health care, immunization etc. Cells for the prevention of repression on women and child and rehabilitation centers for women have been set up to provide legal assistance and counseling against repression on women and child (PRB 1998).

Gender equality is an extremely difficult goal that requires complex cultural, social and economic changes. We attempt a partial estimation of the resources and policies needed to achieve the gender goal, with particular attention to awareness programs, sensitization and training, violence prevention and systemic issues. Of these, vocational training-- programs focus on training adolescent girls in secondary school by building skill sets that can be applied in the workforce-- consistently encompasses over 60 percent of the total per capita costs in Bangladesh. Other cost components include the creation and operation of women's ministries within the governments. We use existing budgets from benchmark countries (those that are on track to meet the gender MDG) to estimate these costs.

Comprehensive responses to violence against women form the final component of our estimates; these include the costs of prevention, protection and punishment of offenders.

The cost estimates target at least half the target populations for the sensitization and awareness campaigns at the school, community and national level. The costs of training women candidates for electoral office are also included, and the estimates cover all women candidates by 2015. The total costs are presented below.

Total cost estimates in 2000 US$ million	2005	2010	2015	Total 2005-15	Average 2005-15
Total ($m)	251	353	381	3,698	336
Total cost per capita ($)	1.6	2.1	2.1	22	**2**

Table 13: Costs of key gender interventions in Bangladesh 2005-2015

The partial cost of gender interventions to meet the MDG on Gender Equality is estimated at $3.6 billion over the 11-year period. This translates into an annual cost of $2 per capita.

Health

In Bangladesh, major health problems include acute respiratory infections, TB and diarrhea. The country has made substantial progress in reducing maternal mortality rates and is on track towards meeting the infant mortality MDG Target (PRB 2003a).

Although HIV/AIDS detection is low, risky behavior is very common among some vulnerable groups since sex workers in Bangladesh have more partners than anywhere else in Asia and almost everyone buying sex in Bangladesh is having unprotected sex. A 2001 report by WHO reported an estimated 13,000 adults living with HIV in Bangladesh (WHO 2002c). However, this figure is expected to rise sharply since insufficient attention is given to prevention and treatment of this disease. Gender equality and empowerment of women will reduce the vulnerability of women and girls especially adolescents (both sexes) to the threat of HIV/AIDS.

The malaria threat in Bangladesh is deepening in parts of the country although aggregate statistics suggest a progressive lowering of the incidence during the last four years. While 13 of the 64 districts in the country are particularly affected, the impoverished populations living in the remote hill tracts and adjacent districts of East and Northeast border of the country are most affected (Mahmood et al. 2000). National mechanisms to combat malaria have been weakened due to insufficient resources, poor surveillance, rising drug resistance, prohibitive costs of insecticides, and poor community mobilization.

Currently, only 30 to 50 percent of those diagnosed with TB are adequately treated; the remainder of the population continues to transmit the infection. Each uncured patient infects approximately 10 persons each year, increasing the pool of sources of infection. Without ensuring "directly observed treatment" (WHO Regional Office for South-East Asia 1999) and making services accessible for all patients, there is every reason to believe that the situation with regard to tuberculosis will in fact worsen with the emergence of multi-drug resistant TB and HIV/TB co-infection.

In addition to these specific health challenges, the health system suffers from lack of funding and adequate management. Patients with access to health services in Bangladesh face many problems including doctor absenteeism, inadequate nursing services, lack of adequate diagnostic facilities, overcrowding, and lack of doctors' sensitivity to female patients.

Our resource estimates for health interventions in Bangladesh for the MDG specific diseases and the health system is presented below. An important driver of cost in the later years is AIDS treatment. This is based on the assumption that AIDS prevalence increases from its current rate of 0.02 to the higher rates seen in the region (2.7 percent). The large increase in cost is also reflective of notably low current coverage levels in child health and maternal health. It is estimated, for example, that only 12.1 percent of deliveries are currently performed by a skilled attendant (PRB 2001).

Bangladesh

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
HIV/AIDS Prevention	65	129	164	3%	1,370	125	4%
HIV/AIDS Care	1	1	1	0%	11	1	0%
HIV/AIDS Treatment	39	401	783	16%	4,435	403	12%
TB	32	35	37	1%	380	35	1%
Malaria Prevention	41	81	123	2%	896	81	2%
Malaria Treatment	61	139	149	3%	1,379	125	4%
Maternal Heath	236	372	499	10%	4,135	376	11%
Child Health	344	586	777	16%	6,356	578	17%
Management	163	349	507	10%	3,792	345	10%
Quality improvement	123	262	380	8%	2,844	259	8%
Human resources (salary incr.)	327	698	1,014	20%	7,585	690	20%
Community demand	59	140	235	5%	1,570	143	4%
R&D capacity	16	35	51	1%	379	34	1%
Infrastructure recurrent costs	247	247	247	5%	2,713	247	7%
Total cost ($m)	**1,751**	**3,473**	**4,968**	**100%**	**37,844**	**3,440**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
HIV/AIDS Prevention	$ 0.4	$ 0.8	$ 0.9	3%	$ 0.7	4%
HIV/AIDS Care	$ 0.0	$ 0.0	$ 0.0	0%	$ 0.0	0%
HIV/AIDS Treatment	$ 0.3	$ 2.4	$ 4.3	16%	$ 2.4	12%
TB	$ 0.2	$ 0.2	$ 0.2	1%	$ 0.2	1%
Malaria Prevention	$ 0.3	$ 0.5	$ 0.7	2%	$ 0.5	2%
Malaria Treatment	$ 0.4	$ 0.8	$ 0.8	3%	$ 0.8	4%
Maternal Heath	$ 1.5	$ 2.2	$ 2.8	10%	$ 2.2	11%
Child Health	$ 2.3	$ 3.5	$ 4.3	16%	$ 3.5	17%
Management	$ 1.1	$ 2.1	$ 2.8	10%	$ 2.1	10%
Quality improvement	$ 0.8	$ 1.6	$ 2.1	8%	$ 1.5	8%
Human resources (salary incr.)	$ 2.1	$ 4.2	$ 5.6	20%	$ 4.1	20%
Community demand	$ 0.4	$ 0.8	$ 1.3	5%	$ 0.9	4%
R&D capacity	$ 0.1	$ 0.2	$ 0.3	1%	$ 0.2	1%
Infrastructure recurrent costs	$ 1.6	$ 1.5	$ 1.4	5%	$ 1.5	7%
Total cost per capita ($)	**11**	**21**	**27**	**100%**	**21**	**100%**

Table 14: Cost of Health interventions in Bangladesh.

Table 15 below shows a very rough estimate of the human resource needs (doctors and nurses/midwives) that may be required to roll out the full set of preventive and treatment interventions by 2015. We emphasize that this is a highly preliminary number calculated here to indicate the order of magnitude of the need.

Health human resource needs	Current	2015
Doctors	29,933	57,752
Nurses/midwives	32,900	144,365

Table 15: Projected Human Resource needs in Bangladesh for the Health Sector by 2015.

To summarize, Bangladesh will need an average of $21 per capita annually in health spending to address the MDGs over the 11 years. In contrast, in 2001, the health spending was $12, with $5 coming from the government. There are of course other health priorities in Bangladesh including the prevention and treatment of arsenic poisoning, which would add to these costs. In terms of human resources, Bangladesh will need to invest heavily in a long-term human resources strategy to achieve the health MDGs.

Environmental Sustainability

The viability of Bangladesh's economy has been in question since its birth in 1971, because of its high population density, poor natural resource base, vulnerability to natural disasters, and high dependence on few agricultural commodities. For this reason environmental degradation is imposing a heavy burden on Bangladesh.

The economic and social consequences of land degradation in the country have been immense. They are accentuated by the fact that a substantial proportion of the poor is particularly vulnerable to the slightest change in the environment. Key drivers of land degradation are (i) increase in salinity of soil, (ii) accumulation of sediments of sand and stone, and (iii) brick kilns on cultivable land. Land degradation also arises from water logging and salinization due to the construction of unplanned embankments, inadequate and faulty construction of sluice gates and lack of suitable drainage facilities. Awareness campaigns may be one of the best ways to combat the different causes of land degradation.

The severe arsenic contamination – an emerging environmental disaster for some parts of Bangladesh – is thought to be the result of changing land use. The gradual lowering of the water table facilitates the oxidation of arsenic, which makes the metal water-soluble and in turn increases its bioavailability.

Air pollution is also a serious environmental hazard for urban populations. Mainly energy consumption, vehicular emissions and industrial production are responsible for air pollution. The most serious health risks arise from exposure to suspended particulate matters, indoor air pollution and lead concentration. The use of high sulfur fuel is also a contributing factor to air pollution**.** To reduce urban air pollution, CNG refueling facilities that are already in place in Dhaka and Chittagong, will be extended to other cities and municipal areas.

As detailed in Section 4.6, several sets of interventions directly relating to the environment, such as access to clean energy services and water treatment, are included as part of the analysis of other sectors. At this point we do not have access to sufficient information to calculate the requirements in terms of human and financial resources for the remaining interventions for ensuring environmental sustainability.

Water and Sanitation

Bangladesh's drinking water and sanitation policies have focused on making water and sanitation services available to all in the shortest time and at a reasonable price. The primary strategy has been to increase the number of tube-wells. In response, millions of shallow tube-wells were installed in Bangladesh since the commencement of the 1970s.

The country now has very high access to safe drinking water in both rural and urban areas and has already reached the corresponding MDGs. However, access to improved sanitation, while increasing, remains low at 35 percent in rural areas and 74 percent in urban areas, as summarized in Table 16. The Government of Bangladesh has decided to achieve the sanitation target by 2010, far ahead of the Millennium Development Goal of 2015. This major challenge may be achievable, but it will require the infusion of major resources into the water and sanitation sector.

Water and sanitation targets Bangladesh	1990	2000	2005	2010	2015	Total 05-15
Water supply						
Total access - urban (%)	99%	99%	99%	99%	100%	
Population provided with access each year - urban			829,973	1,941,578	2,149,727	20,598,553
Total acces - rural (%)	93%	97%	98%	98%	98%	
Population provided with access each year - rural			2,067,599	944,951	673,032	11,046,473
Sanitation						
Total access - urban (%)	71%	74%	76%	81%	86%	
Population provided with access each year - urban			1,021,304	2,038,162	2,398,393	21,914,016
Total acces - rural (%)	11%	35%	41%	48%	56%	
Population provided with access each year - rural			2,471,781	2,176,098	2,157,247	24,046,369

Table 16: Water and Sanitation targets in Bangladesh.

However, in particular the rural areas in Bangladesh suffer from poor water quality. Surface water supplies are generally polluted and groundwater, which till now had been the best source of safe drinking water, is contaminated with arsenic in many parts of the country. It is estimated that a total of 46-57 million people in Bangladesh may be exposed to arsenic poisoning (PRB 2002a).

Chronic exposure to arsenic leads to skin lesions, neurological problems, diabetes, both skin and internal cancers, with an estimated lifetime risk of cancer equal to 1 case per 100 exposed individuals. Unfortunately, no proven and affordable technologies exist yet to safely remove arsenic from drinking water. On an experimental basis, patients with non-cancerous skin lesions are being advised to use antioxidant vitamins (vitamins A, E and C) at an estimated cost of Taka 1,500 (nearly US $30) per patient per year. Spirulina (a sea-weed based protein supplement) has also been suggested, at an estimated cost of Taka 6,600 (a little over US $100) per patient per year (PRB 2002b).

In many areas heavy withdrawals of groundwater for irrigation have also lowered the water tables below the effective reach of hand tube-wells. Seepage of agro-chemicals into shallow aquifers further contributes to the pollution of water used for human and animal consumption. In the southwest of the country salinity intrusion from seawater is rendering groundwater unfit for consumption. Cities and urban areas too are facing the problem of receding water table due to heavy groundwater extraction.

These water supply and sanitation problems have obvious implications for public health. Diarrhea diseases, arising largely from drinking unsafe water, is a leading cause of death in the rural areas as almost 110,000 children below the age of five die of diarrhea every year because of inadequate sanitation (PRB 2003d). Lack of proper sanitation and drainage facilities, inadequate water supply, and insufficient health and hygiene education are the primary causes of diseases in the urban areas. Lack of access to safe water supply in the rural areas is a special hardship for women who have to carry water over long distances, with significant impact on their health and productivity.

Our estimates of the financial resources required to meet the Goals are summarized in Table 17. They are based on unit costs drawn from a number of sources, including BIDS and WHO/UNICEF.

Bangladesh	Water and sanitation						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Water provision							**0%**
Capital cost - rural	50.64	35.72	32.79	3%	402.07	36.55	4%
Operating cost - rural	70.21	84.56	98.56	8%	929.27	84.48	9%
Subtotal rural	***120.85***	***120.29***	***131.34***	***11%***	***1,331.35***	***121.03***	***13%***
Capital cost - urban	69.56	125.95	138.34	11%	1,348.78	122.62	13%
Operating cost - urban	174.30	244.25	320.96	26%	2,702.33	245.67	26%
Subtotal urban	***243.86***	***370.19***	***459.30***	***38%***	***4,051.12***	***368.28***	***38%***
Total	**364.70**	**490.48**	**590.64**	**48%**	**5,382.46**	**489.31**	**51%**
Sanitation							
Capital cost - rural	52.65	47.76	49.07	4%	529.99	48.18	5%
Operating cost - rural	16.28	26.16	38.22	3%	292.51	26.59	3%
Subtotal rural	***68.93***	***73.92***	***87.29***	***7%***	***822.50***	***74.77***	***8%***
Capital cost - urban	90.06	150.46	182.73	15%	1,641.21	149.20	16%
Operating cost - urban	84.15	139.65	214.29	18%	1,578.70	143.52	15%
Subtotal urban	***174.21***	***290.11***	***397.02***	***33%***	***3,219.91***	***292.72***	***31%***
Total	**243.15**	**364.03**	**484.31**	**40%**	**4,042.41**	**367.49**	**38%**
Waste Water Treatment							
Rural	-	-	-	0%	-	-	0%
Urban	34.84	69.50	114.39	9%	787.69	71.61	7%
Total	***34.84***	***69.50***	***114.39***	***9%***	***787.69***	***71.61***	***7%***
Hygiene Education	**26.65**	**28.47**	**30.29**	**2%**	**313.21**	**28.47**	**3%**
Total cost ($m)	**669.34**	**952.48**	**1,219.63**	**100%**	**10,525.78**	**956.89**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Water provision						
Capital cost - rural	0.3	0.2	0.2	3%	0.2	4%
Operating cost - rural	0.5	0.5	0.5	8%	0.5	9%
Subtotal rural	***0.8***	***0.7***	***0.7***	***11%***	***0.7***	***13%***
Capital cost - urban	0.5	0.8	0.8	11%	0.7	13%
Operating cost - urban	1.1	1.5	1.8	26%	1.5	26%
Subtotal urban	***1.6***	***2.2***	***2.5***	***38%***	***2.2***	***38%***
Total	**2.4**	**2.9**	**3.3**	**48%**	**2.9**	**51%**
Sanitation						
Capital cost - rural	0.3	0.3	0.3	4%	0.3	5%
Operating cost - rural	0.1	0.2	0.2	3%	0.2	3%
Subtotal rural	***0.5***	***0.4***	***0.5***	***7%***	***0.4***	***8%***
Capital cost - urban	0.6	0.9	1.0	15%	0.9	16%
Operating cost - urban	0.6	0.8	1.2	18%	0.9	15%
Subtotal urban	***1.1***	***1.7***	***2.2***	***33%***	***1.8***	***31%***
Total	**1.6**	**2.2**	**2.7**	**40%**	**2.2**	**38%**
Waste Water Treatment						
Rural	-	-	-	0%	-	0%
Urban	0.2	0.4	0.6	9%	0.4	7%
Total	***0.2***	***0.4***	***0.6***	***9%***	***0.4***	***7%***
Hygiene Education	**0.2**	**0.2**	**0.2**	**2%**	**0.2**	**3%**
Total cost per capita ($)	**4.4**	**5.7**	**6.7**	**100%**	**5.7**	**100%**

Table 17: Cost of key Water and Sanitation interventions in Bangladesh.

Overall, Bangladesh is projected to require an average of $4.9 per capita over the eleven-year period to meet the water and sanitation goal. This need is lower than in many other countries, reflecting the high rates of access the country already enjoys as well as the comparatively low population growth rate. As a result, a particularly large share of the incremental resources will need to be devoted to operation and maintenance expenditures and to investments that maintain current access levels to drinking water in the face of falling water tables. We emphasize that in the absence of a clear consensus on how best to prevent and treat widespread arsenic poisoning, our preliminary cost estimates do not include an assessment of the corresponding resource requirements.

Improving the Lives of Slum Dwellers

Large-scale internal migration to the metropolitan cities, and particularly to the capital city of Dhaka, will continue. However, the potential benefits of life in cities, fail to reach

the majority of the poor migrants. As a result, many of the migrants live in very poor housing with some living without a shelter.

Bangladesh currently has no clear-cut policy for urban management. One-third of the urban population lives in extreme conditions of poverty, congestion and lack of basic amenities like water, sewerage, and electricity (Begum 1997). Local authorities are unable to reconcile the demand for services with service availability. Slums and squatters record high infant mortality compared to the rural areas. Despite the problems of air, water and noise pollution, congestion, crime and health, migrants from rural areas continue to migrate to the cities (Begum 1999). Slums suffer from lack of basic amenities like water and sanitation, which impinge directly upon the health and earning opportunities of the poor. Roads and infrastructure, electricity, garbage disposal, drainage and livable environment within the low-income communities are minimum or absent. Hence crucial livelihoods are threatened (Begum 1999). At present only 14 percent of slum households in the metropolitan cities have sanitary latrines (PRB 2003e). UN-Habitat (2003) estimates that around 85 percent of the urban population live in slum-like conditions – a figure that underlines the gravity of human deprivation in Bangladesh' cities.

As discussed in Section 4.8 above, we have not yet been able to calculate robust resource requirements for meeting Target 11 in Bangladesh. For this reason the financial requirements of this sector are not included in the subsequent analysis.

Science and Technology

A central institution for promoting science and technology is the Bangladesh Council of Scientific and Industrial Research, which consists of 29 research divisions, 8 research centers, which has been functioning as a premier industrial research organization since 1960. It is estimated that twenty industries have been established based on work developed by this institution (PRB 2002c).

To break the monopoly in the telecommunication sector, the Government permitted Bangladesh Telecom Private Ltd. to operate radio trunking, cellular radiotelephone, maritime radiotelephone network and paging. Subsequently the government also has awarded cellular mobile phone license to three private organizations in 1996. Introduction of mobile phones in Bangladesh has brought a remarkable change in every sectors of the economy.

At this stage insufficient information was available for calculating resource requirements for promoting science and technology in Bangladesh, including the improvement and extension of university education and research, science advice, and ICT infrastructure. As a result, our preliminary analysis does not include the investment needs for these sets of interventions.

Energy

Electrification rates in Bangladesh are extremely low relative to the rest of Asia. While only 25 percent of the urban population and 10 percent of the rural population in Bangladesh is electrified, approximately 41 percent of the South East Asia population

and 87 percent of East Asia is electrified. The vast majority of Bangladesh's population, therefore, is dependent on inefficient and relatively low luminosity fuels, such as kerosene, for lighting. On the cooking side, only about one half of the urban population has access to modern fuels. In rural areas, charcoal and unprocessed biomass dominate. In regard to supply, power plants are presently underutilized, with plants operating at about 2/3 of maximum capacity.

On the energy supply side, current installed power generation capacity totals 3.6GW, composed of hydropower and thermal facilities, and annual electricity generation is estimated to be 14,000 GWh. Households consume only 10 percent of electricity generated. Power plants are presently underutilized, with plants operating at about 2/3 of maximum capacity.

Applying the coverage targets laid out in Section 4.10 to Bangladesh results in an increase in electrification rates to 39 percent in urban areas, and 21 percent in rural areas—reaching an additional 4.9 million households in total between 2005 and 2015. On the cooking side, the proportion of the population with access to cleaner cooking methods will grow by 12 millions households. Increased demand for electricity from households, educational- and healthcare facilities, and industry will require a 65 percent increase in annual power supply. Table 18 summarizes the projected investments needs in the energy sector for Bangladesh.

Total cost estimates for Bangladesh in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Rural							
Devices	183	224	255	9%	2,452	223	8%
Fuels	1,022	1,055	1,085	37%	11,515	1,047	36%
Electricity	725	703	612	21%	7,565	688	23%
Subtotal rural	***1,931***	***1,982***	***1,953***	***66%***	***21,532***	***1,957***	***66%***
Urban							
Devices	195	225	247	8%	2,459	224	8%
Fuels	394	473	562	19%	5,208	473	16%
Electricity	320	303	209	7%	3,228	293	10%
Subtotal urban	***909***	***1,000***	***1,019***	***34%***	***10,895***	***990***	***34%***
Total cost ($)	**2,839**	**2,983**	**2,972**	**100%**	**32,426**	**2,948**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Rural						
Devices	1.2	1.3	1.4	9%	1.3	8%
Fuels	6.7	6.3	6.0	37%	6.3	36%
Electricity	4.8	4.2	3.4	21%	4.1	23%
Subtotal rural	***12.7***	***11.9***	***10.8***	***66%***	***11.7***	***66%***
Urban						
Devices	1.3	1.3	1.4	8%	1.3	8%
Fuels	2.6	2.8	3.1	19%	2.8	16%
Electricity	2.1	1.8	1.2	7%	1.8	10%
Subtotal urban	***6.0***	***6.0***	***5.6***	***34%***	***5.9***	***34%***
Total per capita costs	**18.6**	**17.8**	**16.4**	**100%**	**17.6**	**100%**

Table 18: Cost of key Energy interventions in Bangladesh.

Total per capita costs are particularly high at the beginning of the period since Bangladesh will need to build additional generation capacity to expand access to electricity. The costs for additional capacity have been projected linearly across the 11-year period. The results show that investments in rural energy would require approximately three quarters of total resources.

Not included in these summary results is the cost of increasing generation capacity and providing electricity for industrial needs. We estimate the corresponding resource requirements to amount to roughly $7.2 billion dollars for the period from 2005 to 2015. Due to capacity constraints, these investments will need to be initiated as early as 2005.

Transport Infrastructure

The three main modes of internal transport in Bangladesh are roads, rail, and waterways with an increasing emphasis on the former. Both the quantity and quality of the railways have declined over recent decades. Similar declines have been seen in the waterway system as many rivers have become less navigable over time.

Since the lack of adequate road infrastructure is considered to severely hinder economic development in Bangladesh, the government has recently placed increased emphasis on the sector. As a result, the system has improved considerably and businesses report few complaints about its quality. Despite improvements in the system, costs of transport, construction, and maintenance remain high due to topographical obstacles such as the extensive river system, periodic flooding, and poor soil conditions.

The establishment of the South Asian Growth Quadrangle (SAGQ) amongst Bangladesh, Bhutan, India and Nepal also promises to facilitate transport for Bangladesh. Amongst other goals, the SAGQ aims to develop the region's transport infrastructure to facilitate intra-regional trade. However, the current lack of transshipment facilities hinders cross-border trade (Asian Trade Hub 2003).

As a basis for estimating the investment needs in the roads sector, we project that Bangladesh's per capita density of roads increases to 0.5km per 1000 people. By keeping constant the relative shares of national, district and local feeder roads, we calculate the investment requirements summarized in
Table 19.

Bangladesh	Roads						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Road construction							
Two-lane highway	592	592	592	17%	6,509	592	19%
Two-lane road	1,407	1,407	1,407	41%	15,477	1,407	44%
One-lane road	592	592	592	17%	6,507	592	19%
Total	**2,590**	**2,590**	**2,590**	**75%**	**28,494**	**2,590**	**82%**
Road O&M							
Two-lane highway	175	235	294	9%	2,580	235	7%
Two-lane road	122	263	404	12%	2,894	263	8%
One-lane road	25	84	143	4%	926	84	3%
Total	**323**	**582**	**841**	**25%**	**6,400**	**582**	**18%**
Total cost ($m)	**2,913**	**3,172**	**3,431**	**100%**	**34,893**	**3,172**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Road construction						
Two-lane highway	3.9	3.5	3.3	17%	3.5	19%
Two-lane road	9.2	8.4	7.8	41%	8.4	44%
One-lane road	3.9	3.5	3.3	17%	3.5	19%
Total	**17.0**	**15.5**	**14.3**	**75%**	**15.5**	**82%**
Road O&M						
Two-lane highway	1.1	1.4	1.6	9%	1.4	7%
Two-lane road	0.8	1.6	2.2	12%	1.6	8%
One-lane road	0.2	0.5	0.8	4%	0.5	3%
Total	**2.1**	3.5	4.6	**25%**	**3.5**	18%
Total cost per capita ($)	**19.1**	**19.0**	**18.9**	**100%**	**19.0**	**100%**

Table 19: Cost of key Road Infrastructure interventions in Bangladesh.

We emphasize that our approach to calculating resource requirements for the road sector, while providing the right order of magnitude of required investments, is not well suited for developing detailed country-level road sector plans. These must instead be based on detailed assessments of local demand for transport as well as the country's topography. As a result, the national target of reaching 0.5km of paved roads per 1000 people as well as unit costs may change.

Financing

The total costs estimated for Bangladesh will need to be financed through a combination of private household contributions, domestic government spending, and external assistance. We disaggregate these sources of financing by first estimating the contributions that households can make and projecting the scope for domestic government resource mobilization for the MDGs. Additional resources required to meet the Goals will then need to be externally financed.

The share of household contributions is based on both the ability to pay and the incentive effects of user charges. To calculate the ability to pay, we use national poverty data on the proportion of people living below the poverty line and the income distribution data across quintiles to divide the population into three categories based on their income: those who cannot afford to contribute at all towards meeting the goals (population below the poverty line), those who can contribute partially (population between the poverty line

and two times the poverty line) and those who can contribute the full cost of most interventions (population above two times the poverty line).[50]

As discussed in the introduction, we assume that health and primary education are publicly provided and funded, and therefore estimate no household contributions for interventions related to those goals. For secondary education, agricultural interventions, water and sanitation, and energy services, we estimate partial cost recovery.[51]

We calculate the share of total expenditure devoted to the MDG sectors (including social and economic services) at approximately 41 percent[52]. We then multiply this share with government revenues to get the total domestic spending on the MDGs.[53] In the case of Bangladesh; this translates into domestic spending on the MDGs of 4.3 percent of GDP. We assume that domestic spending will increase by 4 percentage points by 2015, increasing the share of domestic resources spent on the MDGs to 8.3 percent of GDP.[54] On a *pro forma* basis we allocate projected domestic government spending to sectors according to the sectors' share of total costs. External financing is then calculated as the difference between total resource requirements and spending by both households and governments.

Summary of Costs and Financing Results

The following table presents the total cost estimates and financing results for Bangladesh, both in total amounts and in per capita terms.

[50] The Bangladesh national poverty line is defined in Section 0 above. The income distribution data is taken from WDI 2003.

[51] For a detailed description of the proportion of costs in these areas that are borne by households, please refer to Table 5

[52] Table 16, Statistical Appendix, IMF Country Report, http://www.imf.org/external/pubs/ft/scr/2003/cr03194.pdf

[53] Revenue and expenditure data is taken from Table 13: Central Government Operations 1997-2002, Statistical Appendix, IMF country report 03/194 http://www.imf.org/external/pubs/ft/scr/2003/cr03194.pdf

[54] For a complete discussion of the assumptions behind this analysis please refer Section 5 above.

Summary of projected financial resources required for meeting the MDGs in Bangladesh

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
Total Cost (Sum of A+B+C below)	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	319	2.1	869	5.2	1,312	7.2	9,286	844	5.1	0.9%
Education	1,287	8.4	2,093	12.5	4,260	23.5	25,939	2,358	14.1	2.5%
Gender Equality	251	1.6	353	2.1	381	2.1	3,698	336	2.0	0.4%
Health	1,751	11.5	3,473	20.8	4,968	27.4	37,844	3,440	20.6	3.7%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	669	4.4	952	5.7	1,220	6.7	10,526	956.9	5.7	1.0%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	2,839	18.6	2,983	17.8	2,972	16.4	32,426	2,948	17.6	3.1%
Roads	2,913	19.1	3,172	19.0	3,431	18.9	34,893	3,172	19.0	3.4%
Total	**10,028**	**65.7**	**13,895**	**83.1**	**18,544**	**102.2**	**154,613**	**14,056**	**84.1**	**15.0%**

Summary of projected sources of financing in Bangladesh

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
A. Household Contributions	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	93	0.6	250	1.5	745	4.1	3,471	316	1.9	0.3%
Gender Equality	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Health	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	260	1.7	372	2.2	485	2.7	4,120	374.6	2.2	0.4%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	614	4.0	674	4.0	727	4.0	7,364	669	4.0	0.7%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Total	**966**	**6.3**	**1,296**	**7.8**	**1,957**	**10.8**	**14,955**	**1,360**	**8.1**	**1.4%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
B. Domestically Financed Government Expenditures ***	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	91	0.6	315	2.1	574	3.8	3,449	314	1.9	0.3%
Education	367	2.4	759	4.5	1,865	10.3	9,634	876	5.2	0.9%
Gender Equality	71	0.5	128	0.8	167	0.9	1,373	125	0.7	0.1%
Health	499	3.3	1,260	7.5	2,175	12.0	14,056	1,278	7.6	1.4%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	191	1.3	346	2.1	534	2.9	3,909	355.4	2.1	0.4%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	810	5.3	1,082	6.5	1,301	7.2	12,043	1,095	6.6	1.2%
Roads	831	5.4	1,151	6.9	1,502	8.3	12,960	1,178	7.1	1.3%
Total	**2,860**	**18.7**	**5,041**	**30.2**	**8,120**	**44.8**	**57,424**	**5,220**	**31.2**	**5.6%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
C. Required Total External Budget Support	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	228	1.5	554	3.1	738	3.5	5,837	531	3.2	0.6%
Education	827	5.4	1,084	6.5	1,650	9.1	12,834	1,167	7.0	1.2%
Gender Equality	179	1.2	225	1.3	214	1.2	2,324	211	1.3	0.2%
Health	1,252	8.2	2,213	13.2	2,793	15.4	23,789	2,163	12.9	2.3%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	219	1.4	235	1.4	200	1.1	2,496	227	1.4	0.2%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	1,416	9.3	1,227	7.3	944	5.2	13,019	1,184	7.1	1.3%
Roads	2,082	13.6	2,021	12.1	1,929	10.6	21,934	1,994	11.9	2.1%
Total	**6,202**	**40.6**	**7,558**	**45.2**	**8,467**	**46.7**	**82,234**	**7,476**	**44.7**	**8.0%**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above

Table 20: Summary of projected total costs and sources of financing in Bangladesh

We estimate that in order to meet the MDGs, Bangladesh will need to spend a total of $66 per capita in 2005 increasing to $102 by 2015 to meet the MDGs. This translates into a total investment need of $155 billion between 2005 and 2015, which is equivalent to an average annual per capita need of $84. Of the $84, we estimate that $39 will be financed domestically through household and government contributions. ODA commitments to Bangladesh were $1186.3 million in 2001, or $8.4 per capita. In comparison, we project an average external financing need of approximately $45 per capita between 2005 and 2015.

When interpreting these results, it is important to note the gaps in the current analysis. As described in detail in Section 4 we have so far not been able to include a number of interventions for each sector or area. In the case of Bangladesh, the missing interventions, which might have the strongest impact on the overall results, are summarized in the box below.

Important cost factors not included in these resource estimates for Bangladesh

- Prevention and treatment of arsenic poisoning,
- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions to ensure environmental sustainability,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

Cambodia Country Study

Kao Kim Hourn
Ray Zepp
University of Cambodia

In collaboration with the Millennium Project secretariat

8. Cambodia Country Study

MDG status

Cambodia is a country recovering from prolonged conflict where the foundations for human development and economic growth need to be restored. Today, nearly 36 percent of Cambodia's population lives below the national poverty line, although this has improved somewhat over the past six years. There is significantly more poverty in the rural areas versus urban areas (40 percent in rural versus 25 percent in urban) according to a Ministry of Planning survey in 1999. 11.5 percent of the population in 1999 was below the food poverty line.

Cambodia has one of the highest prevalence rates of HIV in the region at 2.6 percent in 2002. Net enrollment and young adult literacy rates in 2001 have shown improvement since 1997. The ratio of girls to boys in primary school was 87 percent in 2001. Women's participation in the National Assembly is 11.4 percent, which represents a near doubling from 1993. Water and sanitation are major challenges for Cambodia, especially in rural areas where 30 percent and 8 percent of the population had access to water and sanitation, respectively. Table 21 below shows a snapshot of Cambodia's progress toward the MDGs.

Indicator	Starting year value (1990)	Ending year value (2000)	Linearly projected 2015 value	MDG target value	Status
Proportion below national poverty line	0.39 (1993)	0.36 (1999)	0.28	0.20	Off Track
Prevalence of Underweight Children	0.69	0.48	.17	.35	On Track
Primary enrollment	0.78 (1997)	0.87 (2001)	1.00	1.00	On Track
Ratio female enrollment primary	0.82 (1997)	0.87 (2001)	1.00	1.00	On Track
Ratio female enrollment secondary	0.51 (1997)	0.61 (2001)	0.96	1.00	Off Track
Literacy of 15-24 year olds	0.80 (1997)	0.82 (1999)	0.98		
U5MR (per 1000)	200	125	12.5	66.7	On Track
Infant Mortality Rate	80	95	117.5		
%with access to improved water (rural)	29%	29%	29%	65%	Off Track
% with access to improved sanitation (rural)	8%	8%	8%	54%	Off Track
% with access to improved water (urban)	58%	58%	58%	79%	Off Track
% with access to improved sanitation (urban)	53%	53%	53%	77%	Off Track

Table 21: Status of Progress towards the MDGs in Cambodia [55]

Geography and Politics

Located in Southeast Asia, Cambodia is bordered by Vietnam on the East, Laos PDR on the North, Thailand on the West, and the Gulf of Thailand on the South. Its land area is 181,000 square kilometers. Cambodia is predominantly flat, and is covered in the center and south with tropical agriculture, mostly rice. Forested mountains cover the northeast along the Vietnam border and the West along the Thai border.

Cambodia is a nominal Monarchy/Democracy with King, Prime Minister, and elected National Assembly. The country has been politically stable since the end of hostilities with the Khmer Rouge in 1996, but political impunity, a weak judiciary, and extra-judicial murders lead to a climate of fear and uncertainty.

[55] Water and sanitation data personal communication WHO/UNICEF; all other data from Council for Social Development (2003).

Population

Cambodia has a population of approximately 12-13 million (11.4 million in 1998 census), which breaks down to 5.5 million males, 5.9 million females. Its population growth rate is 2.5 percent p.a. In the 1998 census, 43 percent of population was below age 15 and rising rapidly. 85 percent of the population lives in rural areas. The population is sparse in the northeastern part of Cambodia. 90 percent of Cambodians are ethnic Khmer or Khmer Chinese. Small minority groups include the Muslim Chams, and hill tribes in the northeastern forests (CSD 2003).

Cambodia's fertility rate was 4.00 per woman in 2000, down from 5.56 in 1990 and 6.29 in 1960 (World Bank 2003d). This is still nearly twice the rate of the East Asia Pacific region where average fertility in 2000 was 2.12. This contributes to a population growth rate of 2.01 percent versus the region's growth rate of 0.93 percent. As a result nearly 44 percent of Cambodia's population is below 15 years of age – a share that has stayed relatively constant since 1960 (World Bank 2003d).

Economy

Cambodia's per capita GDP grew from US$ 259 in 2001, to $273 in 2002, a growth rate of 5.4 percent, with a total GDP of US$ 3.6 billion in 2002. The annual GDP growth rate between 1990 and 2000 was 5.0 percent. The government's budget outlay in 2003 was US$ 666 million (cf. revenues $441 million) (CSD 2003).

Agriculture dominates the economy, contributing an estimated 39 percent of GDP at current market prices in 2001. Agriculture accounted for 46 percent of GDP in 1997. In 2001 industry (comprising mining, manufacturing, construction and utilities) accounted for 21.9 percent of GDP at current market prices, up considerably from 1997, when it accounted for 15.2 percent. The manufacturing sector's contribution to GDP was 15.7 percent of GDP in 2001 (CEIU 2003).

PRSP/PRGF

In its recent PRSP, Cambodia set several priority targets: (CSD 2002):

- Poverty Headcount index (from 36 in 1999 to 31 in 2005),
- Real GDP average annual growth rate (from 5.4 percent in 2000 to 6-7 percent 2001-05),
- Infant Mortality Rate (from 89/1000 in 1998 to 65/1000 in 2005),
- Maternal Mortality Ratio (from 473/100000 in 1998 to 200/100000 in 2005),
- Children under 5 with moderate/severe stunting (decrease of 1.5 percent per year),
- Percent of 12 year-olds completing grade 6 (from 33 in 1998 to 90 in 2005),
- Share of population – both rural and urban -- with access to safe drinking water and,
- Share of population rural and urban with access to sanitation facilities.

Planned Government priority programs include:

- land reform and land titling,
- pro-poor investments such as tourism, community forestry and fisheries,
- rural roads and mine clearance,

- judicial reform,
- scholarships for poor students,
- exemption mechanisms for poor at government hospitals,
- higher teacher salaries,
- nutrition education,
- training and rehabilitation programs for the poor,
- expanded coverage of Village Development Committees (VDCs).

The government plans to spend US$ 450 million on the priority areas in 2003, increasing to $576 million by 2005.

Donor assistance

Cambodia suffered a loss of foreign financial assistance in 1997-98 following the military takeover by Hun Sen and poor budgetary management. However, relations with international donors returned to normal after the present government was put in place in November 1998. In October 1999 the IMF resumed lending in the form of a three-year US$82m enhanced structural adjustment facility. The World Bank successfully concluded negotiations with the government in January 2000 for a US$30m structural adjustment credit facility (CEIU 2003).

The breakdown is as follows:

- Budgetary Aid/Balance of Payments Support 9.98 percent
- Food Aid, Emergency and Relief Assistance 14.11 percent
- Investment Project Assistance 31.66 percent
- Free-standing Technical Cooperation 38.61 percent
- Investment-related Technical Cooperation 5.64 percent

Figure 22 shows that the MDGs are only receiving roughly one third of that amount, with hunger and education particularly neglected.

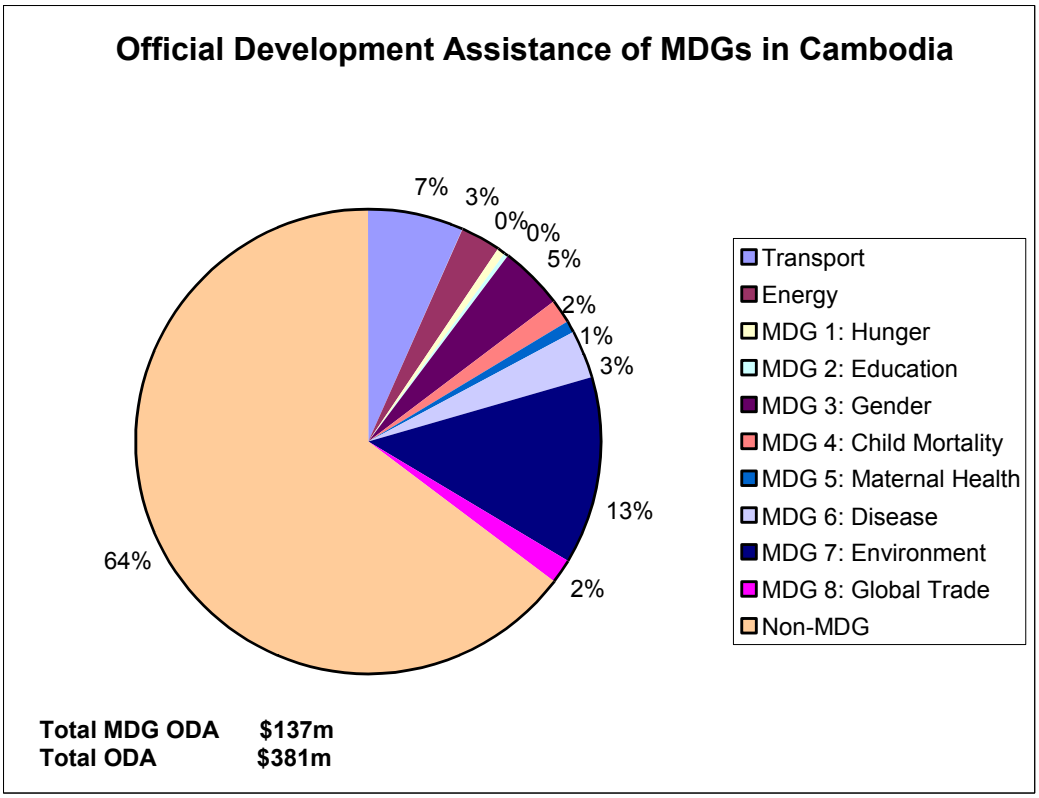

Figure 22: Gross Official Development Assistance to Cambodia in 2001(Simon 2003).

International Environment

Cambodia is a member of the Association of South East Asian Nations (ASEAN). The country was introduced as a new member of the World Trade Organization (WTO) in September 2003. While this event has generally been received positively, it represents new challenges. Quotas, notably those of the United States on garments, have protected Cambodian exports. With full accession to the WTO, these special arrangements will disappear, and Cambodia will have to compete on an open market.

In order to join the WTO, Cambodia has promised major reforms to its legal and commercial systems. These include measures to promote good governance and transparency. The present situation is highly opaque and corrupt, with entrenched vested interests blocking reforms to the legal system. The World Bank estimates that a large company must pay 6-7 percent in bribes as an additional cost, and that the prices of rice and fish exports contain "trade costs" of 44 percent and 55 percent, respectively (World Bank 2003e).

As a result of the difficult and unstable business climate, foreign direct investment in Cambodia has declined by 40 percent since 1998 (UNDP 2003b).

Key Sectoral Challenges for Meeting the MDGs

Poverty
While Cambodia's economy has made great strides, growth has been uneven. In particular, major urban areas have been beautified and infrastructure improved, to the exclusion of rural areas. As a result, the poverty head count rate in Phnom Penh is 14.6 percent, while the rate in rural areas has risen to 56.1 percent. The national poverty gap index has fallen from 9.2 in 1994 to 6.5 by 2000, but this level is still unacceptably high (CSD 2003).

The opening up of vast tracts of land due to demining and forest clearance has given rise to new opportunities as well as new challenges. New land for cultivation has been allocated to poor families, but all too often the land is grabbed by the rich and powerful, forcing the poor into city slums or onto unproductive land with no fertile soil and lacking water. Indeed, residents of mined land feel that if their land is officially demined, it will be given to the powerful, and so they attempt to demine the land themselves, resulting in loss of life and limbs.

Key challenges are therefore:
- Improvement of rural infrastructure and agricultural production,
- Irrigation to dry areas and,
- Equitable distribution of demined land and land title protection.

As discussed in Section 4.1, the required resources for interventions relating to income poverty have been addressed below.

Hunger
Cambodia ranks highest in Southeast Asia in percentage of undernourished people, with 33 percent of the population undernourished, according to the World Food Program. 45 percent of the children are moderately to severely underweight, up from 40 percent in the early nineties.

In general, Cambodia now produces enough rice to feed her growing population, but natural disasters such as floods and drought make food security tenuous from year to year. For centuries, Cambodia's population has benefited from one of the world's richest sources of protein in the form of massive quantities of fish from the Tonle Lap Lake. Those sources, however, are being rapidly depleted by over fishing and poor water and wetlands management. Thus, flood and drought prevention, along with fisheries and conservation management, represent two important challenges for maintaining food security in Cambodia.

The cost estimates for Cambodia reflect the high investment needs in agriculture to develop infrastructure to reduce volatility of food production. The costs are calculated using per household costs to reach at least 80 percent of the subsistence farmers by 2015, 10 percent of whom are assumed to be currently covered by some set of interventions. The interventions include improvements in soil fertility and land leveling for rice farming

systems in rainfed lowland and irrigated areas, agroforestry in upland areas, irrigation development in rainfed areas and strengthening research and extension services. Other interventions include promoting income generation and nutrition programs.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production							
Capital costs	9	24	24	11%	233	21	29%
Operating costs	23	61	60	28%	581	53	71%
Total	***32***	***85***	***84***	***40%***	***814***	***74***	
Other Rural Income Generation				0%			
Capital costs	6	7	7	3%	74	7	24%
Operating costs	9	22	36	17%	240	22	76%
Total	***15***	***28***	***43***	***20%***	***314***	***29***	
Nutrition				0%			
Capital costs	**-**			0%	**-**		***0%***
Operating costs	12	39	85	40%	469	43	***100%***
Total	***12***	***39***	***85***	***40%***	***469***	***43***	
Total cost ($m)	**58**	**153**	**213**		**1,598**	**145**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production	2	5	5	40%	48	4.5	51%
Other Rural Income Generation	1.0	2	2	20%	19	2	20%
Nutrition	1	2	5	40%	27	3	29%
Total cost per capita ($)	**4**	**9**	**12**		**94**	**9**	

Table 23: Costs of key Hunger interventions in Cambodia**.**

The Table shows that the cost of increasing agricultural productivity is $814 million over the 11-year period. 45 percent of these costs are capital, reflecting Cambodia's high needs in infrastructure. The costs decline significantly from 2010 to 2015; this is a reflection of the fact that the agricultural interventions over a five-year time frame yield significant increases in food production, thus reducing the target group of food insecure households. The costs of developing markets and income generation are $314 million over the 11-year period, which translates into $2 per capita on an annual basis. The costs for addressing nutrition issues include the cost of school meals, targeted nutrition programs, awareness and education and population-wide fortification programs. These add up to $3 per capita on an annual basis.

Education

Cambodia has made great efforts in keeping pace with the rapidly expanding school-age population, with the construction of hundreds of schools across the country. It specifically targets remote areas. While recent government statistics suggest an enrollment rate of 84 percent, a study by Sopheak cited a statistic that of 100 students who begin grade 1, only 21 percent (19 percent girls, 23 percent boys) complete primary grade 6 (Sopheak 2003).

While government education budgets are increasing, teachers' salaries remain low at an average of USD $25 per month. This is not enough for teachers to survive, so many supplement their income by soliciting bribes from students, including the sale of examination questions and answers. As a result, Cambodia's constitutionally guaranteed free public education becomes in practice too expensive for many poor families to afford. The end result is a high dropout rate and a low net enrollment rate in poor areas. These same problems extend from primary education through higher education, leading to corruption and inefficiency at all levels. The main challenges are therefore to raise teachers' salaries and thereby reduce corruption and permit more children to attend free public education.

In order to meet the education goal, Cambodia would need to target 100 percent primary school enrolment as well as 100 percent primary completion rates by 2015. The costs are estimated based on the total school going population (as identified by calculations drawn from the UN Population Division Projections 2002), using local unit costs. We particularly focus on raising teacher's salaries to best practice norms (3.6*GDP) as a critical intervention. We also estimate the human resource requirements and the number of classrooms needed by 2015 based on best practice norms as discussed in Section 4.3 and summarized in Table 24.

Human Resource and Infrastructure Needs	2005	2010	2015	Total 2005-2015	Average 2005-2015
Number of teachers					
Primary Education	**42,087**	**52,592**	**67,736**	**589,518**	**53,593**
Secondary Education	**25,015**	**30,560**	**37,897**	**339,828**	**30,893**
Total	***67,103***	***83,152***	***105,633***	***929,346***	***84,486***
Number of classrooms					
Primary Education	**46,536**	**55,472**	**67,736**	**618,372**	**56,216**
Secondary Education	**12,108**	**20,779**	**33,160**	**236,728**	**21,521**
Total	***58,644***	***76,251***	***100,896***	***855,100***	***77,736***

Table 24: Human resources and infrastructure needs of the education sector in Cambodia

For secondary education, we calculate the number of incoming and outgoing students, based on primary school completion and transition rates and drop out rates; for Cambodia, based on these parameters we estimate the net enrolment rate to increase to 55 percent by 2015. The costs are then calculated by scaling up unit costs. As in the case of primary education, we also calculate the number of teachers and classrooms needed for secondary education. Table 25 below presents these results for Cambodia.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education							
Capital cost	23	27	33	9%	304	28	10%
Operating cost	82	101	128	34%	1,128	103	37%
Total	***105***	***128***	***161***	***43%***	***1,432***	***130***	***47%***
Cost per student($)	53	56	59		613	56	
Secondary Education							
Capital cost	11	24	38	10%	268	24	9%
Operating cost	70	104	156	41%	1,182	107	38%
Total	***81***	***128***	***195***	***52%***	***1,451***	***132***	***47%***
Cost per student($)	169	154	147		1,712	156	
Adult Literacy							
Capital cost				0%			0%
Operating cost	14	17	21	6%	192	17	6%
Total	***14***	***17***	***21***	***6%***	192	17	**6%**
Cost per student($)	***23***	***23***	***23***		***253***	***23***	
Total cost ($m)	**200**	**273**	**377**		**3,075**	**280**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education	7	8	9	43%	86	8	47%
Secondary Education	5	8	11	52%	86	8	47%
Adult Literacy	0.9	1.0	1.1	6%	12	1.0	6%
Total cost per capita ($)	**13.5**	**16.4**	**20.5**		**183.4**	**16.7**	

Table 25: Cost of Education Interventions in Cambodia

Table 25 shows that the total cost of primary education is estimated at $1.4 billion over the 11 year period, averaging $130 annually, or $56 per student (rising from $53 in 2005 to $59 in 2015). Teachers' salaries account for 40 percent of the total costs. For secondary education, the total cost is estimated at $1.4 billion, at a much higher unit cost of $156 per student. Adult literacy costs are assumed at $23 per learner. The total costs of providing education are estimated at $3 billion over the 11-year period. This translates into a per capita cost of $16.7 on an annual basis.

Gender Equality

At the level of primary education, the ratio of girls to boys has risen to 87 percent. Parents send their daughters to school to learn to read and write, but girls often drop out by grade 4. By upper secondary school, the ratio has fallen to 60 percent, and falls below 50 percent in tertiary education.

Percentages of women in government position remains very low: 13 percent for the National Senate, 8 percent in commune councils, 8 percent of ministers, 6 percent secretaries of state, 1 percent deputy provincial governors and no provincial governors. Political parties boast of placing women on their rosters of candidates, but they are placed at the bottom of those lists so that they stand no realistic chance of ever being elected.

We attempt a partial estimation of the resources needed to meet the goal of Gender Equality; our effort focuses on awareness programs, sensitization and training, violence prevention and systemic issues. Awareness programs focus on mass media campaigns, community based programs and school based awareness of sexual and reproductive health and rights. Sensitization programs for bureaucrats, police departments and judges are included. Due to the under representation of women in government positions, we also include the cost of training women candidates for electoral positions. Other cost

components the creation and operation of women's ministries within the governments. We use existing budgets from benchmark countries (those that are track to meet the gender MDG) to estimate these costs. Comprehensive responses to violence against women form the final component of our estimates; these include the costs of prevention, protection and punishment of offenders.

The cost estimates aim to target 50 percent of the target population which, depending on the interventions, includes school children, women and adolescent girls and for awareness campaigns, the entire population. The costs are presented below.

Total cost estimates in 2000 US$ million	2005	2010	2015	Total 2005-15	Average 2005-15
Total ($m)	27	39	43	407	37
Total cost per capita ($)	1.8	2.3	2.3	24	2

Table 26: Cost of key gender interventions in Cambodia.

The costs are estimated at $407 million over the 11-year period, which translates into $2 per capita on an annual basis.

Health

The health sector faces many of the same opportunities and challenges as the education sector described above. Hundreds of new clinics and hospital facilities have been built in all areas of the country. But low doctor's salaries lead to bribery and corruption, and ultimately to poor families being priced out of the 'free' medical treatment. They then turn to traditional healers and home remedies.

HIV/AIDS continues to be a problem, with Cambodia having one of the highest percentages of adults who are HIV+ (2.7 percent) in the region. But Cambodia has been one of the leading countries at reducing that percentage over the past four years. The more pressing problem is now becoming that of AIDS orphans. The number of children orphaned by HIV/AIDS has increased from 7,300 in 1997 to 55,000 in 2001, and is still climbing.

Many areas of the country are high malarial zones. Drug-resistant malaria parasites lead to debilitating and chronic malaria among residents in forest zones in many provinces. In 2000, Cambodia recorded 476 cases per 100,000 of population. The risk of contracting dengue fever is growing, as is the prevalence of tuberculosis. In 2000 Cambodia ranked highest in Southeast Asia with 474 cases of tuberculosis per 100,000 of population.

Another major health issue facing Cambodia is the high proportion of physical disability due to the recent armed conflict. The World Bank notes that one in every 250 Cambodians is disabled, and that Cambodia has the world's highest proportion of amputees (1/384 people). Women carry a disproportionate burden of caring for the disabled (World Bank 2003).

We estimate the cost of health interventions for the MDG specific diseases in the table below. Reflecting the high prevalence of HIV/AIDS, treatment costs comprise a

significant percentage of health costs. Another important contributor to the costs is child health interventions. This is due to low level of current coverage for child health interventions combined with relatively high prevalence of critical childhood diseases. Finally Cambodia's high unmet need for family planning will require additional investments.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
HIV/AIDS Prevention	6	12	16	3%	128	12	3%
HIV/AIDS Care	7	13	15	3%	134	12	3%
HIV/AIDS Treatment	5	37	74	14%	415	38	10%
TB	13	15	16	3%	160	15	4%
Malaria Prevention	1	2	4	1%	28	3	1%
Malaria Treatment	0	0	0	0%	5	0	0%
Maternal Heath	16	30	46	9%	343	31	8%
Child Health	53	86	112	21%	937	85	23%
Management	20	39	56	11%	430	39	10%
Quality improvement	15	29	42	8%	322	29	8%
Human resources (salary incr.)	40	78	113	21%	860	78	21%
Community demand	4	13	23	4%	146	13	4%
R&D capacity	2	4	6	1%	43	4	1%
Infrastructure recurrent costs	13	13	13	2%	144	13	4%
Total cost ($m)	**196**	**373**	**535**	**100%**	**4,096**	**372**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
HIV/AIDS Prevention	$ 0.4	$ 0.7	$ 0.8	3%	$ 0.7	3%
HIV/AIDS Care	$ 0.5	$ 0.8	$ 0.8	3%	$ 0.7	3%
HIV/AIDS Treatment	$ 0.3	$ 2.2	$ 4.0	14%	$ 2.3	10%
TB	$ 0.9	$ 0.9	$ 0.9	3%	$ 0.9	4%
Malaria Prevention	$ 0.1	$ 0.1	$ 0.2	1%	$ 0.2	1%
Malaria Treatment	$ 0.0	$ 0.0	$ 0.0	0%	$ 0.0	0%
Maternal Heath	$ 1.1	$ 1.8	$ 2.5	9%	$ 1.9	8%
Child Health	$ 3.6	$ 5.2	$ 6.1	21%	$ 5.1	23%
Management	$ 1.4	$ 2.4	$ 3.1	11%	$ 2.4	10%
Quality improvement	$ 1.0	$ 1.8	$ 2.3	8%	$ 1.8	8%
Human resources (salary incr.)	$ 2.7	$ 4.7	$ 6.1	21%	$ 4.7	21%
Community demand	$ 0.3	$ 0.8	$ 1.2	4%	$ 0.8	4%
R&D capacity	$ 0.1	$ 0.2	$ 0.3	1%	$ 0.2	1%
Infrastructure recurrent costs	$ 0.9	$ 0.8	$ 0.7	2%	$ 0.8	4%
Total cost per capita ($)	**13**	**22**	**29**	**100%**	**22**	**100%**

Table 27: Cost of Health interventions in Cambodia.

Table 28 below shows a very rough estimate of the human resource needs (doctors and nurses/midwives) that may be required to roll out the full set of preventive and treatment interventions by 2015. We emphasize that this is a highly preliminary number calculated here to indicate the order of magnitude of the need.

Health human resource needs	Current	2015
Doctors	4,301	5,848
Nurses/midwives	14,858	16,884

Table 28: Projected Human Resource needs in Cambodia for the Health Sector in 2015.

To summarize, based on our estimates, Cambodia will require approximately $22 per capita annually between 2005 and 2015 to meet the health MDGs. This is does not include the significant other spending for non-MDG related conditions like physical disabilities. While today Cambodia spends $30 per capita this includes all MDG and non-MDG condition spending. Furthermore, only $4 of this comes from government. Thus

the burden on the population of out-of-pocket spending is very high. The modest increase in human resources is a reflection of the relatively higher levels of physician coverage than some of our other countries with 0.297 physicians per capita in 1998 (WHO 2003).

Environmental Sustainability

The Cambodian environment is facing severe threats. Perhaps the most pressing is the loss of forest cover. In 1969, forests covered 13.2 million ha, or 73 percent of the country's total land area. By the year 2000, this percentage had fallen below 53 percent and continues to decline rapidly due in part to an illegal logging industry that is tolerated by corrupt government officials. A second reason is that the demining of unused land for agriculture has led to the clearing of much forested land. The wholesale destruction of the forests bears the principal blame for much of the flooding and drought due to the rapid run-off of water from cleared land.

A second challenge is the destruction of wetlands and pollution of rivers. The area surrounding the Tonle Sap Lake is developing rapidly, destroying the habitat for many species and placing many species of fish and of water birds on the verge of extinction.

Cambodia has set aside protected areas in order to preserve some of its forests and wildlife. However, due to a lack of resources to pay forest rangers, encroachment on protected areas is rampant. One of the major challenges will be to find the resources for environmental protection, as well as for the education of the populace in environmental matters.

As detailed in Section 3, several sets of interventions directly relating to the environment, such as access to clean energy services and water treatment, are included as part of the analysis of other sectors. At this point we do not have access to sufficient information to calculate the requirements in terms of human and financial resources for the remaining interventions for ensuring environmental sustainability.

Water and Sanitation

Cambodia still suffers from the destruction of its water and sanitation infrastructure by the Khmer Rouge. Phnom Penh's sewage system, totally ruined by the Khmer Rouge in the 1970's, is making strides towards becoming a system commensurate with the needs of a large urban area. However, the rural areas are virtually devoid of water and sanitation facilities. According to preliminary data from WHO/UNICEF, 58 percent of the urban population had improved access to safe water in 2000 – unchanged since 1990 - while access in rural areas had stagnated at only 29 percent. The picture is even worse for sanitation, where only 8 percent of the rural population have access to improved sanitation, compared with 53 percent in urban areas (c.f. Table 29). Both urban and rural figures for access to improved sanitation as well as water supply are the lowest in Southeast Asia. Critically, the country does not appear to have made any significant progress during the 1990s and is off track for meeting the corresponding MDG.

Water and sanitation targets Cambodia	1990	2000	2005	2010	2015	Total 05-15
Water supply						
Total access - urban (%)	58%	58%	60%	69%	79%	
Population provided with access each year - urban			95,213	195,907	255,527	2,140,077
Total acces - rural (%)	29%	29%	32%	48%	65%	
Population provided with access each year - rural			463,927	494,642	530,198	5,410,106
Sanitation						
Total access - urban (%)	53%	53%	55%	66%	77%	
Population provided with access each year - urban			98,474	197,460	260,662	2,162,835
Total acces - rural (%)	8%	8%	12%	33%	54%	
Population provided with access each year - rural			519,610	587,932	643,158	6,421,417

Table 29: Water and Sanitation targets in Cambodia.

Unit cost data for estimating the resource requirements for the water and sanitation sector was taken from a broad range of sources and has been differentiated by urban and rural areas as described in Section 4.7. Table 30 lists our preliminary resource estimates for the water and sanitation sector in Cambodia.

Cambodia	**Water and sanitation**						
Total cost estimates in 2000 US$ million	**2005**	**2010**	**2015**	**% of total in 2015**	**Total 2005-15**	**Average 2005-15**	**% of total over period**
Water provision							**0%**
Capital cost - rural	3.65	3.83	4.09	4%	42.01	3.82	5%
Operating cost - rural	1.10	1.90	2.96	3%	21.46	1.95	2%
Subtotal rural	***4.75***	***5.73***	***7.05***	***6%***	***63.47***	***5.77***	***7%***
Capital cost - urban	5.68	10.00	13.16	12%	110.02	10.00	13%
Operating cost - urban	3.02	6.71	12.59	11%	78.63	7.15	9%
Subtotal urban	***8.70***	***16.70***	***25.75***	***23%***	***188.65***	***17.15***	***21%***
Total	**13.45**	**22.44**	**32.80**	**29%**	**252.12**	**22.92**	**29%**
Sanitation							
Capital cost - rural	10.24	11.56	12.65	11%	126.31	11.48	14%
Operating cost - rural	0.19	1.46	4.06	4%	18.98	1.73	2%
Subtotal rural	***10.44***	***13.02***	***16.71***	***15%***	***145.29***	***13.21***	***17%***
Capital cost - urban	9.23	18.18	23.72	21%	198.93	18.08	23%
Operating cost - urban	5.92	12.34	22.47	20%	143.97	13.09	16%
Subtotal urban	***15.15***	***30.52***	***46.19***	***40%***	***342.90***	***31.17***	***39%***
Total	**25.58**	**43.54**	**62.90**	**55%**	**488.19**	**44.38**	**56%**
Waste Water Treatment							
Rural	0.00	0.00	0.00	0%	0.01	0.00	0%
Urban	3.78	8.57	14.39	13%	97.41	8.86	11%
Total	***3.78***	***8.57***	***14.39***	***13%***	***97.42***	***8.86***	***11%***
Hygiene Education	**3.14**	**3.66**	**4.18**	**4%**	**40.27**	**3.66**	**5%**
Total cost ($m)	**45.95**	**78.21**	**114.27**	**100%**	**878.01**	**79.82**	**100%**

Per capita total cost estimates in 2000 US$	**2005**	**2010**	**2015**	**% of total in 2015**	**Average 2005-15**	**% of total over period**
Water provision						
Capital cost - rural	0.2	0.2	0.2	4%	0.2	5%
Operating cost - rural	0.1	0.1	0.2	3%	0.1	2%
Subtotal rural	***0.3***	***0.3***	***0.4***	***6%***	***0.3***	***7%***
Capital cost - urban	0.4	0.6	0.7	12%	0.6	13%
Operating cost - urban	0.2	0.4	0.7	11%	0.4	9%
Subtotal urban	***0.6***	***1.0***	***1.4***	***23%***	***1.0***	***21%***
Total	**0.9**	**1.4**	**1.8**	**29%**	**1.4**	**29%**
Sanitation						
Capital cost - rural	0.7	0.7	0.7	11%	0.7	14%
Operating cost - rural	0.0	0.1	0.2	4%	0.1	2%
Subtotal rural	***0.7***	***0.8***	***0.9***	***15%***	***0.8***	***17%***
Capital cost - urban	0.6	1.1	1.3	21%	1.1	23%
Operating cost - urban	0.4	0.7	1.2	20%	0.8	16%
Subtotal urban	***1.0***	***1.8***	***2.5***	***40%***	***1.9***	***39%***
Total	**1.7**	**2.6**	**3.4**	**55%**	**2.7**	**56%**
Waste Water Treatment						
Rural	0.0	0.0	0.0	0%	0.0	0%
Urban	0.3	0.5	0.8	13%	0.5	11%
Total	***0.3***	***0.5***	***0.8***	***13%***	***0.5***	***11%***
Hygiene Education	**0.2**	**0.2**	**0.2**	**4%**	**0.2**	**5%**
Total cost per capita ($)	**3.1**	**4.7**	**6.2**	**100%**	**4.8**	**100%**

Table 30: Cost of key Water and Sanitation interventions in Cambodia.

Per capita costs for capital and operating expenses in the water and sanitation sector are projected to rise steeply from $2.9 in 2005 to $6.0 in 2015. The steep rise in per capita costs is due to the substantial investments required to gradually increase access to improved water and sanitation. It is noticeable that a particularly large share of overall resources will be devoted to the sanitation sector due to the very low current levels of access. The higher need for resources for urban sanitation results from the relatively higher unit costs.

Improving the Lives of Slum Dwellers

Over 80 percent of Cambodia's population lives in rural areas and make their living from agriculture. This situation is changing only gradually, as there are no major inputs such as mechanized farming or increased use of pesticides and fertilizers to raise productivity and thereby lower the demand for agricultural labor. Thus, Cambodia has yet to experience the massive urban drift felt in other countries, and so the problem of slum dwellers is not as daunting as in many developing nations.

However, the corruption of land grabbing is forcing many poor people off their land and into the cities, where they have no marketable skills to offer, which increases the problem of slum formation. According to UN-Habitat (2003), roughly 72 percent of the urban population already lives in slum-like conditions. Phnom Penh officials have relocated thousands of slum dwellers onto unproductive rural land, creating rural slums. The border area of Poipet is a dumping ground for thousands of people who have no place to go.

Cambodia is just beginning to face the challenge of providing for its slum dwellers. If the land grabbing continues, and if improved agricultural methods force peasants off the land, there could be a large slum problem in the next decade. As discussed in Section 4.8 above, we have not yet been able to calculate robust resource requirements for meeting Target 11 in Cambodia. For this reason the financial requirements of this sector are not included in the subsequent analysis.

Science and Technology

Cambodia, at least in its urban areas, is gradually catching up with technological changes in communications, infrastructure, and production methods. Joining ASEAN and the WTO will accelerate this change, as Cambodia takes its place in the polity of nations. The challenge will be to distribute the benefits of these changes in an even-handed manner. The risk is that improvements in technology will benefit the already rich and the city dwellers, and will leave the rural poor to fall further behind.

At this stage insufficient information is available for calculating resource requirements for promoting science and technology in Cambodia, including the improvement and extension of university education and research, science advice, and ICT infrastructure. As a result, our preliminary analysis does not include the investment needs for these sets of interventions.

Energy

Cambodia has no oil, natural gas, or other energy resources, although a few waterfalls in remote mountain areas could produce hydroelectric power. A large scheme to dam rivers in the mountains along the Thai border has existed on paper for decades and is periodically re-examined, but at present the plan has not come into an operational phase. Because the vast majority of Cambodians cannot afford imported fuels, wood remains the principal source of energy throughout the country. 82 percent of the energy source comes from fuelwood, while 92 percent of the population depends on this energy (CSD 2003). This leads to deforestation, and, as a result, climate change is beginning to be measured in the country. Still, because of Cambodia's large forests, half of the country's provinces are probably net carbon-dioxide sinks.

The present energy situation is unsustainable, however, as forest coverage shrinks and demand for energy increase. Alternative energy sources such as solar power and wind power are being investigated and are in the early stages of development on a small scale. The electrification rate in Cambodia is approximately 15 percent, which is significantly lower than the South East Asia average of 41 percent.

Table 31 summarizes preliminary resource estimates for the energy sector. Unfortunately, the available energy data for Cambodia was extremely limited. For this reason, the thermal energy patterns used to generate cost numbers were derived from our work on Bangladesh. Specifically, we assume that in urban areas, energy for cooking is provided by unprocessed biomass (70 percent), charcoal (15 percent) and kerosene (15 percent). In rural areas, 85 percent of the population is assumed to cook on biomass, and 15 percent on charcoal. On the lighting side, 25 percent of urban- and 10 percent of rural areas are assumed to be electrified, which is consistent with official statistics reporting that 15 percent of the total population has access to electricity. Unelectrified urban- and rural households are assumed to rely on kerosene hurricane and kerosene wick lamps in equal proportion.

Total cost estimates for Cambodia in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Rural							
Devices	16	22	28	8%	242	22	8%
Fuels	72	111	144	41%	1,203	109	40%
Electricity	5	80	88	25%	806	73	27%
Subtotal rural	***92***	***212***	***260***	***73%***	***2,251***	***205***	***75%***
Urban							
Devices	7	12	17	5%	131	12	4%
Fuels	18	33	51	14%	367	33	12%
Electricity	5	23	28	8%	245	22	8%
Subtotal urban	***31***	***68***	***96***	***27%***	***743***	***68***	***25%***
Total cost ($)	**123**	**280**	**356**	**100%**	**2,994**	**272**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Rural						
Devices	1.1	1.3	1.5	8%	1.3	8%
Fuels	4.9	6.7	7.8	41%	6.6	40%
Electricity	0.3	4.8	4.8	25%	4.4	27%
Subtotal rural	***6.2***	***12.8***	***14.1***	***73%***	***12.3***	***75%***
Urban						
Devices	0.5	0.7	0.9	5%	0.7	4%
Fuels	1.2	2.0	2.8	14%	2.0	12%
Electricity	0.4	1.4	1.5	8%	1.3	8%
Subtotal urban	***2.1***	***4.1***	***5.2***	***27%***	***4.1***	***25%***
Total per capita costs	**8.3**	**16.9**	**19.3**	**100%**	**16.4**	**100%**

Table 31: Cost of Energy interventions in Cambodia.

On the supply-side, given that insufficient data was available concerning existing power generation capacity, all numbers were calculated assuming that all incremental demand has to be served by adding new capacity. In other words we assume that there is no over capacity to meet future increases in energy demand. We also do not include fuel costs or O&M expenditures for existing power plants, which will lead to an understatement of true costs. Additionally, it should be noted that the model only makes provision for power generation to serve electricity consumed by households, schools and health facilities. We have not included industrial electricity consumption.

Transport Infrastructure

Cambodia has about 4,200 km of national roads, 3,600 km of provincial roads and 28,500 km of rural roads. The majority of roads are not paved, including national roads. Many bridges and ferries are in a poor state of repair. Inland waterways provide important transport routes, particularly during the rainy season when many roads are impassable. The major routes are the Mekong and Tonle Sap rivers (CEIU 2003). There has been great progress in the construction of rural roads. This has brought agricultural markets closer to many remote areas.

Progress is being made in surfacing major trunk routes, such as Highway 5 to Battambang and Highway 6 to Siem Reap. The first bridge over the Mekong has been completed at Kompong Cham. Still, the Mekong remains a barrier to transportation, as does the Tonle Sap.

The railroad remains very weak. Rail transport is slow, unreliable, and dangerous. Boat traffic on the Mekong is improving. Air links are weak in the chaotic deregulation following the demise of Royal Air Cambodge.

Major challenges are to complete the National Highway system and develop a system of maintenance for rural roads. With increased links to other Asian countries, bringing the railroads up to the standards of neighboring countries is a priority.

To estimate the investments required for the roads sector, we project that Cambodia's per capita density of roads increases to 0.5km per 1000 people. Based on the assumptions and unit costs presented in Section 4.11, we calculate the investment requirements summarized in Table 32. We reiterate the caveat mentioned above, namely that our approach to calculating resource requirements for the road sector is unsatisfactory. While it generates the right order of magnitude of required investments for meeting the MDGs, it is not appropriate as the basis for a country-level planning process. The latter must be based on a detailed assessment of demand for transport services across the country.

Cambodia	Roads						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Road construction							
Two-lane highway	55	55	55	16%	605	55	17%
Two-lane road	142	142	142	42%	1,557	142	45%
One-lane road	60	60	60	18%	659	60	19%
Total	**257**	**257**	**257**	**75%**	**2,822**	**257**	**81%**
Road O&M							
Two-lane highway	17	23	28	8%	253	23	7%
Two-lane road	13	27	41	12%	295	27	9%
One-lane road	3	9	15	4%	94	9	3%
Total	**33**	**58**	**84**	**25%**	**642**	**58**	**19%**
Total cost ($m)	**289**	**315**	**341**	**100%**	**3,464**	**315**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Road construction						
Two-lane highway	3.7	3.3	3.0	16%	3.3	17%
Two-lane road	9.5	8.5	7.7	42%	8.5	45%
One-lane road	4.0	3.6	3.3	18%	3.6	19%
Total	**17.3**	**15.4**	**13.9**	**75%**	**15.4**	**81%**
Road O&M						
Two-lane highway	1.2	1.4	1.5	8%	1.4	7%
Two-lane road	0.9	1.6	2.2	12%	1.6	9%
One-lane road	0.2	0.5	0.8	4%	0.5	3%
Total	**2.2**	3.5	4.6	**25%**	**3.5**	19%
Total cost per capita ($)	**19.5**	**19.0**	**18.5**	**100%**	**19.0**	**100%**

Table 32: Cost of Road Infrastructure interventions in Cambodia.

We emphasize that our approach to calculating resource requirements for the road sector, while providing the right order of magnitude of required investments, is not well suited for developing detailed country-level road sector plans. These must instead be based on detailed assessments of local demand for transport as well as the country's topography. As a result, the national target of reaching 0.5km of paved roads per 1000 people as well as unit costs may change.

Land Mines

While demining is not an official MDG, in Cambodia, it is a critical precursor to achieving all the other MDGs. The PRSP notes that Cambodia is one of the most highly landmine affected countries in the world and that mine action is a top priority in the development of the country. Up to 2.5 percent of the country's land area may be

contaminated by mines or unexploded ordinances (UXOs). The PRSP estimates that the costs for demining 30 million square meters of land are approximately $30 million per year. Mines and UXOs have killed, maimed or wounded over 50,000 people between 1979 and 2002, thus constituting a significant health problem in addition to their direct impact on land use and access to services. The Cambodian government has established and Cambodian Mine Action and Victim Assistance Authority to ensure all mine action programs are planned and carried out in the context of poverty reduction policies and priorities.

Financing

The total costs estimated for Cambodia will need to be financed through a combination of private household contributions, domestic government spending, and external assistance. We disaggregate these sources of financing by first estimating the contributions that households can make and projecting the scope for domestic government resource mobilization for the MDGs. Additional resources required to meet the Goals will then need to be externally financed.

The share of household contributions is based on both the ability to pay and the incentive effects of user charges. To calculate the ability to pay, we use national poverty data on the proportion of people living below the poverty line and the income distribution data across quintiles to divide the population into three categories based on their income: those who cannot afford to contribute at all towards meeting the goals (population below the poverty line), those who can contribute partially (population between the poverty line and two times the poverty line) and those who can contribute the full cost of most interventions (population above two times the poverty line).

As discussed in the introduction, we assume that health and primary education are publicly provided and funded, and therefore estimate no household contributions for interventions related to those goals. For secondary education, agricultural interventions, water and sanitation, and energy services, we estimate partial cost recovery.[56]

We calculate the share of total expenditure devoted to the MDG sectors (including social and economic services) at approximately 42.8 percent[57]. We then multiply this share with government revenues to get the total domestic spending on the MDGs.[58] In the case of Cambodia, this translates into domestic spending on the MDGs of 5.6 percent of GDP. We assume that domestic spending will increase by 4 percentage points by 2015, increasing the share of domestic resources spent on the MDGs to 9.6 percent of GDP.[59] On a *pro forma* basis we allocate projected domestic government spending to sectors according to the sectors' share of total costs. External financing is then calculated as the difference between total resource requirements and spending by both households and governments.

[56] For a detailed description of the proportion of costs in these areas that are borne by households, please refer to Table 5
[57] Calculated using NPRS 2003-05, p135, Table5.2.
[58] Revenue and expenditure data is taken from the International Financial Statistics 2003, IMF.
[59] For a complete discussion of the assumptions behind this analysis please refer Section 5 above.

Summary of Costs and Financing Results

Summary of projected financial resources required for meeting the MDGs in Cambodia

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
Total Cost (Sum of A+B+C below)	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	58	3.9	153	9.2	213	11.5	1,598	145	8.7	2.1%
Education	200	13.5	273	16.4	377	20.5	3,075	280	16.8	4.1%
Gender Equality	27	1.8	39	2.3	43	2.3	407	37	2.2	0.5%
Health	196	13.2	373	22.5	535	29.0	4,096	372	22.4	5.5%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	46	3.1	78	4.7	114	6.2	878	79.8	4.8	1.2%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy***	123	8.3	280	16.9	356	19.3	2,994	272	16.4	4.0%
Roads	289	19.5	315	19.0	341	18.5	3,464	315	19.0	4.7%
Total	**940**	**63.4**	**1,511**	**91.0**	**1,978**	**107.4**	**16,511**	**1,501**	**90.3**	**22.2%**

Summary of projected sources of financing in Cambodia

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
A. Household Contributions	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	34	2.3	52	3.1	79	4.3	594	54	3.3	0.8%
Gender Equality	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Health	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	20	1.4	35	2.1	53	2.9	399	36.3	2.2	0.5%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	48	3.3	79	4.7	106	5.7	860	78	4.7	1.2%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Total	**103**	**6.9**	**166**	**10.0**	**238**	**12.9**	**1,853**	**168**	**10.1**	**2.5%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
B. Domestically Financed Government Expenditures **	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	16	1.1	44	2.9	72	4.9	473	43	2.6	0.6%
Education	55	3.7	78	4.7	128	6.9	910	83	5.0	1.2%
Gender Equality	7	0.5	11	0.7	15	0.8	121	11	0.7	0.2%
Health	54	3.7	106	6.4	181	9.8	1,213	110	6.6	1.6%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	13	0.9	22	1.3	39	2.1	260	23.6	1.4	0.3%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	34	2.3	80	4.8	121	6.5	886	81	4.9	1.2%
Roads	80	5.4	90	5.4	115	6.3	1,026	93	5.6	1.4%
Total	**259**	**17.5**	**431**	**25.9**	**670**	**36.4**	**4,889**	**444**	**26.7**	**6.6%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
C. Required Total External Budget Support	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	42	2.8	109	6.3	141	6.7	1,125	102	6.2	1.5%
Education	111	7.5	143	8.6	170	9.2	1,570	143	8.6	2.1%
Gender Equality	20	1.3	28	1.7	29	1.5	287	26	1.6	0.4%
Health	142	9.6	267	16.1	354	19.2	2,883	262	15.8	3.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	13	0.9	21	1.2	22	1.2	219	20	1.2	0.3%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy***	41	2.8	122	7.3	129	7.0	1,247	113	6.8	1.7%
Roads	210	14.1	225	13.6	225	12.2	2,438	222	13.3	3.3%
Total	**578**	**39.0**	**914**	**55.0**	**1,069**	**58.1**	**9,769**	**888**	**53.4**	**13.1%**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above
*** Resource estimates for energy are extremely preliminary since not all necessary data was available

Table 33: Summary of projected total costs and sources of financing in Cambodia.

We estimate that in order to meet the MDGs, Cambodia will need to spend a total of $63 per capita in 2005 increasing to $107 by 2015 to meet the MDGs. This translates into a total investment need of $16.5 billion between 2005 and 2015, which is equivalent to an average annual per capita need of $90. Of the $90, we estimate that $37 will be financed domestically through household and government contributions. ODA commitments to Cambodia were $381 million in 2001, or $29 per capita. In comparison, we project an average external financing need of approximately $53 per capita between 2005 and 2015.

It is important to note that the estimates above do not include several potentially expensive interventions that will add to the total cost in Cambodia. A list appears in the box below:

Important cost factors not included in these resource estimates for Cambodia

- Demining and removal of unexploded ordinance,
- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions to ensure environmental sustainability,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

Ghana Country Study

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In collaboration with the Millennium Project secretariat

9. Ghana Country Study

MDG status

Ghana has been aggressively targeting the MDGs and is currently on track to meet or exceed many of the goals set forth in the Millennium Declaration. The path to 2015, however, will not be easy and Ghana needs to confront several difficult challenges in order to achieve the Goals. For example, Ghana is beset with a high fertility rate (4.5) and infant mortality rate (56.5/1000), 2001 estimate). Life expectancy still has not reached 60 years of age (59 for women, 56 for men) and only 64.5 percent of the population is literate with a significantly higher percentage of men (70 percent) than women (51 percent). There is growing evidence of deepening poverty among some groups and regions of the country, particularly in the northern and central regions. The news is not all bad, however, as Ghana reduced poverty by 12 percentage points from 1991 (51.7 percent) through 1999 (39.5 percent). Progress on water and sanitation has been faster in urban than rural areas, where provision of both is currently off track for meeting the Millennium Goals.

Thus, the most important challenges lie in combating hunger, reducing under-five mortality, reversing the spread of HIV/AIDS, increasing primary school enrollment as well as improving access to improved water supply and sanitation. Equally difficult to achieve are the elimination of gender disparity and reversal of malaria incidence, where the task is complicated by inadequate data to permit monitoring. There is also weak but improving state support for the achievement of environmental sustainability. The table below summarizes Ghana's progress toward the MDGs.

Indicator	Starting year value	Ending year value	Linearly projected 2015 value	MDG target value	Status
Proportion below poverty line	0.52 (1992)	0.39 (1999)	0.09	0.26	On Track
Proportion below extreme poverty line	0.37 (1992)	0.27 (1999)	0.04	0.19	On Track
Prevalence underweight children	0.27	0.25 (1999)	0.21	0.14	Off Track
Primary net enrollment	-	0.58		1.00	
Literacy of 15-24 year olds	0.82	0.92 (2001)			
Ratio female enrollment primary	0.82	0.90	1.00	1.00	On Track
Ratio female enrollment secondary (JSS)	-	0.85 (2001)		1.00	
U5MR (per 1000)	126	100 (2001)	67	42	Off Track
Infant Mortality Rate	74	58			
% with access to improved water (Rural)	36%	40%	46%	68%	Off Track
% with access to improved water (Urban)	85%	70%	48%	93%	Off Track
% with access to improved sanitation (Rural)	37%	44%	55%	69%	Off Track
% with access to improved sanitation (Urban)	54%	71%	97%	77%	On Track
Incidence of malaria	0.44 (1989)	0.41 (1998)			

Table 34: Status of Progress towards the MDGs in Ghana[60]

Ghana's Geography and Politics

Ghana covers a surface of 238,537 sq km neighboring Côte d'Ivoire, Burkina Faso and Togo. The country is divided into ten administrative and commercial regions with Accra as its capital. The climate in Ghana is tropical, with annual mean temperatures averaging between 26°C and 29°C.

Ghana is arguably one of the most stable countries in West Africa and a successful partner and leader in the democratization of the sub-region. Ghana has declared its commitment to a democratic process since the last presidential and parliamentary elections in 2000. The last elections saw an elected government hand over the reins of power to another democratically elected government. On the whole, Ghana has the ingredients to make the democratic process more effective and vibrant including a well-balanced parliament, an independent judiciary, a vibrant press, efficient election

[60] Water and sanitation data personal communication WHO/UNICEF; all other data from Ghana MDG Report (2002).

machinery, and a growing and knowledgeable civil society. Perhaps the key to the promotion of Ghana's democratic process is the high degree of consensus on the broad direction of economic policy.

Ghana has signed a number of key human rights declarations. These include the International Convention on the Elimination of All Forms of Racial Discrimination, the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights, the Convention on the Elimination of All Forms of Discrimination Against Women, the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment and finally the Convention on the Rights of the Child.

Population and demographic profile

The total population of Ghana was estimated at 18,912,079 in 2000 and is expected to grow annually at 2.1 percent for the period 2000-2015 (UNDP 2002b). Ghana's population density in 2000 stood at 79.3 persons per sq. km, which is high for the West African region.

Ghana's fertility rate was 4.20 per woman in 2000, a significant decline from 6.50 in 1980 (World Bank 2003d). This is lower than the Sub-Saharan African average, which stood at 5.20 in 2000. The population growth was 2.06 in 2000, which was slightly lower than the regional rate of 2.43. The proportion of children under 15 years is still large at 44.2 percent. (World Bank 2003d)

Non-Ghanaians constitute 3.9 percent of the population. Another 3.9 percent have been naturalized with the rest (92.2 percent) being Ghanaians by birth or parenthood. Ghana's birth and death rates are estimated as 28.95 births and 10.26 deaths per 1,000 population, respectively.

Apart from English (the official language), Ghana has more than 100 languages and dialects. The predominant group is the Akan (49.1 percent), followed by the Mole-Dagbane (16.5 percent), the Ewe (12.7 percent) and the Ga-Dangme (8.0 percent). This national picture changes, depending on the base region of the ethnic groups. Ghana enjoys freedom of worship. Three main religious groupings exist in Ghana. Nationally, Christianity is dominant, with over two-thirds (68.8 percent) of the population claiming affiliation with the Christian faith, followed by Islam (15.9 percent) and 8.5 percent of the population practicing the traditional religion (Population and Housing census, 2000).

Economy

The economy of Ghana depends largely on agriculture accounting for nearly 40 percent of GDP and 50 percent (ISSER and GSS 2002) of all employment. Agriculture's growth rate has lagged the other sectors largely due to inefficient farming practices, dependence on rain-fed agriculture and poor transport and distribution channels. Other major exports are minerals (notably gold, diamonds bauxite and manganese). The tourism industry is now becoming an important foreign exchange earner.

Nominal GDP in 2001 was valued at 5.3 billion with per capita GDP corresponding to $421 in 2001 US$. Over the last decade per capita growth averaged 1.8 percent per year corresponding to about 4.4 percent nominal growth (World Bank 2003d). This compares favorably with other countries in the region, but falls far short of the 6.5 percent growth rate required by the Ghana Poverty Reduction Strategy Paper (Republic of Ghana Ministry of Finance 2003a). Ghana's economic policy now focuses on the framework laid out by Vision 2020, which aims to achieve middle-income status for the country by 2020, reducing poverty and improving the welfare of all Ghanaians.

PRSP/PRGF

Ghana's PRSP, called the Ghana Poverty Reduction Strategy 2002-2004 (GPRS), calls for US$5,283 million in total investment to achieve its policy goals. Of this, US$2,515 million will be required for the medium term (2003-2005). It focuses on five priorities for the three-year period 2003-2005:

1. Infrastructure

Road infrastructure is to be improved by linking up the country to the trans-ECOWAS highway project. A complementary network of trunk and urban roads will be rehabilitated and maintained alongside feeder road construction and maintenance. Besides, developments in the main ports (Tema and Takoradi) as well as internal ports will be accelerated. In addition, the government plans to increase the availability of energy to boost industrial growth and production.

2. Modernized agriculture based on rural development

The GPRS identifies the need to modernize agriculture by increasing land areas under cultivation and irrigation to enable all year round growing. Among the several interventions to be undertaken is reform of land acquisition regulation, assistance to the private sector to increase the production of grains, encouragement of the production of non-traditional cash crops such as cashew and support to the private sector to add value to traditional crops such as cocoa.

3. Enhanced Social Services

Social services – particularly health and education – are to be improved to ensure equity and quality. Access to basic education will be supported by early childhood development and alternative education for children out of school, with emphasis on the hard-to-reach areas of northern Ghana, remote rural areas and urban slums. In order to bridge the equity gaps in health care provision, outreach services and clinics in deprived rural and peri-urban areas will be a priority for the period.

4. Good governance

The GPRS focuses on strengthening the rule of law, respect for human rights and to work towards the attainment of social justice and equity. Actions to be undertaken include restructuring the civil service, increasing support to parliament, improving the police service and to ensuring transparency and accountability in resource generation, allocation and management.

5. Private Sector Development
The private sector is recognized as the engine of growth and poverty reduction. To support it the government plans a divestiture program, increased financial support and the streamlining of government bureaucracy.

The sectoral breakdown of GPRS funding is given in Table 35:

Areas	HIPC	Dev't Partners	Others*	Total	Per capita ($)**
Education	8,270,968.12	7,140,578.75	9,682,842.86	25,094,389.74	1.27
Health	1,622,575.76	1,915,879.72	912,571.79	4,451,027.26	0.23
Water	709,749.81	3,846,373.80	630,578.08	5,186,701.69	0.26
Sanitation	3,376,553.73	2,548,618.18	1,939,389.78	7,864,561.69	0.40
Governance	-	508,706.98	3,851,584.13	4,360,291.12	0.22
Production/Employment	-	5,384,440.40	3,757,162.63	9,141,603.03	0.46
Roads	-	9,745,112.77	19,511,575.21	29,256,687.98	1.48
Totals	**13,979,847.42**	**31,089,710.60**	**40,285,704.48**	**85,355,262.51**	**4.32**

Source: GPRS Implementation (2002 Annual Progress Report)
* This is made up of District Assemblies Common Fund, Government of Ghana and Internally generated Revenues.
** Conversion based on 2.1% annual population increase (2000-2015)

Table 35: Sectoral breakdown of GPRS funding (source: GPRS Implementation, 2002 Annual Progress Report)

The GPRS makes little mention of the MDGs and associated targets. It does, however, set its own shorter-term indicators and targets for many of the MDG areas. MDG targets which have no corresponding GPRS targets include:

- Literacy rate of 15-25 year olds
- Proportion of seats held by women in national parliament
- Proportion of children immunized against measles
- Prevalence and death rates associated with malaria
- Proportion of TB cases detected and cured under DOTS

Beyond this, the policies outlined do not in every case reflect global consensus on best practices. For instance, in HIV/AIDS, the GPRS does not focus on ARV treatment. The focus instead is on mother-to-child transmission, condom use, targeting high-risk groups, counseling and treatment of opportunistic infections for PLWHAs, and institutional change to raise the profile of HIV/AIDS in the country.

Donor assistance
As part of its debt management strategy, the Government opted for the Highly Indebted Poor Country (HIPC) status in March 2001. Ghana formally gained HIPC status in February 2002. Total relief from all creditors amounts to $3.7 billion, and IDA's

contribution amounts to $1.45 billion spread out over 20 years. Debt service payments will be reduced by an average $215 million per year, or roughly 15 percent of the 2001 government budget, during 2002-2011 (World Bank 2002b).

International donors contribute 36 percent of direct financing for the GPRS and another 16 percent through HIPIC relief. The largest contributions came from concessional multilateral aid from IDA ($330 million) and the African Development Fund ($97 million), with the Netherlands being the most important bilateral donor (Republic of Ghana Ministry of Finance 2003a).

Figure 5 below shows the current percentage breakdown of ODA for specific MDG targets. The graph clearly indicates a need to allocate further resources towards the achievement of the goals, especially in the education, gender, and health sectors:

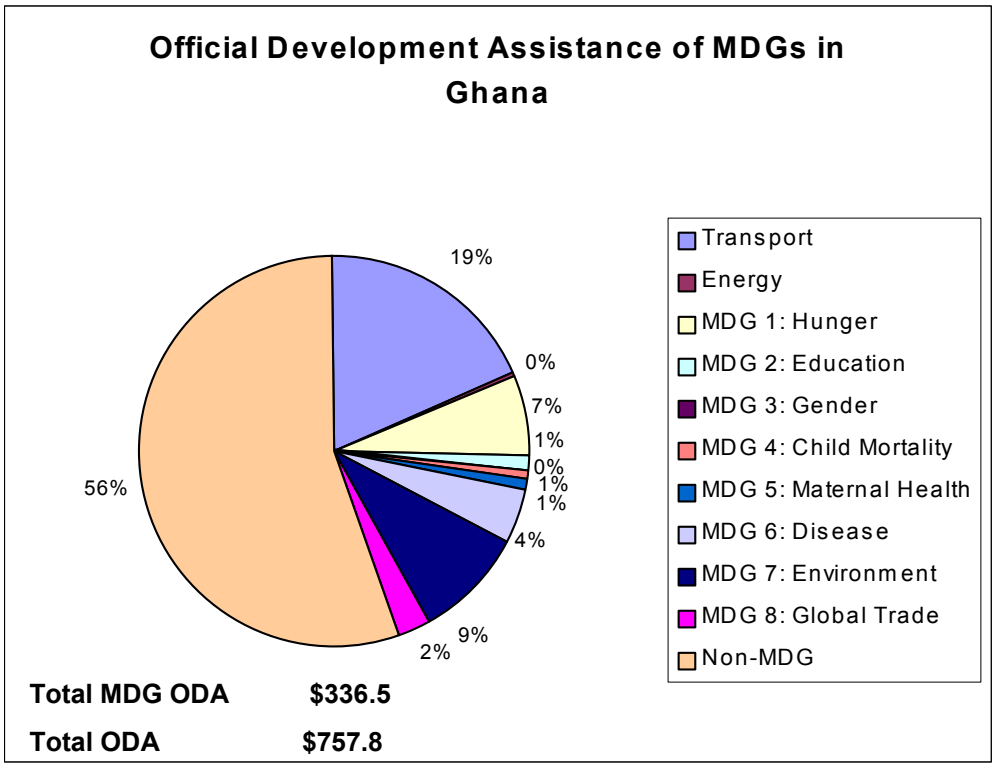

Figure 5: Gross Official Development Assistance to Ghana in 2001 (Simon 2003).

International Environment

Ghana derives most of its foreign exchange from cocoa, gold and timber. Apart from these traditional products, Ghana is beginning to diversify into non-traditional products such as horticultural products, pineapples, and fish and seafood products. For instance, total export of non-traditional commodities yielded US$417.5 million in 2001. This figure is expected to increase in subsequent years through the export of garments via the African Growth and Opportunity Act (AGOA). Europe, the United States of America and some ECOWAS countries remain the dominant destinations of Ghana's trade. Crude Oil importation tops Ghana's import bill. Although Ghana had been recording negative trade balances for the past seven years (starting from 1996), the overall balance of payments

moved from a negative US$117.0 million in 2000 to a slight surplus of US$39.8 million (Bank of Ghana 2003).

Key Sectoral Challenges for Meeting the MDGs

Poverty

Ghana's poverty incidence declined from 51.7 percent in 1992 to 39.5 percent in 1999. Extreme poverty also dropped from 36.5 percent in 1992 to 26.8 percent in 1999. Although the incidence of poverty has declined, the depth of poverty is greater by the standard definition as compared to the extreme poverty levels. Furthermore, statistics show that the declines were not across the entire country. The gap between rural and urban poverty is still a matter of concern. For example, "standard" poverty incidence for rural community in 1999 was 49.5 percent as against 19.4 percent in the urban centers. The three regions in the northern part of Ghana continue to top the poverty chart with incidence ranging from 63 percent to 88 percent (Republic of Ghana 1995, 1999).

In the past the absence of a comprehensive poverty reduction program, lack of disaggregated data on poverty and the failure to link national plans to the annual budget, have hampered efforts for well-targeted policy interventions to reduce poverty in Ghana.

As discussed in Section 4.1, the required resources for interventions relating to income poverty have been addressed as part of the analysis of the following categories.

Hunger

The key challenge to reducing hunger is demonstrated in the proportion of underweight children. Ghana's prevalence of underweight children remains very high at 25 percent and has only reduced slightly over the past decade. At the same time, however, great progress was made in reducing the number of undernourished people. The Government has identified household food security as an important challenge. Other related challenges include promoting equitable growth through pro-poor growth initiatives, minimizing the incidence of inappropriate feeding practices, ensuring adequate dietary intake and the reduction of population growth. Health education messages need to be more specific and targeted. There is also the need to emphasize behavioral change regarding food and nutritional intake. Yet, another challenge is to integrate nutrition into the relevant health, education and agricultural policies at all levels.

The cost estimates for Ghana reflect the strides made in dealing with food insecurity in the country. We aim to target at least 80 percent of all subsistence farmers by 2015; we assume 10 percent of those receive some form of interventions currently. The interventions include soil fertility, improved inputs and improve food production, link subsistence farmers to the market, and promote nutrition programs. This includes an emphasis on provision of community based nutrition programs, population wide fortification programs and school meals.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production							
Capital costs	5	11	6	3%	95	9	24%
Operating costs	16	35	18	10%	296	27	76%
Total	***22***	***46***	***24***	***13%***	***391***	***36***	
Other Rural Income Generation				0%			
Capital costs	3	3	4	2%	39	4	23%
Operating costs	5	12	19	11%	128	12	77%
Total	***8***	***15***	***23***	***13%***	***167***	***15***	
Nutrition				0%			
Capital costs	**-**			0%	**-**		***0%***
Operating costs	21	62	128	73%	733	67	***100%***
Total	***21***	***62***	***128***	***73%***	***733***	***67***	
Total cost ($m)	**51**	**122**	**175**		**1,291**	**117**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production	1	2	1	13%	16	1.5	31%
Other Rural Income Generation	0.4	1	1	13%	7	1	13%
Nutrition	1	3	5	73%	30	3	56%
Total cost per capita ($)	**2**	**5**	**7**		**53**	**5**	

Table 36: Cost of key Hunger interventions in Ghana.

Table 36 shows that the cost of increasing agricultural productivity is $391 million over the 11-year period. The costs decline significantly from 2010 to 2015; this is a reflection of the fact that the agricultural interventions over a five-year time frame yield significant increases in food production, thus reducing the target group of food insecure households. The costs of developing markets and income generation are $167 million over the 11-year period, which translates into $1 per capita on an annual basis. The costs for addressing nutrition issues include the cost of school meals, targeted nutrition programs, awareness and education and population-wide fortification programs. These add up to $3 per capita on an annual basis.

Education

The key challenges to achieving universal basic enrolment include the minimization of the relatively high incidence of rural poverty, ensuring adequate funding for education investments and school improvement, assessment and establishment of obstacles towards the implementation of the Free Compulsory Universal Basic Education (FCUBE) and increase and sustain investment in basic education with emphasize to the increment of enrolment and retention of girls. Inadequate funding for school inputs such as the supply of instructional materials and the maintenance of infrastructure, expanding programs that integrate children not in school into the mainstream educational system and the provision of appropriate incentive structure to reduce absenteeism and high dropout rates continue to be constraints towards the achievement of the targeted 100 per cent by 2015.

Table 37 summarizes the human resources and infrastructure needs for the education sector in Ghana. These have formed the basis for our estimate of financial resource requirements.

Human Resource and Infrastructure Needs	2005	2010	2015	Total 2005-2015	Average 2005-2015
Number of teachers					
Primary Education	**103,299**	**120,592**	**136,074**	**1,322,996**	**120,272**
Secondary Education	**20,012**	**14,101**	**12,217**	**163,542**	**14,867**
Total	***123,311***	***134,694***	***148,290***	***1,486,538***	***135,140***
Number of classrooms					
Primary Education	**92,935**	**123,528**	**155,513**	**1,362,404**	**123,855**
Secondary Education	**8,805**	**9,901**	**12,217**	**111,641**	**10,149**
Total	***101,741***	***133,429***	***167,729***	***1,474,045***	***134,004***

Table 37: Human resources and infrastructure needs of education sector in Ghana

The cost estimates for Ghana calculate the costs of providing free basic education (which includes primary and junior secondary education). We also calculate the costs of higher secondary education; we estimate the resources for 100 percent enrollment and completion at the basic education level. For higher secondary education, the net enrolment rate is calculated based on incoming and outgoing students, and reaches 29 percent by 2015.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education							
Capital cost	106	134	162	31%	1,478	134	31%
Operating cost	177	228	284	55%	2,519	229	54%
Total	***283***	***363***	***446***	***86%***	***3,997***	***363***	***85%***
Cost per student($)	91	86	82		949	86	
Secondary Education							
Capital cost	1	5	9	2%	56	5	1%
Operating cost	56	48	51	10%	550	50	12%
Total	***57***	***53***	***60***	***12%***	***607***	***55***	**13%**
Cost per student($)	142	125	124		1,409	128	
Adult Literacy							
Capital cost				0%			0%
Operating cost	7	8	9	2%	91	8	2%
Total	***7***	***8***	***9***	***2%***	91	8	**2%**
Cost per student($)	***13***	***13***	***13***		***143***	***13***	
Total cost ($m)	**347**	**424**	**516**		**4,695**	**427**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education	13	15	17	86%	165	15	85%
Secondary Education	3	2	2	12%	25	2	13%
Adult Literacy	0.3	0.3	0.4	2%	4	0.3	2%
Total cost per capita ($)	**15.9**	**17.6**	**19.6**		**194.0**	**17.6**	

Table 38: Cost of Education interventions in Ghana.

Table 38 shows the total cost of basic education at $4 billion over the 11-year period. The costs per student go down from 2005-2015 since Ghana has pupil-teacher (29) and pupil-classroom ratios (33), which are lower than the targets of 40 (based on best practices) and 35 (Ghana national targets) respectively. This means that the fewer classrooms need to be built and fewer teachers hired over the years as enrolment increases. Therefore the per student costs decline from $91 to $82 over the 11-year period, which also explains why the per student cost of secondary education goes down from 2005 to 2015. Adult literacy costs are $13 million annually over the period.

Gender Equality

The indicator to measure gender equality is the ratio of females to males in primary, junior and senior secondary schools respectively. Achieving this goal has been hampered by certain factors. The main challenge has to do with changing certain cultural beliefs and practices such as early marriage, customary fostering, puberty rites and Trokosi (female ritual slavery). Once enrolled, girls are more likely to be withdrawn from school due to some of the mentioned cultural beliefs and practices. Other challenges include minimizing the incidence of teenage pregnancies, increasing the transition rate, which has been constant at 3 percent (Republic of Ghana Ministry of Education) for some time now. Increasing employment opportunities for educated young women as well as minimizing gender wage disparities have also constrained the success of attaining gender equality in Ghana.

Achievement of the MDG on Gender Equality requires complex cultural, social and economic changes as is evident in Ghana. We however, attempt a partial estimation of the requirements needed to achieve the gender goal, with particular attention to awareness programs, sensitization and training, violence prevention and systemic issues. Of these, awareness and sensitization programs about sexual and reproductive health and rights are especially key in the case of Ghana. Other cost components include the creation and operation of women's ministries within the government, for which we use benchmarks from countries on track to meet the Gender MDG. Comprehensive responses to violence against women form the final component of our estimates and are comprised of include the costs of prevention, protection and punishment of offenders. We recognize the scarcity of data on violence against women, and acknowledge that these figures are probably an underestimate.

Total cost estimates in 2000 US$ million	2005	2010	2015	Total 2005-15	Average 2005-15
Total ($m)	38	54	59	565	51
Total cost per capita ($)	1.8	2.2	2.2	23	**2**

Table 39: Cost of key gender interventions in Ghana 2005-2015.

We estimate these costs at $565 million from 2005-2015, which translates into per capita costs of approximately $2 annually.

Health

Ghana's MDG in the health sector is geared towards three main targets: reducing child mortality, improving maternal health and finally to combat HIV/AIDS, malaria and other diseases. Reversing the high incidence of under-five mortality is fraught with several challenges. Foremost among these include risky fertility behavior, high incidence of poverty and low level of education among mothers, immunization and the improvement of household and community practices some of which include sanitation, water supply and environmental issues, nutrition and counterproductive cultural beliefs. Other key challenges facing the reduction of child mortality are the improvements of quality care at all levels especially the referral system and the prevention of mother to child HIV transmission particularly through breastfeeding.

Efforts and programs aimed at addressing the high incidence of maternal mortality are also confronted by many challenges some of which are to minimize spatial inequalities, improving the reliability and timeliness in the release of data, documenting and disseminating information about gaps in access and utilization of services and improving availability and retention of trained health personnel (which has become a major national problem), infrastructure and equipment. In addition, the this target is challenged by the recognition of community-based providers who are not part of the formal (health) system, minimizing complications in child delivery posed by the rapid spread of HIV/AIDS and improving the nutritional status of women of child bearing age. Malnutrition among women, high fertility rates and harmful traditional practices equally marred the achievement of maternal mortality goal.

Although outpatient morbidity dropped from 44 percent in 1989 to 41 percent in 1998 (World Bank 2003c), malaria is still the leading cause of outpatient morbidity in all age and sex groups. Among the main drivers of the disease are low use of bed nets, particularly for children, that results from limited availability and high cost; the high cost of malaria treatment, lack of education and non-adherence to treatment regimes, poorly managed community environmental sanitation and finally limited geographical access to basic health services

The fight against the emerging HIV/AIDS epidemic is rendered difficult due to limited financial and human resources, persistent denial and the stigmatization attached to the disease. Areas needing particular attention are the availability of treatment, cost of treatment and testing and counseling as well as workplace policy.

The cost of health interventions for the health MDGs in Ghana is shown below. While Ghana has relatively high levels of coverage in several key areas (e.g. ITNs, maternal health), current levels of child health coverage are relatively low according to the 1998 DHS survey (GSS 1998). Below shows the costs of key health interventions for Ghana.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
HIV/AIDS Prevention	45	69	88	11%	754	69	11%
HIV/AIDS Care	9	13	15	2%	142	13	2%
HIV/AIDS Treatment	6	58	101	13%	616	56	9%
TB	11	12	13	2%	131	12	2%
Malaria Prevention	9	15	20	2%	164	15	2%
Malaria Treatment	9	9	8	1%	100	9	2%
Maternal Heath	33	53	74	9%	599	54	9%
Child Health	59	84	100	12%	907	82	14%
Management	36	63	84	10%	683	62	10%
Quality improvement	27	47	63	8%	512	47	8%
Human resources (salary incr.)	73	126	168	21%	1,365	124	21%
Community demand	9	21	35	4%	237	22	4%
R&D capacity	4	6	8	1%	68	6	1%
Infrastructure recurrent costs	27	27	27	3%	302	27	5%
Total cost ($m)	**358**	**604**	**804**	**100%**	**6,578**	**598**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
HIV/AIDS Prevention	$ 2.1	$ 2.9	$ 3.3	11%	$ 2.8	11%
HIV/AIDS Care	$ 0.4	$ 0.5	$ 0.6	2%	$ 0.5	2%
HIV/AIDS Treatment	$ 0.3	$ 2.4	$ 3.8	13%	$ 2.3	9%
TB	$ 0.5	$ 0.5	$ 0.5	2%	$ 0.5	2%
Malaria Prevention	$ 0.4	$ 0.6	$ 0.8	2%	$ 0.6	2%
Malaria Treatment	$ 0.4	$ 0.4	$ 0.3	1%	$ 0.4	2%
Maternal Heath	$ 1.5	$ 2.2	$ 2.8	9%	$ 2.3	9%
Child Health	$ 2.7	$ 3.5	$ 3.8	12%	$ 3.4	14%
Management	$ 1.7	$ 2.6	$ 3.2	10%	$ 2.6	10%
Quality improvement	$ 1.2	$ 2.0	$ 2.4	8%	$ 1.9	8%
Human resources (salary incr.)	$ 3.3	$ 5.2	$ 6.4	21%	$ 5.1	21%
Community demand	$ 0.4	$ 0.9	$ 1.3	4%	$ 0.9	4%
R&D capacity	$ 0.2	$ 0.3	$ 0.3	1%	$ 0.3	1%
Infrastructure recurrent costs	$ 1.3	$ 1.1	$ 1.0	3%	$ 1.1	5%
Total cost per capita ($)	**16**	**25**	**31**	**100%**	**25**	**100%**

Table 40: Cost of key Health interventions in Ghana.

The following table shows a very rough estimate of the human resource needs (doctors and nurses/midwives) that may be required to roll out the full set of preventive and treatment interventions by 2015. We emphasize that this is a highly preliminary number calculated here to indicate the order of magnitude of the need.

Health human resource needs	Current	2015
Doctor	1,325	8,170
Nurse/midwive	26,764	34,096

Table 41: Projected Human Resource needs for Ghana in the Health sector by 2015

To summarize, we estimate that Ghana needs to spend on average $24 per capita annually between 2005 and 2015 on MDG health interventions. The total cost in 2015 is relatively low compared to the other African countries in our study, which reflects Ghana's low HIV/AIDS prevalence and relatively low levels of malnutrition, which is costly to treat. Nonetheless, this is much higher than the health spending today which is $12 with $7 coming from the government. The human resources estimate also indicates the need for significant scale-up of doctors and nurses to meet the need for basic health services.

Environmental Sustainability

A major environmental problem in Ghana is rapid deforestation. Poor enforcement of regulations on natural resource utilization, inefficient management of forest resources and

the dependence on wood-fuel by the poor have impeded the goal of ensuring environmental sustainability. Several reasons can be advanced to account for this. First, tax enforcement of forestry regulations has been left unchecked. Secondly, as a result of inefficient management of forest reserves and weak enforcement mechanisms, the loss of forest through fire, unsustainable logging practices, indiscriminate wood-fuel extraction and forest encroachment have accelerated. Furthermore, environmental resource degradation arising out of mining and manufacturing activities has been on the rise due to weak enforcement of environmental and mining laws. All these caused Ghana to lose about 79 percent of its forest cover since the beginning of the 20th century (UNDP 2003c).

As detailed in Section 4.6, several sets of interventions directly relating to the environment, such as access to clean energy services and water treatment, are included as part of the analysis of other sectors. At this point we do not have access to sufficient information to calculate the requirements in terms of human and financial resources for the remaining interventions for ensuring environmental sustainability.

Water and Sanitation

The priority activities for the water and sanitation sector are to increase access to safe water in rural areas, especially guinea worm endemic areas and to provide proper sanitary facilities. Although access to safe water has improved, there are wide disparities among regions and between urban and rural areas. Improved rural access to safe water ranges from a low of 22.7 percent in the Greater Accra region to a high of 69 percent in the Upper West region (Republic of Ghana 2003b). According to preliminary data from WHO/UNICEF, 40 percent of the rural population had access to safe water in 2000 compared to 70 percent in urban areas. The rural-urban gap is similarly wide in sanitation, where 44 percent of the rural population enjoys improved access against 71 percent in urban areas (see Table 42).

Water and sanitation targets Ghana	1990	2000	2005	2010	2015	Total 05-15
Water supply						
Total access - urban (%)	85%	70%	72%	82%	93%	
Population provided with access each year - urban			289,156	422,454	516,125	4,683,950
Total acces - rural (%)	36%	40%	43%	55%	68%	
Population provided with access each year - rural			459,363	405,549	468,035	5,004,003
Sanitation						
Total access - urban (%)	54%	71%	74%	76%	77%	
Population provided with access each year - urban			149,881	238,304	274,416	2,629,237
Total acces - rural (%)	37%	44%	48%	58%	69%	
Population provided with access each year - rural			408,446	335,470	393,356	4,281,671

Table 42: Water and Sanitation coverage targets in Ghana.

Water shortages are frequent in many urban areas while rural areas experience seasonality of supply. A number of factors constrain the supply of water. These include low installed plant capacity, inadequate collaboration between stakeholders and lack of funding. In rural areas, the limited ability of communities to contribute to capital costs is real. Other constraints for rural dwellers are the low borehole yield, poor quality of ground water and low levels of training of local maintenance staff (leading to long out-of-service periods of most of the bore-holes). Obtaining spare parts is yet another obstacle, as there is difficulty in establishing spare parts outlets in remote rural areas. Although the

government has established the Public Utilities Regulatory Commission (PURC) to address a number of challenges facing the water sector, much of its work is centralized in the capital. Regional offices of the PURC are yet to be established to respond more effectively to community requests.

Ghana	Water and sanitation						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Water provision							**0%**
Capital cost - rural	8.60	8.00	7.99	3%	87.24	7.93	4%
Operating cost - rural	4.97	8.42	12.31	5%	93.53	8.50	5%
Subtotal rural	***13.57***	***16.42***	***20.30***	***8%***	***180.76***	***16.43***	***9%***
Capital cost - urban	24.41	33.43	40.75	17%	370.73	33.70	19%
Operating cost - urban	17.89	34.98	59.36	24%	401.12	36.47	20%
Subtotal urban	***42.30***	***68.42***	***100.11***	***41%***	***771.85***	***70.17***	***39%***
Total	**55.87**	**84.84**	**120.41**	**49%**	**952.62**	**86.60**	**49%**
Sanitation							
Capital cost - rural	7.97	8.06	8.35	3%	87.97	8.00	4%
Operating cost - rural	1.97	3.65	5.86	2%	41.30	3.75	2%
Subtotal rural	***9.94***	***11.72***	***14.21***	***6%***	***129.27***	***11.75***	***7%***
Capital cost - urban	19.37	27.09	33.16	14%	300.58	27.33	15%
Operating cost - urban	14.49	24.03	36.73	15%	271.48	24.68	14%
Subtotal urban	***33.87***	***51.12***	***69.89***	***28%***	***572.06***	***52.01***	***29%***
Total	**43.81**	**62.84**	**84.10**	**34%**	**701.33**	**63.76**	**36%**
Waste Water Treatment							
Rural	0.00	0.00	0.00	0%	0.01	0.00	0%
Urban	11.47	21.20	33.09	13%	239.17	21.74	12%
Total	***11.48***	***21.20***	***33.09***	***13%***	***239.18***	***21.74***	***12%***
Hygiene Education	**4.69**	**6.35**	**8.00**	**3%**	**69.80**	**6.35**	**4%**
Total cost ($m)	**115.85**	**175.23**	**245.60**	**100%**	**1,962.93**	**178.45**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Water provision						
Capital cost - rural	0.4	0.3	0.3	3%	0.3	4%
Operating cost - rural	0.2	0.3	0.5	5%	0.4	5%
Subtotal rural	***0.6***	***0.7***	***0.8***	***8%***	***0.7***	***9%***
Capital cost - urban	1.1	1.4	1.5	17%	1.4	19%
Operating cost - urban	0.8	1.5	2.3	24%	1.5	20%
Subtotal urban	***1.9***	***2.8***	***3.8***	***41%***	***2.9***	***39%***
Total	**2.6**	**3.5**	**4.6**	**49%**	**3.6**	**49%**
Sanitation						
Capital cost - rural	0.4	0.3	0.3	3%	0.3	4%
Operating cost - rural	0.1	0.2	0.2	2%	0.2	2%
Subtotal rural	***0.5***	***0.5***	***0.5***	***6%***	***0.5***	***7%***
Capital cost - urban	0.9	1.1	1.3	14%	1.1	15%
Operating cost - urban	0.7	1.0	1.4	15%	1.0	14%
Subtotal urban	***1.6***	***2.1***	***2.7***	***28%***	***2.2***	***29%***
Total	**2.0**	**2.6**	**3.2**	**34%**	**2.6**	**36%**
Waste Water Treatment						
Rural	0.0	0.0	0.0	0%	0.0	0%
Urban	0.5	0.9	1.3	13%	0.9	12%
Total	***0.5***	***0.9***	***1.3***	***13%***	***0.9***	***12%***
Hygiene Education	**0.2**	**0.3**	**0.3**	**3%**	**0.3**	**4%**
Total cost per capita ($)	**5.3**	**7.3**	**9.3**	**100%**	**7.4**	**100%**

Table 43: Cost of Water and Sanitation interventions in Ghana.

The above Table 43 summarizes the preliminary results of our needs assessment for the water and sanitation sector in Ghana. To meet the MDGs, per capita costs for capital and operating expenses in the water and sanitation sector are projected to rise from $5.0 in 2005 to $8.9 in 2015. Even though current coverage levels – particularly in urban sanitation – are relatively high, major investments are required in this area to keep up with rapid population growth. Due to high levels of urban access to waterborne sanitation, a relatively large share of the future spending will be devoted to wastewater

treatment. The high per capita costs towards the end of the period are driven in parts by substantial outlays on O&M, particularly in urban areas.

Improving the Lives of Slum Dwellers

According to UN-Habitat, about 70 percent of Ghana's urban population lives in slum-like conditions.[61] The country's rate of urbanization remains relatively low at 36.4 percent (UN 2002), which corresponds roughly to the average in Sub-Saharan Africa. With rapid urban growth projected to continue over the coming decades, the number of slum dwellers is likely to increase unless corrective action is undertaken. As discussed in Section 4.8 above, we have not yet been able to calculate robust resource requirements for meeting Target 11 in Ghana. For this reason the financial requirements of this sector are not included in the subsequent analysis.

Science and Technology

Although some achievements have been made, notably the expansion of 9,150 fixed lines across the country, much needs to be done in this area if Ghana is to achieve a middle-income status by 2020 (Republic of Ghana 2003b; Ministry of Science and Environment). Many challenges need to be addressed head-on. The major one is a lack of advocacy at the highest level of decision-making. As of the end of 2002, limited progress had been achieved with respect to providing ICT for schools. The main indicator for this goal has equally not been developed. A second problem lies in the absences of state-of-the-art science laboratories as well as experts in this field. Another challenge concerns the handling of information and assignment of responsibilities between the separate ministries for Science and Technology. So far Ghana has not been able to implement the Lagos Plan of Action (which asks governments to set aside 1 percent of its Gross National Product for research and development). Partly as a result, very little or no funds exist to undertake research.

At this stage insufficient information was available for calculating resource requirements for promoting science and technology in Bangladesh, including the improvement and extension of university education and research, science advice, and ICT infrastructure. As a result, our preliminary analysis does not include the investment needs for these sets of interventions.

Energy

While urban rates of electrification in Ghana at 78 percent are relatively high compared to the rest of sub-Saharan Africa (23 percent), rural access (18 percent) ***remains comparatively limited. The vast majority of Ghana's rural population depends on inefficient and relatively low luminosity fuels, such as kerosene, for lighting. On the cooking side, only a very small proportion of the population has access to modern fuels: in urban areas, charcoal is the most widespread cooking fuel, although LPG has made inroads. In rural areas, unprocessed biomass dominates.

[61] We are very grateful to UN-HABITAT for providing country-level estimates of the number of slum dwellers. Regional aggregates of these estimates have been published in UN-Habitat (2003) "The Challenge of Slums – Global Report on Human Settlements 2003", Nairobi, Kenya. The Report is available at http://www.unchs.org/global_report.asp.

Recent droughts in Ghana have caused significant power shortages and underscored the need for additional power sources. Currently, electricity is mainly produced from hydro sources. Households consume only 10 percent of all electricity generated in the country. The Ministry of Mines and Energy has created a Renewable Energy Development Program and a Self Help Electrification Program (SHEP) to help rural communities connect to the grid (African Rural Enterprise Development 2002).

The performance in the energy policy area is positive in the area of the West African Gas pipeline for which negotiations are at an advanced stage. However, there is no evidence of progress with respect to the Bui Dam, Solar Energy and the Takoradi Thermal Plant. Furthermore, although the Residual Fluid Catalytic Cracker has been completed, it is not 100 percent operational because the broiler is not working. Progress on the Buipe-Bolga pipeline is still at an early stage. Phase 3 of SHEP 3 and SHEP 4 are also yet to commence. With respect to the indicators for this policy area, currently, no data has been compiled on the ratio of energy demand to energy supply. There is also no available baseline for this indicator (Republic of Ghana 2003b).

Applying our coverage targets set out in Section 4.10 to Ghana requires the country to increase electrification rates to 82 percent in urban areas, and 28 percent in rural areas—reaching an additional 0.6 million households in total between 2005 and 2015. On the cooking side, the proportion of the population with access to cleaner cooking methods will increase by 2 million households. Increased demand for electricity from households, educational- and healthcare facilities, and industry will require a 45 percent increase in annual power supply. Table 44 below summarizes our resource estimates for the energy sector

Total cost estimates for Ghana in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Rural							
Devices	22	28	32	8%	302	27	8%
Fuels	82	116	156	39%	1,276	116	34%
Electricity	42	38	29	7%	414	38	11%
Subtotal rural	***146***	***182***	***217***	***54%***	***1,992***	***181***	***53%***
Urban							
Devices	34	45	57	14%	499	45	13%
Fuels	45	74	114	28%	831	76	22%
Electricity	45	46	16	4%	468	43	12%
Subtotal urban	***124***	***164***	***187***	***46%***	***1,798***	***163***	***47%***
Total cost ($)	**270**	**346**	**404**	**100%**	**3,790**	**345**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Rural						
Devices	1.0	1.1	1.2	8%	1.1	8%
Fuels	3.7	4.8	5.9	39%	4.8	34%
Electricity	1.9	1.6	1.1	7%	1.6	11%
Subtotal rural	***6.7***	***7.5***	***8.2***	***54%***	***7.5***	***53%***
Urban						
Devices	1.6	1.9	2.2	14%	1.9	13%
Fuels	2.1	3.1	4.3	28%	3.1	22%
Electricity	2.1	1.9	0.6	4%	1.8	12%
Subtotal urban	***5.7***	***6.8***	***7.1***	***46%***	***6.8***	***47%***
Total per capita costs	**12.4**	**14.3**	**15.3**	**100%**	**14.3**	**100%**

Table 44: Cost of key Energy interventions in Ghana.

Due to the high rates of electrification – particularly in urban areas – Ghana's investment needs in the sector are lower than in other countries we have studied. In absolute terms,

though, they vary between $12 and $15 over the period. Not included in these summary results is the cost of increasing generation capacity and providing electricity for industrial needs. We estimate the corresponding resource requirements to amount to roughly $495 million dollars for the period from 2005 to 2015.

Transport Infrastructure

While Ghana had one of the most extensive transport systems in Africa at the time of independence, this system witnessed considerable declines over the 1970s. Since then, renewed emphasis has been placed on this sector with government dedicating nearly 19 percent of ODA in 2001 to transport. Within the transport sector, roads play the most critical road and account for nearly 98 percent of the freight moved (EIU 2003b). The rail system is plagued by long travel times and delays with throughput remaining low.

Overall, the performance in the road sector has been compromised by lack of resources, delays in disbursements and the procurement process. This has resulted in the date of tender lagging many months behind the commencement date for works. Nonetheless, performance with respect to feeder road construction is quite impressive given the amount of resources available. On the other hand, the policy objective of linking regional markets to urban centers is bogged down by lack of resources. For instance, as of February 2003, only 23 percent (Republic of Ghana 2003b) of the total amount had been secured for projects falling in this category of road construction.

In addition to its generally strong road sector, Ghana boasts some of the best ports in the region. The ports were recently rehabilitated and are currently being upgraded further. The government hopes that the ports will serve as regional trade hubs (EIU 2003b).

Our very preliminary analysis suggests that the extension of the network of paved roads is not the top priority. Since Ghana has approximately 0.6km of paved roads per 1000 people (World Bank 2003d), thereby exceeding the .5 threshold, the projected financing needs for the road sector focus on O&M and the investments required to ensure that as a result of rapid population growth, the per capita density of paved roads does not fall below 0.5km per 1000 people.

Ghana	Roads						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Road construction							
Two-lane highway	-	-	-	0%	-	-	0%
Two-lane road	-	-	-	0%	-	-	0%
One-lane road	13	13	13	6%	143	13	6%
Total	**13**	**13**	**13**	**6%**	**143**	**13**	**6%**
Road O&M							
Two-lane highway	147	147	147	65%	1,612	147	66%
Two-lane road	54	54	54	24%	596	54	24%
One-lane road	8	9	10	5%	101	9	4%
Total	**209**	**210**	**211**	**94%**	**2,309**	**210**	**94%**
Total cost ($m)	**222**	**223**	**224**	**100%**	**2,452**	**223**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Road construction						
Two-lane highway	-	-	-	0%	-	0%
Two-lane road	-	-	-	0%	-	0%
One-lane road	0.6	0.5	0.5	6%	0.5	6%
Total	**0.6**	**0.5**	**0.5**	**6%**	**0.5**	**6%**
Road O&M						
Two-lane highway	6.7	6.1	5.6	65%	6.1	66%
Two-lane road	2.5	2.2	2.1	24%	2.2	24%
One-lane road	0.4	0.4	0.4	5%	0.4	4%
Total	**9.6**	8.7	8.0	**94%**	**8.7**	94%
Total cost per capita ($)	**10.1**	**9.2**	**8.5**	**100%**	**9.2**	**100%**

Table 45: Cost of Road Infrastructure interventions in Ghana.

We emphasize that our approach to calculating resource requirements for the road sector, while providing the right order of magnitude of required investments, is not well suited for developing detailed country-level road sector plans. These must instead be based on detailed assessments of local demand for transport as well as the country's topography. As a result, the national target of reaching 0.5km of paved roads per 1000 people as well as unit costs may change, and Ghana may have to invest more heavily in its road sector.

Financing

The total costs estimated for Ghana will need to be financed through a combination of private household contributions, domestic government spending, and external assistance. We disaggregate these sources of financing by first estimating the contributions that households can make and projecting the scope for domestic government resource mobilization for the MDGs. Additional resources required to meet the Goals will then need to be externally financed.

The share of household contributions is based on both the ability to pay and the incentive effects of user charges. To calculate the ability to pay, we use national poverty data on the proportion of people living below the poverty line and the income distribution data across quintiles to divide the population into three categories based on their income: those who cannot afford to contribute at all towards meeting the goals (population below the poverty line), those who can contribute partially (population between the poverty line and two times the poverty line) and those who can contribute the full cost of most interventions (population above two times the poverty line).

As discussed in the introduction, we assume that health and primary education are publicly provided and funded, and therefore estimate no household contributions for interventions related to those goals. For secondary education, agricultural interventions, water and sanitation, and energy services, we estimate partial cost recovery.[62]

We calculate the share of total expenditure devoted to the MDG sectors (including social and economic services) at approximately 29.6 percent[63]. We then multiply this share with government revenues to get the total domestic spending on the MDGs.[64] In the case of Ghana, this translates into domestic spending on the MDGs of 5.1 percent of GDP. We assume that domestic spending will increase by 4 percentage points by 2015, increasing the share of domestic resources spent on the MDGs to 9.1 percent of GDP.[65] On a *pro forma* basis we allocate projected domestic government spending to sectors according to the sectors' share of total costs. External financing is then calculated as the difference between total resource requirements and spending by both households and governments.

Summary of Costs and Financing Results

[62] For a detailed description of the proportion of costs in these areas that are borne by households, please refer to Table 5
[63] Calculated using Planned Poverty Reduction Expenditure by Sub-Sector, 2001-2002, Table 6, Source: Budget and MDA Annual Estimations 2001-2002.
[64] Revenue and expenditure data is taken from the Ministry of Finance, Budget 2002, p16-17, http://www.finance.gov.gh/Budget-2002.pdf
[65] For a complete discussion of the assumptions behind this analysis please refer Section 5 above.

Summary of projected financial resources required for meeting the MDGs in Ghana

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
Total Cost (Sum of A+B+C below)	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	51	2.3	122	5.1	175	6.6	1,291	117	4.9	1.3%
Education	347	15.9	424	17.6	516	19.6	4,695	427	17.7	4.7%
Gender Equality	38	1.8	54	2.2	59	2.2	565	51	2.1	0.6%
Health	358	16.4	604	25.0	804	30.5	6,578	598	24.8	6.5%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	116	5.3	173	7.2	246	9.3	1,963	178.5	7.4	1.9%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	270	12.4	346	14.3	404	15.3	3,790	345	14.3	3.8%
Roads	222	10.1	223	9.2	224	8.5	2,452	223	9.2	2.4%
Total	**1,401**	**64.2**	**1,946**	**80.7**	**2,427**	**92.1**	**21,334**	**1,939**	**80.4**	**21.2%**

Summary of projected sources of financing in Ghana

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
A. Household Contributions	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	24	1.1	22	0.9	24	0.9	250	23	0.9	0.2%
Gender Equality	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Health	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	51	2.3	79	3.3	114	4.3	890	80.9	3.4	0.9%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	79	3.6	112	4.6	150	5.7	1,235	112	4.7	1.2%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Total	**154**	**7.0**	**212**	**8.8**	**289**	**11.0**	**2,375**	**216**	**9.0**	**2.4%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
B. Domestically Financed Government Expenditures ***	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	12	0.6	35	1.6	60	2.8	376	34	1.4	0.4%
Education	83	3.8	120	5.0	178	6.8	1,369	124	5.2	1.4%
Gender Equality	9	0.4	15	0.6	20	0.8	165	15	0.6	0.2%
Health	86	3.9	171	7.1	277	10.5	1,918	174	7.2	1.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	28	1.3	49	2.0	85	3.2	572	52.0	2.2	0.6%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	65	3.0	98	4.1	139	5.3	1,105	100	4.2	1.1%
Roads	53	2.4	63	2.6	77	2.9	715	65	2.7	0.7%
Total	**337**	**15.4**	**551**	**22.9**	**837**	**31.8**	**6,220**	**565**	**23.5**	**6.2%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
C. Required Total External Budget Support	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	38	1.8	88	3.5	114	3.9	915	83	3.4	0.9%
Education	239	10.9	282	11.7	314	11.9	3,076	280	11.6	3.1%
Gender Equality	29	1.3	38	1.6	38	1.5	400	36	1.5	0.4%
Health	272	12.5	433	18.0	527	20.0	4,661	424	17.6	4.6%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	37	1.7	46	1.9	47	1.8	501	46	1.9	0.5%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	126	5.8	136	5.7	114	4.3	1,450	132	5.5	1.4%
Roads	168	7.7	160	6.6	147	5.6	1,737	158	6.5	1.7%
Total	**911**	**41.7**	**1,183**	**49.1**	**1,301**	**49.4**	**12,739**	**1,158**	**48.0**	**12.6%**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above

Table 46: Summary of projected total costs and sources of financing in Ghana.

We estimate that in order to meet the MDGs, Ghana will need to spend a total of $64 per capita in 2005 increasing to $92 by 2015 to meet the MDGs. This translates into a total investment need of $21.2 billion between 2005 and 2015, which is equivalent to an average annual per capita need of $80. Of the $80, we estimate that $32.5 will be financed domestically through household and government contributions. ODA commitments to Ghana were $576 million in 2001, or $29 per capita. In comparison, we project an average external financing need of approximately $48 per capita between 2005 and 2015.

It is important to note that the cost estimates above do not encompass an exhaustive list of country specific interventions. There are, in fact, several important interventions that are currently uncosted but can potentially increase the total cost substantially. A list appears in the box below.

Important cost factors not included in these resource estimates for Ghana

- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions to ensure environmental sustainability,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

Tanzania Country Study

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Economic and Social Research Foundation

In collaboration with the Millennium Project secretariat

10. Tanzania Country Study

MDG status

Tanzania is one of the poorest countries in the world with an annual per capita income estimated at $257 (World Bank 2003d). It was identified as one of the 'top priority' countries in this year's Human Development Report since it is not making sufficient progress to meet the MDGs in 2015.

Based on the 2001/2002 Household Budget Survey, 36 percent of the population live below the national basic needs poverty line (URT 2003a). The majority of the poor continue to live in rural areas even though urban poverty is of growing concern. The main development challenge, which all efforts in Tanzania eventually aim to address, is to reduce widespread and persistent poverty.

Primary school enrollment in Tanzania has increased significantly during the 1990s to a Net Enrollment Rate of 88 percent, and the country is on track for achieving the MDGs. In addition, dropout rates have come down to 5 percent. However, transition rates to secondary schools remain very low (UNDP 2002b).

During the 1990s, life expectancy in Tanzania has decreased from 50 years to less than 44 years in large parts due to the worsening HIV/AIDS pandemic (World Bank 2003d). The prevalence of HIV/AIDS in the adult population has been growing rapidly during the 1990s and now stands above 10 percent (URT 2002a). The country faces other acute challenges in the health sector, where maternal mortality rates have been extremely high. Unfortunately, this important indicator is no longer tracked as part of the PRS. Similarly, child mortality rates remain high and have actually *increased* during the 1990s. The health challenges are further compounded by a prevalence of underweight children that remains very high at 29 percent (World Bank 2003d).

Another big challenge for Tanzania is how to address equity issues in relation to MDGs. The MDG reports produced so far have focused on national averages, but for national policy making, it would be more helpful to explore how the status of MDG indicators differ by sex, rural/urban strata, region and so forth, in order to strengthen the national policies and strategies and make them more targeted and effective. Table 47 summarizes some key MDG indicators in Tanzania.[66]

[66] All indicators from the World Bank, except water and sanitation which are from WHO/UNICEF (personal communication 2003).

Indicator	Starting year value (1990)	Ending year value (2000)	Linearly projected 2015 value	MDG target value	Status
Proportion below poverty line	0.39 (1992)	0.36	0.30	0.20	Off Track
Prevalence underweight children	0.30	0.25	0.18	0.15	Off Track
Primary gross enrollment	0.74	1.05 (2003)	1.05	1.00	On Track
Literacy of 15-24 year olds	0.75 (1985)	0.82			
Ratio female enrollment primary	0.82	0.95 (2003)	1.00	1.00	On Track
Ratio female enrollment secondary	0.62	0.84 (2003)	1.00	1.00	On Track
Maternal mortality	530 (1996)	-		133	
Under five mortality rate	141 (1992)	147 (1999)	161	47	Off Track
Infant mortality rate	92 (1992)	99 (1999)			
% with access to improved water (urban)	83%	86%	91%	92%	Off Track
% with access to improved water (rural)	45%	48%	53%	73%	Off Track
% with access to improved sanitation (urban)	53%	53%	53%	77%	Off Track
% with access to improved sanitation (rural)	46%	41%	34%	73%	Off Track

Table 47: Status of Progress towards the MDGs in Tanzania

Geography and Politics

Tanzania borders Kenya and Uganda in the North, Rwanda, Burundi, the Democratic Republic of Congo in the West, Zambia, Malawi and Mozambique in the South and the Indian Ocean in the East. It covers an area of 945,000 Km^2.

Large parts of the country experience tropical climate that is mostly influenced by the geographical features and distance from the Indian Ocean. The climate ranges from arid, semi arid and mountainous, to woodland and dry Savanna. In the highlands, temperatures range from 10^oC to 20^oC. In the rest of the country temperatures never fall below 20^oC. With the influence of the physical features large parts of the country receive moderate rainfall with the mean annual rainfall between 500mm – slightly above 2500mm.

The government of Tanzania is a union government between two countries Tanganyika and Zanzibar. State authority rests with the President of the United Republic of Tanzania (URT) and Revolutionary Government of Zanzibar. The central government, which is made up of Ministries, Agencies, and Departments, coordinates its activities in a decentralized manner where Regional Secretariats and Local government authorities are involved. Local authorities are made up of district councils for rural districts, Municipals and City/town councils for urban districts.

Tanzania has a multi-party democracy since 1992 following the amendment of the constitution. The current total number of political parties is 16 with the ruling party (Chama cha Mapinduzi) having won both the 1995 and 2000 general elections. The country has been politically stable for the past four decades with the exception of clashes resulting in the loss of 30 lives after the January 2001 election in Pemba Island. The cause of the conflict has now been resolved with the signing of a peace accord in late 2001.

Tanzania has ratified several conventions on human rights. These include the Convention Governing the Specific Aspects of Refugee Problem in Africa, UN Convention on the Right of a Child, Convention on the Elimination of All Forms of Discrimination against Women, International Covenant on Civil and Political Rights, International Convention on all forms of Racial Discrimination and Convention Against Torture and other Cruel Human and Degrading Treatment of Punishment.

Population

Tanzania's population of 34.6 million is made up of about 120 ethnic groups comprising mainly Bantus, Nilotics, Bushmen, etc. According to the Population and Housing Census conducted in August 2002, the average population growth in Tanzania is 2.9 percent. About 51 percent of the population is comprised of women and 46 percent of the total population is under the 15 years of age. The average household size, calculated by dividing the number of persons by the total number of households in Tanzania has decreased from 5.2 persons per household in 1988 to 4.9 persons per household in 2002 (URT 1993, 2002b).

The combination of high HIV/AIDS prevalence and high population growth rates will continue to exert pressure on the basic social services especially health and threaten to reduce life expectancy further.

The demographic transition in the country has barely begun with fertility rates still at 5.3 per woman in 2000, down only slightly from 6.25 in 1990, 6.47 in 1980 and 6.80 in 1960 (World Bank 2003d). This is roughly in line with the average fertility rate for Sub-Saharan Africa of 5.2, but much higher than the average of all low-income countries (3.6). As a result over 45 percent of Tanzania's population is below 15 years of age – a share that has hardly declined from a maximum of 48 percent in 1980. In response to the falling fertility rate, population growth in Tanzania has decelerated to 2.2 percent in 2000 from 3.2 percent in 1990 (World Bank 2003d), with much of this growth taking place in

urban areas. Overall, the country's population is expected to increase from 34 million today to 46 million in 2015 (UN 2002).

Economy

Tanzania's economy depends primarily on agriculture (primarily coffee, cotton, tea, rice, wheat, and cassava), which contributes nearly 48 percent of GDP, providing about 85 percent of exports and employing about 80 percent of the workforce (URT 2003). The real GDP per capita at 1992 prices grew at 4.0 percent in 2002 compared to 2.7 percent in 2001. This growth was mainly attributed to the contribution of the agriculture sector (47.5 percent); trade, hotels, and restaurants including tourism (16.6 percent); and manufacturing (8.4 percent) (URT 2003e). In 2002, the Gross Domestic Product[67] amounted to $8.6 million (Bank of Tanzania 2003). The per capita income amounted to $257 at current prices. Preceding 2002 the economy stagnated in per capita terms between 1990 and 2000 when it generated an average GDP per capita growth rate of 0.1 percent (World Bank 2003d).

Tanzania's economy is highly vulnerable to shocks, such as climatic changes and fluctuations of world market prices for export and import commodities. As a result, the economy needs to grow at above 6 percent in order to absorb the impact of external shocks – a rate of growth, which the country has not managed to sustain in the past.

Over the past ten years the government policy has been to shift away from state control of the economy towards a market economy focusing on liberalization and privatization. Since the 1986 structural adjustment program a number of comprehensive policies have been undertaken including a reduction of the budget deficit and improvement of monetary control, devaluation, trade liberalization, removal of price controls, liberalization of food and export crops markets, freeing of interest rates and restructuring of the financial sector. These economic reforms have been accompanies by economic and institutional reforms. To ensure that the benefits from growth reach the poor, the government has established both macro and sectoral strategies including the National Poverty Eradication Strategy (NPES), PRS and Agricultural Sector Development Strategy (ASDS).

Infrastructure

The road sector is among the priority sectors defined in the PRSP and clearly mentioned in the Rural Development Strategy and Agriculture sector Development Strategy. The road network is critical for Tanzania's economy and accounts for approximately 60 percent of internal freight traffic (Ministry of Works, 2003). The total classified road network in Tanzania has a length of 85,000 km, distributed as follows: trunk roads - 10,300 km; regional roads - 24,700 km; district roads - 20,000 km; urban roads - 2,450 km, and feeder roads - 27,550 km. Out of the total road network, only 3801 (URT 2000b) km is paved and the rest is unpaved. This translates into 0.11 km of paved road per 1000 people, a ratio that is very low compared to other low-income countries.

[67] The exchange rate stood at $1=993.000 at December 2002

PRSP/PRGF

Tanzania became the third country in Africa to qualify for the Heavily Indebted Poor Countries (HIPC) Initiative debt relief towards the end of 1990s. In this context, the Tanzania's PRSP was developed in year 2000 through broad consultation with national and international stakeholders. The PRS is a short-term strategy that operationalizes the Vision 2025[68] and the National Poverty Eradication Strategy (NPES).[69] Implementation of the PRS began in the financial year 2000/01 and will conclude in 2003/04 followed by a review of progress.

Tanzania's long-term policy frameworks are broadly aligned with the MDGs, but differ in terms of timeframe and baseline years (ESRF 2003a). While the PRSP includes many targets that are consistent with the MDGs, several Targets, such as Target 9 on environmental sustainability are not addressed in any detail. Six priority sectors are identified in the PRS. These are; Agriculture, Primary education, Rural roads, Water and sanitation, Legal and judicial system, and Health. The cross cutting issues are also identified in the PRS namely: HIV/AIDS, environment, gender and governance. With the exception of the environment, the rest of these issues have been given a serious attention in the current PRS. The PRSP is currently being reviewed and remaining gaps are expected to be addressed as part of the review.

The Medium Term Expenditure Framework (MTEF) process has established resource requirements for the PRS. The government remains steadfast in continuing to implement polices that can enhance domestic resource mobilization to raise government domestic resources and giving priority to funding poverty reduction programs. The outcome of recent efforts has been encouraging. In fiscal year 2001/02, domestic sources reached $1,042 million, which is about 70 percent of constrained requirements of the priority sectors as identified in the MTEF, which stood at TShs 1,498 billion. In the medium term, priority sector requirements are projected to be much higher, as sector development programs become operationalized. Figure 6 shows the budget framework for the years 2001/02-2004/05.

[68] Vision 2025 is a long-term development strategy that defines the overall level of development the country wants to achieve by the year 2025 for the Mainland Tanzania. Its major goals are to have high quality of livelihood, peace, stability and unity, good governance, educated and learning society and competitive economy capable of producing sustainable growth and shared benefits by the year 2025.

[69] This is a medium-term strategy, which sets a wide range of more specific poverty reduction targets. Its overall objective is to reduce abject poverty by 50 percent by 2010 and eliminate abject poverty completely by 2025.

	2001/02	2002/03	2003/04	2004/05
	Actual	Budget	Projection	Projection
Total Resources	**1626.5**	**2219.2**	**2210.9**	**2314.3**
Domestic revenue	1042.9	1172.3	1295.9	1455.2
Budget support loans and grants	216.2	289.1	306.4	321.4
Project loans and grants	294.4	624.5	530.8	451.2
HIPC relief (ADB, IMF, WB)	60.3	80.1	77.7	86.4
Drawdown of deposits	-	21.3	-	-
Borrowing	22.6	9	-	-
Privatization funds	-	18	-	-
Adjustment to cash	35.3	-	-	-
Recovery of NBC bond	-	5	-	-

Figure 6: Budget Framework, 2001/02-2004/05 (million $) (URT 2003f)

Donor Assistance

In April 2000, Tanzania qualified for the enhanced initiative for Highly Indebted Poor Countries (HIPC initiative). Under the agreement, Tanzania was to be provided with $2,026m of debt relief, reducing Tanzania's debt by 54 percent. Debt service payments were cut by over 47 percent over time, from $193m in 2000 to $87 million in 2021 with an average of $116 in 2011 (World Bank 2003f).

Bilateral aid makes up most of the financial assistance to Tanzania, with a combined $944m coming from European countries (EIU 2003c) notably the United Kingdom with $296m. Multilateral aid, totaling $286m, stems primarily from the IDA, which contributes $120m.

Figure 7 shows the current outlay of development assistance that is targeted to specific MDGs. With total levels of international aid reaching over $1,440 million, financing for the MDGs make up just under 60 percent.

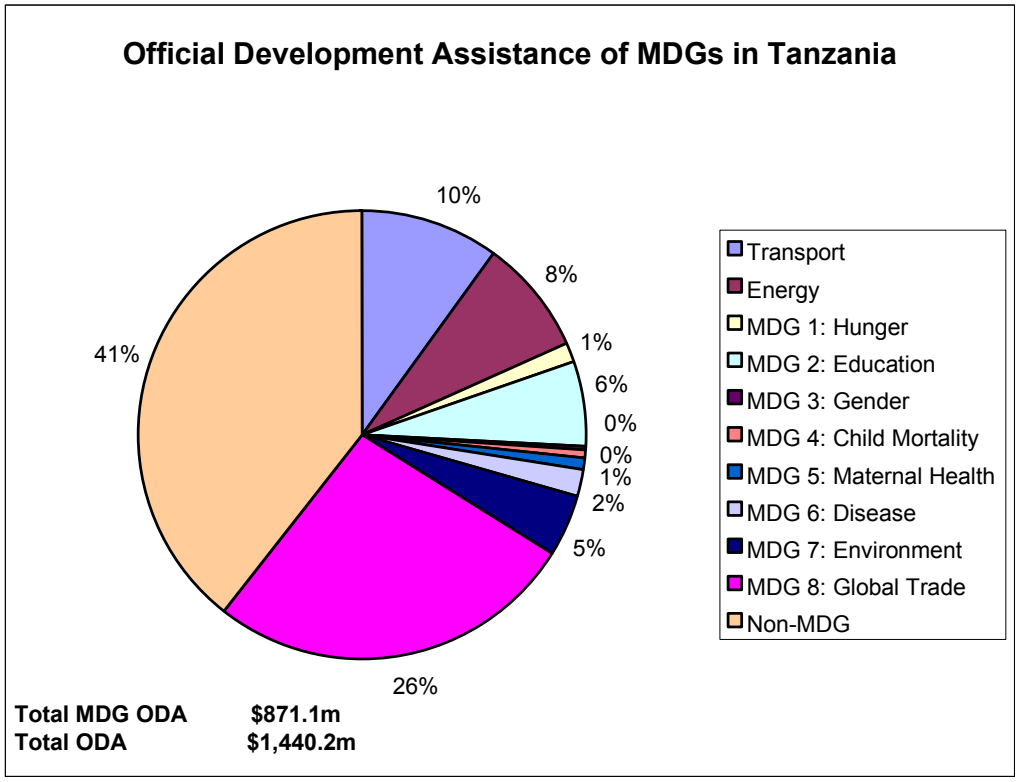

Figure 7: Gross Official Development Assistance to Tanzania in 2001 (Simon 2003).

International environment
Tanzania's economy is very dependent on international trade policies. Over the past ten years traditional exports, such as coffee, cotton, tea, tobacco, cashew nuts and cloves, have declined in value. The performance of the export sector is strongly affected by WTO Agreements and instruments. The principal challenge is how to built a strong market economy that is competitive both domestically and internationally without compromising the sustainability of the country's economic growth and development. In particular, Tanzania's economic institutions will have to accelerate change to match increasing importance of international trade.

Key Sectoral Priorities for Meeting the MDGs

Poverty
Statistics from Household Budget Surveys show that in 2000/01 some 36 percent of Tanzanians fell below the basic needs poverty line and 19 percent below the food poverty line compared with 39 and 22 percent in 1991/92 (URT 1993, 2003a). The food poverty line is defined as income that is insufficient to afford the basic basket of food consumption. People living below the basic need poverty line cannot afford a basket of basic necessities. There has also been a small decline in the poverty gap, a measure of the depth of poverty.

The experienced decline in poverty is not large enough to be statistically significant. It is important to note that the absolute number of people living in poverty increased during the 1990s because of population growth. Using national population projections, there are now 11.4 million Tanzania below the basic needs poverty line compare with 9.5 million in 1991/92. The HBS statistics also shows an increase in inequality over the period, with a Gini coefficient increasing from 0.34 to 0.37 (URT 1993, 2003a). Poverty is highest in rural areas, where 39 percent of the population falls below the basic needs poverty line. Dar es Salaam has the lowest level of poverty, with 18 percent below the same line (URT 1993, 2003a).

As discussed in Section 4.1, the required resources for interventions relating to income poverty have been addressed as part of the analysis of the following categories.

Hunger

Hunger and malnutrition are extremely high in Tanzania with 25 percent of all children under the age of five suffering from malnourishment. In 1996, 43 percent of the children under five were found to be stunted (low height for age) and 18 percent were severely stunted (PRSP). The proportion of severely underweight children has *increased* slightly on the mainland during the 1990s from 28.8 percent in 1991/92 to 29.4 percent in 2000 (World Bank 2003d).

Clearly linked to this severe hunger situation falling capita food production in Tanzania, which reached a peak in the late 1970s and has declined by 32 percent since then (FAOSTAT 2003). In comparison, average per capita food production has also fallen in Sub-Saharan Africa, but only by 11 percent. Declining soil nutrient quality and very low rates of mechanization or animal traction have resulted in very low agricultural productivity, which currently stands at 1.2 tons per hectare and has barely increased over the past decade.

The majority of Tanzania's small-scale farmers rely on rain-fed agriculture with only 3.3 percent of total cropland under irrigation (FAOSTAT 2003). Annual agricultural output is highly variable with an average percent variation from the mean of over 9 percent during 1992-2001, compared to a world average of only 3.5 percent (FAOSTAT 2003). Partly as a result of this, food insecurity in Tanzania is extremely high with an average per capita consumption of merely 1,940 kcal per day, compared to a world average of 2,808 kcal.

Declining per capita agricultural production is one important cause of hunger. In addition, large proportions of Tanzania's population suffer from malnourishment resulting from inadequate intake of nutrients. Vitamin and mineral deficiencies are widespread, particularly among young infants and adolescent girls and women.

The interventions in this analysis are targeted at smallholder subsistence farm households in Tanzania; they focus on improving soil fertility, improving inputs, small-scale water management and significantly increase research and extension efforts. Other interventions include efforts to improve storage facilities, value added processing facilities and marketing facilities. Specific nutrition interventions that aim at reaching

infants and adolescent girls and women are also included. The cost estimates use unit costs obtained from local experts and used to calculate the total costs of reaching 80 percent of the rural population that relies on maize mixed farming as a primary source of employment.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production							
Capital costs	20	40	18	5%	341	31	24%
Operating costs	63	125	58	16%	1,064	97	76%
Total	***83***	***165***	***76***	***21%***	***1,405***	***128***	
Other Rural Income Generation				0%			
Capital costs	13	12	13	3%	136	12	23%
Operating costs	18	42	68	19%	469	43	77%
Total	***30***	***55***	***81***	***22%***	***605***	***55***	
Nutrition				0%			
Capital costs	**-**			0%	**-**		***0%***
Operating costs	49	117	208	57%	1,331	121	***100%***
Total	***49***	***117***	***208***	***57%***	***1,331***	***121***	
Total cost ($m)	**163**	**337**	**365**		**3,341**	**304**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production	2	4	2	21%	34	3.0	43%
Other Rural Income Generation	0.8	1	2	22%	14	1	18%
Nutrition	1	3	5	57%	31	3	39%
Total cost per capita ($)	**4**	**8**	**8**		**79**	**7**	

Table 48: Cost of Hunger interventions in Tanzania.

Table 48 shows that the cost of increasing agricultural productivity is $1.4 billion over the 11-year period. The costs decline significantly from 2010 to 2015; this is a reflection of the fact that the agricultural interventions over a five-year time frame yield significant increases in food production, thus reducing the target group of food insecure households. The costs of developing markets and income generation are $605 million over the 11-year period, which translates into $1 per capita on an annual basis. The costs for addressing nutrition issues include the cost of school meals, targeted nutrition programs, awareness and education and population-wide fortification programs. These add up to $3 per capita on an annual basis.

Education

Over the past two years, there has been significant progress towards achieving Universal Primary Education targets, mainly after the implementation of Primary Education Development Plan (PEDP).[70] The PEDP has introduced a capitalization grant of US $10 per student per year for the financing of non-salary expenditure on primary education. This and other measures have resulted in a rapid increase in gross enrollment from 73.5 percent in 1990 to 105 percent in 2003 while net enrollment was recorded at 85.7 percent in the same year. Despite good performance in enrollment, the challenge still remains to

[70] PEDP implementation commenced from July 2001.

sustain the resources flowing into the sector to increase retention levels of students. Transition rates to secondary school remain extremely low, especially for girls. In addition, repetition is high and pass rates for the primary learning exams have been reported to be as low as 20 percent (UNDP 2002a).

Other challenges in the education sector include the slow pace of educational reform, as well as the high variation and unpredictability of resources flowing into the sector, particularly from donors. The sector further suffers from low numbers of teachers who tend to be poorly trained. These problems are exacerbated by the growing impact of the HIV/AIDS pandemic coupled with limited resources to treat infected teachers and to replace the dying ones. Finally, the increasing level of poverty prevents households from meeting school fees and other related cost. These increasingly act as a deterrent for raising primary school enrollment.

In order to meet the education goal, Tanzania would need to target 100 percent primary school enrolment as well as 100 percent primary completion rates by 2015. The costs are estimated based on the total school going population (as identified by calculations drawn from the World Bank Education Statistics), using local unit costs. In particular, as prioritized by the Tanzanian PEDP, we focus on providing teacher housing to 30 percent teachers to reduce attrition. We also estimate the human resource requirements and the number of classrooms needed by 2015 based on best practice norms as discussed earlier. The preliminary estimates are summarized in Table 49.

Human Resource and Infrastructure Needs	2005	2010	2015	Total 2005-2015	Average 2005-2015
Number of teachers					
Primary Education	**120,945**	**155,036**	**195,275**	**1,714,397**	**155,854**
Secondary Education	**13,408**	**15,233**	**19,847**	**173,507**	**15,773**
Total	***134,353***	***170,269***	***215,122***	***1,887,904***	***171,628***
Number of classrooms					
Primary Education	**102,948**	**141,018**	**195,275**	**1,582,207**	**143,837**
Secondary Education	**7,488**	**11,870**	**19,847**	**138,676**	**12,607**
Total	***110,435***	***152,888***	***215,122***	***1,720,883***	***156,444***

Table 49: Human resources and infrastructure needs of the education sector in Tanzania

For secondary education, we calculate the number of incoming and outgoing students, based on primary school completion and transition rates and drop out rates; for Tanzania, based on these parameters we estimate the net enrolment rate to increase to 11 percent by 2015. The costs are then calculated by scaling up unit costs. As in the case of primary education, we also calculate the number of teachers and classrooms needed for secondary education. Table 50 below presents these results for Tanzania.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education							
Capital cost	65	76	109	16%	848	77	15%
Operating cost	257	340	458	67%	3,800	345	68%
Total	***321***	***416***	***567***	***83%***	***4,647***	***422***	***83%***
Cost per student($)	50	58	73		647	59	
Secondary Education							
Capital cost	2	12	15	2%	116	11	2%
Operating cost	42	55	84	12%	643	58	12%
Total	***43***	***67***	***100***	***15%***	***759***	***69***	**14%**
Cost per student($)	165	162	143		1,747	159	
Adult Literacy							
Capital cost				0%			0%
Operating cost	13	16	19	3%	169	15	3%
Total	***13***	***16***	***19***	***3%***	169	15	**3%**
Cost per student($)	***17***	***17***	***17***		***192***	***17***	
Total cost ($m)	**377**	**499**	**686**		**5,575**	**507**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education	8	10	12	83%	110	10	83%
Secondary Education	1	2	2	15%	18	2	14%
Adult Literacy	0.3	0.4	0.4	3%	4	0.4	3%
Total cost per capita ($)	**9.8**	**11.9**	**14.9**		**131.7**	**12.0**	

Table 50: Cost of Education Interventions in Tanzania.

As Table 50 shows, the total cost of primary education is $4.6 billion over the 11-year period. The per student cost increases from $50 in 2005 to $73 in 2015. The main drivers of the cost are teachers' salaries and the cost of classroom construction.

The total cost for secondary education is $759 million, or $2 in per capita terms. This is significantly lower than costs in the other countries primarily because Tanzania is starting from a very low net enrolment rate of 5 percent, primary completion rate of 33 percent and a low transition rate of 22 percent. Thereafter, even with significantly high targets for primary completion (100 percent) and transition rate (60 percent) the overall target population remains low. The per student costs decline from $165 in 2005 to $143 in 2015; this is primarily due to underutilization of current resources; pupil teacher ratio is 18, leaving scope to increase the number of student per teacher. Adult literacy costs are estimated at $17 per student, based on actual programs. The total cost of education is estimated at $5.6 billion over 2005-2015. This translates into annual costs of $507 million, or $12 per capita per year.

Gender Equality

In Tanzania, issues of gender equality have mainly been addressed in Primary Schools and gender parity in primary level is likely to be achieved by 2005. The major challenges that exist today, include improving the performance level of girls relative to boys in school exams at the primary level and increasing public awareness of socio-cultural practices that discriminate against girls and women. Important issues to be addressed are the gender division of labor at the household level and the high dropout rates of girls in schools especially at the secondary level.

Women's representation in parliament and political parties is still low. However, the government of Tanzania has introduced a law of affirmative action to increase the proportion of women in elected positions. Affirmative action has favored women in parliament representation where the old quota system of 15 guaranteed female seats was replaced by 15 percent female representation in the 1995 parliament (Mukangara and Koda, 1997). This percentage has been increased to 30 percent in year 2000 elections. Nevertheless, the women's quota system was strongly challenged by female activists because it perpetuates the negative attitudes that women are not capable of competing with men in their electoral constituencies.

We attempt a partial estimation of the costs of interventions that aim at reaching the Gender MDG; this estimation focuses on awareness programs, sensitization and training, violence prevention and systemic issues. Of these, vocational training consistently encompasses over 60 percent of the total per capita costs. These programs focus on training adolescent girls in secondary school by building skill sets that will increase employability, thereby facilitating the transition of girls into the labor force. Other cost components the creation and operation of women's ministries within the governments. We use existing budgets from benchmark countries (those that are track to meet the gender MDG) to estimate these costs. Comprehensive responses to violence against women form the final component of our estimates; these include the costs of prevention, protection and punishment of offenders.

Total cost estimates in 2000 US$ million	2005	2010	2015	Total 2005-15	Average 2005-15
Total ($m)	82	100	118	1,086	99
Total cost per capita ($)	2.1	2.4	2.6	26	**2**

Table 51: Cost of key gender interventions in Tanzania, 2005-2015.

Our results show that Tanzania needs at least $1.1 billion over 2005-2015 to attempt to meet the gender goal. We recognize that gender data is it a large extent nonexistent, and that therefore these numbers probably underestimate the true cost of meeting the gender MDG.

Health

Life expectancy in Tanzania is low at 44 years. It *decreased* by 12 percent between 1990 and 2000, primarily due to the worsening HIV/AIDS pandemic (World Bank 2003d). Maternal mortality rates were extremely high, at 530 in 1996 (URT 1997). Since then national statistics offices have stopped tracking this critical indicator, so no trend data is available. The main drivers of maternal mortality include unsafe abortions, eclampsia, hemorrhage, anemia, and obstructed labor. Without dramatically increasing access to emergency obstetric care and reproductive health services, it will be difficult to bring down high maternal mortality rates. This picture of deteriorating health outcomes is further compounded by child mortality rates that have *increased* from 141 in 1992 to 147 in 2000 (URT 2000a). Wide-spread epidemics like cholera appear regularly in Tanzania.

At present, AIDS is the leading killer disease in the age group 15-59 years. For example, AIDS accounts for as much as 35.5 percent and 44.5 percent of male and female deaths in that age group in Dar es Salaam (URT 2003f). As a result of AIDS mortality and morbidity, the active labor force is estimated to be 9 percent lower today than it would have been in the absence of AIDS. The rapid rise of adult deaths leaves an increased number of orphans who tend to suffer from malnutrition and lack of education, which entrenches their poverty.

In addition, the situation regarding malaria remains equally severe. Virtually all of Tanzania is an endemic malaria area. According to the government, the annual incidence ranges from 400-500 cases per 1000, accounting for approximately 30 percent of the country's total disease burden and 17 percent of all deaths (URT 2003f). The number of clinical malaria cases per year is estimated to be between 14 and 18 million with a mortality rate that ranges from 140 to 650 per 100,000 people, depending on geographical location (URT 2003g). The country's predominant malaria vector is anopheles gambiae, which is notoriously difficult to contain and more than 95 percent of reported malaria cases are plasmodium falciparum, the most lethal form of the parasite.

Respiratory tract infection and diarrhea contribute to high morbidity and mortality figures in Tanzania. According to WHO 2001 data, Tanzania is one of the 22 countries with the highest TB burden. The disease currently claims 124 thousand cases each year, which is equivalent to an incidence rate of 344. With the growing HIV/AIDS pandemic, TB incidence has risen by over 100 percent over the past 15 years.

The cost of health interventions in Tanzania is projected to rise to $43 per capita by 2015. This is the highest health cost of all countries in our study and is mainly driven by Tanzania's relatively high rate of HIV/AIDS prevalence – the highest amongst our countries. The high cost of health interventions in Tanzania also reflects its high malaria incidence, which is more than twice as high as the next highest in our study, Uganda. A summary of the associated health costs can be seen in Table 52 below.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
HIV/AIDS Prevention	74	116	149	7%	1,258	114	8%
HIV/AIDS Care	41	58	67	3%	626	57	4%
HIV/AIDS Treatment	27	252	440	22%	2,672	243	17%
TB	13	14	15	1%	155	14	1%
Malaria Prevention	11	21	33	2%	239	22	1%
Malaria Treatment	76	85	73	4%	891	81	6%
Maternal Heath	40	66	94	5%	745	68	5%
Child Health	169	189	206	10%	2,080	189	13%
Management	90	160	216	11%	1,733	158	11%
Quality improvement	67	120	162	8%	1,300	118	8%
Human resources (salary incr.)	180	320	431	22%	3,466	315	22%
Community demand	15	36	60	3%	404	37	3%
R&D capacity	9	16	22	1%	173	16	1%
Infrastructure recurrent costs	30	30	30	2%	331	30	2%
Total cost ($m)	**842**	**1,483**	**1,999**	**100%**	**16,073**	**1,461**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
HIV/AIDS Prevention	$ 1.9	$ 2.8	$ 3.2	7%	$ 2.7	8%
HIV/AIDS Care	$ 1.1	$ 1.4	$ 1.5	3%	$ 1.4	4%
HIV/AIDS Treatment	$ 0.7	$ 6.0	$ 9.6	22%	$ 5.8	17%
TB	$ 0.3	$ 0.3	$ 0.3	1%	$ 0.3	1%
Malaria Prevention	$ 0.3	$ 0.5	$ 0.7	2%	$ 0.5	1%
Malaria Treatment	$ 2.0	$ 2.0	$ 1.6	4%	$ 1.9	6%
Maternal Heath	$ 1.0	$ 1.6	$ 2.1	5%	$ 1.6	5%
Child Health	$ 4.4	$ 4.5	$ 4.5	10%	$ 4.5	13%
Management	$ 2.3	$ 3.8	$ 4.7	11%	$ 3.7	11%
Quality improvement	$ 1.8	$ 2.9	$ 3.5	8%	$ 2.8	8%
Human resources (salary incr.)	$ 4.7	$ 7.6	$ 9.4	22%	$ 7.5	22%
Community demand	$ 0.4	$ 0.9	$ 1.3	3%	$ 0.9	3%
R&D capacity	$ 0.2	$ 0.4	$ 0.5	1%	$ 0.4	1%
Infrastructure recurrent costs	$ 0.8	$ 0.7	$ 0.7	2%	$ 0.7	2%
Total cost per capita ($)	**22**	**35**	**44**	**100%**	**35**	**100%**

Table 52: Cost of Health Interventions in Tanzania.

Table 53 below shows a very rough estimate of the human resource needs (doctors and nurses/midwives) that may be required to roll out the full set of preventive and treatment interventions by 2015. We emphasize that this is a highly preliminary number calculated here to indicate the order of magnitude of the need.

Health human resource needs	Current	2015
Doctors	1,545	14,010
Nurses/midwives	48,972	60,712

Table 53: Human Resource requirements for the Health Sector in Tanzania in 2015.

In summary, we estimate that Tanzania requires on average $35 per capita annually between 2005 and 2015 for the health related MDGs. This compares to $11 spent on all health today. Of this $11, the government spends $5, which places the majority of the health cost burden on households. Human resources also need to be increased substantially if Tanzania is to meet the Millennium health goals. While the above table suggests relatively more need for physicians than nurses, this could change depending on locally specific role definitions. We should also note that Tanzania has a cadre of health workers called clinical officers who are not MDs (and who are not included in current doctor numbers), yet who play a critical role in primary health care provision. Their contribution may reduce the needed numbers of formally trained MDs in the future, which is not accounted for in this analysis.

Environmental Sustainability

The environment is one of the main concerns of the Tanzanian government, even though no environmental targets were set in the current PRS. Tanzania's priority environmental concerns are land degradation and deforestation; lack of improved water supply and deteriorating water quality; environmental pollution; deterioration of aquatic systems; and loss of wildlife habitats and biodiversity. Deforestation has been the main problem over decades now as it is estimated that approximately 91,000 hectares of forest were destroyed between 1990 and 2000 through unplanned forest clearance for agriculture, forest fires, and other non-sustainable forest resource uses (FAO 2001). The major challenge today is to restore the affected areas and increase participation of key actors in environmental management and suitable use of environmental resources. For this the limited government capacity for environmental management will need to be improved significantly.

Another challenge is to identify robust and meaningful poverty-environment indicators which can be measured and provide insights into the impact of the poverty reduction policies. Until now, issues of human development and the environment have generally been addressed separately, without due acknowledgement of their inter linkages.

As detailed in Section 4.6, several sets of interventions directly relating to the environment, such as access to clean energy services and water treatment, are included as part of the analysis of other sectors. At this point we do not have access to sufficient information to calculate the requirements in terms of human and financial resources for the remaining interventions for ensuring environmental sustainability.

Water and sanitation

Access to improved water supply and sanitation in Tanzania is very low. According to preliminary estimates by WHO/UNICEF, access to water supply ranges from 48 percent to 86 percent in rural and urban areas. The bigger challenge lies in the sanitation field where access is as low as 40 percent and 53 percent in rural and urban areas, respectively. The pace of progress in extending access to improved water supply and sanitation has been inadequate to meet the corresponding MDG and the Johannesburg sanitation target, as illustrated in Table 54.

Water and sanitation targets Tanzania	1990	2000	2005	2010	2015	Total 05-15
Water supply						
Total access - urban (%)	83%	86%	87%	89%	92%	
Population provided with access each year - urban			295,154	710,180	773,186	7,269,301
Total acces - rural (%)	45%	48%	51%	62%	73%	
Population provided with access each year - rural			725,468	543,477	576,110	6,366,137
Sanitation						
Total access - urban (%)	53%	53%	55%	66%	77%	
Population provided with access each year - urban			444,466	825,033	998,107	8,743,166
Total acces - rural (%)	46%	41%	43%	58%	73%	
Population provided with access each year - rural			893,702	750,977	789,267	8,610,885

Table 54: Water and Sanitation Targets in Tanzania.

Both time and distance measures give a partial indication of the burden of domestic water management felt mainly by women and children in Tanzania and an indication of time that could be spent on more productive and social activities. Although survey data exists

on the distance to source and time taken to fetch water, there is no data on the affordability and quality of water. Another challenge lies in identifying meaningful indicators for the sanitation targets and in translating the targets into specific actions. Household survey data on sanitation is confined to information on use (or ownership) of toilet facilities. This does not capture the full range of problems related to disposal of household refuse and septic tanks.

Unit cost data for our analysis was taken from a broad range of sources and has been differentiated by urban and rural areas as described in Section 4.7. Our resource estimates for the water and sanitation sector in Tanzania are summarized in Table 55.

Tanzania	Water and sanitation						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Water provision							**0%**
Capital cost - rural	18.08	12.49	13.72	4%	148.88	13.53	6%
Operating cost - rural	10.54	17.65	25.75	8%	196.53	17.87	8%
Subtotal rural	***28.62***	***30.14***	***39.47***	***13%***	***345.41***	***31.40***	***14%***
Capital cost - urban	23.25	40.94	46.22	15%	430.99	39.18	17%
Operating cost - urban	27.70	48.35	73.27	24%	540.74	49.16	22%
Subtotal urban	***50.96***	***89.29***	***119.49***	***39%***	***971.73***	***88.34***	***39%***
Total	**79.58**	**119.43**	**158.96**	**52%**	**1,317.14**	**119.74**	**53%**
Sanitation							
Capital cost - rural	16.75	15.46	16.05	5%	173.85	15.80	7%
Operating cost - rural	2.19	5.30	9.87	3%	61.55	5.60	2%
Subtotal rural	***18.93***	***20.76***	***25.92***	***8%***	***235.40***	***21.40***	***9%***
Capital cost - urban	28.88	44.79	57.63	19%	486.66	44.24	20%
Operating cost - urban	7.40	17.60	33.92	11%	206.89	18.81	8%
Subtotal urban	***36.29***	***62.39***	***91.55***	***30%***	***693.55***	***63.05***	***28%***
Total	**55.22**	**83.15**	**117.47**	**38%**	**928.95**	**84.45**	**37%**
Waste Water Treatment							
Rural	-	-	-	0%	-	-	0%
Urban	5.21	10.77	17.29	6%	120.44	10.95	5%
Total	***5.21***	***10.77***	***17.29***	***6%***	***120.44***	***10.95***	***5%***
Hygiene Education	**9.40**	**10.43**	**11.47**	**4%**	**114.75**	**10.43**	**5%**
Total cost ($m)	**149.41**	**223.78**	**305.19**	**100%**	**2,481.27**	**225.57**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Water provision						
Capital cost - rural	0.5	0.3	0.3	4%	0.3	6%
Operating cost - rural	0.3	0.4	0.6	8%	0.4	8%
Subtotal rural	***0.7***	***0.7***	***0.9***	***13%***	***0.7***	***14%***
Capital cost - urban	0.6	1.0	1.0	15%	0.9	17%
Operating cost - urban	0.7	1.2	1.6	24%	1.2	22%
Subtotal urban	***1.3***	***2.1***	***2.6***	***39%***	***2.1***	***39%***
Total	**2.1**	**2.8**	**3.5**	**52%**	**2.8**	**53%**
Sanitation						
Capital cost - rural	0.4	0.4	0.3	5%	0.4	7%
Operating cost - rural	0.1	0.1	0.2	3%	0.1	2%
Subtotal rural	***0.5***	***0.5***	***0.6***	***8%***	***0.5***	***9%***
Capital cost - urban	0.8	1.1	1.3	19%	1.1	20%
Operating cost - urban	0.2	0.4	0.7	11%	0.4	8%
Subtotal urban	***0.9***	***1.5***	***2.0***	***30%***	***1.5***	***28%***
Total	**1.4**	**2.0**	**2.6**	**38%**	**2.0**	**37%**
Waste Water Treatment						
Rural	-	-	-	0%	-	0%
Urban	0.1	0.3	0.4	6%	0.3	5%
Total	***0.1***	***0.3***	***0.4***	***6%***	***0.3***	***5%***
Hygiene Education	**0.2**	**0.2**	**0.2**	**4%**	**0.2**	**5%**
Total cost per capita ($)	**3.9**	**5.3**	**6.6**	**100%**	**5.4**	**100%**

Table 55: Cost of key Water and Sanitation interventions in Tanzania.

Per capita costs for capital and operating expenses in the water and sanitation sector are projected to rise from $2.8 in 2005 to $4.6 in 2015. These costs are comparatively low

since Tanzania relies on relatively inexpensive technologies for providing access to improved water supply and sanitation. This is particularly so in the case of urban and rural sanitation, where pit latrines dominate.

Improving the Lives of Slum Dwellers

Tanzania has one of the highest percentage shares of slum dwellers in the world. According to UN-Habitat, over 90 percent of Tanzania's urban population lives in slum-like conditions (UN-Habitat 2003).[71] This is significantly above the average for Sub-Saharan Africa, which lies at roughly 72 percent. The country's relatively low rate of urbanization of 33 percent is expected to rise sharply as a result of projected urban population growth of close to 5 percent (UN 2002). If the proportion of slum dwellers were to stay constant, this would result in an additional 6.5 million slum dwellers in Tanzania between 2005 and 2015. As discussed in Section 4.8 above, we have not yet been able to calculate robust resource requirements for meeting Target 11 in Tanzania. For this reason the financial requirements of this sector are not included in the subsequent analysis.

Science and Technology

Science and technology are powerful instruments for the development process. So far this area has played a significant contribution in promoting overall productivity in different sectors by establishing structural changes that improve production methods and efficiency. Over the past 40 years, Tanzania has attempted successfully to establish over 8 science and technology education institutions and over 9 research and development institutions. The growth and performance of these institutions has however, been upset by lack of enough resources both for increasing the existing structures and carrying out operational activities. To improve the efficacy of the existing institutions and establishing new ones remains a challenge the country should address. Adequate resources need to be mobilized to the sector and science and technology aspects need to be integrated effectively into national development plans and strategies including the PRSP.

Tanzania's ICT infrastructure is severely underdeveloped. The country only has 5 telephone mainlines per 1000 people compared to the low- and middle-income averages of 27 and 134, respectively (World Bank 2003d).

At this stage insufficient information was available for calculating resource requirements for promoting science and technology in Bangladesh, including the improvement and extension of university education and research, science advice, and ICT infrastructure. As a result, our preliminary analysis does not include the investment needs for these sets of interventions.

Energy

In Tanzania the energy sector remains a major input in the development process. The major challenge in the energy sector is how to establish an efficient energy production, procurement, transportation, distribution, and end-user systems in an environmentally

[71] We are very grateful to UN-HABITAT for providing country-level estimates of the number of slum dwellers. Regional aggregates of these estimates have been published in UN-Habitat (2003).

sound manner and with due regard to gender issues. Total energy consumption is more than 22 million tons of oil equivalent (TOE) or 0.7 TOE per capita. Tanzania's electrification rates of 10 percent in urban areas and 1 percent in rural areas are significantly lower than the sub-Saharan average of 23 percent. These rates are comparable to those for Uganda. The vast majority of Tanzania's population is therefore dependent on inefficient and relatively low luminosity fuels, such as kerosene, for lighting. Similarly, on the cooking side, only a very small proportion of the population has access to modern fuels: in urban areas, charcoal is the most widespread cooking fuel, while in rural areas, unprocessed biomass dominates.

Overall, energy consumption in rural areas accounts for about 85 percent of total national energy consumption. It is estimated that biomass energy currently accounts for over 90 percent of energy source in the country. Commercial energy sources i.e., petroleum and electricity, account for about 8 percent and 1.2 percent, respectively, of the primary energy used. Coal, solar and wind account for less than 1 percent of energy used (National Energy Policy, 2002).

Applying our energy targets to Tanzania results in an increase in electrification rates to 27 percent in urban areas, and 13 percent in rural areas—reaching an additional 1.3 million households between 2005 and 2015. For cooking, the proportion of the population with access to cleaner cooking methods will grow by 3.6 million households over the same period. Increased demand for electricity from households, educational- and healthcare facilities, and industry will require a 30 percent increase in annual power supply. Our preliminary resource estimates are summarized in Table 56.

Total cost estimates for Tanzania in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Rural							
Devices	30	42	52	7%	456	41	7%
Fuels	181	223	254	36%	2,431	221	37%
Electricity	75	70	67	10%	773	70	12%
Subtotal rural	***285***	***335***	***373***	***53%***	***3,660***	***333***	***55%***
Urban							
Devices	37	54	74	10%	606	55	9%
Fuels	108	163	218	31%	1,794	163	27%
Electricity	57	54	43	6%	585	53	9%
Subtotal urban	***202***	***271***	***335***	***47%***	***2,986***	***271***	***45%***
Total cost ($)	**488**	**606**	**708**	**100%**	**6,645**	**604**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Rural						
Devices	0.8	1.0	1.1	7%	1.0	7%
Fuels	4.7	5.3	5.5	36%	5.3	37%
Electricity	1.9	1.7	1.5	10%	1.7	12%
Subtotal rural	***7.4***	***8.0***	***8.1***	***53%***	***7.9***	***55%***
Urban						
Devices	1.0	1.3	1.6	10%	1.3	9%
Fuels	2.8	3.9	4.7	31%	3.9	27%
Electricity	1.5	1.3	0.9	6%	1.3	9%
Subtotal urban	***5.3***	***6.5***	***7.3***	***47%***	***6.5***	***45%***
Total per capita costs	**12.7**	**14.4**	**15.4**	**100%**	**14.4**	**100%**

Table 56: Cost of key Energy interventions in Tanzania.

The results show, that due to very low levels of access to improved energy in rural areas, significant investments will need to be made to serve the non-urban population with improved energy services. Not included in these summary results is the cost of increasing generation capacity and providing electricity for industrial needs. We estimate the corresponding resource requirements to amount to roughly $218 million dollars for the period from 2005 to 2015. Since current capacity is sufficient for meeting industrial demand, most investments to satisfy the industrial sector's energy needs will need to be made after 2008.

Transport Infrastructure

Transport infrastructure has been identified as one of the priority sectors in the PRS. The main transport infrastructure that is of serious concern in Tanzania is the road sector. The total coverage of paved roads is as low as 0.11km per 1000 people and requires urgent upgrading as well as extension. Across the country, 67 percent of the road network is in either fair or poor condition (URT 2000b). Roads in rural areas that are under the authority of district councils are in particularly bad condition.

The main challenges facing this sector include inadequacy of resources both at the national and local levels, the mismatch between the timing of resources and the best time for carrying out road projects, the capacity of local contractors in terms of equipment, finance and expertise, and management of road funds.

Based on Tanzania's extremely low road density, we project substantial investments in the road sector to move towards the tentative target road density of 0.5km per 1000 people. Reaching this target by 2015 would require a more than five-fold increase in the network of paved roads, which may be impossible to achieve given the substantial institutional and operational constraints in the roads sector. To account for this, we have limited investments to increasing the existing road network by a factor of five.

Tanzania	Roads						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Road construction							
Two-lane highway	203	203	203	23%	2,230	203	25%
Two-lane road	312	312	312	35%	3,427	312	38%
One-lane road	129	129	129	15%	1,414	129	16%
Total	**643**	**643**	**643**	**73%**	**7,072**	**643**	**79%**
Road O&M							
Two-lane highway	90	111	131	15%	1,217	111	14%
Two-lane road	14	46	77	9%	501	46	6%
One-lane road	3	15	28	3%	170	15	2%
Total	**107**	**172**	**236**	**27%**	**1,888**	**172**	**21%**
Total cost ($m)	**750**	**815**	**879**	**100%**	**8,960**	**815**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Road construction						
Two-lane highway	5.3	4.8	4.4	1%	4.8	25%
Two-lane road	8.1	7.4	6.8	1%	7.4	38%
One-lane road	3.4	3.1	2.8	0%	3.1	16%
Total	**16.8**	**15.3**	**14.0**	**2%**	**15.3**	**79%**
Road O&M						
Two-lane highway	2.4	2.6	2.9	0%	2.6	14%
Two-lane road	0.4	1.1	1.7	0%	1.1	6%
One-lane road	0.1	0.4	0.6	0%	0.4	2%
Total	**2.8**	4.1	5.1	**1%**	**4.1**	21%
Total cost per capita ($)	**19.6**	**19.4**	**19.1**	**2%**	**19.4**	**100%**

Table 57: Cost of Road Infrastructure interventions in Tanzania.

We emphasize that our approach to calculating resource requirements for the road sector, while providing the right order of magnitude of required investments, is not well suited for developing detailed country-level road sector plans. These must instead be based on detailed assessments of local demand for transport as well as the country's topography. As a result, the national target of reaching 0.5km of paved roads per 1000 people as well as unit costs may change

Financing

The total costs estimated for Tanzania will need to be financed through a combination of private household contributions, domestic government spending, and external assistance. We disaggregate these sources of financing by first estimating the contributions that households can make and projecting the scope for domestic government resource mobilization for the MDGs. Additional resources required to meet the Goals will then need to be externally financed.

The share of household contributions is based on both the ability to pay and the incentive effects of user charges. To calculate the ability to pay, we use national poverty data on the proportion of people living below the poverty line and the income distribution data across quintiles to divide the population into three categories based on their income: those who cannot afford to contribute at all towards meeting the goals (population below the poverty line), those who can contribute partially (population between the poverty line and two times the poverty line) and those who can contribute the full cost of most interventions (population above two times the poverty line).

As discussed in the introduction, we assume that health and primary education are publicly provided and funded, and therefore estimate no household contributions for interventions related to those goals. For secondary education, agricultural interventions, water and sanitation, and energy services, we estimate partial cost recovery.[72]

We calculate the share of total expenditure devoted to the MDG sectors (including social and economic services) at approximately 52.1 percent[73]. We then multiply this share with government revenues to get the total domestic spending on the MDGs.[74] In the case of Tanzania, this translates into domestic spending on the MDGs of 5.9 percent of GDP. We assume that domestic spending will increase by 4 percentage points by 2015, increasing the share of domestic resources spent on the MDGs to 9.9 percent of GDP.[75] On a *pro forma* basis we allocate projected domestic government spending to sectors according to the sectors' share of total costs. External financing is then calculated as the difference between total resource requirements and spending by both households and governments

Summary of Costs and Financing Results

[72] For a detailed description of the proportion of costs in these areas that are borne by households, please refer to Table 5

[73] Calculated using Statistical Appendix, IMF Country Report 03/2, Table 15: http://www.imf.org/external/pubs/ft/scr/2003/cr0302.pdf

[74] Revenue and expenditure data is taken from the International Financial Statistics 2003, IMF

[75] For a complete discussion of the assumptions behind this analysis please refer Section 5 above.

Summary of projected financial resources required for meeting the MDGs in Tanzania

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
Total Cost (Sum of A+B+C below)	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	163	4.2	337	8.0	365	8.0	3,341	304	7.2	1.6%
Education	377	9.8	499	11.9	686	14.9	5,575	507	12.1	2.8%
Gender Equality	82	2.1	100	2.4	118	2.6	1,086	99	2.4	0.5%
Health	842	21.9	1,483	35.4	1,999	43.5	16,073	1,461	34.8	7.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	149	3.9	224	5.3	305	6.6	2,481	225.6	5.4	1.2%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	488	12.7	606	14.4	708	15.4	6,645	604	14.4	3.3%
Roads	750	19.6	815	19.4	879	19.1	8,960	815	19.4	4.4%
Total	**2,851**	**74.3**	**4,063**	**96.9**	**5,061**	**110.2**	**44,162**	**4,015**	**95.5**	**21.8%**

Summary of projected sources of financing in Tanzania

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
A. Household Contributions	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	20	0.5	28	0.7	42	0.9	322	29	0.7	0.2%
Gender Equality	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Health	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	69	1.8	106	2.5	149	3.2	1,182	107.5	2.6	0.6%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	161	4.2	217	5.2	268	5.8	2,374	216	5.1	1.2%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Total	**250**	**6.5**	**351**	**8.4**	**459**	**10.0**	**3,879**	**353**	**8.4**	**1.9%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
B. Domestically Financed Government Expenditures ***	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	42	1.1	101	2.6	139	3.6	1,056	96	2.3	0.5%
Education	98	2.6	150	3.6	262	5.7	1,762	160	3.8	0.9%
Gender Equality	21	0.6	30	0.7	45	1.0	343	31	0.7	0.2%
Health	218	5.7	447	10.7	762	16.6	5,079	462	11.0	2.5%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	39	1.0	67	1.6	116	2.5	784	71.3	1.7	0.4%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	126	3.3	183	4.4	270	5.9	2,100	191	4.5	1.0%
Roads	195	5.1	245	5.9	335	7.3	2,831	257	6.1	1.4%
Total	**739**	**19.3**	**1,224**	**29.2**	**1,930**	**42.0**	**13,955**	**1,269**	**30.2**	**6.9%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
C. Required Total External Budget Support	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	120	3.1	235	5.4	226	4.3	2,285	208	4.9	1.1%
Education	260	6.8	321	7.6	382	8.3	3,491	317	7.6	1.7%
Gender Equality	61	1.6	70	1.7	73	1.6	743	68	1.6	0.4%
Health	623	16.3	1,036	24.7	1,237	26.9	10,994	999	23.8	5.4%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	42	1.1	50	1.2	40	0.9	515	47	1.1	0.3%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	200	5.2	207	4.9	170	3.7	2,171	197	4.7	1.1%
Roads	556	14.5	569	13.6	544	11.8	6,128	557	13.3	3.0%
Total	**1,862**	**48.5**	**2,488**	**59.3**	**2,672**	**58.2**	**26,328**	**2,393**	**57.0**	**13.0%**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above

Table 58: Summary of projected total costs and sources of financing in Tanzania.

We estimate that in order to meet the MDGs, Tanzania will need to spend a total of $74 per capita in 2005 increasing to $110 by 2015 to meet the MDGs. This translates into a total investment need of $44.1 billion between 2005 and 2015, which is equivalent to an average annual per capita need of $95. Of the $95, we estimate that $39 will be financed domestically through household and government contributions. ODA commitments to Tanzania were $1,440 million in 2001, or $41 per capita. In comparison, we project an average external financing need of approximately $57 per capita between 2005 and 2015.

It should be noted that the above costs do not comprise and exhaustive list of interventions for Tanzania. There are several, potentially expensive, interventions that still need to be accounted for; a list appears in the box below.

Important cost factors not included in these resource estimates for Tanzania

- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions to ensure environmental sustainability,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

Uganda Country Study

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In collaboration with the Millennium Project secretariat

11. Uganda Country Study

MDG status

Poverty still remains Uganda's major development challenge. The growth the country recorded in the 1990s initially led to a reduction in poverty from 56 percent in 1997 to 35 percent in 2000. However, by 2002 poverty had increased to about 38 percent. It is unlikely that the proportion of people living below the poverty line will have halved by 2015, even though the trend data based on 1990 estimates predicts otherwise (see Table 57 below).

On hunger, it is unlikely that the proportion of underweight under-five year olds will have halved by 2015. Almost a million people are displaced from their homes and have lived in refugee camps for about 15 years. They mainly depend on food relief items from United Nations Agencies because they cannot grow their own food. In such places, malnutrition is a serious problem. Elsewhere in the country, agriculture is rain-fed and food storage facilities are inadequate, which compounds the hunger situation.

Gender equality in terms of access for boys and girls to primary and secondary schooling by 2005 is likely to be realized, though retention of girls is more difficult and requires greater attention. Reduction of child mortality by two thirds by 2015 is unlikely to be achieved; current trends are worsening. Similarly, reduction of maternal mortality by three quarters by 2015 is unlikely to be achieved. The target for HIV/AIDS (i.e. halting and reversing the spread of HIV/AIDS) has been achieved.

On the goal of environmental sustainability, halving the proportion of people without access to safe drinking water is potentially achievable. Furthermore, reversal of loss of environmental resources by 2015 is potentially possible because of the massive campaign to plant trees. The table below summarizes Uganda's current MDG status.

Indicator	Starting year value (1990)	Ending year value (2000)	Linearly projected 2015 value	MDG target value	Status
Proportion below poverty line	0.56 (1992)	0.35	0.00	0.28	On Track
Prevalence underweight children	0.30	0.26	0.20	0.15	Off Track
Primary enrollment	0.63 (1992)	0.89	1.00	1.00	On Track
Literacy of 15-24 year olds	0.65 (1985)	0.78	1.00	1.00	On Track
Ratio female enrollment primary	0.92 (1992)	0.98	1.00	1.00	On Track
Ratio female enrolment secondary	0.66 (1992)	0.87	1.00	1.00	On Track
U5MR (per 1000)	165	127	70	55	Off Track
Infant Mortality Rate	100	81			
% with access to improved water	30%	50%	80%	65%	On Track
% with access to improved sanitation (urban)	54%	53%	52%	77%	Off Track
% with access to improved sanitation (rural)	41%	40%	39%	71%	Off Track

Table 59: Status of Progress towards the MDGs in Uganda[76]

Geography and Politics

Uganda is a country of 236,040 square kilometers located in Africa between longitudes 30E and 34E and lies along the Equator between latitudes 1S and 4N. It is an equatorial landlocked country, bordered by Kenya, Tanzania, Rwanda, Congo and Sudan. Uganda's main access to international markets is through the Kenyan port of Mombasa; the Tanzanian port of Dar es Salaam is to a lesser extent used as a seaport for Uganda's exports and imports. Uganda lies at an altitude varying from 621 meters to 5,110 meters. The large variation in altitude enables Uganda to enjoy varied temperature conditions ranging from warm grassland plateau to snow capped mountains. About 15.4 percent of

[76] All indicators from the World Bank, except water and sanitation, which are from WHO/UNICEF (personal communication 2003).

the surface is lakes and rivers. Because of its location along the equator, most of the country experiences two rainfall seasons every year.

Uganda was a British colony from about 1900 until 1962 when it gained self-rule. Constitutional rule that started in 1962 was short-lived following takeover of power by Idi Amin in 1971. This marked the beginning of a military dictatorship that lasted up to 1979. From 1971 to the present moment, Uganda has been bedeviled by war, in one form or another.

In 1995, the country embarked on a path of democracy when a new constitution was promulgated. The country held presidential and parliamentary elections in 1996 and 2001. Decentralization is becoming firmly rooted and local government leaders are elected for defined term limits. But civil war rages on, especially in the northern part of the country where The Lords Resistance Army (LRA) has been fighting the government since 1986 and has committed several atrocities against the population in the North; the unstable political situation has also created new challenges for development efforts

Population

Uganda's population was 24.7 million as of September 2002 of whom 12.1 million were males and 12.6 million were females. The average population density is 126 persons per square kilometer, which is on an upward trend compared to a population density of 85 persons per square kilometer in 1991. The spatial distribution of Uganda's population is uneven.

The population is growing at an annual rate of 3.4 percent, which is one of the highest population growth rates in the world (UBOS, 2002). Consistent with this, Uganda's fertility rate was 6.9 per woman in 2000, which was a decline from 7.22 in 1980 but is still higher than the Sub-Saharan African average of 5.20 in 2000(World Bank 2003d).

In terms of age structure, the population under one year is estimated to be about 1,064,000 while that under-five year is estimated to be about 5 million. The primary School age population (6-12 years) is estimated to be about 5.8 million. Young adults (10-24 years) are estimated to be about 7.9 million (UBOS, 2002).

Economy

Uganda has a per capita income of US$ 300. The country is endowed with a wide range of natural resources, including fertile soils, regular rainfall and some mineral deposits of copper and cobalt. The share of agriculture as a percentage of GDP has fallen from 57 percent in 1989 to 44 percent in 1999, while that of industry has increased from 10.7 percent to 17.8 percent and that of services from 32.5 percent to 37.8 percent over the same period. At the same time, agriculture still employs about 80 percent of the labor force and accounts for about 40 percent of GDP. Uganda's main exports are coffee, fish, and tobacco (UMFPED, 2003).

Uganda recorded impressive growth rates averaging annual real GDP per capita growth of 3.7 percent between 1992 and 1997, peaking at a record high of 8.2 percent in 1994/5.

However, beginning with the turn of the century the annual rate of economic growth per capita slowed down to about 2.5 percent (UMFPED, 2003).

Inflation has been contained in single digits for over a decade. Government has complemented macroeconomic stabilization policies with measures that are geared at attracting direct foreign investment such as liberalization of the capital and current accounts of the balance of payments, establishment of supportive institutions to private sector investment, and removal of constraints to direct foreign investment. However, several constraints to investment especially to local investors remain. When interest rates were liberalized, they stabilized at very high levels, which does not auger well for investment firms that rely on the domestic money market for capital.

Recently, the fiscal deficit has widened to about 11 percent of GDP from about 6 percent of GDP three years ago. The widened fiscal deficit, which leads to excess liquidity in the economy, has made maintenance of macroeconomic stability difficult. The focus on the need to maintain macroeconomic stability has raised concerns about Uganda's absorptive capacity of aid and the extent to which financing of the development process can rely on external financing. Yet, the focus on local investment is low. Micro and small-scale investors face more severe constraints especially the high cost of credit, inputs, taxes and inadequate infrastructure.

PRSP/PRGF

- Uganda has the Poverty Eradication Action Plan (PEAP) as its broad development framework. The PEAP, which was first prepared in 1997 had 4 pillars, namely: Macroeconomic stability and economic growth and transformation,
- Peace, security and good governance,
- Increasing the incomes of the poor, and
- Directly improving the quality of life of the poor (through social services delivery).

The PEAP is being revised in 2003/2004. The following five pillars or components have been proposed for the revised PEAP:

- Economic Management
- Security, conflict resolution and disaster management
- Governance
- Enhancing production competitiveness and incomes
- Human resources development

A summary version of the PEAP is Uganda's PRSP. The preparation of the PRSP has enabled Uganda to access IMF financing (PRGF) and other donor aid from bi-lateral and multilateral institutions. Financing from the IMF has however decreased in the recent past to about US$16 million per year from over US$40 million per year in the 1990s.

The budgetary processes in Uganda have undergone significant changes to reflect the dual requirements of sound macroeconomic management and targeting resources towards

priority spending. Since 1992, the annual budgetary allocations and spending have been determined through the Medium Term Expenditure Framework (MTEF). The Poverty Action (PAF), designed in 1998 as a mechanism to channel the funds associated with HIPC into poverty reduction programs, is the main channel for spending on priority sectors such as primary health, primary education, agriculture, water and road infrastructure. The PAF comprised 5.9 percent of GDP in 2002/03. Within the PAF, the highest share goes to primary education (46 percent of PAF) though this is a decline from the initial levels of 84.9 percent. The shares of primary health (19.7 percent of PAF), rural roads (6.1 percent of PAF), agriculture (6.6 percent of PAF) and water and sanitation (7 percent of PAF) have steadily increased their share since 1997/98, though primary education still dominates the PAF portfolio (IMF 2003).

Uganda is also in the midst of an ambitious decentralization program and this is reflected in the design of the budget as well. An increasingly high proportion of expenditure is being transferred to districts (14 percent in 1994/95 to 34 percent in 2002/03). Operational challenges remain, in terms of proper monitoring of funds, accountability, as well as the low capacity at the local level. However, it is an important initiative to align national budgeting priorities and exercises to the local level.

The Government's PEAP/PRSP targets, particularly in the social sector require significant resource commitments. Domestic revenue as a share of GDP in Uganda increased from 7.1 percent in 1992 to 12.1 percent in 1996-97. However, revenue performance has stagnated since, and currently stands at 11.8 percent per year. This stagnation is due in part to weak tax administration, lowering of import duties and reduction of excise duties on several products and the culture of non-compliance.

Donor Assistance

The country enjoys a good relationship with donors especially, the Bretton Woods Institutions. Consequently, Uganda receives substantial amount of aid amounting to an average of US$ 500 million per year. The country has also recently benefited from debt relief under the HIPC and enhanced HIPC debt initiative (UMFPED, 2002a) that provided for over $87m in debt relief in 2002 (EIU 2003d).

Recently, Uganda has been a favorite target for assistance from the IMF and has benefited handsomely from its Poverty Reduction and Growth Facility (PRGF) with over $267 in aid still waiting to be disbursed. The recent receipts of international aid, however, has not come without the notable drawback of drastically increasing Uganda's international debt, which reached 55 percent of GNP and over 500 percent of exports in 2000 (EIU 2003d).

The limiting of public expenditure to defined expenditure ceilings in the Medium Term Expenditure Framework (MTEF) and Uganda's preference of receiving aid in the form of budget support have raised new challenges in the disbursement of aid to Uganda. There is on-going dialogue between donors and government on the ways of pursuing MDG targets without causing macroeconomic instability, but the government seems to prefer to reduce the size of government and with it the amount of excess liquidity created in the economy.

The figure below shows the current levels of international financing for the MDGs in Uganda. With total international assistance at $957 million, direct investment for the MDGs is currently at 47 percent.

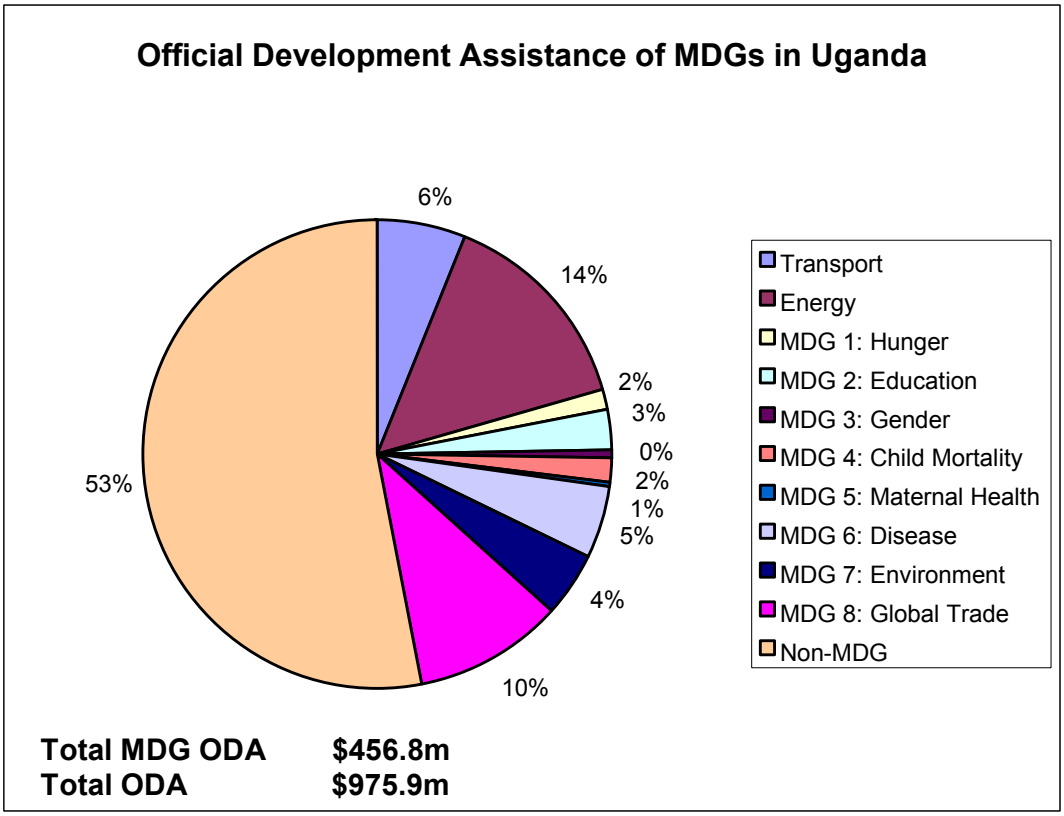

Figure 8: Gross Official Development Assistance to Uganda in 2001 (Simon 2003).

International environment

Uganda's growth strategy is private sector led growth that is export oriented; factors that have been instrumental to the cultivation of an open and liberal economy. With a view to facilitating investment (particularly direct foreign investment) and trade, Uganda liberalized both the current account and capital account of the balance of payments. Although direct foreign investment has increased, it is yet to increase to the desired levels. The external trade environment still remains unfavorable in various respects including poor market access to western markets, declining commodity prices on the international market, and unfavorable international trade rules.

At the regional level, economic integration through the re-establishment of the East African Community is progressing fast. Nonetheless, the Great Lakes region, in which Uganda is located, is still engulfed in conflicts. The trend of the conflicts in the Great Lakes region, among other things, will influence the extent to which Uganda can benefit from international and regional trade.

Key Sectoral Challenges for Meeting the MDGs

Poverty

Broadly, poverty eradication is Uganda's biggest development challenge. Poverty in Uganda is mainly a rural phenomenon. It afflicts women and children relatively more than men. Poverty manifests itself in various ways but low income is the main characteristic of poor people. Although the proportion of people below the poverty line declined from 56 percent in 1997 to 35 percent in 2000, the level of poverty is too high. In some areas, especially northern Uganda, the proportion of people living below the poverty line is as high as 65 percent (UBOS, 2003).

In order to combat the challenge, the Ugandan government has been relying on the PEAP. Implementation of the PEAP faces several challenges, however, including internal and regional conflicts that have necessitated high spending on ensuring security, many constraints to investment – particularly domestic investment, and inadequate capacity for delivery of social services at all levels particularly at the local government level. Because of budget constraints, funding of social services including the universal primary education is made possible by donor support. Uganda's tax revenue to GDP is a dismal 12 percent compared to expenditure of about 23 percent of GDP. (UMFPED, 2002a) Thus the country is heavily dependent on donor financing to fund its development and poverty reduction program. As of 2002 Uganda's total external debt amounted to US$3.8 billion and heavy debt serving leaves the country with too little resources to provide social services in adequate quantity and quality. (UMFPED, 2003)

As discussed in Section 4.1, the required resources for interventions relating to income poverty have been addressed as part of the analysis of the following categories.

Hunger

The Government has focused on agricultural development as the primary strategy for reducing poverty, through the adoption of the Plan for Modernization of Agriculture. Although Uganda receives two rainfall seasons in a year in most parts, and indeed produces food that should be enough for its people, hunger is still a common phenomenon mainly arising from poor distribution system and poor storage and processing facilities. War that has raged for over 17 years and displaced people from their homes has compounded the problem. In war-ravaged areas, there is hardly any food production going on. Most people in such areas depend on relief food from the UN agencies.

Some areas produce abundant food but most of it is perishable and seasonal. Thus, in off-season periods, famine becomes a reality even in abundant food producing areas. Produce buyers that have storage facilities and the capacity to preserve some food items such as maize and beans purchase them from farmers at harvest time. Thus, after selling their harvest, most farmers lack food for self-sustenance. This leads to malnutrition especially of children from poor households. It is common for many households in Uganda to have just one meal each day. With reduced food supply, many children from poor household that attend school, do so on empty stomachs.

The analysis has focused on addressing the needs of small-scale subsistence farmers in Uganda. One set of interventions address productivity issues (improving soil fertility and inputs, small scale water management etc.), another set focus on the need for improved storage and market development (by focusing on the need to improve connectivity to markets and graduate to higher value added products), as well as investments in improved agricultural research and extension. Nutrition related issues are also addressed through provision of community based nutrition programs, population wide fortification and school meals supplementation programs. The cost estimates target 80 percent of subsistence farmers and use unit costs to estimate the resources needed to scale up the interventions to reach this target population by 2015. The cost estimates are summarized below.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production							
Capital costs	17	41	29	8%	362	33	24%
Operating costs	53	126	92	25%	1,127	102	76%
Total	***70***	***167***	***121***	***33%***	***1,489***	***135***	
Other Rural Income Generation				0%			
Capital costs	9	12	15	4%	127	12	25%
Operating costs	12	33	60	16%	376	34	75%
Total	***21***	***44***	***75***	***20%***	***503***	***46***	
Nutrition				0%			
Capital costs	**-**			0%	**-**		***0%***
Operating costs	28	85	174	47%	997	91	***100%***
Total	***28***	***85***	***174***	***47%***	***997***	***91***	
Total cost ($m)	**118**	**296**	**370**		**2,989**	**272**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Agricultural Production	3	5	3	33%	45	4.1	51%
Other Rural Income Generation	0.8	1	2	20%	15	1	17%
Nutrition	1	3	4	47%	29	3	33%
Total cost per capita ($)	**4**	**9**	**9**		**88**	**8**	

Table 60: Costs of key Hunger interventions in Uganda.

The Table shows that the cost of increasing agricultural productivity is $1.4 billion over the 11-year period. The costs decline significantly from 2010 to 2015; this is a reflection of the fact that the agricultural interventions over a five-year time frame yield significant increases in food production, thus reducing the target group of food insecure households. The costs of developing markets and income generation are $503 million over the 11-year period that translates into $1 per capita on an annual basis. The costs for addressing nutrition issues include the cost of school meals, targeted nutrition programs, awareness and education and population-wide fortification programs. These add up to $3 per capita on an annual basis

Education

The government and the private sector provide education in Uganda, at all levels. However, private sector service providers are located mainly in urban areas where the

relatively rich people reside. In 1997, Uganda introduced Universal Primary Education (UPE) with a view to enrolling in school all children of primary school going age. However, while government was to pay tuition fees for all children in primary schools, parents were to contribute other requirements such as clothing, transport to and from school, pens, and exercise books, which were not affordable by some households. Consequently, not all children have enrolled in schools and the dropout rates, especially for girls, are very high. Government has committed at least 65 percent of the education budget to financing of primary education. Education as a whole is already taking up about 25 percent of the national budget. Prospects for increased budgetary allocation to the education sector are limited (IDS, 2003).

At the secondary school level, over 50 percent of students are in private schools located mainly in urban areas. The poor can hardly afford the cost of secondary education. Providing adequate space in post-primary education and training institutions is Uganda's major education challenge. Coupled with this is the challenge of ensuring quality and relevance of the education given to the learners. Other levels of education including university and tertiary education suffer from inadequate funding. Although private sponsorship has increased enrolment at university and tertiary level, it is adversely affecting education quality and remains outside the reach of the poor.

In order to meet the education goal, Uganda would need to target 100 percent primary school enrolment as well as 100 percent primary completion rates by 2015. The costs are estimated based on the total school going population (as identified by calculations drawn from the World Bank Education Statistics), using local unit costs. We also estimate the human resource requirements and the number of classrooms needed by 2015 based on best practice norms as discussed in Section 4.3. Table 61 presents these preliminary results.

Human Resource and Infrastructure Needs	2005	2010	2015	Total 2005-2015	Average 2005-2015
Number of teachers					
Primary Education	**74,592**	**110,453**	**162,175**	**1,246,926**	**113,357**
Secondary Education	**26,607**	**29,894**	**34,585**	**331,352**	**30,123**
Total	***101,199***	***140,347***	***196,760***	***1,578,278***	***143,480***
Number of classrooms					
Primary Education	**46,651**	**81,548**	**162,175**	**990,850**	**90,077**
Secondary Education	**11,217**	**20,697**	**34,585**	**237,590**	**21,599**
Total	***57,868***	***102,244***	***196,760***	***1,228,439***	***111,676***

Table 61: Human resource and infrastructure needs for the education sector in Uganda.

For secondary education, we calculate the number of incoming and outgoing students, based on primary school completion and transition rates and drop out rates; for Uganda, based on these parameters we estimate the net enrolment rate to increase to 28 percent by 2015. The costs are then calculated by scaling up unit costs. As in the case of primary education, we also calculate the number of teachers and classrooms needed for secondary education. Table 62 below presents these results for Uganda.

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education							
Capital cost	26	47	120	19%	610	55	12%
Operating cost	161	230	338	53%	2,608	237	51%
Total	***188***	***278***	***458***	***71%***	***3,218***	***293***	***63%***
Cost per student($)	43	51	71		585	53	
Secondary Education							
Capital cost	7	22	24	4%	217	20	4%
Operating cost	135	134	145	23%	1,494	136	29%
Total	***142***	***156***	***170***	***26%***	***1,711***	***156***	**34%**
Cost per student($)	279	176	123		2,042	186	
Adult Literacy							
Capital cost				0%			0%
Operating cost	9	12	16	3%	141	13	3%
Total	***9***	***12***	***16***	***3%***	141	13	**3%**
Cost per student($)	***13***	***13***	***13***		***143***	***13***	
Total cost ($m)	**338**	**445**	**644**		**5,069**	**461**	

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Primary Education	7	8	12	71%	95	9	63%
Secondary Education	5	5	4	26%	52	5	34%
Adult Literacy	0.3	0.4	0.4	3%	4	0.4	3%
Total cost per capita ($)	**12.2**	**13.5**	**16.4**		**151.2**	**13.7**	

Table 62: Costs of education interventions in Uganda.

Table 62 shows that the cost of primary education is $3.2 billion over the 11-year period. The cost per student increases from $43 to $71 by 2015. Classroom construction and teachers salaries form the major shares of these costs.

The costs of secondary education are estimated at $1.7 billion over the 11-year period. The costs per student decline from $279 to $123 due to low pupil-teacher ratios of 17. Student classroom ratios remain higher than the target, leading to the initial high capital costs of building more classrooms. The per capita costs are $5 on an annual basis. The costs for adult literacy are based on actual program costs of $13 per learner, and total costs of $143 over the 11-year period. The total costs of education are estimated at $5 billion from2005-2015 or per capita costs of $14 on an annual basis.

Gender Equality

The inappropriate and inadequate sanitation facilities for girls in schools contribute to their dropout, particularly with the onset of puberty. Qualitative evidence suggests that in many rural communities, most parents, when faced with a choice either to take a boy or a girl to school, prefer taking boys rather than girls. Girls are further disadvantaged by domestic chores, early marriage pregnancy, and social norms and values.

One of the objectives of introducing the Universal Primary Education (UPE) was to address gender disparities in access to education. However, the relatively higher dropout rate for girls in recent years has led to widening gender gaps in access to primary education. At secondary education, gender gaps are even wider with the ratio of boys to girls dropping to about 55:45. At tertiary and university education the ratio of boys to girls, though on the increase, is still poor at about 65:35 (Government of Uganda, 2000).

However, there is a policy of affirmative action in accessing university and tertiary education in favor of female students. Every female applicant to university and tertiary institutions is awarded a bonus of 1.5 points (on a scale of 0 to 55 points – weighted). Similarly, in the job market preference is given to female applicants with the same qualifications of a boy applicant. Even in politics, there is affirmative action implemented through the policy of having a woman representative for every district (there are 56 districts in Uganda) (UMFPED, 2003). Affirmative action notwithstanding, there are still wide disparities in positions held between women and men in various categories of employment.

We attempt a partial estimation of the costs of achieving the gender MDG; this includes awareness programs, sensitization and training, violence prevention and systemic capacity building at the ministerial level. The costs of direct education and health interventions are included in the education and health results. We focus on sensitization and training programs for government officials, awareness building at the community, school and national level and resources for strengthening national ministries. Comprehensive responses to violence against women form the final component of our estimates; these include the costs of prevention, protection and punishment of offenders.

Total cost estimates in 2000 US$ million	2005	2010	2015	Total 2005-15	Average 2005-15
Total ($m)	48	78	108	854	78
Total cost per capita ($)	1.7	2.4	2.7	25	2

Table 63: Cost of key gender interventions in Uganda, 2005-2015.

We estimate the costs at $854 million from 2005-2015, which translates into an annual figure of $2 per capita.

Health

Until 1995 HIV/AIDS was the greatest health challenge facing Uganda, in addition to Malaria and other diseases. In 1996 there was a substantial decline in the national HIV/AIDS prevalence rate, from 20 percent in 1991 to 6.5 percent in 2001, which made Uganda a model example internationally in combating HIV/AIDS. In this regard, Uganda moved ahead of the international target for the MDG on HIV/ AIDS. Whereas it aims at halting and beginning to reverse the spread of HIV/AIDS by 2015, Uganda met this target in 1996, almost twenty years ahead of schedule. However, the important challenge is that complacency seems to have set in which might cause a reversal in the downward trend. Recent evidence reveals that the prevalence rate increased from 6.1 percent in 2000 to 6.5 percent in 2001. Although awareness of HIV/AIDS is widespread, knowledge of ways of avoiding the virus are not as well known. According to the 2000 Uganda Demographic and Health Survey, 13.4 percent of Ugandans did not know any programmatically important way to avoid HIV/ AIDS (UBOS, 2001).

This situation is made worse due to culture and traditional practices which perpetuate the reluctance of implementation of certain preventive measures, for example the use of condoms. Although this is a well-known means of avoiding AIDS, only 7 percent of women and 15 percent of men use condoms nationally. Female respondents in the

recently concluded second Participatory Poverty Assessment felt particularly vulnerable. A woman from Barungwee in Kitgum district was quoted as saying,: *"You know that AIDS has entered the home and you accept to die of AIDS, because the men do not know how to protect themselves against AIDS,"* (UNDP 2002c). Although AIDS is being openly discussed in Uganda, there is need to address the issue of stigma and discrimination of people living with HIV/AIDS.

Challenges related to HIV/AIDS also include looking after and providing for the 2 million orphans who have an urgent need for housing, food and education. At the moment only 10 percent of patients that urgently need anti retroviral medication access these life saving drugs (UNDP, 2002c).

As for malaria, empirical evidence has revealed that higher income households are more likely to possess a mosquito net than their poorer counterparts as poor households simply cannot afford them. This implies that the key challenge to malaria prevention is the rampant poverty levels among households and increased resistance of the malaria parasite to the commonly available treatment, chloroquine.

The costs of health interventions for the MDG specific conditions are presented below. The costs are largely driven by the costs of AIDS treatment and Uganda's high incidence of childhood diseases, especially malaria. Uganda's also has the highest unmet need for family planning amongst our five countries, which impacts costs.

Uganda

Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
HIV/AIDS Prevention	49	80	110	7%	880	80	7%
HIV/AIDS Care	14	21	26	2%	232	21	2%
HIV/AIDS Treatment	16	105	236	15%	1,244	113	11%
TB	11	14	16	1%	151	14	1%
Malaria Prevention	5	15	29	2%	173	16	1%
Malaria Treatment	24	32	32	2%	336	31	3%
Maternal Heath	35	67	110	7%	770	70	7%
Child Health	176	223	267	17%	2,453	223	21%
Management	66	111	165	11%	1,247	113	11%
Quality improvement	50	84	124	8%	936	85	8%
Human resources (salary incr.)	132	223	330	21%	2,495	227	21%
Community demand	11	28	52	3%	327	30	3%
R&D capacity	7	11	17	1%	125	11	1%
Infrastructure recurrent costs	35	35	35	2%	389	35	3%
Total cost ($m)	**632**	**1,050**	**1,548**	**100%**	**11,756**	**1,069**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
HIV/AIDS Prevention	$ 1.8	$ 2.4	$ 2.8	7%	$ 2.4	7%
HIV/AIDS Care	$ 0.5	$ 0.6	$ 0.7	2%	$ 0.6	2%
HIV/AIDS Treatment	$ 0.6	$ 3.2	$ 6.0	15%	$ 3.4	11%
TB	$ 0.4	$ 0.4	$ 0.4	1%	$ 0.4	1%
Malaria Prevention	$ 0.2	$ 0.5	$ 0.7	2%	$ 0.5	1%
Malaria Treatment	$ 0.9	$ 1.0	$ 0.8	2%	$ 0.9	3%
Maternal Heath	$ 1.3	$ 2.0	$ 2.8	7%	$ 2.1	7%
Child Health	$ 6.4	$ 6.7	$ 6.8	17%	$ 6.7	21%
Management	$ 2.4	$ 3.4	$ 4.2	11%	$ 3.4	11%
Quality improvement	$ 1.8	$ 2.5	$ 3.1	8%	$ 2.6	8%
Human resources (salary incr.)	$ 4.8	$ 6.8	$ 8.4	21%	$ 6.8	21%
Community demand	$ 0.4	$ 0.9	$ 1.3	3%	$ 0.9	3%
R&D capacity	$ 0.2	$ 0.3	$ 0.4	1%	$ 0.3	1%
Infrastructure recurrent costs	$ 1.3	$ 1.1	$ 0.9	2%	$ 1.1	3%
Total cost per capita ($)	**23**	**32**	**39**	**100%**	**32**	**100%**

Table 64: Cost of Health interventions in Uganda.

The following table shows a very rough estimate of the human resource needs (doctors and nurses/midwives) that may be required to roll out the full set of preventive and treatment interventions by 2015. We emphasize that this is a highly preliminary number calculated here to indicate the order of magnitude of the need.

Health human resource needs	Current	2015
Doctors	3,631	11,801
Nurses/midwives	5,954	65,716

Table 65: Human Resource needs in Uganda for the Health Sector by 2015.

In summary, Uganda needs to spend on average $32 per capita annually between 2005 and 2015. This compares to $14 spent in 2001, $8 of which were spent by the government. While AIDS prevalence is down, there remains a large unmet need for anti-retroviral treatment, which contributes significantly to AIDS costs. The human resource needs in Uganda are also significant and long term planning for scale-up of nursing and medical education is a key component of MDG planning.

Environmental Sustainability

Uganda has taken steps to integrate the principal of environmental sustainability into the county's policies and program and to reverse the loss of environmental resources. The National Environment Management Authority (NEMA) is mandated to regulate the use of environmental resources and ensure that investments do not harm the environment. However, in practice regulation and control tends to be only possible for big investments, which are required to undertake an Environmental Impact Assessment (EIA) prior to approval.

These efforts aside, threats to biodiversity still remain. With over 80 percent of the population depending on the natural resource base virtually for everything, including food (agriculture), and energy for cooking and lighting, the pressure on the environment continues to be high (DFID 2002b). Soils have lower productive capacity than before because of soil mining. Firewood collection has added to pressure on forests. Drought is now more common than it used to be and the rain cycle has virtually been altered. In urban areas, solid waste management systems are hardly functional. On a positive note, however, there is a momentum behind initiatives to increase the planting of trees in an effort to reverse deforestation.

As detailed in Section 4.6, several sets of interventions directly relating to the environment, such as access to clean energy services and water treatment, are included as part of the analysis of other sectors. At this point we do not have access to sufficient information to calculate the requirements in terms of human and financial resources for the remaining interventions for ensuring environmental sustainability.

Water and Sanitation

Substantial progress has been made in improving access to safe water over the past ten years. According to preliminary data from WHO/UNICEF rural coverage increased from 40 percent in 1990 to 50 percent in 2000, while urban coverage increased from 79 percent to 86 percent during the same period. Despite the above efforts and achievements in the

water sector, a number of challenges remain and these include among others, maintenance of water sources to maintain access in areas where water sources have been constructed, low coverage in some districts (10 districts have water coverage of 30 percent or less), and improving service delivery at the district level, in view of decentralization. Because of these challenges, progress needs to be accelerated to meet the water MDG.

Water and sanitation targets Uganda	1990	2000	2005	2010	2015	Total 05-15
Water supply						
Total access - urban (%)	79%	86%	87%	88%	90%	
Population provided with access each year - urban			139,008	321,691	434,398	3,556,572
Total acces - rural (%)	40%	50%	54%	62%	70%	
Population provided with access each year - rural			782,875	928,779	1,110,901	10,182,091
Sanitation						
Total access - urban (%)	54%	53%	55%	66%	77%	
Population provided with access each year - urban			175,225	354,487	526,099	3,995,606
Total acces - rural (%)	41%	40%	42%	56%	71%	
Population provided with access each year - rural			966,664	1,204,412	1,487,399	13,252,221

Table 66: Water and Sanitation targets in Uganda.

Past spending in the water sector was on tangible outputs, and aimed at the provision of materials like pumps and pipes. However, owing to a policy shift from a centralized to a bottom up approach, present spending priorities encompass the facilitation of community planning processes, policy formulation and sector capacity building. While these activities are essential for the development of a sense of community ownership of safe water sources, evidence from the recent Participatory Poverty Assessments (PPA II) suggests that the impact of increased spending on community planning processes have not been felt on the ground.

In the case of sanitation the picture is less positive. During the 1990s the percent of rural and urban populations with improved access to safe water and sanitation facilities has stagnated at around 40 and 53 percent, respectively. Sanitation has been highlighted as a high priority in the sector plans of water, health, and education. Practically however, it is yet to clearly come out as a funding priority for any of them. In fact, by spreading out everywhere, it has received no attention anywhere! There is a memorandum of understanding between the Health Sector, Education Sector, and the Water and Sanitation Sector on the matter of implementing the sanitation plan. However, implementation of the memorandum that was signed two years ago seems to have hit a dead end. This is partly due to the fact that sanitation differs from each of these sectors' core function and expertise.

As can be seen from Table 67, which presents our preliminary results for Uganda, we project that per capita costs for capital and operating expenses in the water and sanitation sector to rise from $3.6 in 2005 to $6.2 in 2015.

Uganda	Water and sanitation						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Water provision							**0%**
Capital cost - rural	11.29	12.99	15.32	9%	142.53	12.96	10%
Operating cost - rural	4.54	8.09	12.40	7%	90.62	8.24	7%
Subtotal rural	***15.82***	***21.08***	***27.72***	***16%***	***233.15***	***21.20***	***17%***
Capital cost - urban	9.45	17.25	23.21	13%	191.55	17.41	14%
Operating cost - urban	8.86	16.43	26.76	15%	186.94	16.99	14%
Subtotal urban	***18.31***	***33.68***	***49.97***	***28%***	***378.50***	***34.41***	***28%***
Total	**34.13**	**54.76**	**77.69**	**44%**	**611.65**	**55.60**	**45%**
Sanitation							
Capital cost - rural	18.72	24.02	30.41	17%	265.24	24.11	19%
Operating cost - rural	2.04	5.89	12.51	7%	70.82	6.44	5%
Subtotal rural	***20.76***	***29.91***	***42.92***	***24%***	***336.06***	***30.55***	***25%***
Capital cost - urban	10.36	18.82	29.63	17%	215.60	19.60	16%
Operating cost - urban	2.42	6.16	13.14	7%	74.96	6.81	6%
Subtotal urban	***12.78***	***24.99***	***42.77***	***24%***	***290.56***	***26.41***	***21%***
Total	**33.54**	**54.89**	**85.68**	**48%**	**626.62**	**56.97**	**46%**
Waste Water Treatment							
Rural	-	-	-	0%	-	-	0%
Urban	1.21	2.88	5.32	3%	33.67	3.06	2%
Total	***1.21***	***2.88***	***5.32***	***3%***	***33.67***	***3.06***	***2%***
Hygiene Education	**6.48**	**8.06**	**9.65**	**5%**	**88.66**	**8.06**	**7%**
Total cost ($m)	**75.36**	**120.59**	**178.34**	**100%**	**1,360.59**	**123.69**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Water provision						
Capital cost - rural	0.4	0.4	0.4	9%	0.4	10%
Operating cost - rural	0.2	0.2	0.3	7%	0.2	7%
Subtotal rural	***0.6***	***0.6***	***0.7***	***16%***	***0.6***	***17%***
Capital cost - urban	0.3	0.5	0.6	13%	0.5	14%
Operating cost - urban	0.3	0.5	0.7	15%	0.5	14%
Subtotal urban	***0.7***	***1.0***	***1.3***	***28%***	***1.0***	***28%***
Total	**1.2**	**1.7**	**2.0**	**44%**	**1.7**	**45%**
Sanitation						
Capital cost - rural	0.7	0.7	0.8	17%	0.7	19%
Operating cost - rural	0.1	0.2	0.3	7%	0.2	5%
Subtotal rural	***0.8***	***0.9***	***1.1***	***24%***	***0.9***	***25%***
Capital cost - urban	0.4	0.6	0.8	17%	0.6	16%
Operating cost - urban	0.1	0.2	0.3	7%	0.2	6%
Subtotal urban	***0.5***	***0.8***	***1.1***	***24%***	***0.8***	***21%***
Total	**1.2**	**1.7**	**2.2**	**48%**	**1.7**	**46%**
Waste Water Treatment						
Rural	-	-	-	0%	-	0%
Urban	0.0	0.1	0.1	3%	0.1	2%
Total	***0.0***	***0.1***	***0.1***	***3%***	***0.1***	***2%***
Hygiene Education	**0.2**	**0.2**	**0.2**	**5%**	**0.2**	**7%**
Total cost per capita ($)	**2.7**	**3.7**	**4.5**	**100%**	**3.7**	**100%**

Table 67: Cost of key Water and Sanitation interventions in Uganda.

These results are very similar to resource estimates for Tanzania. Again, relatively inexpensive technologies dominate in Uganda, which drives down costs. Critically, the relatively low levels of current access imply that the country will have to spend less on operating and maintenance costs. Similarly, due to an extremely low density of waterborne sanitation systems in urban areas, investments needs for wastewater treatment appear relatively modest.

Improving the Lives of Slum Dwellers

According to UN-Habitat (2003) 93 percent of Uganda's urban population lives in slum-like conditions. This is one of the highest ratios in the world. Unfortunately, slum dwellers are rarely a group that is focused on by the key development managers in urban areas. Slum dwellers mostly live on land that is not theirs and in very squalid conditions. Improvement of their living conditions calls for public sector intervention, mainly by the

urban authorities. Provision of dwelling houses for such groups of people would entail acquisition of land, construction of low-cost houses and resettlement of the beneficiaries to their new places of aboard or the improvement of living conditions in the slums including better policing to reduce crime, better solid waste management, and delivery of social services especially education, health, and water and sanitation. Local government, which are expected to deliver these services often lack financial resources. This is the situation in Kampala, where the Kampala City Council (KCC) can hardly do anything to improve the quality of life in slums on account of inadequate funds.

As discussed in Section 4.8 above, we have not yet been able to calculate robust resource requirements for meeting Target 11 in Uganda. For this reason the financial requirements of this sector are not included in the subsequent analysis.

Science and Technology

Science and technology are major driving forces of the development process and of poverty reduction. Science and technology development in Uganda is facing many challenges, especially the education and research system. The teaching of science in secondary schools and institutions of higher learning is bedeviled with inadequate equipment and other inputs, mainly on account of lack of financial resources. Secondary schools in rural areas have no laboratories and consequently their curriculum is Arts based. Science is mainly taught well in urban schools where schools can afford the cost of equipment and chemicals. At university and tertiary level of education, science based courses are offered almost exclusively by government institutions. Yet, there are only four government universities compared to about 16 private universities (UMoES 2002).

With regard to generation of technologies and its dissemination, Uganda is doing extremely poorly. Agricultural technologies that have been generated through research are hardly disseminated. Government is almost totally reliant on donors to find research. Technology is hardly streamlined in the country's development process. However, with globalization, Uganda is beginning to benefit from technologies generated from elsewhere. Computers are becoming more common, and telecommunication has improved especially the use of mobile phones.

At this stage insufficient information was available for calculating resource requirements for promoting science and technology in Uganda, including the improvement and extension of university education and research, science advice, and ICT infrastructure. As a result, our preliminary analysis does not include the investment needs for these sets of interventions.

Energy

The country's electrification rates of 10 percent in urban areas and 1 percent in rural areas are significantly lower than the sub-Saharan average of 23 percent. These rates are comparable to those for Tanzania. The vast majority of Uganda's population is therefore dependent on inefficient and relatively low luminosity fuels, such as kerosene, for lighting. Similarly, on the cooking side, only a very small proportion of the population has access to modern fuels: in urban areas, charcoal is the most widespread cooking fuel, while in rural areas, unprocessed biomass dominates.

Uganda has a program of rural electrification through which distribution of electric power to rural areas, especially the semi-urban areas, should improve. However, power generation will need to be increased, if the rural electrification program is to achieve its objectives. Success of the rural electrification program could reduce the pressure on forests and thereby contribute to environmental sustainability. Uganda also intends to build more energy generating plants. The construction of a power dam at Bujagali has stalled for now over five years mainly on account of a controversy on the likely environmental damage construction of the dam is likely to cause. Nonetheless, Uganda lacks funds to build an adequate number of power generating plants.

The MDG-consistent energy targets require Uganda to increase electrification rates to 27 percent in urban areas, and 13 percent in rural areas—reaching an additional 1 million households between 2005 and 2015. On the cooking side, an additional 3.1 million families will gain access to cleaner cooking methods over the same period. Increased demand for electricity from households, educational- and healthcare facilities, and industry will require a 70 percent increase in annual power supply.

Total cost estimates for Uganda in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Rural							
Devices	35	50	66	10%	553	50	12%
Fuels	95	204	324	50%	2,271	206	48%
Electricity	2	93	123	19%	955	87	20%
Subtotal rural	***132***	***347***	***512***	***78%***	***3,779***	***344***	***80%***
Urban							
Devices	10	18	28	4%	202	18	4%
Fuels	18	46	85	13%	527	48	11%
Electricity	4	22	29	4%	234	21	5%
Subtotal urban	***32***	***86***	***142***	***22%***	***964***	***88***	***20%***
Total cost ($)	**164**	**433**	**654**	**100%**	**4,743**	**431**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Rural						
Devices	1.3	1.5	1.7	10%	1.5	12%
Fuels	3.4	6.2	8.2	50%	6.2	48%
Electricity	0.1	2.8	3.1	19%	2.6	20%
Subtotal rural	***4.8***	***10.5***	***13.0***	***78%***	***10.4***	***80%***
Urban						
Devices	0.4	0.5	0.7	4%	0.6	4%
Fuels	0.7	1.4	2.2	13%	1.4	11%
Electricity	0.1	0.7	0.7	4%	0.6	5%
Subtotal urban	***1.1***	***2.6***	***3.6***	***22%***	***2.6***	***20%***
Total per capita costs	**5.9**	**13.1**	**16.6**	**100%**	**13.0**	**100%**

Table 68: Cost of Energy interventions in Uganda.

It is noticeable that the majority of investments will need to be made in rural areas, focusing on improved fuel inputs. Our projections show that with increasing coverage rates, operating costs rise sharply, contributing to a steep increase in per capita costs. Not included in these summary results is the cost of increasing generation capacity and providing electricity for industrial needs. We estimate the corresponding resource requirements to amount to roughly $350 million dollars for the period from 2005 to 2015. Since current capacity is sufficient for meeting industrial demand, most investments to satisfy the industrial sector's energy needs will need to be made after 2007.

Transport Infrastructure

Transport infrastructure, which includes road networks, rail system, and ports, facilitates market access by the poor. Uganda's transport infrastructure is wanting in many respects and affects market access, especially by the poor that reside in rural areas. Access to international markets is further complicated by Uganda's position as a landlocked country. The volatile rains in the region present further challenges for the transport sector.

The rail system is in a dilapidated state with only the main line from Kampala to Mombassa operational. The remaining section of the rail network is not commercially viable on its own. Government is yet to decide whether the rail system should be privatized or not. In case it becomes privatized, the section that is not commercially viable is likely to close down thereby reducing on the length of rail infrastructure.

Responding to high transport costs, the Ugandan government has committed itself to improving transport infrastructure. It has put forth a ten-year road sector plan, which is intended to improve the road infrastructure, especially the national roads. However, Uganda is highly dependent on donors to finance its transport infrastructure.

Based on Uganda's extremely low road density, we project substantial investments in the road sector to move towards the tentative target road density of 0.5km per 1000 people. Reaching this target by 2015 would require a more than five-fold increase in the network of paved roads, which may be impossible to achieve given the substantial institutional and operational constraints in the roads sector. To account for this, we have limited investments to increasing the existing road network by a factor of five.

Uganda	Roads						
Total cost estimates in 2000 US$ million	2005	2010	2015	% of total in 2015	Total 2005-15	Average 2005-15	% of total over period
Road construction							
Two-lane highway	189	189	189	29%	2,077	189	31%
Two-lane road	161	161	161	24%	1,766	161	26%
One-lane road	136	136	136	21%	1,494	136	22%
Total	**485**	**485**	**485**	**73%**	**5,337**	**485**	**79%**
Road O&M							
Two-lane highway	66	85	104	16%	935	85	14%
Two-lane road	9	25	41	6%	279	25	4%
One-lane road	3	16	30	5%	179	16	3%
Total	**78**	**127**	**175**	**27%**	**1,393**	**127**	**21%**
Total cost ($m)	**563**	**612**	**660**	**100%**	**6,730**	**612**	**100%**

Per capita total cost estimates in 2000 US$	2005	2010	2015	% of total in 2015	Average 2005-15	% of total over period
Road construction						
Two-lane highway	6.8	5.7	4.8	29%	5.7	31%
Two-lane road	5.8	4.9	4.1	24%	4.8	26%
One-lane road	4.9	4.1	3.5	21%	4.1	22%
Total	**17.6**	**14.7**	**12.3**	**73%**	**14.6**	**79%**
Road O&M						
Two-lane highway	2.4	2.6	2.6	16%	2.6	14%
Two-lane road	0.3	0.8	1.1	6%	0.8	4%
One-lane road	0.1	0.5	0.8	5%	0.5	3%
Total	**2.8**	3.8	4.5	**27%**	**3.8**	21%
Total cost per capita ($)	**20.4**	**18.5**	**16.8**	**100%**	**18.4**	**100%**

Table 69: Cost of Road Infrastructure Interventions in Uganda.

Apart from the costs of repairing and extending the road network within Uganda, we also calculate the cost of upgrading and repairing the Kampala-Mombasa highway, which is critical for the transportation of Ugandan goods and services to global markets. The road is one of Uganda's most important links to maritime trade but requires significant repairs and upgrading. Current estimates show that it takes twice as long to transport a container from Kampala to Mombasa, as it does to transport it from London to Mombasa (Global Security 2002, quoted in Faye et al 2003). Significant repairs are needed primarily in the Kenyan segment of this route. We estimate that repairs and upgrading of this road will cost a total of $620 million over the 11-year period with an average annual cost of $49 million. We do not, however, include this cost in resource needs for Uganda since it will need to be shared between the two countries depending on the nature and location of repairs.

We emphasize that our approach to calculating resource requirements for the road sector, while providing the right order of magnitude of required investments, is not well suited for developing detailed country-level road sector plans. These must instead be based on detailed assessments of local demand for transport as well as the country's topography. As a result, the national target of reaching 0.5km of paved roads per 1000 people as well as unit costs may change.

Financing

The total costs estimated for Uganda will need to be financed through a combination of private household contributions, domestic government spending, and external assistance. We disaggregate these sources of financing by first estimating the contributions that households can make and projecting the scope for domestic government resource mobilization for the MDGs. Additional resources required to meet the Goals will then need to be externally financed.

The share of household contributions is based on both the ability to pay and the incentive effects of user charges. To calculate the ability to pay, we use national poverty data on the proportion of people living below the poverty line and the income distribution data across quintiles to divide the population into three categories based on their income: those who cannot afford to contribute at all towards meeting the goals (population below the poverty line), those who can contribute partially (population between the poverty line and two times the poverty line) and those who can contribute the full cost of most interventions (population above two times the poverty line).

As discussed in the introduction, we assume that health and primary education are publicly provided and funded, and therefore estimate no household contributions for interventions related to those goals. For secondary education, agricultural interventions, water and sanitation, and energy services, we estimate partial cost recovery.[77]

[77] For a detailed description of the proportion of costs in these areas that are borne by households, please refer to Table 5

We calculate the share of total expenditure devoted to the MDG sectors (including social and economic services) at approximately 68.7 percent[78]. We then multiply this share with government revenues to get the total domestic spending on the MDGs.[79] In the case of Uganda, this translates into domestic spending on the MDGs of 7.5 percent of GDP. We assume that domestic spending will increase by 4 percentage points by 2015, increasing the share of domestic resources spent on the MDGs to 11.5 percent of GDP.[80] On a *pro forma* basis we allocate projected domestic government spending to sectors according to the sectors' share of total costs. External financing is then calculated as the difference between total resource requirements and spending by both households and governments

Summary of Costs and Financing Results

[78] Calculated using Uganda MTEF, MoFPED, GoU 2002
[79] Revenue and expenditure data is taken from the International Financial Statistics June 2003, IMF
[80] For a complete discussion of the assumptions behind this analysis please refer Section 5 above.

Summary of projected financial resources required for meeting the MDGs in Uganda

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
Total Cost (Sum of A+B+C below)	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	118	4.3	296	9.0	370	9.4	2,989	272	8.2	2.0%
Education	338	12.2	445	13.5	644	16.4	5,069	461	13.9	3.4%
Gender Equality	48	1.7	78	2.4	108	2.7	854	78	2.3	0.6%
Health	632	22.9	1,050	31.8	1,548	39.3	11,756	1,069	32.2	7.8%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	75	2.7	121	3.7	178	4.5	1,361	123.7	3.7	0.9%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	164	5.9	433	13.1	654	16.6	4,743	431	13.0	3.1%
Roads	563	20.4	612	18.5	660	16.8	6,730	612	18.4	4.5%
Total	**1,938**	**70.2**	**3,034**	**92.0**	**4,162**	**105.8**	**33,501**	**3,046**	**91.8**	**22.2%**

Summary of projected sources of financing in Uganda

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
A. Household Contributions	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	64	2.3	67	2.0	73	1.8	739	67	2.0	0.5%
Gender Equality	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Health	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	34	1.2	56	1.7	84	2.1	631	57.4	1.7	0.4%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	68	2.5	141	4.3	222	5.6	1,573	143	4.3	1.0%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Total	**166**	**6.0**	**263**	**8.0**	**379**	**9.6**	**2,943**	**268**	**8.1**	**2.0%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
B. Domestically Financed Government Expenditures ***	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	38	1.4	105	3.8	159	5.8	1,111	101	3.0	0.7%
Education	110	4.0	159	4.8	277	7.0	1,884	171	5.2	1.3%
Gender Equality	15	0.6	28	0.8	46	1.2	317	29	0.9	0.2%
Health	205	7.4	374	11.3	666	16.9	4,369	397	12.0	2.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	24	0.9	43	1.3	77	2.0	506	46.0	1.4	0.3%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	53	1.9	154	4.7	281	7.2	1,762	160	4.8	1.2%
Roads	182	6.6	218	6.6	284	7.2	2,501	227	6.9	1.7%
Total	**627**	**22.7**	**1,081**	**32.7**	**1,791**	**45.5**	**12,449**	**1,132**	**34.1**	**8.3%**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
C. Required Total External Budget Support	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Annual total ($m)*	*Per capita ($)*	*Overall total ($m)*	*Average per year ($m)*	*Average per capita ($)*	*Average % GDP*
Hunger	80	2.9	191	5.2	211	3.6	1,878	171	5.1	1.2%
Education	165	6.0	220	6.7	294	7.5	2,446	222	6.7	1.6%
Gender Equality	32	1.2	50	1.5	62	1.6	536	49	1.5	0.4%
Health	427	15.5	676	20.5	882	22.4	7,388	672	20.2	4.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	17	0.6	22	0.7	17	0.4	224	20	0.6	0.1%
Improving the Lives of Slum Dwellers	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Science and Technology	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Energy	42	1.5	138	4.2	150	3.8	1,408	128	3.9	0.9%
Roads	381	13.8	394	11.9	376	9.6	4,229	384	11.6	2.8%
Total	**1,145**	**41.4**	**1,690**	**51.2**	**1,993**	**50.7**	**18,108**	**1,646**	**49.6**	**12.0%**

* I.e. government expenditures on the MDGs, which are financed solely through domestic revenue generation
** On a pro forma basis, expenditures are allocated to budget line items based on their relative share of total costs above

Table 70: Summary of projected total costs and sources of financing in Uganda.

We estimate that in order to meet the MDGs, Uganda will need to spend a total of $70.2 per capita in 2005 increasing to $106 by 2015 to meet the MDGs. This translates into a total investment need of $33.5 billion between 2005 and 2015, which is equivalent to an average annual per capita need of $92. Of the $92, we estimate that $42 will be financed domestically through household and government contributions. ODA commitments to Uganda were $976 million in 2001, or $42 per capita. In comparison, we project an average external financing need of approximately $50 per capita between 2005 and 2015.

It is important to note that the above cost estimates are based upon a partial list of interventions that are specific to Uganda. There are several other interventions that have not yet been taken into account that could increase the total costs substantially. A list is included in the box below.

Important cost factors not included in these resource estimates for Uganda

- Water storage and transport infrastructure, including large-scale irrigation,
- Improving the lives of slum dwellers,
- Interventions for to ensure environmental sustainability,
- R&D expenditures (except for health) and higher education systems,
- Information and communication technologies,
- Ports and railways,
- Large-scale fuel distribution and storage infrastructure, and
- Disaster response and food aid.

12. Lists of interventions

The lists below summarize the interventions, defined as the goods, services and infrastructure that need to be delivered in each area. Not all of these interventions have been quantified (please see the relevant sections of the document for more details) and some remain to be specified in further detail. This list will continue to be updated and refined based on the evolving findings of the Millennium Project.

MDG 1 Target 2:	**Halve, between 1990 and 2015, the proportion of people who suffer from hunger**
Category	**Intervention**
Agricultural production	
Livestock production	Improve animal breeds and control diseases
	Introduce soil conservation methods
Pest control	Introduce pest control techniques
Seed and farming inputs	Introduce high yielding seeds
	Introduce mechanized farm implements
Soil fertility	Provide quality tree-germplasm
	Provide manure
	Introduce crop mixing
	Provide chemical fertilizers
Water management	Revive traditional water conservation methods
	Provide pumps
	Provide drip irrigation
	Provide hosepipes
	Provide water harvesting
	Provide storage tanks
	Extend small scale irrigation system across households
	Implement appropriate medium and large scale irrigation projects
Agricultural and irrigation extension service	Provide extension services to smallholder farmers and promote agricultural mechanization, especially female workers
	Strengthen animal health and crop protection services
	Improve land and water resource utilization and management
	Set up training institutes and farmer-to-farmer training services
Land Tenure	Review land tenure systems
Urban Agriculture	*(To be specified)*
Supporting Rural Income Generation	
Agro-processing and marketing	Promote agro-processing and rural industrialization *(to be specified further)*
Storage, stocking, shipment and trade	Build and improve storage and trans-shipment facilities
	Provide farm and national level facilities
Testing	Build facilities for quality testing and storing
Promote Agro-Processing	Increase access to technical inputs (such as threshing machines) in rural areas
Access to assets	Start community grain banks
	Build micro finance institutions to create access to credit
	Strengthen rural household links to the formal banking system *(to be specified further)*

Rural Infrastructure	
Energy	Extend rural electrification
Communications	Improve rural postal services
	Build community communications centers
Telecommunications	*(To be specified)*
Market information systems	*(To be specified)*
Transportation	Build new rural roads
	Rehabilitate and upgrade strategic road networks
	Maintain feeder road network
Improving Nutrition	
General	Provide target subsidies to make nutrient-dense food available to vulnerable Groups
	Expand, and endorse nutrient-fortification legislation
	Implement population-wide fortification programs for iron, iodine and Vitamin A
Adolescent girls and women of childbearing age	Provide micronutrient supplements as part of antenatal and post natal care to women
	Provide community-based nutrition programs for adolescent girls and women
	Provide micronutrient supplementation programs for adolescent girls and women
	Launch public awareness campaigns focusing on improving the nutritional status of adolescent girls and women
Children	Introduce school meals through locally produced and fortified food
	Provide micronutrient supplementation for severely undernourished children
Infants	Promote complementary feeding programs for infants in the 7-24 months
Emergency Food Assistance	Provide direct food assistance (e.g. community kitchens) and food-for-work programs
Strengthening Institutional Capacity	
Ministry-level capacity strengthening	*(To be specified)*
Agricultural research and data collection	Undertake and expand high quality agricultural research
	Improve systems of data collection and management
Technical support to farmers	Set up technical advisory services for farmers
	Train facilitators needed to mobilize local communities
Policy formulation and strategic planning	Supervise and monitor implementation of plans
	Develop food security policy
	Develop and monitor product standards regulations
	Review existing agricultural, trade, micro-finance and land policies and legislation
Disaster Management Systems	Establish flood/drought monitoring stations, early warning systems

MDG 2, TARGET 3:	**Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling**
Category	**Intervention**
Child Preparation	Extend early child development programs
	Ensure visits and check-ups to schools by health officials
Primary Education	
Infrastructure	Build classrooms
	Build girls' toilets
	Install furniture (blackboards, desks, chairs)
	Build teachers' houses
	Provide transportation facilities
Teachers	Hire teachers
	Hire female teachers
	Provide pre-service training
	Provide in-service training
Materials	Provide textbooks
	Provide other learning materials (stationery, chalk etc.)
Demand side incentives	Provide uniforms
	Provide subsidies to girls
	Provide school meals
	Provide take-home rations
	Provide subsidies for vulnerable populations
	Keep HIV/AIDS orphans in school
Curriculum Reform	Design new textbooks
	Provide learning aids
	Provide teacher training for new curriculum
	Introduce a communication strategy to disseminate the curriculum changes
Distance Education	Introduce distance education for hard-to-reach, out of school children
	Provide IT equipment and radio
	Hire teachers/instructors
	Train teachers/instructors
	Provide learning material
	Introduce emergency schooling in conflict areas
Secondary Education	
Infrastructure	Build Classrooms
	Build furniture (blackboards, desks, chairs)
	Build toilets
	Build teacher housing
	Develop transportation facilities
	Build libraries
	Build laboratories
	Build sports facilities
Teachers	Hire teachers
	Hire female teachers
	Provide pre-service training
Materials	Provide in-service training
	Provide textbooks

MDG 2, TARGET 3:	**Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling**
Category	**Intervention**
	Provide other learning materials (stationery, chalk etc.)
Demand side interventions	Provide uniforms
	Provide subsidies to girls
	Develop school meals programs
	Provide take-home rations
	Provide subsidies for vulnerable populations
	Introduce conditional cash transfers
	Keep HIV/AIDS orphans in school
Curriculum Reform	Design new textbooks
	Provide learning aids
	Provide teacher training for new curriculum
	Improve a communication strategy to disseminate the curriculum changes
Adult literacy	Develop adult literacy programs
	Train instructors and volunteers
	Undertake mass media campaigns to increase awareness of the importance of adult literacy
Out-of-school Children	Introduce distance education
	Introduce emergency schooling in conflict areas
System wide Quality Improvements	Create processes for national guidelines *(to be specified further)*
	Improve monitoring of schools' performance *(to be specified further)*
Community involvement	Mobilize communities for better school management *(to be specified further)*
	Scale up pilot programs and undertake evaluations
	Coordinate community schools with Ministry of Education *(to be specified further)*
Quality	Improve monitoring, accounting and reporting of schools' performance at ministry and district level through school performance systems
Monitoring	Create national guidelines for monitoring quality
	Measure cognitive abilities and learning outcomes
Decentralization	Evaluate current structure of the school system
	Redesign financing mechanism (to be specified further)
	Restructure school system along decentralized structures as necessary
Strengthening Institutional Capacity	
School Management	Improve accounting and reporting mechanisms
	Hire non-training and administrative staff
	Train non-teaching and administrative staff
	Increase parents involvement in schools for greater accountability
Ministry of Education	*(To be specified)*

MDG 3 Target 4:	**Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015**
Category	**Intervention**
Systemic support	
Support to Government Capacity to promote gender equality and women's empowerment (including implementation of CEDAW and other international women's rights)	Provide budgetary and human resources for national women's machineries
	Provide budgetary and human resources for gender focal points throughout the system of government
	Provide budgetary and human resources for gender training as a part of in service training for professional bureaucrats at all levels of government
	Provide budgetary and human resources for women elected representatives Provide initial training for newly elected representatives and support for developing capacity on a ongoing basis
	Support the judicial system (including training for judges etc.)
Support to civil society organizations to promote gender equality and women's empowerment (including implementation of CEDAW and other international women's rights)	Provide financial grants to women's organizations
Monitoring and Evaluation	Undertake performance research: epidemiology surveillance, national statistics building, national registration systems
Data Collection and Monitoring	Collect data on gender disaggregated statistics on health, education outcomes, access to assets and infrastructure and conditions of work and employment and political representation and gender specific violence Conduct surveys (labor force, household based income/consumption/health, nterprise surveys etc.)
Special country specific focus (e.g. Internally Displaced Persons)	Special focus on the needs of IDPs *(to be specified further)*
Enhancing women's capabilities *Health*	
Health system interventions	Covered under Health sector analysis
Legislation	Legalize and decriminalize abortion
	Introduce legislation that protects the rights of women to plan families
	Set up regulatory agencies to ensure provision of safe, effective contraceptives
Awareness building and education about the importance of reproductive and sexual rights, targeted to men and women	Produce manuals of good practices and training for medical staff
	Undertake mass media campaigns (TV novellas, soap opera, radio shows, PSAs, posters, advertisements)
	Undertake large scale community-based programs to discourage female genital mutilation and other harmful practices
Education	Covered under education interventions specifically targeted to girls at primary and secondary level
Sexuality education	Provide school based sexuality education
	Provide community based sexuality education
Nutrition (Pre-pregnancy to post birth)	Increase food and micronutrient intake and diet diversification
	Undertake supplementation program of iron-folate, iodine, multi-vitamins for women and girls from ages 15-25

MDG 3 Target 4:	**Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015**
Category	**Intervention**
	Develop awareness campaigns for improving adolescent girls and women's nutritional status
Enhancing women's economic opportunities	
Access to Infrastructure	Provide equal access to safe drinking water and sanitation
	Provide adequate access to clean cooking fuels
	Provide access to energy for household and income generating needs
	Provide access to roads and transportation means for greater mobility
Access to assets	Promote legislation to guarantee property and inheritance rights to women and girls
	Develop sensitization campaigns to train land titling officials
	Develop gender equitable land titling and registration
	Develop mass legal literacy campaign for land and housing rights
	Provide legal aid and counseling for land, inheritance and housing rights
	Improve systems of issuing ID documents to women and registering them in the official records
	Provide equitable access to new, innovative financial products and services for poor women (insurance, savings, equity, debt)
Equal access to and treatment in work	
Gender sensitive labor market legislation	Provide equal opportunity legislation (against gender based discrimination)
	Provide legislation providing leave for dependent care
	Promote minimum wage legislation and enforcement *(to be specified further)*
Implementation and enforcement	Promote effective regulatory agencies within labor ministry
	Providing legal literacy *(to be specified further)*
	Provide manuals of good practices and training for employers
	Provide access to judicial redress (including sexual harassment)
	Ensure that social protection schemes reach women on an equitable basis with men
	Provide pension (public subsidy element+ cost of delivering)
	Provide unemployment benefits (public subsidy element+ cost of delivering)
	Provide disability benefits (public subsidy element+ cost of delivering)
	Provide minimum income transfer schemes (public subsidy element+ cost of delivering)
	Provide child and other dependent (crèches, old-age homes, paid home based) care
	Provide subsidies to maternity and paternity leave and dependent care leave
	Provide vocational or technical skill training to help young girls make the transition to work
	Ensure that training and support programs for SMEs (small and medium enterprises) reach women on an equitable basis (information, training, subsidized credit)
Enhancing women's political opportunities	Provide measures to promote affirmative action to increase the presence of women in all representative bodies
	Develop awareness campaigns on opportunities
	Provide Training and support for women candidates

MDG 3 Target 4:	**Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015**
Category	**Intervention**
Enhancing women's security	
Prevention of Violence	Enact and enforce legislation banning violence against women at the domestic and public level
	Provide training programs for government agencies
	Provide awareness campaign to focus on violence prevention
	Design manuals of procedures for police
Promotion (of awareness of women's rights to a life free from violence)	Develop mass media campaign
	Provide school-based education
	Develop community based education campaigns
Protection from violence	Provide services for victims (temporary shelter, health, counseling, hotlines)
	Provide access to judicial redress and legal services
	Provide referral services for employment and housing
	Prepare service providers to detect signs of violence/abuse
	Provide conciliation and mediation services
	Provide women staffed police stations
	Provide sensitivity training for police and legal officers
Punishment	Provide (formal or informal) tribunals to bring perpetrators to justice
	Provide rehabilitation services for offenders
	Provide training for adjudicators, police services

MDG 4 Target 5:	**Reduce by two thirds the mortality rate amongst children under 5**
Category	**Intervention**
Neonatal Interventions	Manage preterm labor
	Newborn resuscitation
	Ensure skilled birth attendance
	Manage low birth weight
	Manage infection/malformations
Childhood disease prevention	Ensure immunization including the following
	BCG
	DPT
	Hepatitis B
	Hib
	Measles
	MMR
	OPV
	Yellow Fever
	Offer micronutrient supplementation
	Encourage breast feeding
	Provide complementary feeding
Behavior change programs	Increase community awareness of IMCI and CDD
	Provide advocacy and social mobilization for control of diarrhoeal diseases
Childhood treatment	Integrated Management of Childhood Illness comprising medical interventions to treat the following conditions
	Acute respiratory infections
	Causes of fever (e.g., malaria)
	Anemia
	Diarrhea
	Measles
	Malnutrition
	Ear problems
	Bacterial Infections - Infants
	Feeding Problem - Infants

* Health systems interventions, including enhancing community demand, are included separately

MDG 5 Target 6:	**Reduce by three quarters, between 1990 and 2015 the maternal mortality ratio**
Category	**Intervention**
Prenatal period	Provide antenatal Care
	Treat complications during pregnancy
	Treat concurrent illness in pregnancy (e.g., HIV, TB, Malaria)
Intrapartum period	Ensure skilled birth attendance (includes neonatal resuscitation, prevention of mother to child transmission of HIV/AIDS (PMTCT))
	Provide emergency Obstetric Care to treat the following conditions
	Ecclampsia
	Haemorrhage
	Obstructed labor
	Sepsis
	Ensure appropriate management of neonatal complications
	Provide postpartum care
Other reproductive health	Offer family planning counseling
	Provide contraception (male condoms, female condoms, Deproprovera, Intrauterine device, Norplant, Oral Contraception, male sterilization, female sterilization)
	Provide diagnosis and treatment of sexually transmitted infections (including cervical cancer)
	Provide safe abortions & counseling (including care of post-abortion complications)
	Ensure appropriate treatment of obstetric fistula

* Health systems interventions, including enhancing community demand, are included separately

MDG 6 Target 7:	**Have halted and begun to reverse the spread of HIV/AIDS**
Category	**Intervention**
HIV Prevention	Mass media and awareness campaign
	Voluntary counseling and testing (VCT)
	Condom social marketing
	School-based AIDS education
	Education for out-of-school youth
	Outreach programs for sex workers and their clients
	Outreach programs for men who have sex with men
	Harm reduction programs for injecting drug users
	Provide sterile needles & syringes
	Ensure safety of blood transfusions
	Offer public sector condom promotion and distribution
	Target sexually transmitted infections for early diagnosis, treatment, prevention and control
	Ensure workplace prevention programs
	Prevent mother-to-child transmission (PMTCT)
	Offer post-exposure prophylaxis
	Provide needles and support to ensure safe injections
	Promote universal precautions
	Policy, administration and research *(to be specified further)*
HIV Care	Offer palliative care
	Diagnosis of HIV infection (HIV testing)
	Treatment for opportunistic infections
	Prophylaxis for opportunistic infections
	Offer anti retroviral therapy (ART), including laboratory services for monitoring treatment
Orphan support	Community support for orphan care *(to be specified further)*
	Extend operation of orphanages
	School fee support for orphans

* Health systems interventions, including enhancing community demand, are included separately

MDG 6 Target 8:	**Have halted and begun to reverse the incidence of malaria and other major diseases**
Category	**Intervention**
Malaria	
Prevention of mosquito bites	Provide and distribute of insecticide-treated nets
	Provide residual indoor spraying
	Provide household screening/improvement
Prevention of infection	Promote prevention in pregnant women
	Provide intermittent preventive treatment to infants (IPTI)
	Provide Chemoprophylaxis to young children
Treatment	Provide treatment for clinical episodes of malaria
Epidemic control	Provide surveillance and preparedness
	Provide rapid response
Environmental control	Provide intermittent irrigation
	Provide spraying
	Provide drainage
	Provide leveling roads with puddles
TB	
TB Prevention	Provide BCG vaccinations
Programs for people with TB	Directly Observed Treatment Shortcourse (DOTS)

Health System Interventions required for achieving the Health MDGs	
Category	**Intervention**
Strengthen human resources	Improve planning for human resource needs
	Provide pre-service education and training for health professionals (e.g. doctors, nurses, lab-technicians, pharmacists, etc.) and management staff
	Provide in-service training to ministry of health central and district management staff
	Provide continuing in-service medical education to doctors, nurses, and other health staff
	Review and improve remuneration and incentive packages of health workers
Improve infrastructure	Build new infrastructure
	Invest in non-facility infrastructure
	Rehabilitate existing infrastructure
	Establish systems to manage buildings and equipment
Strengthen system management	Strengthen Ministry of Health and District Health Teams' capacity in planning, budgeting, supervision, drugs and medical supplies management *(to be specified further)*
	Establish mechanism to ensure transparent & accountable management of financial resources
Improve monitoring, evaluation and quality assurance	Regulate service delivery for public and private sector practitioners
	Develop treatment protocols and implement practice audits
	Formulate policy guidelines for traditional medicine
	Institute or improve health system data gathering
	Institute or improve vital registries and epidemiological surveillance
Enhance community demand and access	Create demand for appropriate health services (e.g. through fighting stigma, providing education on importance of timely diagnosis and treatment); *(to be specified further)*
	Eliminate user fees for essential services
	Enhance access to clinics and hospitals through improving transportation and communication
	Educate traditional providers about treatment/referral systems
Build capacity for research and development	Design and conduct operational and clinical research studies for priority health areas

This list has been developed by the Millennium Project Task Force on Access to Essential Medicines to translate the principles of human rights relating to drug access into enforceable rights for the individual. Details of some interventions remain to be specified further

MDG 8 Target 17:	**Provide access to affordable essential drugs in developing countries**
Category	**Intervention**
Availability of Essential Medicines	
Strengthen innovation	Encourage advocacy for appropriate innovation and priority setting
	Provide policy, funding and infrastructure for research for national priority health needs
	Promote R and/or D for indigenous medicines
	Promote public investment in research for priority health needs of developing countries
	Ensure international standards for ethical research are applied in all countries
	Create environment that mandates private sector to contribute to innovation in public health
Supply systems	Promote all effective supply channels (public, private, NGO) giving priority to sustainable, reliable supply systems
	Provide clear regulations for supply systems
	Ensure judicial system enforces regulations
	Promote information sharing on successful national and pooled supply strategies to enable innovation
	Provide producers with reliable forecasts of priority product requirements
	Promote international standards for procurement agencies
	Prequalify procurement agents
Safety of medicines	Strengthen drug regulatory authority with political support, financing, and staff
	Institute system for monitoring and redressing drug injury
	Enforce compliance with international Good Manufacturing Practice
	Share information about poor quality products and producers
	Set up system for sharing information on benefit-risk assessment and regulatory decisions (e.g., withdrawals)
	Prequalify and monitor priority products and suppliers and share this information (e.g., white list)
Affordability of Essential Medicines	
Financing	Increase public sector budget for essential medicines and ensure equity of access
	Promote prepayment and insurance schemes including employer schemes
	Phase out user fees for essential medicines in favor of more equitable drug financing
	Institute performance based payment for providers
	Promote good donation practices as per international guidelines
	Increase total international financing for essential medicines targeting the poor
	Provide comparative health and other sectoral accounts and pharmaceutical expenditure to encourage fair financing
Prices of medicines	Promote generic and therapeutic competition
	Monitor and regulate the prices of essential medicines
	Remove inappropriate tariffs and taxes and reduce inappropriate distribution and dispensing margins and informal payments
	Adapt and use national legislation to take advantage of TRIPs flexibilities and suspension of pharmaceutical patents for Least Developed Countries as per Doha declaration

MDG 8 Target 17:	**Provide access to affordable essential drugs in developing countries**
Category	**Intervention**
	Develop strategies to ensure production and availability of generic medicines after 2005 and beyond the options that are currently available.
	Promote equity pricing through company discounts, bulk purchasing, voluntary licensing, compulsory licensing, etc.
	Promote company differential pricing for public health priorities
	Monitor impact of pharmaceutical trade agreement on access to medicines and take action if negative
	Share information on producer prices, mark-ups, tariffs and taxes, fees and other charges
	Support a competitive international pharmaceutical environment that includes generic and therapeutic competition
	Ensure that international understandings that support access to medicines are not undermined though regional and bilateral negotiations
Appropriate use	
Prescribing and dispensing	Create essential medicines list based on evidence-based treatment guidelines for prevalent conditions
	Implement national coordinating policy on activities to improve rational drug use
	Ensure responsible and ethical drug promotion and availability of independent and impartial information for continuing education of prescribers and dispensers
	Develop evidence-based treatment guidelines for teaching, monitoring, and evaluation
	Train, regulate and monitor people prescribing and dispensing medicines
	Update and enforce WHO ethical guidelines for drug promotion and drug information (e.g., internet)
	Share, disseminate, and translate independent information on treatment of priority conditions for national adaptation
Use by households	Promote culturally appropriate health literacy and community support
	Ensure availability of independent and impartial information for households through culturally appropriate means
	Mobilize and engage communities to improve use of medicines
	Control direct to consumer promotion
Human resources	Ensure sufficient numbers of trained pharmacy workers of different levels
	Develop, support, and involve communities own resource persons
	Continuously update and adapt to needs training curricula for prescribers and dispensers
	Increase financing for health human resources in low-income countries
	Institute international agreements and cooperation on health worker migration

MDG 7 Target 9:	**Integrate the principles of sustainable development into country policies & programs & reverse the loss of environmental resources**
Category	**Intervention**
General environmental policies and regulation	Develop national strategy to manage ecosystems, protect biodiversity and reduce pollution
	Strengthen regulatory regime and enforcement of pollution control, set emission standards for water and air quality *(to be specified further)*
	Ensure environmental appraisal of sectoral policies (e.g. through Environmental Impact Assessments)
	Remove environmentally adverse subsidies
Increase institutional capacity for environmental policy making and regulation	*(to be specified)*
Strengthen national environmental monitoring systems	*(to be specified)*
Education and training	Train environmental experts
	Hire and train community workers who can raise environmental awareness and provide community training
	Introduce environmental training in school curricula
	Implement national media campaigns to raise environmental awareness
Improved land management to assist the fight against desertification	Improve land husbandry through soil erosion control and soil fertility improvement
	Reduce unsustainable demand for biomass for energy consumption *(see energy interventions for details)*
	(other interventions to be specified)
Forest management	Implement sustained-yield forest management techniques
	Develop plantations to meet needs for pulp and timber while reducing unsustainable deforestation
	Reduce the reliance on wood as a source of energy *(see energy interventions for details)*
Watershed and freshwater ecosystem management	Promote aforestation to reduce soil erosion
	Protect water catchment areas and their vegetation cover *(to be specified further)*
	Other interventions to prevent eutrophication *(to be specified)*
Management of coastal ecosystems and fisheries	*(to be specified)*
Manage and extend protected areas	*(to be specified)*
Transport-related pollution	*(to be specified)*
Industrial air pollution	Develop pollution abatement strategy (including emissions inventory and source apportionment analysis)
	(O*ther interventions to be specified)*
Energy-related air pollution	Develop air pollution control technologies for existing energy plants than can be implemented in low-income countries
	Provide infrastructure for delivery of improved fuels to urban population
	Increase access to improved fuels
Water pollution	Extend industrial wastewater treatment
	(O*ther interventions to be specified)*
Solid waste and soil pollution	(to be specified)

MDG 7 Target 10:	**Halve, by 2015, the proportion of people without access to safe drinking water**
WSSD Target:	**Halve, by 2015 the proportion of people who do not have access to improved sanitation**
Category	**Intervention**
Integrated Water Resources Management (IWRM)	Develop and implement national water resources strategy *(details to be specified)*
	Strengthen national and regional institutions for water resource management *(details to be specified)*
	Extend hydrological monitoring systems to cover all critical watersheds and groundwater aquifers
Water supply	Provide new infrastructure for water supply using locally appropriate technologies (including protected dug wells and boreholes)
	Operate and maintain water supply systems
	Promote safe storage systems for drinking water
	Repair and upgrade existing water supply infrastructure
	Introduce alternative water supply technologies at household level (e.g. rainwater harvesting)
Water infrastructure and supply management	Construct water storage systems and extend large-scale water harvesting
	Improve and extend large-scale water distribution systems
	Ensure operation and management of water storage and distribution systems
Sanitation	Construct new sanitation systems and infrastructure
	Maintain and operate sanitation systems
	Upgrade and repair of existing sanitation systems and infrastructure
	Construct and operate sewage treatment systems
	Regularly empty pit latrines, septic tanks, etc.
Behavior Change Programs	Promote hygiene education in schools and at the household level
	Accompany roll-out of water and sanitation infrastructure with targeted behavior change programs to improve hygiene education
	Run national awareness campaigns to improve hygiene behavior and promote conservation of drinking water

MDG 7, Target 11:	**By 2020, to have achieved a significant improvement in the lives of 100 million slumdwellers**
Category	**Intervention**
Strengthen institutions for urban management and planning	*(To be specified)*
Slum upgrading	Upgrade and build new houses
	Upgrade and extend roads & sidewalks
	Provide street lighting
	Provide storm drainage
	Build and extend communication infrastructure
Secure Tenure	Improve land management systems
	Improve legal protection and enforcement of slum dwellers' rights
	(Other interventions to be specified)
City-wide infrastructure	Develop comprehensive transport strategy and plan
	Construct roads
	Construct footpaths
	Construct sidewalks
	Construct bus lanes
	Provide street lighting
	Construct other transport infrastructure (rails, subway, etc)
	Build and maintain water and sanitation infrastructure (addressed under Target 10)
	Ensure maintenance and operation of urban infrastructure
Basic services	Provide refuse collection & solid waste disposal services
	Provide policing and security services
	Provide fire-protection services
Improve access to credit	*(To be specified)*
Public transport system	*(To be specified)*

MDG 8, Target 18:	**In co-operation with the private sector, make available the benefits of new technologies, especially information and communications**
Category	**Intervention**
Strengthen science advice to policymakers	*(To be specified)*
Accelerate private enterprise development	*(To be specified)*
Build human capabilities through improved and expanded higher education	*(To be specified)*
Invest in national R&D systems outside of the tertiary education sector	*(To be specified)*
Promote underfunded research on priority areas	*(To be specified)*
Institute technology forecasting	*(To be specified)*
Promote information and communication technology	*(To be specified)*

Support of all MDGs:	**Provide access to clean energy**
Category	**Intervention**
National energy framework	Develop and strengthen regulatory framework to support energy sector development
	Assess and project national energy needs
	Appraise existing infrastructure and project future infrastructure requirements
	Establish Rural Electrification Board for policy direction implementing roll-out strategy
	Develop programs to promote improved demand-side energy efficiency, particularly at the industrial level
Thermal energy systems	Develop strategies for energy service delivery (cooking, heating, energy for productive applications), particularly to rural households, community centers, health facilities, and schools: including installation and maintenance of systems; consumer financing of capital and recurrent costs; payment collection
	Rehabilitate and rationalize the petroleum refining, storage and distribution infrastructure
	Develop distribution system for improved thermal energy inputs to the end user, including charcoal, kerosene, and LPG
	Develop and disseminate appropriate end-use device technologies, notably for cooking
Grid-based electricity generation	Increase installed electricity generation capacity (thermal or hydro, as appropriate)
	Upgrade existing generation infrastructure (including major repairs)
	Maintain and operate generation infrastructure
	Retrofit pollution control technologies to existing power plants
Electricity grid	Develop strategies for energy service delivery (lighting, communications, energy for productive applications) to households, community centers, health facilities, and schools: including connection (installation) and maintenance of systems; consumer financing of capital and recurrent costs; payment collection
	Develop, expand and rehabilitate electricity distribution and transmission systems
	Extend electricity grid by constructing High-voltage lines (including international connections), Medium to low-voltage lines (including end-user connections) and other related infrastructure (e.g. transformer stations), as well as expanding existing grid systems to rural areas
Non-grid based electricity systems	Develop strategies for energy service delivery to households, community centers, healthcare facilities, and schools: including connection (installation) and maintenance of systems; consumer financing of capital and recurrent costs; payment collection
	Provide diesel generators to rural communities
	Provide Hybrid systems (wind-diesel, solar-diesel....) to rural communities
	Develop and distribute solar home systems for very remote areas
R&D on energy technologies and increasing efficiency of use	Strengthen research on renewable and alternative technologies (e.g. wind, geothermal)
	Improve efficiency of fossil-fuel based systems
	(Other interventions to be specified)

Support of all MDGs:	**Provide adequate transport infrastructure**
Category	**Intervention**
Strengthen institutional capacity	*(To be specified)*
Roads	Undertake environmental audits
	Pave existing roads and build new paved roads
	Rehabilitate, maintain and selectively upgrade existing roads
	Streamline the institutional and policy guidelines to make the roads construction process more effective
Rail	Integrate railway systems
	Lay new tracks
	Upgrade existing tracks
	Introduce new rolling stock
Ports	Modernize and upgrade existing ports
	Enhance physical port capacity for accommodating containerized freight
	Increase coordination with rail and road transport authorities

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