

# Ending Africa's Poverty Trap

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## 1. Introduction

Large parts of sub-Saharan Africa are stuck in a poverty trap, in which poverty is so extreme that the countries are unable to solve crippling problems of hunger, disease, and the lack of infrastructure, and in which these crises, in turn, hamper economic growth. Rapid population growth exacerbates the crisis. As rural populations rise, farm sizes shrink and Africa's ecosystems come under increasing stress. Soils that were once fertile have lost their fertility, and the scarcity of land now blocks Africa's traditional escape route of letting old lands lie fallow while new farmlands are established. According to our analysis in this paper, the crucial ingredient to breaking Africa's poverty trap is for the rest of the world to help African economies to reach threshold levels of capital of various types – infrastructure, human, and natural – to enable these economies to establish a process of self-sustaining growth.

Several key indicators are shown in Table 1, comparing sub-Saharan Africa with other regions of the developing world. Sub-Saharan Africa is not only the poorest part of the world, but is also the only major region with a systematic decline in output per person during the past 20 years. According to Angus Maddison's (2001)<sup>2</sup> historical data, sub-Saharan Africa has also been the slowest growing region of the world during the entire period of modern economic growth that began in the early 1800s, and always among the slowest growing regions during each sub-period as well. Africa's poverty is not only evident in the levels and growth of income per capita (which in any event is very imperfectly measured when economies are at or near subsistence levels of income), but in every major dimension of material deprivation. Life expectancy is shockingly low; child (under-5) mortality is shockingly high; AIDS is pandemic (as are many other diseases, notably including malaria); children are chronically under-nourished; and grain yield per hectare is the lowest in the world.

[TABLE 1]

Africa's distinctive negative growth performance is also confirmed in the data developed and analyzed by Bosworth and Collins (2003)<sup>3</sup>, as shown in Table 2. Of all major regions in the Bosworth-Collins analysis, Africa is unique in showing declining output per capita in both periods 1980-90 and 1990-2000. The negative growth is accounted for by especially poor performance in two components of the growth decomposition: the change in physical capital per worker and in total factor productivity. The contribution to aggregate growth of rising education per worker is comparable to the other regions, though given the low starting point in sub-Saharan Africa, we might have expected a much larger positive contribution from this component of growth. The drop in physical capital per worker reflects the low rate of domestic saving, which has not been sufficient to keep up with depreciation and population growth. The decline in total factor

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<sup>2</sup> Maddison, Angus. 2001. *The World Economy : A Millennial Perspective*. OECD, Paris. Available at <http://www.theworldeconomy.org/about.htm>

<sup>3</sup> Bosworth, Barry P. and Susan M. Collins, "The Empirics of Growth: An Update", *BPEA*:2:2003.

productivity signals two phenomena: the low rate of innovation within Africa, and the low rate of technological diffusion from the rest of the world to Africa, both of which are discussed later, and reflect in part structural barriers.

[TABLE 2]

Around the world, thirty-six countries experienced negative per capita GNP growth during 1980-2000, of which about half (19) were in sub-Saharan Africa.<sup>4</sup> The other main categories of countries with negative growth were: the post-communist transition economies (most of which are now growing); the oil-exporting countries, which suffered a sharp terms-of-trade decline after 1986; the countries in the Andes (and Paraguay) and Central America, which are burdened by ethnic divisions, high internal transport costs, and an unusually large number of natural disasters.

The world has in fact committed to help Africa, even though the follow-through has been far below the promise. In September 2000, the world's leaders endorsed the Millennium Declaration, which set a number of objectives for poverty reduction known as the Millennium Development Goals (MDGs). These eight goals call for international efforts to cut extreme poverty sharply by the year 2015. The first seven goals spell out specific targets to reduce income poverty, hunger, exclusion from education, maternal and child mortality, pandemic diseases, environmental degradation, and lack of access to basic amenities of safe water and sanitation. The eighth goal establishes a partnership of rich and poor countries to achieve the first seven goals through a combination of policy reforms, increased development assistance, a more equitable trading system, and other means. The goals are summarized in Table 3. The G-8 countries also committed to assisting Africa in the form of a New Partnership for African Development (NEPAD). NEPAD is an African Union initiative that puts particular stress on improved governance within Africa, a political "peer-review" mechanism among African countries to monitor and improve governance, and greatly increased level of investments in development – especially infrastructure – financed in part through increased development assistance. The world also committed to helping the world's least developed countries, of which 34 out of 50 are in sub-Saharan Africa, in the Brussels Declaration of 2001.

[TABLE 3]

Despite these commitments, and their reiteration in several important international forums,<sup>5</sup> sub-Saharan Africa is far off track from meeting the MDGs, as reported in the *Human Development Report 2003* of the United Nations Development Program.<sup>6</sup>

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<sup>4</sup> We refer to the change in 1995 constant-dollar GNP per capita in the World Development Indicators, and restrict our attention to countries with a population of at least 1 million people.

<sup>5</sup> Especially the Doha Round of International Trade negotiations launched in November 2001, the Monterrey Consensus of the International Conference on Financing for Development in Monterrey, Mexico in March 2002, and the Plan of Implementation of the World Summit on Sustainable Development in September 2002, in Johannesburg.

<sup>6</sup> Of the 59 *top and high priority countries* identified by the HDR (2003), 38 are in Sub-Saharan Africa. Only six *top priority countries* in the world are outside of this region. *Top Priority countries* are those where entrenched human poverty is combined with failing progress.

Moreover, the level of international assistance and changes in the trading system to give more market access to African products have not yet been commensurate with Africa's challenge. Even when individual African countries are well governed – indeed we might say heroically governed given their state of impoverishment -- and even when they have put forward detailed and credible plans of action, those countries have not benefited from an adequate response from donors and trade partners among the developed nations.

Our proposed solution has three parts:

1. A revised understanding of Africa's development challenge, which takes into account Africa's unique structural burdens and resulting poverty trap;
2. A bold investment and policy program sufficient to put Africa on a path of self-sustaining growth within one generation; and
3. A greatly increased flow of official development assistance (ODA) and trade reforms in the rich countries to support the investment and policy program. While trade reforms are important in certain contexts, we stress that the popular slogan "trade not aid" is simply wrong: increased official development assistance is crucial even with trade reforms.

With regard to diagnosis, our starting point is Africa's extreme rural poverty. A significant proportion of Africa's rural poor live at the very edge of survival, without the most basic elements of modern life: paved roads, electricity, modern cooking fuels, safe drinking water, latrines, modern health services, contraceptives, schools, and motor transport. One distinctive and crucial aspect of the extreme rural poverty is the extreme rural isolation that accompanies it, and helps to perpetuate it. Many of Africa's rural communities are almost not part of the national economy except through rural-to-urban migration, as they are cut off by the absence of paved roads, rail, and telecommunications. The situation is not only dire but getting worse. Since household poverty is extreme, saving rates are low or negative, and fertility and population growth rates are very high (as is characteristic of poor, rural households). National and local governments are unable to mobilize fiscal resources to provide infrastructure and social services. With rising populations crowding limited arable land, environmental stresses of various kinds have reached alarming proportions. Even when Africa's farmers can eke out something of value for world markets – especially tropical cash crops such as cotton and sugar -- they face rich-country barriers to trade.

To an important extent, Africa's urban poverty is also a reflection of the extreme rural poverty, the result of the migration of desperately poor people from impoverished rural areas into urban squatter settlements. When these migrants arrive, they confront an absence of jobs in the formal economy. Africa's urban areas are largely administrative centers, recipients of food aid, and to a lesser extent, providers of port services for imports and commodity exports. They are not, in general, self-sustaining export economies. The cities are packed with informal, non-tradable, service-sector activities such as street-hawking, rather than export-oriented jobs in tourism, apparel, electronics processing, call centers, and similar sectors, which have fueled exports in other low-income cities. The cities lack the physical infrastructure, skilled labor, and market access

in the rich countries to attract significant levels of foreign investment in these new urban-based industries. Moreover, they often face large international shipping costs (itself a reflection of low shipping volumes) which impede entry into manufacturing export industries.

We propose that the best way to pull Africa out of its poverty trap is through greatly increased investments in key sectors of the economy, both rural and urban. These investments would be designed not only to meet basic needs of the population, but to raise rural and urban productivity to a sufficient level to enable African economies to achieve self-sustained growth. Key areas of investment include agricultural productivity (soil nutrients, water harvesting and irrigation, post-harvest storage, agricultural extension), rural and urban infrastructure (roads, power, water and sanitation, ports) and social services (health, nutrition, education, and family planning).

*We take the MDGs to be the specific outcome targets of the expanded investment program as of the year 2015.* There are two reasons for using the MDGs as the intermediate targets for the investment program. First, the world has already agreed on the MDGs as quantified and time-bound goals, and the rich countries have already declared repeatedly their readiness to help finance those goals, even if they haven't yet provided the promised financing. Second, we believe that if African countries achieve the MDGs, they will be in a much stronger position as of 2015 to enjoy sustained growth thereafter. In particular, with lower poverty rates and lower population growth rates (both targeted in the investment package), the poverty trap should be broken. No doubt that Africa would continue to need international assistance, but the current disastrous situation of persistently declining per capita incomes could be ended.

There are three interrelated reasons why the expanded investment program needs to be primarily publicly financed.<sup>7</sup> First, in the case of investments in smallholder farm productivity, Africa's subsistence communities are too poor to finance the needed investments (e.g. roads, fertilizers, water and sanitation, *electrification*, modern cooking fuels) on a commercial basis. In fact, the market-based approach was tried, unsuccessfully, for more than a decade. Rural liberalization schemes championed by the IMF and World Bank led to the dismantling of fertilizer subsidies, agricultural marketing boards, parastatal seed marketers, etc., in the expectation that market-based commerce would naturally replace these state-run mechanisms. The strategy widely failed to create markets for farm inputs and outputs precisely because most of the subsistence communities were living beyond the market – disconnected from roads, power, transport, and rural-urban trade in general. Since these communities are not economic viable under their current conditions, they need direct transfers to reach critical thresholds of infrastructure and human capital before they can achieve market-based self-sustained growth.

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<sup>7</sup> Note that our concern is with financing of these investments, not with how they are provided. It may be the case, in some circumstances, that the investments and related services are actually provided by NGOs or private-sector providers, and then are reimbursed by the state. In other cases, especially where contracting costs may prove unwieldy, the state itself may be the investor or service provider. The key is that the end beneficiaries, Africa's extreme poor, are not expected to carry the financing burden.

Second, many of the needed investments are natural monopolies (e.g. roads, urban sewerage) or have such strong externalities (urban waste water treatment, infectious disease control) that private financing is grossly inefficient. Road fees have repeatedly failed throughout the low-income world, partly because the road fees have been unable to recover costs, and partly because the fees have raised the access price to the roadways far above the marginal cost of road use (i.e., congestion and maintenance), and thereby have led to grossly suboptimal utilization. Similarly, attempts to distribute anti-malaria bed nets through "social marketing," in which the bed nets are sold at a partially subsidized rate, have proven to be a failure, again for two reasons. The poorest households have simply dropped out of the bed net market, excluded even by the subsidized price. And the powerful externality benefits of bed nets (in which each bed net protects not only the immediate user but other neighbors in the village) are tremendously underexploited.

The third and closely related reason for public financing is that many, indeed most, of the desired investments are merit goods, i.e. goods that by social agreement should reach the entire population, irrespective of income level. Classic merit goods include essential health services, adequate nutrition, and primary education. For households already below subsistence levels (i.e. below the national basic-needs poverty line), user fees and other costs of access to essential health services have repeatedly proven to be excessively costly. Moreover, when a substantial proportion of the population is at or near subsistence, as in sub-Saharan Africa, means testing is likely to be costly, inaccurate, arbitrary, and politically unsustainable. Middle-income countries such as Mexico, indeed, have begun not only to provide health and education services for free, but actually to give direct cash transfers to poor households to ensure that the parents enroll their children in these services. In the poorest countries in Africa, ironically, IMF-World Bank policies have continued to call for cost recovery policies rather than subsidies.

As the final leg of our analysis, we propose that Africa is too poor to muster the domestic resources to make the needed investments. *International donors will have to finance a significant part of the expanded investment program.* In order to carry out this increased international resource transfer to Africa in a sensible and efficient manner, the system of donor system will require major revamping. The current system of donor assistance is fundamentally flawed. It relies excessively on a plethora of disconnected top-down projects by individual donor agencies, rather than coordinated investment programs at the national level that engage both government and civil society. The current system also relies on a very weak analytical assessment of country needs; high volatility of aid deliveries; excessively short planning horizons; insufficient monitoring and evaluation, excessive donor expenditures on technical assistance and food aid as opposed to direct budgetary support, and unnecessary vulnerability to corruption. A revamped system of donor assistance is a critical component of a successful breakthrough to sustained growth in Africa. We envision a major role of civil society in the design, implementation, and monitoring of these programs, as an ally rather than competitor of government. We specifically urge the empowerment of women's groups at the community-level in implementing the recommended investments. Women not only suffer a disproportionate share of the burdens of Africa's poverty, but given their role in agriculture, caregiving,

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and childrearing, will have to play a greatly increased leadership role if the increased rural investments are to be effectively utilized.

In summary, the great challenge for meeting the MDGs in Africa is to identify, target, and implement a bold publicly financed investment program – in a way that is economically sensible, efficient in donor-recipient relations, subject to monitoring and evaluation, and protected against debilitating corruption. Such an investment program will necessarily differ by country and sub-region, and will have to be designed first and foremost by the countries themselves, in partnership with donors who will substantially finance the program, expert international agencies, and civil society institutions who will have to help carry it out. Our proposal is unprecedented in ambition since the Marshall Plan: to help an entire region to escape from extreme poverty through a deliberate, evidence-based, and cooperative international effort. The goal of this paper is to justify such a dramatic proposition.



## 2. Diagnosis of Africa's Poverty Trap

We begin this section with a quick typology of extreme poverty in Africa. Our focus is on tropical sub-Saharan African countries with a population of at least 2 million people in 2001. We leave out North Africa (Morocco, Tunisia, Algeria, Libya, and Egypt), southernmost Africa (South Africa, Namibia, Botswana, Lesotho, and Swaziland), and a number of very small economies (Cape Verde, Comoros, Djibouti, Equatorial Guinea, Gabon, the Gambia, Guinea-Bissau, Mauritius, Sao Tome and Principe, Seychelles). Both non-tropical ends of Africa are much richer than tropical Africa. They grow temperate crops, escape the worst of malaria, enjoy vast deposits per capita of gold and diamonds in the south, and proximity to European Union markets in the north. The small economies present their own idiosyncrasies that would distract more than inform the analysis. The 32 countries that remain had a combined population of 601 million in 2001, with a population-weighted average income of \$267 per person, or a mere 73 cents a day.

The picture in Table 4 is one of unremitting poverty. Every country on the list is a low-income country, and 25 out of the 32 countries are so-called Least Developed Countries (LDCs), putting them among the 49 least developed countries in the world by UN classification. Of the four countries with a per capita income above \$500, three of the four (Angola, Cameroon, and Congo) are oil exporters and only Cote d'Ivoire, which is currently in a vertiginous political and economic collapse, makes the top four as a non-oil exporter. Every country on the list has a life expectancy at birth (LEB) below 60 years, and all but Ghana and Madagascar have an LEB below 55 years. Child mortality rates (deaths per 1000 live births before the age of 5) are above 100 in every country. Only a handful of countries outside of sub-Saharan Africa have child mortality rates above 100 (Afghanistan, Cambodia, Haiti, Iraq, Laos, Myanmar, Pakistan, Tajikistan, Timor-Leste, Yemen).

[TABLE 4]

[TABLE 5]

The extreme poverty is largely rural,<sup>8</sup> as shown in Table 5, with the rural share of national extreme poverty usually around three-fourths or more. This is both because these countries are overwhelmingly rural, and because rural poverty rates across measures of income, health, hunger, and access to basic services and infrastructure are typically much higher than urban poverty rates. As we see in the table, only the oil and mining countries (Cameroon, Congo, Gabon, and Mauritania) have more than half of the population in urban areas. The average rate of urbanization in the other countries is less than one third. With few exceptions, a very high proportion of all economically active men and women are engaged in agriculture.

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<sup>8</sup> Extreme poverty here is defined as food poverty line – the income level that is required to satisfy basic nutritional needs.

None of this is to deny the serious challenge of urban extreme poverty. There are many urban slums in Africa where the depth of poverty rivals or exceeds that found in rural areas. Indeed, the severity of urban poverty is almost surely underestimated, as Satterthwaite has importantly explained (Satterthwaite 2004)<sup>9</sup>. Some problems in slums – tuberculosis, exposure to toxic wastes – can indeed be much worse than in rural areas. The slums need major investments in infrastructure and policy reforms regarding land tenure and political participation. Still, we should remember that the bulk of Africa's extreme poverty is in rural areas, and that much of Africa's urban poverty is in reality a reflection of the rural poverty, brought to urban areas through massive rural-to-urban migration of desperately poor people with few financial and human capital assets.

In terms of policy response to Africa's poverty, any successful poverty reduction strategy will need to target both rural and urban poverty. In the short term, to the year 2015, investments to raise the productivity of smallholder farmers are likely to be the single most important strategy for poverty reduction. Our recommendations outlined below are designed to triple food production per farm household by 2015. Over the longer term, poverty will be reduced by boosting the scale and efficiency of urban manufactures and services, especially export-oriented activities; by raising the overall level of human capital in the population; and by encouraging a faster demographic transition. All of this is outlined in the middle third of the paper.

### **2.1. What Makes Africa Different?**

Economists are gradually returning to the wisdom of Adam Smith, who recognized in Book I of the *Wealth of Nations* that because of physical geography not all economies are created equal. Smith put stress on Africa's very high transport costs as a fundamental impediment to prosperity:

All in the inland parts of Africa . . . seem in all ages of the world to have been in the same barbarous and uncivilized state in which we find them at present. There are in Africa none of those great inlets, such as the Baltic and Adriatic seas in Europe, the Mediterranean and Euxine seas in both Europe and Asia, and the gulphs of Arabia, Persia, India, Bengal, and Siam, in Asia, to carry maritime commerce into the interior parts of that great continent; and the great rivers of Africa are at too great a distance from one another to give occasion to any considerable inland navigation. [Bk I, Ch. III, p. 23]

Recent data on population location show that 75 percent of sub-Saharan Africa's population live more than 100 km from the coast, the highest proportion of "hinterland" population for any region in the world. This low concentration of populations along the coast probably reflects the vagaries of the coastal tropical climate and soils, since Africa's most fertile farmlands (in terms of soils, temperature, and rainfall) are in the highlands, such as Ethiopia, Uganda, and Rwanda, not the coastal regions. The low coastal population, conceivably, might also be a demographic legacy of centuries of the slave trade.

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<sup>9</sup> Satterthwaite, D. 2004. *The Under-Estimation of Urban Poverty in Low and Middle-Income Countries*. Forthcoming.

Bloom and Sachs (1998)<sup>10</sup> stressed that Africa had several other unique geographical features that also predisposed it to a poverty trap. These include Africa's unique disease ecology (especially vis-a-vis malaria and other tropical vector-borne diseases), the vagaries of rain-fed agriculture in the sub-humid (savannah) tropics, and highly weathered soils. Gallup, Sachs and Mellinger (1998)<sup>11</sup>, Gallup and Sachs (2001)<sup>12</sup>, Sachs and Malaney (2002)<sup>13</sup>, amplify these themes. Bosworth and Collins (2003)<sup>14</sup> also find that frost-free (tropical) economies grew systematically more slowly than temperate economies in both periods 1960-80 and 1980-2000. Sub-Saharan Africa is structurally distinct from other regions along several dimensions – non-coastal location, tropical climate, aridity, disease burden, poor infrastructure, and low agricultural productivity – as summarized in Table 6. In addition, Figure 1 shows Africa's relative lack of carbon storage in soils, an indicator of the extreme nutrient depletion of Africa's soils under decades of farming without fertilizer inputs.

[TABLE 6]

[FIGURE 1]

Ironically, the favorite recent explanation of Africa's poor economic growth is that Africa has been singularly poorly governed (or that its economic institutions are especially poor), but this explanation is simply wrong on two counts. First, Africa's governance indicators are not systematically worse than those of other countries at comparable levels of per capita income. In the cross-country regressions in Table 7a, we regress four governance indicators on per capita income (PPP adjusted) and a dummy variable for sub-Saharan African countries. In general, poorer countries around the world have a lower governance score, but among countries at a given income level, Africa is not unusual. The dummy variable is never statistically significant, and indeed has a sign indicating better African governance in three for three of the four indicators. Second, Africa's poor growth can not be explained simply by poor governance indicators, a point made in Table 7b. To show that the one-factor explanation of "poor governance" is incorrect, we regress per capita growth during 1980-2000 on the (log) initial per capita income in 1980 and a variety of governance measures, at the start of the period, end of the period, and averaged during the period. In all cases, the Africa dummy is statistically significant, indicating that average national growth in the region is more than 2 percent lower than other regions', even after controlling for governance.

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<sup>10</sup> Sachs, Jeffrey D. and David Bloom. 1998. "Geography, Demography, and Economic Growth in Africa." *BPEA*, 2:1998.

<sup>11</sup> Sachs, Jeffrey D., Andrew Mellinger and John Gallup. 1999. "Climate, Water Navigability, and Economic Development," CID Working Paper Number 24, September 1999.

<sup>12</sup> Sachs, Jeffrey D. and John Luke Gallup. 2001. "The Economic Burden of Malaria," The Supplement to *The American Journal of Tropical Medicine & Hygiene*, vol. 64, no. 1, 2, pp 85-96.

<sup>13</sup> Sachs, Jeffrey D. and Pia Malaney. 2002. "The Economic and Social Burden of Malaria." *Nature*, Vol. 415, no. 6872.

<sup>14</sup> Bosworth, Barry P. and Susan M. Collins, "The Empirics of Growth: An Update", *BPEA*: 2:2003.

[TABLE 7a & TABLE 7b]

Three other factors are critical in understanding Africa's plight. The first is Africa's initial conditions upon political independence. European colonial powers, which ruled over Africa from the 1880s to independence in the 1950s-90s, left very little behind in terms of education, health care, and physical infrastructure. The starting conditions in Africa in the 1960s were far behind those of other parts of the developing world, as shown in Table 8. Contrary to casual discourse (e.g. the common comparison of Ghana and Korea in the 1960s, for example), African countries at the time of independence had almost no individuals with higher education, very few paved roads, almost no electrification of rural areas where the bulk of the population lived, and food yields far below those of other parts of the developing world. Africa had a much harder path to follow, and was much more vulnerable to getting stuck in a poverty trap.

[TABLE 8]

Consider the facile comparison often drawn between Ghana and Korea as of 1965. This comparison is one of the most famous in the economic development literature, because the two countries were at roughly the same measured GNP per capita in that period. Subsequently Korea grew rapidly while Ghana stagnated. This is nearly universally attributed to differences in governance. A much better explanation is differences in productivity as of 1965. It is true that per capita GNP in 1990 PPP dollars was roughly comparable. Using Maddison's (1995) estimates, Korea was 7% poorer than Ghana in that year, \$1295 in Korea versus \$1393 in Ghana. But in key dimensions of underlying productivity, Ghana lagged badly. Adult literacy was far lower (86.8% in Korea in 1970 versus 29% in Ghana); health conditions were much worse (life expectancy of 56.7 in Korea versus 47.2 in Ghana); and agricultural productivity was far lower (\$2609 value added per agricultural worker in Korea compared with \$685 in Ghana). Partly as a result of these differences in education and health, total fertility rates (4.9 in Korea versus 6.8 in Ghana) and overall population growth rates were far higher in Ghana than in Korea.

Ghana had one evanescent advantage over Korea in 1965: larger commodity exports per capita. Ghana's exports totaled \$45 per capita, while Korea's exports totaled \$9 per capita. But Ghana could not easily build on this initial resource endowment, given the very low stocks of physical and human capital. The physical volume of cocoa production was constrained, and much more importantly, world markets were easily saturated, leading to a collapse of world cocoa prices and to Ghana's export earnings in the early 1980s. When that occurred about twenty years after independence, thereby throwing Ghana into an extreme financial crisis that itself lasted almost twenty years, only a small amount of progress had been made in solving the underlying problems of Ghana's weak infrastructure and human capital. Ghana's capital stock crisis was greatly exacerbated by rapid population growth, itself a characteristic of the low-level production trap. Ghana's population nearly tripled during 1960-2000, while Korea's less than doubled.

The second distinctive feature of Africa's recent development is the nearly exclusive export dependence on a few primary commodities, with almost no diversification into light manufacturing as in so many other developing country regions of the world. As Bloom and Sachs (1998) noted, a handful of commodities account for more than 90 percent of the exports of almost all of sub-Saharan Africa: coffee, tea, cotton, sisal, hydrocarbons, iron ore, copper, diamonds. Most of these experienced a devastating terms-of-trade collapse after 1980, and this greatly exacerbated Africa's crisis, as shown in Table 9. A core part of any long-term growth strategy must be export diversification, especially the development of urban-based manufacturing and service-sector export activities.

[TABLE 9]

The third distinctive feature of Africa's development crisis is the lack of technological advance, either from home-grown innovation or diffusion of technologies from abroad. Every year, of the 60,000 or so patents that are issued to foreign inventors by the U.S. Patent Office, only a handful – usually fewer than five – are issued to inventors in tropical African countries. Moreover, technologies in many areas, including agriculture, health, construction, and building materials, do not diffuse readily from the temperate-zone rich-country markets to the tropical and arid African context. The disease patterns are different, as are the crops. Africa, notably, did not have a Green Revolution. The varieties developed in Asia for irrigation-fed farming could not be transferred readily to the African context, so that the take-up in Africa of hybrid, high-yield varieties was delayed by decades and is still far below other parts of the low-income world (Evenson and Gollinson, 2003).

### **2.2. A simple model of Africa's poverty trap**

Africa's adverse structural conditions produce a poverty trap (or at least very slow growth). To see how this happens, consider a simple economy which produces output  $Q$  with capital stock  $K$  and labor force  $L$ . National output (and national income) per capita is  $q = Q/L$ , and the capital-labor ratio is  $k = K/L$ . Output per capita  $q$  is an increasing function of the capital-labor ratio  $k$ :

$$(1) \quad q = f(k) \quad f_k \geq 0$$

Let  $s$  be the rate of domestic saving, so that per capita saving is given by  $sf(k)$ . The evolution of the capital-labor ratio is then given by Solow's famous formula:

$$(2) \quad dk/dt = sf(k) - (n+d)k$$

where  $n$  is the rate of growth of the labor force  $(1/L)dL/dt$  and  $d$  is the rate of depreciation as a proportion of  $k$ .<sup>15</sup> The per capita growth rate of the economy is defined as  $\gamma(t) = (1/q)(dq/dt)$ , which in turn is equal to  $\alpha (1/k)(dk/dt)$ , where  $\alpha$  is the share of

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<sup>15</sup>  $dK/dt = I - dK = sY - dK$ . Since  $k = K/L$ ,  $dk/dt = (1/L)dK/dt - K(1/L^2)(dL/dt)$ . Substituting for  $dK/dt$ , we have  $dk/dt = sy - dk - nk = sf(k) - (n+d)k$ .

capital in national output.<sup>16</sup> From (2) the growth rate of output per capita is a function of the level of the capital stock:

$$(3) \quad \gamma(k) = \alpha s(k) [f(k)/k] - \alpha [n(k)+d(k)]$$

Note the saving rate  $s$ , the population growth rate  $n$ , and the depreciation rate  $d$ , are written in (3) as functions of  $k$ . In the baseline Solow growth model, these three variables are treated as constants, but more generally they should be treated as functions of per capita income, and hence  $k$ .<sup>17</sup> In the simple AK model, in which  $q = Ak$ , (3) becomes:

$$(3') \quad \gamma = sA - (n+d)$$

Growth is positive or negative depending on whether saving per unit of capital  $sA$  is greater than  $n+d$ , which is capital widening per unit of capital. An economy with a high rate of saving  $s$  and high capital productivity  $A$  is more likely to achieve positive growth. An economy with a high rate of population growth  $n$  or depreciation  $d$  is more likely to experience negative growth.

In the most general terms, Africa has a very low value of  $A$ , which in turn has led to chronically low or negative rates of economic growth. Yet our hypothesis is not simply that Africa's growth is inevitably negative, but rather that Africa is trapped in a set of circumstances in which growth is negative. Specifically, the saving rate  $s$ , the productivity coefficient  $A$ , and the population growth rate  $n$ , are all functions of  $k$ . It is our hypothesis that  $sA - (n+d)$  is negative for low values of  $k$ , but becomes positive for sufficiently high values of  $k$ . By raising  $k$  above a threshold  $k^T$  it should be possible to shift from a negative to a positive growth path.

We define a poverty trap as a situation in which growth is negative when  $k < k^T$  and positive when  $k > k^T$ . From (3), this occurs if the following conditions hold:

$$(4) \quad s(k)f(k) < [n(k)+d(k)]k \quad \text{for } k < k^T$$

$$s(k)f(k) > [n(k)+d(k)]k \quad \text{for } k > k^T$$

There are three important ways that a poverty trap may occur, and all are relevant to the case of Africa. First,  $s(k)$  may be low for low  $k$  and high for high  $k$ . This is a *low-level saving trap*. Second,  $f(k)/k$  may be low for low  $k$  and high for high  $k$ . This is a *scale-economy trap*. Third,  $n(k)$  may be high for low  $k$  and low for high  $k$ . This is a *demographic trap*. Let's see how each of these works.

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<sup>16</sup>  $\alpha = k f_k / q$

<sup>17</sup> Of course, a rigorous theory of  $s$ ,  $n$ , and  $d$  requires an inter-temporal framework and a detailed description of institutional, cultural, and physical constraints facing households. The description of  $s$ ,  $d$ , and  $n$  as functions of  $k$  is a mere shorthand that is justified later.

A *saving trap* may occur because very poor households save only when they have already met their basic needs (e.g. food, safe drinking water, rudimentary clothing and shelter). Suppose that the basic-needs poverty line may be defined as  $q_p = f(k_p)$ , where  $q_p$  is the amount of income needed per person to satisfy minimum caloric needs plus a small amount of other basic needs, with details differing by country. We define discretionary income  $q^d$  as the excess of  $q$  over  $q_p$ . Discretionary income is zero when  $q < q_p$ :

$$(5) \quad q^d = q - q_p \quad q > q_p$$

$$q^d = 0 \quad q \leq q_p$$

We assume that households save a constant  $\sigma$  of discretionary income:

$$(5) \quad s(k) f(k) = \sigma q^d$$

This kind of saving function easily leads to a poverty trap. At very low levels of  $k$ , when households are not meeting their basic needs, the saving rate is zero, and the capital-labor ratio declines by the rate  $n+d$ . At high levels of  $k$ , the saving rate approaches  $\sigma$ , and assuming that per capita saving  $\sigma f(k)$  is greater than capital widening  $(n+d)k$ , the economy has a positive growth rate. In the AK model, the threshold capital stock  $k_T$  equal to  $k_T = Ak_p / [\sigma A - (n+d)]$ . The growth rate of the AK economy as a function of the capital stock is shown in Figure 2. When the capital stock is below  $k_T$ , the per capita growth rate is, and remains, negative. When the capital stock is above the threshold, the growth rate is and remains positive, increasing asymptotically to  $\gamma = \sigma A - (n+d)$ . In addition, we have labeled  $k_{MDG}$  in Figure 2 to convey the hypothesis that the achievement of the MDGs would raise  $k$  high enough (that is, above  $k_T$ ) to spring countries out from poverty traps into sustained positive growth rates. A later section (3.4) discusses whether the MDGs are ambitious enough to reach  $k_T$ , in other words whether they are intermediate goals which are an insufficient push to break countries out of the trap.

[FIGURE 2]

There is strong empirical evidence to support the theory that the saving rate is very low at low income levels, and rises as income rises above the poverty threshold. Loayza and colleagues finds that in developing countries the doubling of private income raises the long-run private saving rate by 10 percentage points (Loayza, Schmidt-Hebbel, and Johnson, 2000).<sup>18</sup> Many other studies have shown that saving rates rise at low levels of income (Ogaki, et al., 1996).<sup>19</sup> In an interesting survey of rural Ugandan households, only 23.8 percent of rural households indicated that had undertaken any savings, and “the most common reason given for not saving was low income (85.4%), although a number of

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<sup>18</sup> Loayza, N, Schmidt-Hebbel, K and Serven, L. 2000. “Saving in Developing Countries: An Overview.” The World Bank Economic Review. World Bank, Washington, D.C.

<sup>19</sup> Ogaki, M., Ostry, J., Reinhart, C. 1996. “Saving Behavior in Low-and-Middle-Income Developing Countries,” IMF Staff Papers, Vol. 43, No. 1, March

non-saving respondents also referred to the poor access to financial institutions.<sup>20</sup> More generally, 2001 income and saving rate for non-Soviet developing countries are plotted in Figure 3, and even this crude correlation is statistically significant with doubling of income being linked to a 4.3 percentage point increase in the saving rate.

[FIGURE 3]

A *scale-economy trap* can result from an exceptionally low level of basic infrastructure. Suppose that there exists a threshold level  $k^1$  of basic infrastructure (roads to link farms and cities) that is necessary before modern production systems can be used. For  $k < k^1$ , the production function is  $q(k) = A^L k$ , and for  $k \geq k^1$  and  $q(k) = A^H k$ , with  $A^H > A^L$ . Even if the saving rate  $s$  is constant, a poverty trap occurs if  $sA^H > n+d$  while  $sA^L < n+d$ . In that case, when  $k < k^1$  the economy is so unproductive that it can't generate a sufficient surplus of saving to maintain the per capita capital stock  $k$ . Only when the economy has the minimum infrastructure  $k^1$  does it succeed in achieving self-sustained economic growth. As Adam Smith stressed, transport conditions are among the biggest single determinants of a country's overall productivity, and thus one of the key determinants of whether a country or region gets stuck in a poverty trap.<sup>21</sup>

A *demographic trap* may occur when  $n(k)$  is very high when  $k$  is low and low when  $k$  is high. In this case, a very poor country may have capital widening greater than saving,  $sq < [n(k)+d]k$ , while a rich country has saving that is greater than capital widening,  $sq > [n(k)+d]k$ . The relationship between growth and the capital stock would look something like the case of the saving trap in Figure 2. Africa's population growth rates are among the highest in the world, and these high population growth rates indeed contribute to low per capita income growth rates. There are several reasons why population growth rates tend to be high in countries with low  $k$  (and therefore low per capita income). First, when  $k$  is low, and therefore  $q(k)$  is low, a high proportion of households in the economy are likely to be subsistence farmers, and children are likely to be net economic assets as workers on the farm. Second, the opportunity cost of the mother's time will tend to be low, leading households to choose larger investments in time-intensive child rearing. Third, the costs of contraception will be high relative to household income. Fourth, risk-averse households will choose a large number of children in the face of high child mortality, in order to ensure a high probability of a surviving heir. Fifth, the woman's

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<sup>20</sup> Musinguzi, P. and Smith, P. "Saving and Borrowing in rural Uganda," University of Southampton, unpublished, p. 9.

<sup>21</sup> Consider an economy that imports an intermediate product  $N$  and exports a final good  $F$ , with  $F = AK$  and  $N = \beta F$  (fixed proportion of input to output). The good  $N$  is imported from abroad at the international price  $P_N^*$ . The final good  $F$  is exported at the international price  $1$ . The good  $N$  must be transported to the domestic producers at proportional transport cost  $\tau_N$  and the final good is exported at proportional transport cost  $\tau_Q$ . The entire output of  $F$  is exported in return for a final good imported costlessly from world markets at international price  $1$ . The landed (cif) price of the intermediate good is  $(1+\tau_N)P_N^*$ , and the (fob) price received by domestic  $F$  producers is  $1/(1-\tau_F)$ . The gross national product  $Q$  is therefore:  $Q = [1/(1-\tau_F)][1-\beta(1+\tau_N)P_N^*]Q = A[1/(1-\tau_F)][1-\beta(1+\tau_N)P_N^*]K$ . The coefficient linking  $K$  and  $Q$  is a negative function of the transport costs: as transport costs rise, a larger part of domestic gross output is be used to cover transport costs. Since road infrastructure reduces transport costs, a country without a high-quality road system may face a poverty trap.



power to negotiate her fertility is likely to be especially low in circumstances where the mother has no outside income and works in drudgery every day to fetch water, fuel wood, and other basic needs for the low-income household.

There are really two lessons from the poverty trap model. The first is obvious: a region that starts out with a low level of  $k$  is vulnerable to being caught in a poverty trap. To the extent, for example, that Africa's colonial powers failed to invest in infrastructure and education, they would have left the newly independent Africa vulnerable to a poverty trap. That seems to have in fact been the case, as we stress later. The second point is not so evident, but is perhaps even more important. Consider two countries that start with the same level of capital per person  $k_0$ . If the economies differ in level of  $A$ , the economy with lower  $A$  may get stuck in a poverty trap while the economy with higher  $A$  may escape the poverty trap. What seem like comparable initial conditions may lead to highly divergent outcomes.

It's worth recalling that the standard neoclassical growth models, including both Solow's basic model and the Ramsey model, rule out a poverty trap as a matter of assumption. First, the basic Solow model takes  $s$ ,  $n$ , and  $d$  as fixed constants, while the Ramsey model in which saving is based on inter-temporal utility maximization does not recognize "basic needs" that must be met before saving occurs. Second, these models rule out threshold levels of the capital stock by assuming that  $f(k)/k \rightarrow \infty$  as  $k \rightarrow \infty$ .<sup>22</sup> With these assumptions, (3) implies that growth is positive when the capital stock is close to zero, as in Figure 4. For example, in the case of the Cobb-Douglas production function and constant values of  $s$ ,  $n$ , and  $d$ , (3) becomes:

$$(3') \quad \gamma(k) = \alpha s [1/k^{1-\alpha}] - \alpha (n+d)$$

[FIGURE 4]

It is immediately apparent that the growth rate is then necessarily positive when  $k$  is small. This is an implication of the Cobb-Douglas production function and a constant saving rate, not a general feature of real economies.

### **2.3. Saving and Capital Accumulation in Africa**

The macroeconomic underpinnings of Africa's poverty trap are shown in Table 10, where we compare rates of growth of per capita output, domestic saving rates, population growth rates, and rates of capital depreciation, for the period 1980-2000. The domestic saving rate is counted in two ways (described in detail in Table 11), first in the conventional national accounts manner, and second, subtracting the dissaving of natural capital, including deforestation, mineral deposits, and soil nutrients. To calculate  $s_A -$

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<sup>22</sup> Specifically, these models assume the Inada condition,  $f_k \rightarrow \infty$  as  $k \rightarrow 0$ , which in turn implies  $k/f(k) \rightarrow 0$  as  $k \rightarrow 0$ .

( $n+d$ ), the presumptive growth rate in the simple AK model, we use a coefficient  $A = 1/3$ , i.e. a capital-output ratio of  $3^{23}$ .

[TABLE 10]

As we see from the Table, Africa has the lowest gross national saving rate, and the highest population growth rate, and therefore the lowest value of  $sA - (n+d)$ . Of course both the low value of  $s$  and the high value of  $n$  are precisely the characteristics of Africa's low-level poverty trap. Africa is indeed the only region where we predict a negative rate of GNP per capita. African growth is indeed negative during this period, though slightly less negative than predicted (perhaps because of foreign-funded capital accumulation).

The situation is actually worse than it appears, since much of Africa's purported national saving is actually one or another form of capital-stock depletion. Africa is actually dissaving when we take into account the extensive amount of resource depletion. Estimates of corrected saving rates are shown in Table 11.

[TABLE 11]

The corrected saving rates are based on the work of the World Bank, which we have augmented in the case of Africa. The World Bank corrections to the national saving rate add back into the national-accounts definition of saving one major category of expenditure – education – which is inappropriately counted as consumption rather than saving in the national accounts, and then subtract off from the national accounts definition of saving several kinds of resource depletion: deforestation, depletion of hydrocarbon resources, and depletion of mineral resources. We also measure the depletion of soil nutrients due to the under-utilization of fertilizers (and therefore the 'mining' of soil nutrients). We have calculated the negative saving of soil nutrients by putting a dollar value on the annual estimated decline in the three macro-soil nutrients (nitrogen, phosphorus, and potassium) in African farmlands, valuing these nutrients at replacement cost, according to average prices for fertilizer replacements. The annual loss of soil nutrients, measured at replacement cost, is on the order of 2 percent of GDP.

These corrections to measured saving rates make a substantial difference. Even on the official measures, Africa's saving rates are too low to replace capital and to keep up with population growth. When we recognize that Africa is systematically living off of its resource endowments – hydrocarbons, minerals, soil nutrients – the situation is even more dramatic. In the World Bank estimates (column 2), adjusted saving rates are 7.4 percentage points lower than the saving rates in the national income accounts, and with the soil depletion the saving rate is lowered by 9.4 percentage points. We can say that Africa's situation is even more dire than the disastrous situation that appears in the

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<sup>23</sup> This is a typical measure used for the incremental capital output ratio (ICOR) in macroeconomic planning exercises. The Bosworth-Collins data suggest an average  $K/Y$  ratio of 2.5 for African countries in the year 2000

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official data. Africa is not only trapped in deep poverty but is living off of the depletion of its remaining resources.

### **3. Achieving the MDGs**

The Millennium Development Goals (MDGs)<sup>24</sup> are the internationally agreed-upon targets for poverty reduction that have been agreed by member states of the United Nations. The MDGs are relevant to the current discussion since they constitute a shorthand form for the minimum capital stock  $k$  that countries in Sub-Saharan Africa need to achieve in order to exit from their poverty trap. In addition to specifying quantified outcome targets to be achieved by developing countries by 2015, the MDGs also contain the commitment from rich countries to make available the external finance – up to 0.7 percent of their combined GNP – necessary for all countries to achieve the Goals. The MDGs have subsequently been reaffirmed at the 2002 International Conference on Financing for Development in Monterrey and the 2002 World Summit on Sustainable Development in Johannesburg.

This section proposes a strategy to end the poverty trap by meeting  $k_{MDG}$  in Sub-Saharan African countries and thereby to generate sustained economic growth. It consists of a detailed intervention package for achieving the MDGs. The section concludes with a preliminary analysis of the resources required to meet the MDGs and outlines a basic financing strategy.

#### **3.1. Ending the Poverty Trap in Africa by 2015**

Our basic strategy for ending the poverty trap in Sub-Saharan Africa consists of publicly financed interventions to raise the capital stock  $k$  sufficient to produce a halving of the poverty rate and to achieve the other MDGs by 2015.

##### *3.1.1. Generating Sustained Economic Growth in Africa by 2015*

The most important investments for raising incomes and promoting economic growth focus on smallholder farm communities. The goal is to raise food output per capita approximately threefold as of 2015. In terms of cereal yields, this is an increase from around 1 ton per hectare to around 3 tons per hectare, comparable to the levels in other low-income regions (see Table 1, last column). This is an enormous increase, but it is achievable because of the astoundingly low productivity and absence of modern inputs to African farming under current conditions. The desired threefold increase in farm production can be achieved through proven interventions in soil management, water harvesting and irrigation, and basic rural infrastructure, which need to be accompanied by improved social services including health and education. The combination of higher food output, disease control, and other interventions, would reduce headcount poverty roughly by half, as shown in a later section. In turn, the halving of the poverty rate will raise national saving rates by around 5 percentage points of GNP.

The interventions are also designed to reduce the fertility rate to 3.3 by 2025 (the UN Population Division “low variant”) and to lower the overall population growth rate to 1.7 percent per annum for the period 2015–25. The combination of a higher saving rate and a

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<sup>24</sup> See Table 3.

lower population growth rate puts Africa on a course of self-sustaining growth after 2015, as discussed at greater length below.

The impact of the MDG intervention package on the qualitative dynamics of income per capita is shown in Figure 5. The solid line for 1990-2004 shows the historical path, of gradual decline. The business-as-usual path (dotted line) extends that trajectory to 2015, and assumes continued decline though perhaps not as steep as earlier (as the result of improved macroeconomic policies). The proposed path based on the MDG intervention package (dashed line) has a quick upward jump to 2015, based on a major increase in key investments (funded largely by donor assistance), followed by a more gradual upward trajectory based largely on self-sustaining growth after 2015. We are not claiming that official development assistance should be ended after 2015, but that Africa will be in a position to grow on its own accord after that date.

[FIGURE 5]

### **3.2. The Integrated Intervention Package to Achieve the MDGs**

Meeting the MDGs in Sub-Saharan Africa is possible through a broad-based strategy of sustained and integrated interventions. Table 12 provides a qualitative overview of the MDG production function listing sectoral inputs as column headers and summarizing MDG outcomes in the rows. Each cell in the table lists the impact of one particular set of interventions on an outcome, e.g. impact of improving access to water and sanitation on gender equality or health. The table underlines the complex relationships between inputs and outcomes, where typically each intervention affects multiple goals, and each goal is a function of several interventions.

[TABLE 12]

We have developed a basic methodology for designing the MDG intervention package and for calculating needs in terms of infrastructure and human as well as financial resources to meet the MDG targets by 2015. Figure 6 summarizes the five steps for designing the intervention package.

[FIGURE 6]

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 deliver them. Since many different policies and institutions can conceivably deliver a specific intervention and are subject to a high degree of country specificity, they can only be designed through detailed national planning processes and are thus not included here.

Details and preliminary results of the needs assessment are presented in section 3.9 and draw on Millennium Project (2004)<sup>25</sup>. The integrated intervention package for the MDGs proposed here has six major components as outlined below and described in detail in Annex 1.

*(i) Food Productivity and Rural Infrastructure:*

- Agricultural production (soils, water, agricultural extension, etc.)
- Rural transport infrastructure
- Rural energy services
- Rural access to water and sanitation
- Rural environmental sustainability

*(ii) Health, Nutrition, and Family Planning*

- Health systems
- Child Health
- Maternal Health
- Infectious Disease (HIV/AIDS, TB, and malaria)
- Access to essential medicines
- Nutrition
- Family Planning

*(iii) Education*

- Primary Education
- Secondary Education
- Adult Literacy Programs

*(iv) Urban Infrastructure and Slum Upgrading*

- Urban transport
- Urban water and sanitation
- Urban energy
- Slum upgrading
- Urban environmental sustainability

*(v) Science and technology*

- Higher education
- Science advisory processes

*(vi) Gender Equity*

- Investments in gender equality not included in the other sectors

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<sup>25</sup> Millennium Project. 2004. *Millennium Development Goals Needs Assessment: Country Case Studies of Bangladesh, Cambodia, Ghana, Tanzania, and Uganda*. Working Paper. Millennium Project, New York.

In addition to country-level investments in each of these components, countries will need to invest in cross-national transport and energy infrastructure, and these are reviewed briefly in section 3.8.

Our analysis certainly does not pretend to address all of the important institutional conditions necessary for achieving economic growth and meeting the MDGs. In particular, questions of private sector development and international trade are not analyzed in detail. Hence 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.

We now turn to the six key packages of interventions, describing their main content.

### *3.2.1. Agricultural Productivity and Rural Infrastructure*

The package of rural interventions includes five sub-components: agricultural production, rural transport, rural energy services (electricity and cooking fuels), access to water and sanitation, and investments in environmental sustainability

#### **(i) Farm production.**

Over 1999-2001 approximately 198 million people in Sub Saharan Africa (SSA) were undernourished or hungry (SOFI 2003)<sup>26</sup> of whom 75 percent live in rural areas. It is estimated that nearly 50 percent of the hungry in SSA live in subsistence, smallholder farm households, where the farm output is simply insufficient to feed the family. A substantial proportion of farm output in many rural communities is used for own production, and the marketed production is often much less than half of the total harvest. Studies have shown that though hunger has several causes, in the case of SSA insufficient food production particularly by smallholder farmers is the single most significant reason for persistent hunger (Hazell and Johnson 2002).<sup>27</sup>

SSA is the only major developing region in the world where per capita food cereal output has been declining (World Bank 2003)<sup>28</sup>. Between 1976 and 1985, the region moved from net agricultural exports of \$3.2 billion to net imports of \$4.5 billion (FAO 1993). SSA now has the largest cereal deficits (that is, a gap between the demand and supply for food cereals) in the world; if there is no change in current productivity growth rates, deficits will more than triple by 2020 (Agcaoili and Rosegrant 1996)<sup>29</sup>.

One key driver of falling per capita food production is declining per capita availability of arable land, which has fallen dramatically from 0.38 to 0.25 ha per capita over the past 20

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<sup>26</sup> FAO. 2003. *State of Food Insecurity in the World*. FAO, Rome.

<sup>27</sup> Hazell, P. and Johnson, M. 2002. "Cutting Hunger in Africa Through Smallholder-led Agricultural Growth." A Technical Paper in Support of USAID Agricultural Initiative to Cut Hunger in Africa (AICHA). IFPRI and USAID.

<sup>28</sup> World Bank 2003. *World Development Indicators 2003*. World Bank, Washington D.C.

<sup>29</sup> Agcaoili, M.C., and M.W. Rosegrant. 1996. "World Production of Cereals, 1966-90." Brief No. 3, 2020 Vision for Food, Agriculture, and the Environment. IFPRI, Washington, D.C.

years (CIAT 2002)<sup>30</sup>. As a result, the ratio of land under crop cultivation to population in agriculture (which is a proxy for per capita farm size) has fallen across Africa. In some relatively densely populated countries like Kenya and Ethiopia, this ratio has halved over the last 40 years as summarized in Table 13 (Jayne et al 2001)<sup>31</sup>.

[TABLE 13]

The fall in average farm sizes and per capita land availability requires intensification of agriculture. However, four sets of constraints need to be overcome to raise per hectare productivity in Sub-Saharan Africa. First, soil fertility is particularly low and has been declining. Several severe constraints are commonplace: lack of available nutrients (such as nitrogen, phosphorus, sulphur, magnesium, and zinc), inadequate soil organic matter, poor physical structure, poor water-holding capacity, high risk of erosion, limited rooting depth, and lack of soil biodiversity (Donovan and Case. 1998)<sup>32</sup>. Second, smallholder farmers in SSA lack access to improved and appropriate seeds, suited to the needs of smallholder farmers. Third, limited water availability represents a third constraint on increasing agricultural productivity. The high dependence of African farmers on rainfed agriculture, coupled with highly variable precipitation, poses a major constraint towards increasing farm yields.<sup>33</sup> Fourth, knowledge about new technologies that can increase crop yields is extremely limited.

Below we present five sets of interventions to reduce these constraints in order to increase agricultural productivity: (i) investments in soil health, (ii) provision of improved seeds, (iii) small-scale water management, (iv) large-scale provision of agricultural extension services, and (v) special efforts to target women farmers.

### **Investments in Soil Health**

Several interventions to overcome soil nutrient deficiencies and improve soil health can increase crop yields by a factor of two to four and reduce pest and disease incidence. They have been well documented across a number of countries<sup>34</sup>. Depending on soil conditions and the local economic context a combination of approaches can be used to improve soil health, including conservation tillage, green manure, cover crops, agroforestry and chemical fertilizers.

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<sup>30</sup> CIAT, TSBF, ICRAF 2002. "Soil Fertility Degradation in Sub Saharan Africa: Leveraging Lasting Solutions to a Long Term Problem", Conclusions from a Workshop held at the Rockefeller Foundation Bellagio Study and Conference Center, March 4-8, 2002.

<sup>31</sup> Jayne, T.S., T. Yamano, M. Weber, D. Tschirley, R. Benfica, D. Neven, A. Chapoto and B. Zulu 2001. Smallholder Income and Land Distribution in Africa: Implications for Poverty Reduction Strategies. MSU International Development Paper No. 24. Department of Agricultural Economics, Department of Economics, Michigan State University.

<sup>32</sup> Donovan, Graeme and Frank Casey. 1998. "Soil Fertility Management in Sub-Saharan Africa." Technical Paper No. 408, World Bank, Washington D.C.

<sup>33</sup> According to FAO data, Sub Saharan Africa includes 11 of the 16 nations of the world receiving less than 1000m<sup>3</sup>/ha of water – a situation described as 'absolute water scarcity' FAO (Food and Agriculture Organisation). 1995. "Irrigation in Africa in figures." Water Reports No.7. ISBN 1020-1203. FAO, Rome.

<sup>34</sup> Sanchez, P 2002. "Soil Fertility and Hunger in Africa", *Science*, Volume 295.



Chemical fertilizers are a critical source of the nutrients required for plant growth and food production. In the nutrient-poor soils of the tropics, proper and balanced use of fertilizer can increase crop production and prevent soil degradation from nutrient mining. The evidence for this intervention is strong. For example, a third of the increase in cereal production worldwide and 50 percent of the increase in India's grain production has been attributed to fertilizer-related factors (Yanggen et al 1998).<sup>35</sup> However, the efficacy of fertilizer use depends on two additional factors in the case of SSA: the quality of soils (in terms of their fertility and drainage) and the availability of adequate and regular water supply.

But chemical fertilizers form just one of the many investments needed to restore soil nutrients. An effective set of interventions is agroforestry whereby farmers grow trees and shrubs with their crops or livestock to provide additional benefits such as improving soil fertility, providing animal fodder, creating a favorable micro-climate for crops and livestock, producing tree fruits and expanding fuelwood supplies.<sup>36</sup> The trees are interplanted into a young maize crop and allowed to grow as fallows during dry seasons, accumulating 100 - 200 kg nitrogen per hectare in 6 months to 2 years in subhumid regions of East and Southern Africa and yields of maize, the staple food in this region, can increase 2 - 4 times as nitrogen deficiency is overcome (Sanchez, 2002).<sup>37</sup> Further research in Zambia has also shown that agroforestry can generate up to 250 percent increases in the yield of maize and yield 12 tons of firewood per ha per year under improved fallows (CFAN 2002)<sup>38</sup>.

Another effective intervention for increasing soil fertility is the application of green manure and cover crops, which can add up to 50 t/ha of organic matters (green weight) to the soil during each application. These interventions permit a recycling and pumping of nutrients up to the soil surface accompanied by improvements in the soil's water-holding capacity and nutrient content. A critical advantage of green manure/cover crops is that they do not require any capital outlay once the farmer has purchased his/her first handful of seed. (Bunch 2003<sup>39</sup>).

Over 150, 000 of farm families in Kenya, Uganda, Tanzania, Malawi, Zambia, Zimbabwe and Mozambique are using various combinations of fallows, phosphorus, and biomass transfers with good and consistent results. Adoption is taking place through farmer-to-farmer and village-to-village knowledge transfers, promoted by community-based organizations, and by a multitude of national research and extension institutes, universities, non governmental organizations and development projects. The challenge now is to accelerate the adoption rate to reach tens of millions of farm families. The main obstacles are the insufficient supply of quality tree germplasm (seeds and seedlings), availability of

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<sup>35</sup> Yanggen, D, Kelly, V, Reardon T, Naseem, A. 1998. "Incentives for Fertilizer Use in Sub-Saharan Africa: A Review of Empirical Evidence on Fertilizer Response and Profitability", MSU ID paper 70.

<sup>36</sup> Such trees include leguminous trees of the genera Sesbania, Tephrosia, Crotalaria, Glyricidia.

<sup>37</sup> Sanchez, P 2002. "Soil Fertility and Hunger in Africa", *Science*, Volume 295.

<sup>38</sup> CIDA Forestry Advisers Network. *Forestry Profiles: Southern Africa: Agroforestry Research Network*. Available at [www.rcfa-cfan.org/english/profile.9.html](http://www.rcfa-cfan.org/english/profile.9.html).

<sup>39</sup> Bunch, Roland. 2003. "An Odyssey of Discovery: Principles of Agriculture for the Humid Tropics."

rock phosphate and insufficient awareness and knowledge of the technology components (Millennium Project 2003)<sup>40</sup>.

These interventions to replenish soil fertility have several limitations and may hence not be applicable in all situations. For example, improved tree fallows have not yet been proven to work in semiarid tropics of Africa because the much longer dry season limits their growth and nitrogen fixation potential. Fallows also do not perform well in shallow or poorly drained soils, and in frost-prone areas. Nevertheless, the interventions can be applied by the bulk of the rural population in Sub-Saharan Africa, who farm on the 'red' soils of the subhumid tropics.

### **Improved Seeds**

Investments in soil health need to be supplemented with investments in researching and providing improved and appropriate seeds bred for specific environmental conditions and levels of agricultural inputs. Improved seeds can raise yields, reduce the time to harvest, improve germination, reduce labor requirements, reduce vulnerability to diseases, and improve cooking, processing and storage qualities of the food (FAO 2001).<sup>41</sup> Special emphasis needs to be placed on crops, trees and livestock with traits that benefit smallholder farmers and address their food security concerns. Maintaining a fairly high level of agricultural genetic and crop diversity is an important strategy for poor farmers and communities with insecure access to markets, heterogeneous ecological conditions on their farms, and variable climate. "Appropriate" seeds refer not just to potential yield and adaptability to various farmers' conditions, but to the ability of the germplasm to perform in ways desired by poor farmers. .

### **Small-Scale Water Management**

The evidence is mixed on which technologies are most appropriate for ensuring regular and adequate water supply to smallholder farmers. However, there is reasonable consensus now that large-scale irrigation schemes have not been entirely successful in reaching smallholder farmers due to technical and management problems, as well as high development and operating costs (FAO 2001).<sup>42</sup>

It is generally acknowledged that Sub-Saharan Africa focus on the development of small-scale and technically simple water management systems, which have proven to be more successful due to their lower cost and greater ease of operation and maintenance (FAO 1996<sup>43</sup>). Low cost, small-scale options in water management include water harvesting through bunds, check dams and small impoundment dams, shallow wells, structures for ground water recharge, drip irrigation and treadle or diesel pumps. Collecting runoff and

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<sup>40</sup> Millennium Project 2003. "Interim Report of the Task Force on Hunger." Millennium Project: New York

<sup>41</sup> FAO. 2001. "World Food Summit: Five Years Later." High Level Panel on Resources mobilization for food security and for Agricultural and Rural Development. 26-27 June 2001. FAO, Rome.

<sup>42</sup> FAO. 2001. "Smallholder Irrigation Technology: Prospects for Sub Saharan Africa". International Programme for Technology and Research in Irrigation and Drainage. Knowledge Synthesis Report 3. FAO, Rome.

<sup>43</sup> FAO. 1996. *Special Feature: Crucial Role Of Irrigation Development In Increasing Food Production In Sub-Saharan Africa*. Africa Report 05/96. Available at <http://www.aces.uiuc.edu/~ILwfood/fao/Water-e.pdf>. FAO, Rome.

using it to irrigate crops, pastures and trees can significantly improve both yields and the reliability of agricultural production. Experience in Burkina Faso, the Sudan and Kenya shows that rain harvested from one hectare for supplementary irrigation of another can triple or even quadruple production. (FAO 1996)<sup>44</sup>.

Investing in water management at the farm level is critical, but can only be successful in conjunction with an improved management of water resources across Sub-Saharan Africa including water allocation mechanisms for agricultural, industrial and domestic water use. The necessary interventions are discussed in Section 0 below.

### **Agricultural Extension Services and Research**

None of the interventions described above are likely to be successful without the provision of improved agricultural extension services that reach the farmers on a regular and sustained basis (Birkhaeuser et al 1988).<sup>45</sup> In a study of 22 sub-Saharan African countries, crop yields increased by 40 percent in the first year that agricultural extension was offered (FAO 1996)<sup>46</sup>. While there is debate over the most appropriate model of extension services for subsistence farmers in SSA, there is consensus on the need for much higher investments in building both the human resource base as well as research programs for reaching smallholder farmers.<sup>47</sup>

An important focus will need to be on improving the technical qualification of extension workers. Of the 150,000 extension workers currently active in Sub-Saharan Africa, perhaps one in six have a university degree. The rest hold a certificate or, at most, a diploma. An estimated 85 percent of the extension workers begin their careers in the field with a weak grasp of agricultural science and limited skills in extension communication (Sasakawa 2000)<sup>48</sup>.

Additional interventions in the education sector, as outlined in section 3.4 can be critical in enabling farmers to adopt new technologies and adapt more quickly to extension and training. A year of additional primary education to a woman farmer in Kenya is estimated to increase her maize yields by 24 percent (IFPRI 2000)<sup>49</sup>. Other studies capture the

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<sup>44</sup> FAO. "Water and Food Security." <http://www.fao.org/docrep/004/w1144e/w1144e54.htm>.

<sup>45</sup> Birkhaeuser, D., Evenson, R. E. & Feder, G. 1988. "The economic impact of agricultural extension: A review." World Bank Working Paper. World Bank, Washington, D.C.; also published by Economic Growth Center. 1989. Discussion Paper No. 567. New Haven: Yale University.

<sup>46</sup> FAO 1996. World Food Summit: Food for All. FAO Rome

<sup>47</sup> The Green Revolution relied mainly on the T&V model (training and visitation) whereby extension served as a transmission belt between research centers and farmers through cadres of field based, professional trainers. However, this model had its limitations: poor linkages of research with the needs of small farmers, inability to adapt to local conditions, trainers had inadequate practical knowledge and all of these shortcomings were compounded by budgetary constraints and long term fiscal support. Increasingly, hybrid solutions have been proposed that combine the best of the T&V model with principles of demand driven and farmer led knowledge creation and management systems. However, basic principles of increased investment in hiring and training extension workers, especially women workers to reach women farmers, close links to research and continual and timely training remain critical.

<sup>48</sup> Sasakawa Africa Association. 2000. Available at <http://www.saa-tokyo.org/english/safe/>.

<sup>49</sup> IFPRI. 2000. Women-The Key to Food Security: Looking Within the Household. IFPRI Policy Brief, October 2000. IFPRI, Washington DC

external effects of education; a study in Uganda shows that a year increase in the average primary schooling of neighboring farmers is associated with a 4.3 percent rise in output compared to a 2.8 percent effect of own farmer primary education in Uganda (Appleton and Balihuta 1996, reported in Appleton 2000).<sup>50</sup>

### **Specific Efforts to Reach Women Farmers**

Women contribute 60-80 percent of the labor used to produce food for both household consumption and for sale (FAO 1995)<sup>51</sup>. Special interventions are needed to both reach them through extension services, but also provide them access with technologies and skills that they can use to reduce the time they spend in the field and increase production. Studies show that there are significant differences between yields on men's and women's plots; a study in Burkina Faso showed that yields on plots managed by women could be up to 18 percent lower than those on plots managed by men and that virtually all fertilizers were applied only on plots managed by men. The study then estimates that providing adequate inputs such as fertilizer to plots managed by women, could increase output by 10-15 percent (Udry et al 1995)<sup>52</sup>. It is important to increase the number of extension workers and to also ensure that farm inputs reach women farmers on an equitable basis with men.

#### **(ii) Rural Transport**

To bring products to market over longer distances and to lower the transport costs of agricultural inputs, such as fertilizer and improved seed varieties, farmers need to have access to improved transport services through the extension and upgrading of footpaths, feeder, district, and national roads in conjunction with improved access to credit. Several studies associate rural road construction in Africa with increases in agricultural production and expansion of rural markets (Anderson et al. 1982)<sup>53</sup>. Recently, Stifel et al. (2003)<sup>54</sup> have analyzed crop yields, use of agricultural inputs and other price data across villages in Madagascar as a function of their remoteness<sup>55</sup>. The authors show that per hectare crop yields in the most remote quintile are only 45 to 67 percent of yields in the least remote quintile. Figure 7 summarizes representative data for the much higher transport costs in Sub-Saharan Africa as compared to Asia underlining the substantial increase of transport costs over shorter distances.

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<sup>50</sup> Appleton, S. 2000. "Education and Health at the Household Level in Sub-Saharan Africa." Harvard University Center for International Development Working Paper No. 33.

<sup>51</sup> FAO 1995. A Synthesis Report of the Africa Region-Women, Agriculture and Rural Development. FAO, Rome

<sup>52</sup> Udry, Christopher, John Hoddinott & Lawrence Haddad (1995). *Gender differentials in farm productivity: implications for household efficiency & agricultural policy*. Food Policy. Elsevier, Science Ltd: Great Britain Vol. 20, No. 5, pp. 407-423

<sup>53</sup> Anderson, J.R., C.G. Vaneervoort, C.M. Suggs, and C. Clapp-Wincek. 1982. "Rural roads evaluation summary report." AID Program Evaluation Report 5. USAID, Washington D.C.

<sup>54</sup> Stifel D, B. Minten, and P. Dorosh. 2003. "Transaction Costs and Agricultural Productivity: Implications of Isolation for Rural Poverty in Madagascar." IFPRI MSSD Discussion Paper No. 56. IFPRI, Washington D.C.

<sup>55</sup> The authors construct a remoteness indicator as the outcome of a factor analysis comprising various isolation measures. The indicator is correlated with travel times to the nearest city or plot of land, as well as the ratio of transportation costs to the nearest city as a ratio of the price of 50kg of rice.

[FIGURE 7]

One important determinant of high transport costs across the continent is the extreme underdevelopment of transport infrastructure compared to other regions of the world. The average density of paved roads is 0.23 km per 1000 people, well below South Asia (1.08). The regional average masks a tremendous variation in the density of paved roads from 0.06km per 1000 people in Ethiopia to 0.62km in Ghana.

The extent of rural isolation in much of Sub-Saharan Africa is underlined by Hine and Rutter (2000)<sup>56</sup> who show that 51 percent of villages in Ghana and 60 percent of villages in Malawi had walking distances of more than 2km to the nearest pickup point for motorized transport services, while 10 percent of Ghanaian villages and 19 percent of Malawi villages had walking distances of over 10km to the pickup point.

Moreover, the state of many roads is appalling with 50 to 90 percent of all local government roads in need of rehabilitation or reconstruction – partly due to the fact that expenditure on operation and maintenance of the road network has been only 5 to 15 percent of the required levels (Malmberg-Calvo 1998)<sup>57</sup>. The impact of degraded roads on transport costs can be severe – particularly during the wet season when unpaved roads can become impassable.

A series of interventions are required to lower the cost of rural transport and to increase transport volumes across Sub-Saharan Africa more generally. Clearly, major investments in the network of feeder, district and national roads are critical. For example, Spencer (1994)<sup>58</sup> estimates that in order to reach a road density equivalent to that of India in 1950 at the onset of the Green Revolution (measured in km per 1000 km<sup>2</sup>), the total length of roads in the tropical regions of Africa would have to be increased by a factor of 6.

Road investments need to distinguish between national highways, district, urban, and feeder roads, as well as footpaths. To ensure year-round access and to reap the full benefits of transport infrastructure – particularly in tropical countries with a wet season – national highways, district and urban roads need to be paved. Ideally, all feeder roads should be paved as well, but in some instances improved gravel roads may provide sufficient access.

However, improving road infrastructure alone will not solve farmers' transport problems. Due to widespread income poverty and lack of access to credit, farmers as well as the urban poor often cannot afford alternative forms of non-motorized transport, such as bicycles, hand or animal carts, which would be ideally suited for local transport. The

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<sup>56</sup> Hine, John, and J. Rutter. 2000. "Roads, personal mobility and poverty: the challenge." Transport and Poverty Alleviation Workshop: Transport Research Laboratory.

<sup>57</sup> Malmberg-Calvo, Christina. 1998. "Options for Managing and Financing Rural Transport Infrastructure." World Bank Technical Paper No.411. World Bank, Washington, D.C.

<sup>58</sup> Spencer, D.S. 1994. Infrastructure and Technology Constraints to Agricultural Development in the Humid and Subhumid Tropics of Africa. EPTD Discussion Paper No. 3. IFPRI, Washington D.C.

limited availability of non-motorized 'intermediate means of transport' (Sieber 1999)<sup>59</sup> further reinforces the quasi-monopolistic structure of the motorized transport market<sup>60</sup>. Improving access to credit through microcredit schemes can enable farmers to invest in intermediate means of transport to effectively lower their transport costs and reduce dependence on few traders.

### (iii) Rural Energy Services

Energy is a necessary input into sustaining human life, providing social services and infrastructure, and powering productive activities. Consequently, most interventions for achieving the MDGS rely improved energy services. Even though, access to infrastructure services like energy has not been widely accepted as a basic need like water and food (Cecelski 2003)<sup>61</sup>, they are critical for halving poverty and achieving other MDGs.

Current per capita levels of energy consumption in Sub-Saharan Africa (excluding South Africa) are the lowest in the world. In 2001 the average per capita consumption of primary energy was only 4.9GJ compared with 11.9GJ in South Asia and 52.8GJ in Latin America and the Caribbean (EIA 2003)<sup>62</sup>. Only 19.5 percent of the population in Sub-Saharan Africa (excluding South Africa) has access to electricity, which is the lowest share of any region in the world. Access in rural areas is particularly low at 7.5 percent. At the current rate of electrification, it would take over 80 years to electrify Sub-Saharan Africa (IEA 2002)<sup>63</sup>.

Conversely, the reliance on biomass and inefficient cookstoves is the highest in the world. Over 90 percent of the residential energy needs of low-income households are met by biomass, such as fuelwood, charcoal and dung (IEA 2002)<sup>64</sup>. As discussed in the health sections, the high reliance on biomass is the major cause of extreme levels of indoor air pollution observed in Sub-Saharan Africa. Further, inefficient cookstoves also increase the time spent cooking by girls and women, leaving them with little time to attend school, or undertake income generating activities, as seen in Section 3.7 below.

Interventions to improve access to energy services need to cover the full range of energy needs of households, schools, hospitals, the productive sectors, and so forth. These include the need for cooking, space heating, lighting, refrigeration, productive activities, transport, and the operation of water and sanitation infrastructure, as well as information

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<sup>59</sup> Sieber, N. 1999. Transporting the Yield: Appropriate Transport for Agricultural Production and Marketing in Sub-Saharan Africa. *Transport Reviews* 19(3).

<sup>60</sup> Surveys of agricultural traders confirm their market power. For example, surveys in Benin and Malawi report that agricultural traders' mean gross margins on sales range between 22 and 48 percent (Fafchamp and Gabre-Madhin 2001. *Agricultural Markets in Benin and Malawi: Operation and Performance of Traders*. World Bank Working Papers Agriculture. Land, commodity prices, markets No. 2734, World Bank, Washington D.C.). The same study shows that transport costs make up 40 to 45 percent of traders' marketing costs.

<sup>61</sup> Cecelski, E. 2003. *Energy, Poverty and Gender*. Washington D.C.: World Bank.

<sup>62</sup> Energy Information Administration, Available at <http://eia.doe.gov/indexjava.html>.

<sup>63</sup> IEA (International Energy Agency). 2003. *World Energy Outlook 2002*. Paris.

<sup>64</sup> IEA (International Energy Agency). 2003. *World Energy Outlook 2002*. Paris.

and communication technologies. In designing interventions to deliver these services, it is necessary to distinguish between thermal energy needs for cooking and space heating, which can be provided through fossil fuels and renewable energy sources, and electricity, which can power a broad range of applications.

The choice of appropriate thermal energy carriers for meeting the MDGs therefore needs to take into account a broad range of criteria as summarized in the stylized decision tree in Figure 8.

[FIGURE 8]

In most cases providing access to improved thermal energy services requires access to improved fuels as well as stoves. The former requires investments in fuel distribution systems and infrastructure, which will be discussed further below. A critical additional element of the distribution system for fuel is the provision of safe containers for the fuel that can be reused by the household. Improved cookstoves also need to be distributed to poor households to increase fuel efficiency. Under some circumstances additional investments in smoke hoods or other changes in the house design can further reduce indoor air pollution (c.f. Warwick and Doig 2004)<sup>65</sup>.

Experience from around the world shows that the poor are often unable to afford improved cooking fuels and stoves without any subsidies. This is particularly the case in rural areas where households do not tend to incur any financial cost for the biomass they consume since it tends to be collected by women and girls. To accelerate the shift towards improved thermal energy services that is required to meet the MDGs, it will therefore be necessary to subsidize fuel inputs and cooking stoves in many parts of Sub-Saharan Africa<sup>66</sup>.

In comparison to other forms of energy, electricity has very low marginal costs and its supply can often be scaled to meet demand. It is by far the most versatile form of energy since it can power electronic devices and is easily transformed into motive power or heat using simple devices. Electricity can be supplied using three types of distribution technologies: a central grid, a decentralized mini-grid covering a village or small community, and individual home systems. Central grid-based distribution, while more capital intensive in rural areas, is more scalable, which is particularly important for permitting productive uses of electricity, while mini-grids and home-based systems offer more limited scalability. A disadvantage of electricity lies in the relatively high up-front cost of connecting households.

Electricity generation capacity for a grid-based system should exploit locally-available renewable energy sources, such as hydropower and geothermal potential, and otherwise

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<sup>65</sup> Warwick, H. and a. Doig. 2004. *Smoke – the Killer in the Kitchen*. ITDG Publishing. London.

<sup>66</sup> Many country programs, such as Brazil, that have successfully increased the share of improved fuel among the poor have relied on some form of subsidies (Moreira and Goldemberg 1999). In the absence of subsidies, LPG tends to be more expensive than biomass or other fuels (see for example World LP Gas Association, <http://www.worldlpgas.com/sustdev/mainpages/transition/demand.php>)

rely on thermal power plants. Diesel generators, micro-hydroplants, or other small-scale systems are best suited to generate electricity for mini-grids. In each case it is critical that adequate and regular supply of fuel be ensured, which in turn may require additional investments in transport infrastructure.

Energy planners will need to decide on a case-by-case basis if grid extension to serve a particular community is economically viable. Critical factors in making the decision include the current population density of a region, the distance to the nearest high-voltage line, particular energy demand for productive activities, and locally available energy sources, such as hydropower. In choosing the appropriate electricity transmission system, it is important to take into account the expected rate of population growth – particularly in the urban areas of Sub-Saharan Africa where rapid population growth will favor grid extension.

In the case of grid extension, high-, medium-, and low-voltage electricity lines need to be built including transformer stations as necessary. In contrast, micro-grids and home-based systems may only require simple low-voltage wiring that can be laid by the communities themselves.

**(iv) Access to Water Supply and Sanitation & Water Management Infrastructure**

The water MDG calls on countries to halve, between 1990 and 2015, the proportion of people without access to improved water supply. The Johannesburg World Summit on Sustainable Development adopted the target to halve the number of people without access to basic sanitation by 2015. In 2000 only 46 percent of the rural population in Sub-Saharan Africa had access to improved water supply, and 45 percent enjoyed access to improved sanitation, as summarized in Table 14. While access to rural water supply has increased slightly between 1990 and 2000, the percentage of people with access to improved sanitation has completely stagnated underlining the magnitude of the challenge facing Sub-Saharan Africa in meeting the water and sanitation goals. Lack of access to clean drinking water and sanitation affects women and girls in particular, since they need to walk long distances to collect water for the household as seen below in Section 3.7; in addition, lack of sanitation facilities also keeps girls out of school.

[TABLE 14]

The interventions required to meet the water and sanitation goals in rural areas fall into three broad categories:

1. Extension and rehabilitation of water supply and sanitation infrastructure;
2. Promotion of hygienic behavior by households and proper use of water and sanitation facilities through hygiene education and behavior change programs;
3. Extension of water management infrastructure for drinking water supply as well as agricultural water use.

Several technologies exist for providing improved access to water supply, including household connections, public standpipes, boreholes, dug wells, protected springs, and rainwater collection. The choice of the appropriate system depends on factors such as



community preferences, population density, cost, remoteness, and the local geohydrological profile. In many parts of rural Africa groundwater remains underutilized as a resource for drinking water supply, which can be tapped through investments in wells and boreholes. Rural sanitation technologies consist of decentralized systems, such as simple pit latrines, ventilated improved pit latrines, and septic tanks. Again, the choice of system depends on local characteristics and preferences.

Hygiene education and behavior change programs are also required to ensure that water and sanitation systems respond to the needs of the community, are used effectively by all users including young children, and are properly maintained. For example, community workers, mass media campaigns, as well as integrating water and hygiene education into school curricula can be used. The best approach typically comprises a mix of these interventions and will be extremely time and context specific.<sup>67</sup>

Overall, precipitation and available run-off in Sub-Saharan Africa are sufficient for meeting the water supply target since the region only uses 3.8 percent of its internally renewable water resources for domestic, industrial and agricultural needs (World Water Council 2000)<sup>68</sup>. However, four sets of hydrological constraints prevail across Sub-Saharan Africa and impose the need for investments in water management infrastructure, such as storage, to permit the expansion of water use for agricultural purposes.

1. The regional distribution of precipitation is very uneven, ranging from 71mm in the north to 1400mm in the center. Over 60 percent of the continent is classified as dryland, where inter-seasonal water storage is critical (World Water Council 2000)<sup>69</sup>.
2. Rainfall in Sub-Saharan Africa exhibits high seasonal and interannual variation around the mean, as depicted in Figure 9. Indeed during the last thirty years the continent has experienced unusually low precipitation leading to a high frequency of droughts over the same period.
3. Surface water run-off, as percent of total precipitation, is unusually low in Africa (see Figure 10), thus reducing available internally renewable water resources. In the Sudano-Sahelian and Southern African regions, only 5.9 percent and 9.3 percent of precipitation is available as run-off (World Water Council 2000)<sup>70</sup>.
4. Groundwater resources only account for 15 percent of the continent's internally renewable water resources (World Water Council 2000)<sup>71</sup>. Most aquifers in Sub-Saharan Africa are relatively small and tend to be much deeper than for example in South Asia<sup>72</sup>. Hence the groundwater is a relatively expensive source of drinking water and cannot offset the high variability of precipitation.

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<sup>67</sup> Pruess et al. (2002)<sup>67</sup> review the strong evidence that links behavior change programs to effective use and maintenance of infrastructure as well as improved health outcomes.

<sup>68</sup> World Water Council. 2000. The Africa Water Vision for 2025

<sup>69</sup> World Water Council. 2000. The Africa Water Vision for 2025

<sup>70</sup> World Water Council. 2000. *The Africa Water Vision for 2025*.

<sup>71</sup> World Water Council. 2000. The Africa Water Vision for 2025

<sup>72</sup> BGR (Bundesanstalt für Geowissenschaften und Rohstoffe) 2003. Groundwater Resources of the World. Available at: <http://www.bgr.de/b1hydro/fachbeitraege/a200401/folie0.pdf>

[FIGURE 9]

[FIGURE 10]

In the face of these four constraints, water storage infrastructure is critical to effectively increase the water available all year for agriculture and other productive purposes. Despite the need for storage, Sub-Saharan Africa (excluding South Africa) has only 25 cubic meters of water storage per capita compared with 7,000 cubic meters per capita in the United States. An additional argument for investing in water storage is that Sub-Saharan Africa only exploits 4.3 percent of its economically viable hydropower potential (Journal on Hydropower and Dams 2001)<sup>73</sup>. In the light of the urgent need to increase electricity generation across Sub-Saharan Africa and to raise water storage capacity, investments in hydropower will need to be considered.

African countries also need to institute integrated water resources management policies “promoting the coordinated development and management of water, land and related resources, in order to maximize the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP 2000)<sup>74</sup>. These policies need to be accompanied by increased investments in hydrological monitoring systems, which are deemed inadequate in Sub-Saharan Africa (UNESCO-WWAP 2003)<sup>75</sup>.

A number of interventions from other sectors contribute to meeting the water and sanitation goals in rural areas. Improving access to electricity through rural electrification is necessary to power water pumps (Cecelski 2003)<sup>76</sup>. Alternatively, diesel pumps can be used to power water supply systems, which in turn require improved transport and distribution systems to ensure a reliable supply of energy at low cost. In particular feeder and district roads to dispersed communities are therefore necessary to maintain and operate deep boreholes that provide water supply across many parts of rural Sub-Saharan Africa.

#### (v) Investments in Environmental Sustainability

As part of MDG 7 (“Ensure environmental sustainability”) countries have committed themselves to “integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources”. Meanwhile, much of Sub-Saharan Africa is experiencing a rapid degradation of ecosystems and other environmental resources with particularly adverse consequences on the rural poor who tend to depend most heavily on the environment for their income (see for example Cavendish 1999)<sup>77</sup>.

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<sup>73</sup> “World Atlas and Industry Guide.” *International Journal of Hydropower and Dams*.

<sup>74</sup> GWP (Global Water Partnership). 2000. “Integrated Water Resources Management.” TAC Background Paper No. 4. GWP. Stockholm.

<sup>75</sup> UNESCO-WWAP. 2003. “Water for People – Water for Life.” *The United Nations World Water Development Report*. Paris.

<sup>76</sup> Cecelski, E. 2003. “Energy, Poverty and Gender.” World Bank, Washington D.C.

<sup>77</sup> Cavendish, W. 1999. *Empirical Regularities in the Poverty-Environment Relationship of African Rural Households*. Working Paper Series 99-21. Center for the Studies of African Economies.

While extent and cause of environmental degradation in the rural areas of Sub-Saharan Africa are highly specific to a given country and region, some principal challenges across the continent include deforestation and desertification; degradation of watersheds and freshwater ecosystems; and degradation of coastal and marine ecosystems.<sup>78</sup>

Strategies for meeting the environment target tend focus on policies and institutions, which are highly specific to each country or sub-region. Examples include reinforcing property rights and removing other market distortions, strengthening regulatory mechanisms, mandating environmental impact assessments for development strategies, extending conservation areas to protect biodiversity, etc. Increased investments in the management of specific environmental resources are also required, such as the provision of tree seedlings and other measures to promote forestation and contain desertification.

In addition, interventions across many of the sectors can help achieve the target on environmental sustainability. For example, while demand for fuelwood has not outpaced sustainable supply on a scale that makes it a major cause of deforestation, some studies have linked deforestation with fuelwood extraction and charcoal production, which can represent a principal source of tree loss in the vicinity of large cities (Ninnin 1994)<sup>79</sup>, Geist and Lambin 2002<sup>80</sup>, Arnold et al. 2003)<sup>81</sup>. Hence a shift towards non-biomass fuels can relieve pressure on forests and other ecosystems.

By promoting food production in areas with high agricultural potential through agricultural intensification, fertilizer use can reduce pressures on marginal lands and forest clearing (Bumb and Baanante 1996)<sup>82</sup>. Moreover, the improved agricultural land management practices outlined in Section 3.7 above can help contain soil erosion and help reverse desertification (for a more detailed treatment, see McNeely and Scherr 2003)<sup>83</sup>.

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<sup>78</sup> Sub-Saharan Africa, excluding South Africa, experienced the most rapid rate of deforestation of all World Bank regions with an average annual reduction in forest cover of 0.80 percent (WDI 2003)<sup>78</sup>. Reich et al. (2001)<sup>78</sup> estimate that 46 percent of the land area in Africa is affected by desertification. Deforestation and the conversion of wetlands into agricultural land contribute to rising soil and nutrient loads in run-off causing eutrophication as observed in Lake Victoria. Human-induced changes in the flora and fauna can further result in rising incidence of parasitic infections (e.g. Fuggle 2001)<sup>78</sup>. The rapidly rising population along the coastline of Sub-Saharan Africa is causing widespread degradation and pollution of marine and coastal ecosystems as well as resources (UNEP 2002)<sup>78</sup>.

<sup>79</sup> Ninnin B. 1994. « Elements d'économie spatiale des énergies traditionnelles: application au cas de cinq pays Sahelens: Burkina Faso, Gambie, Mali, Niger, Senegal. » RPTES. World Bank, Washington, D.C.

<sup>80</sup> Geist, H.J. and E.L. Lambin. 2002. "Proximate causes and underlying driving forces of tropical deforestation." *BioScience* 52(2) 143-150.

<sup>81</sup> Arnold, M., Köhlin, G., Persson, R., and Shepherd, G. 2003. "Fuelwood Revisited: What has changed in the last decade?" CIFOR Occasional Paper No. 39. Center for International Forestry Research, Jakarta

<sup>82</sup> Bumb, Balu L. and Carlos A. Baanante. 1996. IFPRI. "Policies to promote environmentally sustainable fertilizer use and supply to 2020. Vision Brief 40.

<sup>83</sup> McNeely, J.A. and S. J. Scherr. 2003. *Ecoagriculture – Strategies to Feed the World and Save Wild Biodiversity*. Washington D.C.: Island Press.

### 3.2.2. Health, Nutrition, and Family Planning

A critical lesson from past experience with development programs in the health sector is that while it is technically possible – and important -- to deliver interventions vertically, the successful scale-up and utilization of a broad range of health interventions requires a functioning health system. Thus, it is not sufficient to provide the disease-specific interventions listed above in an isolated manner; rather, these interventions must be complemented by the broad strengthening of the health system. Strong health systems include an adequate complement of health workers, good management capacity for supervision and oversight, ongoing monitoring, evaluation and quality assurance, and sustained outreach and education for communities, among other features. Thus while the following sections address specific interventions to meet Millennium Development Goal Targets for child health, maternal health, HIV/AIDS, TB, malaria, and access to essential medicines, they should be seen not as isolated programs but as an integrated set of health services provided through a strengthened system of health care delivery.

#### (i) Child health

Roughly 4 million children under five die in sub-Saharan Africa each year. At 175 deaths per live births, the average under-five mortality rate in sub-Saharan Africa is nearly 30 times higher than the average in the industrialized world. Twenty-five percent of these child deaths in Africa are the result of neonatal disorders (infections, birth asphyxia and injuries, and complications of prematurity) that occur in the first 28 days of life. The remainder are caused mainly by four conditions: malaria (22 percent), pneumonia (21 percent), diarrhea (20 percent), and AIDS (8 percent). (Black et al. 2003).<sup>84</sup>

While these conditions are the most proximate causes of death, important contributing factors render children more susceptible to those causes. In particular, malnutrition is a contributing factor in at least one-half of all child deaths, since malnourished children cannot resist common infections as readily as normal children and when infected have a much higher risk of complications and death. Evidence suggests that even mildly underweight children have a two-fold higher risk of death than those that are adequately nourished (Black et al. 2003).<sup>85</sup> Meanwhile poor indoor air quality and lack of access to drinking water and sanitation predispose children to pneumonia and diarrhea.

Since the causes of child death are both direct and indirect, interventions focused on saving children's lives need to address the proximate causes of death and the underlying factors that contribute to child death. In effect, combined interventions are needed both to treat children who are sick and to prevent children from becoming sick. Fortunately, there is strong evidence to suggest that known interventions can be implemented to great effect. In a prominent recent paper, Jones et al. (2003) evaluated the impact of health and non-health sector interventions on child survival and concluded that 63 percent of child

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<sup>84</sup> Black et al. 2003. "Where and why are 10 million children dying every year?" *The Lancet*. Vol 361: 2226-34.

<sup>85</sup> Black et al. 2003. "Where and why are 10 million children dying every year?" *The Lancet*. Vol 361: 2226-34.

deaths could be prevented by providing universal access<sup>86</sup> to an integrated set of interventions.<sup>87</sup>

This set includes preventive medical interventions like immunization, micronutrient supplementation, clean delivery and curative interventions like oral rehydration therapy (salt tablets), antibiotics for pneumonia and sepsis, and antimalarial medications. (Jones et al, 2003)<sup>88</sup> This intervention package also includes numerous interventions outside the traditional health sector, including breastfeeding promotion, insecticide-treated bednets, complementary feeding, and improved access to water, sanitation, and hygiene education.<sup>89</sup>

While the entire set of interventions discussed above has not been field tested, UNICEF and the WHO have implemented the Integrated Management of Childhood Illness program to address the key causes of child death in 80 countries, which includes many of the same preventive and curative interventions.<sup>90</sup> Early results indicate that the program has the potential to raise child survival rates quickly even in poor countries, like Tanzania, where preliminary results show a significantly reduced hospital admission rate for children in IMCI districts. (Armstrong, Schellenberg and others, 2004)<sup>91</sup>

There is also strong evidence on the efficacy of neonatal interventions to prevent deaths occurring during or shortly after birth. These include clean delivery, newborn resuscitation, prevention of hypothermia, antibiotics for infection, tetanus toxoid, breastfeeding education, and community hygiene education (Marsh et al, 2002).<sup>92</sup>

As suggested above, numerous interventions not classically considered as part of the health sector are crucial for reducing child mortality. Important among these are interventions to decrease malnutrition, to cut indoor air pollution, to provide water and sanitation services, to enhance maternal education, and to provide access to contraception. Targeted nutritional interventions can have a significant impact on reducing child mortality addressing malnutrition, which as noted above is a co-factor in half of child deaths. A review study conducted under the auspices of the UN Administrative Committee on Coordination/Subcommittee on Nutrition demonstrated

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<sup>86</sup> Defined in the Lancet series as 99 percent access.

<sup>87</sup> Jones et al. 2003. "How many child deaths can we prevent this year?" *The Lancet*. Vol 362: 65-71.

<sup>88</sup> Jones et al. 2003. "How many child deaths can we prevent this year?" *The Lancet*. Vol 362: 65-71.

<sup>89</sup> Importantly, Jones et al. point out that their estimate of child life savings due to known interventions may be conservative, since they only evaluate interventions for which good cause-effect evidence exists and those that are "feasible" for developing countries to implement (e.g., they exclude emergency obstetric care). They do not assess other underlying factors like maternal education that have a strong though indirect impact on child survival.

<sup>90</sup> Some IMCI interventions include: ITNs, complementary feeding, vaccinations, micronutrient supplementation, case management of ARI, diarrhea, measles, malaria, and malnutrition, treatment with iron, and antihelminthic treatment (<http://w3.whosea.org/imci/imcicomponent.htm>).

<sup>91</sup> Armstrong, Schellenberg et al. 2004. "The effect of Integrated Management of Childhood Illness on observed quality of care of under-fives in rural Tanzania" *Health Policy and Planning*; 19(1): 1-10.

<sup>92</sup> Marsh and others. 2002. *Advancing Newborn Health and Survival in Developing Countries: A Conceptual Framework*. Saving Newborn Lives Initiative, Office of Health, Save the Children Federation-US, Washington, D.C., USA.

that Vitamin A supplementation resulted in an average reduction of 23 percent in mortality rates of infants and children between 6 months and five years (ACC/SCN 1993)<sup>93</sup>. Substituting clean cooking fuels for domestic biomass fuels has been estimated to reduce acute respiratory infections—a key contributor to child deaths—by approximately 30 percent (IIPS 1997; Ezzati et al 2002).<sup>94</sup>

Meanwhile, improved water and sanitation have powerful effects on child health. For example, simple hand washing with soap and water reduces *Shigella* and other diarrhoea transmission by 35 percent (Kotloff et al., 1999; Khan, 1982)<sup>95</sup>. To ensure proper hygiene, sufficient quantities of water must be easily available. A recent World Bank working paper finds that improved access to water explains a quarter of the difference in infant mortality between the poorest and richest quintiles and 37 percent of the difference in child mortality (Leipzig et al. 2003)<sup>96</sup>.

Maternal education also has a strong impact on infant and child mortality. It appears that on average each one-year increment in mother's education corresponds with a 7-9 percent decline in her under-five child's mortality risk.. While the mechanisms for this relationship have not been fully elaborated, the economic benefits of education (i.e. higher income, water and latrine facilities, housing quality, etc.) is estimated to account for approximately one-half of the overall impact (Cleland JG, Van Ginneken JK, 1988).<sup>97</sup> Contraception can also have a strong impact on child mortality. This is discussed in the section on family planning below.

### (ii) Maternal health

Each year 252,000 women die in pregnancy in sub-Saharan Africa. For every woman who dies, approximately 30 more endure injuries, infection and disabilities in pregnancy or childbirth (UNICEF 2003).<sup>98</sup> In sub-Saharan Africa, a woman has a 1 in 13 lifetime risk of death while pregnant. This translates to a maternal mortality ratio of 1100/100,000 live births in sub-Saharan Africa versus 430/100,000 in South Asia and 12/100,000 in industrialized countries. Yet in sub-Saharan Africa, only 42 percent of

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<sup>93</sup> ACC/SCN 1993. Effectiveness of Vitamin A supplementation in the control of young child morbidity and mortality in developing countries. SOA# 13. ACC/SCN: Geneva

<sup>94</sup> Range of 21-44 percent for acute lower respiratory infections and 24-64 percent for all acute respiratory infections in Ezzati and Kammen.

Ezzati, M. and D.M. Kammen. 2002. "Evaluating the Health Benefits of Transitions in Household Energy Technologies in Kenya," *Energy Policy*, 30: 815-826

<sup>95</sup> Kotloff KL et al., 1999. Global burden of *Shigella* infections: implications for vaccine development and implementation of control strategies. *Bulletin of the World Health Organization*, 1999, 77(8): 651-666.

Khan M, 1982 Interruption of shigellosis by hand washing. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1982, 76(2):164-168.

<sup>96</sup> Leipzig D., M. Fay, Q. Wodon, and T. Yepes. 2003. Achieving the Millennium Development Goals: The Role of Infrastructure. World Bank Policy Research Working Paper 3163. World Bank, Washington D.C.

<sup>97</sup> Cleland JG, Van Ginneken JK. 1988. Maternal education and child survival in developing countries: the search for pathways of influence. *Social Science Medicine*;27(12):1357-68.

<sup>98</sup> UNICEF. 2003. *Maternal mortality*. Available at [http://www.unicef.org/specialsession/about/sgreport-pdf/09\\_MaternalMortality\\_D7341Insert\\_English.pdf](http://www.unicef.org/specialsession/about/sgreport-pdf/09_MaternalMortality_D7341Insert_English.pdf).

births are assisted by a skilled attendant trained to recognize and address key causes of maternal death, a proportion that has hardly changed through the 1990's (UNICEF 2003).<sup>98</sup>

Sixty-one percent of these maternal deaths are caused by conditions around the time of delivery. These conditions include severe bleeding, infection, eclampsia, and obstructed labor. While most of these conditions cannot be predicted or prevented, specialized treatment exists that can save the mother's life. In fact, maternal mortality is one of the few health conditions primarily addressed by treatment rather than prevention. In addition to the conditions above, it is estimated that another 13 percent of maternal deaths are caused by complications of unsafe abortion (WHO 1997)<sup>100</sup>.

One important intervention that can improve maternal survival is the presence of skilled attendants at delivery. Trained midwives, nurses, and physicians can recognize and address some of these emergencies at the community level. However, treatment with some specialized emergency obstetric care interventions (EmOC) requires timely referral to a comprehensive health center or hospital with surgical and transfusion capacity. The full set of emergency obstetric care (EmOC) interventions includes:

- Intravenous antibiotics for infection,
- Oxytocic drugs to stimulate labor,
- Anti-convulsants to manage seizures,
- Management of postpartum bleeding including blood transfusion, and
- Assisted delivery for prolonged labor such as vacuum or forceps delivery, and/or cesarean section.<sup>99</sup>

The complications of unsafe abortion, another important cause of maternal death, can largely be prevented through universal access to contraception and access to safe abortion and post-abortion care.<sup>100</sup>

Emergency obstetric care is an extremely effective intervention. Assuming 80 percent effectiveness of the above interventions, which is conservative, their provision to all women developing complications can have a potential life savings of at least 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 universal access to contraception to prevent unwanted pregnancy, this integrated set of interventions has potential to reduce maternal mortality by three quarters.

In terms of prevention, while the overall effectiveness of antenatal care in reducing maternal mortality is limited, several antenatal interventions do have proven value in addressing morbidity in pregnant women and improving the odds of survival for their babies. These were discussed in the child health section and include intermittent

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<sup>99</sup> For a full discussion of EmOC interventions see <http://cpmcnet.columbia.edu/dept/sph/popfam/amdd/>

<sup>100</sup> WHO. 1997. *Maternal health around the world*. WHO, Geneva.

treatment for malaria, nevirapine for HIV, antibiotics for sexually transmitted infections and counseling on smoking cessation and diet. (WHO, 2003)<sup>101</sup>

While the provision of EmOC services in health facilities is necessary, it is not sufficient. For the services to be effective, they must be accessed in time to save the mother's life. Yet, equipped and staffed EmOC facilities are often remote; accessing these services quickly is often impossible for women in much of the developing world due to poor roads and limited means of transport. It is thus necessary to extend and rehabilitate the road network, which not only provides the necessary physical links to health facilities, but can also reduce the cost barriers for accessing these health services. Another critical component of the EmOC referral system is a functioning communication system that enables the efficient transfer of information and appropriate referrals. Similarly energy systems are needed to power operating room lights, medical equipment and water supply and sanitation facilities.

Girls' education is another key component in lowering maternal mortality. Women who have not completed the full course of primary schooling tend to marry and have children at a younger age. As a result, these women have higher fertility rates than those who have completed primary schooling (Herz and Measham, 1997, Ainsworth et al 1996)<sup>102</sup>. Access to contraception, by preventing unwanted pregnancies, is an important intervention to reduce maternal mortality and morbidity and is discussed in detail in the section on family planning below.

*(iii) HIV/AIDS.*

Approximately 29 million people in Sub-Saharan Africa are infected with the HIV virus. In 2001, nearly 2.2 million of the 3 million global AIDS deaths occurred in the region. The epidemic has already left behind 11 million orphaned children in Africa. (UNAIDS 2002)<sup>103</sup> The effects of the pandemic are staggering and well documented (Cornia and Zagonari 2002; Barnett and Whiteside 2002; Bonnel 2000)<sup>104,105,106</sup>: However, the international community now has in hand a series of prevention and treatment interventions that, if implemented at scale, could prevent 28 million of these infections and prolong the lives of those currently infected (Stover 2002).<sup>107</sup>

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<sup>101</sup> WHO. 2003. [http://www.euro.who.int/HEN/Syntheses/antenatal/20031223\\_5](http://www.euro.who.int/HEN/Syntheses/antenatal/20031223_5). WHO, Geneva.

<sup>102</sup> Ainsworth, M., K. Beegle and A. Nyamete. 1996. "The Impact of Womens Schooling on Fertility and Contraceptive Use : A Study of Fourteen Sub Saharan African Countries" World Bank Economic Review 10(1): 85-122

<sup>103</sup> UNAIDS. 2002. *Report on the Global HIV/AIDS Epidemic*. Geneva.

<sup>104</sup> Cornia, Giovanni Andrea, and Fabio Zagonari. 2002. "The HIV/AIDS Impact on the Rural and Urban Economy." In *AIDS, Public Policy and Child Well-Being*, edited by Giovanni Andrea Cornia.

<sup>105</sup> Barnett, Tony and Alan Whiteside. 2002. "Poverty and HIV/AIDS: Impact, Coping and Mitigation Policy" In *AIDS, Public Policy and Child Well-Being*, edited by Giovanni Andrea Cornia.

<sup>106</sup> Bonnel, René. 2000. "Economic Analysis of HIV/AIDS." ADF 2000 Background Paper.

<sup>107</sup> Stover, John et al. 2000. "Can we reverse the HIV/AIDS pandemic with an expanded response?" *The Lancet* 360(9326): 73-77. Other estimates suggest that HIV incidence can be reduced by as much as 80 percent (Jha et al. 2001)



### **HIV/AIDS Prevention**

Behavior programs intended to encourage safer sexual behavior by promoting condom use or a reduction in sexual contacts have been shown to be powerful tools for change. There is strong evidence to suggest that these interventions are effective in school-age children, heterosexual women, and men who have sex with men (Jermott et al. 1992; DiClemente 1994; Valdisseri et al. 1989)<sup>108, 109, 110</sup>. Evidence also suggests that the provision of voluntary counseling and testing (VCT) can reduce risky behavior by infected individuals. Such counseling and testing also serves as a first step to treatment (Voluntary HIV-1 Counseling and Testing Efficacy Control Group 2000)<sup>111</sup>. Currently, most individuals living with HIV/AIDS in the developing world are unaware of their infection.

While it is generally agreed that heterosexual contact is the primary means of HIV transmission in Sub-Saharan Africa, injecting drug users (IDUs) are thought to account for a significant portion of global HIV/AIDS infections. Although this issue is not pronounced in Sub-Saharan Africa, it is estimated that in 1998 there were approximately 5.5 million IDUs worldwide (Ball et al. 1998)<sup>112</sup>. In instances where this is a problem, needle exchange programs can reduce rates of transmission without a corresponding increase in drug use. (Normand 1995; Hurley 1997)<sup>113,114</sup>

HIV can also be transmitted through the transfusion of infected blood. Several studies have shown the significant impact of targeted safe blood interventions: a 1993 study in Cote d'Ivoire found that excluding people that had had contact with a prostitute in the last five years would have excluded 31 percent of the donors but reduced by 73 percent the donation of HIV infected blood (Schutz et al. 1993)<sup>115</sup>.

Susceptibility to HIV transmission is dramatically increased by infection with another sexually-transmitted disease (STD) (Population Council 2001)<sup>116</sup>. Consequently, it is

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<sup>108</sup> Jermott, J. et al. 1992. "Reductions in HIV risk-associated behaviors among black male adolescents: Effects of an AIDS prevention initiative." *American Journal of Public Health*, 83: 372-77.

<sup>109</sup> DiClemente, Ralph and Gina Wingood. 1995. "Randomized Controlled Trial in an HIV Sexual Risk Reduction Intervention for Young African-American Women." *JAMA*. 274: 1271-76.

<sup>110</sup> Valdisseri et al. 1989. "AIDS prevention in homosexual and bisexual men: Results of a randomized trial evaluating two risk-reduction interventions." *AIDS*. 3: 21-26.

<sup>111</sup> Voluntary HIV-1 Counseling and Testing Efficacy Study Group. 2000. "Efficacy of voluntary HIV-1 counselling and testing in individuals and couples in Kenya, Tanzania, and Trinidad: a randomized trial." *Lancet*. 356 (9224): 103-112.

<sup>112</sup> Ball, Andrew, Sujata Rana and Karl L. Dehne. 1998. "HIV Prevention among Injecting Drug Users: Responses in Developing and Transitional Countries." *Public Health Reports*. 113(1): 170-181.

<sup>113</sup> Normand, J. et al. 1995. *Preventing HIV transmission: the role of sterile needles and bleach*. National Research Council and Institute of Medicine. National Academy Press.

<sup>114</sup> Hurley, S.F et al. 1997. "Effectiveness of needle-exchange programmes for prevention of HIV infection." *Lancet*. 349(9068): 1797-1800.

<sup>115</sup> Schutz et al. 1993. "Excluding blood donors at high risk of HIV infection in a west African city". *British Medical Journal*. 307: 1517-1519.

<sup>116</sup> Population Council. 2001. *Sexually-transmitted infections and HIV/AIDS*. Fact sheet. Accessed at [http://www.popcouncil.org/rhfp/rfi\\_fact\\_sheets/stiandaids.html](http://www.popcouncil.org/rhfp/rfi_fact_sheets/stiandaids.html).

generally agreed that STD management is an essential component of HIV prevention.<sup>117</sup> It is therefore noted that while STDs clearly increase the risk of HIV, more evidence is needed on specific mechanisms for managing STDs.

For newborns at risk of contracting HIV from their mothers, several studies have demonstrated that short courses of AZT or nevirapine during pregnancy can reduce transmission from 37 percent-68 percent in low-income countries (De Cock et al. 2000)<sup>118</sup>

In terms of non-health sector interventions, general education can increase HIV knowledge and appears to reduce risk behavior. A recent 32 country study found that women with post primary education are five times more likely than illiterate women to know facts about HIV/AIDS (Vandemoortele and Delmonica 2000).<sup>119</sup>

### **HIV Care and Treatment**

While the effective treatment of HIV/AIDS with triple ART has been available since 1996, less than 2 percent of those needing treatment are receiving it in Sub-Saharan Africa (WHO 2003)<sup>120</sup>. Treatment has been shown to reduce mortality by up to 90 percent in developed countries as well as reducing the incidence of major opportunistic infections (Jones et al. 1997; Dorrucchi et al. 1999; Palella 1998).<sup>121,122,123</sup> (Brazil AIDS Programme 2001)<sup>124</sup>.

While ART is the most effective means of reducing mortality and morbidity, the treatment of opportunistic infections has also been shown to have significant effects. It is particularly important among people living with HIV who have not progressed far

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<sup>117</sup> One randomized community trial in Mwanza, Tanzania demonstrated a 38 percent reduction in HIV incidence resulting from general STI management to the general population; however, another study in Rakai, Uganda, based on periodic mass STI treatment of adults failed to reduce HIV incidence (Grosskurth et al. 1995; Wawer et al. 1999)

<sup>118</sup> De Cock, K.M. et al. 2000. "Prevention of Mother-to-Child HIV Transmission in Resource-Poor Countries: Translating Research into Policy and Practice." *JAMA*. 283(9): 1175-1182.

<sup>119</sup> Vandemoortele, J and E. Delmonica. 2000. "Education 'Vaccine' against HIV/AIDS". *Current Issues in Comparative Education* 3(1).

<sup>120</sup> WHO. 2003. *Treating 3 million by 2005: Making it happen*. Geneva.

<sup>121</sup> Jones, J.L., D.L. Hanson, M.S. Dworkin, D.L. Alderton, P.L. Fleming, J.E. Kaplan & J. Ward (1999). Surveillance for AIDS-defining opportunistic illnesses, 1992-1997. *MMWR CDC Surveill Summ.* 48(2): 1-22.

<sup>122</sup> Dorrucchi, M., M. Balducci, P. Pezzotti, A. Sinicco, F. Alberici & G. Rezza. 1999. Temporal changes in the rate of progression to death among Italians with known date of HIV seroconversion: estimates of the population effect of treatment. *Italian HIV Seroconversion Study (ISS)*. *J Acquir Immune Defic Syndr.* 22(1): 65-70.

<sup>123</sup> Palella, F.J., Jr. et al. (1998). Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. HIV Outpatient Study Investigators. *New England Journal of Med.* 338(13): 853-60.

<sup>124</sup> Brazilian Program of Sexually Transmissible Diseases and AIDS. 2001. National AIDS Drug Policy.

enough in their illness to meet standard criteria for ART and those for whom ART is not effective. (McNaghten et al. 1999; Grimwade and Gilks 2001).<sup>125,126</sup>

Malnutrition often co-exists with HIV/AIDS in the developing world. Some research indicates that food fortification and nutritional interventions for children and women can help in reducing fatigue and in increasing the work productivity of people living with HIV and AIDS (Privoz and Preble 2000)<sup>127</sup>.

**(iv) Tuberculosis**

While Tuberculosis (TB) is nearly 100 percent curable, it is estimated to cause over 2 million deaths per year (Stop TB Partnership 2001)<sup>128</sup>. The highest rates of TB incidence are also in Africa, where it was estimated that 290 out of 100,000 people are infected annually. The AIDS epidemic is further aggravating the situation by increasing individuals' risk of developing active tuberculosis: while 9 percent of global TB cases in adults were attributable to HIV, in Africa this figure is significantly higher at 31 percent. As a result, the African region has the highest annual rate of increase of TB cases (6 percent) (Corbett et al. 2003).<sup>129</sup>

In terms of prevention, The BCG vaccine has been shown to have modest protective effects against all forms of TB regardless of HIV status (Arbelaez 2000)<sup>130</sup>. A meta-analysis has recently shown that on average BCG reduced the risk of TB by 50 percent. Regarding treatment, Directly Observed Treatment Short course (DOTS) is effective in reducing incidence and preventing death. One study estimates that if the global targets of 70 percent case detection and 85 percent cure are met, countries with stable incidence of TB and absence of HIV-1 can reduce incidence by 11 percent and death rates by 12 percent (Dye 1998).<sup>131</sup> Another cross-sectional study showed that participating countries in DOTS programmes since 1991 were, by 1997, preventing at least 46 percent of the TB deaths that would have otherwise occurred (Dye 2000)<sup>132</sup>. Evidence also exists that DOTS leads to significant reductions in the frequency of primary drug resistance, acquired resistance, and the relapse rate (Weis 1994)<sup>133</sup>.

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<sup>125</sup> McNaghten et al. 1999. "Effects of antiretroviral therapy and opportunistic illness primary chemoprophylaxis on survival after AIDS diagnosis." *AIDS*. 13: 1687-1695.

<sup>126</sup> Grimwade, K. and C. Gilks. 2001. "Cotrimoxazole prophylaxis in adults infected with HIV in low-income countries". *Current Opinion in Infectious Diseases*. 14(5): 507-512.

<sup>127</sup> Piwoz EG and Preble EA 2000. HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in Sub Saharan Africa. SARA Project. Academy for Educational Development: Washington DC.

<sup>128</sup> Stop TB Partnership. 2001. *The Global Plan to Stop Tuberculosis*. World Health Organization. Geneva.

<sup>129</sup> Corbett et al. 2003. "The Growing Burden of Tuberculosis: Global Trends and Interactions with the HIV Epidemic." *Archives of Internal Medicine*. 163: 1009-1021.

<sup>130</sup> Arbeláez, María et al. 2000. "BCG vaccine effectiveness in preventing tuberculosis and its interaction with human immunodeficiency virus infection." *International Journal of Epidemiology*. 29: 1085-1091.

<sup>131</sup> Dye, C. et al. 1998. "Prospects for worldwide tuberculosis control under the WHO DOTS strategy." *352(1944)*: 1886-1891.

<sup>132</sup> Dye, C. et al. 2000. "Evaluating the impact of tuberculosis control: number of deaths prevented by short-course chemotherapy in China." *International Journal of Epidemiology*. 29: 558-564.

<sup>133</sup> Weis SE et al. 1994. "The effect of directly observed therapy on the rates of drug resistance and relapse in tuberculosis." *New England Journal of Medicine*. 330:1179-84 (April 28).

(v) **Malaria.**

Each year 1 to 3 million people die of malaria (Bremen 2001)<sup>134</sup>. Ninety percent of these occur in Sub-Saharan Africa and a majority of the victims are children (WHO and UNICEF 2003).<sup>135</sup> In Africa, the WHO estimates that approximately 20 percent of child (under 5 yrs) deaths are attributable to malaria (WHO and UNICEF 2003).<sup>136</sup> The notably high levels of malaria incidence and mortality in Sub-Saharan Africa is largely a consequence of the underlying geographical and biological conditions. The NIH states, "the epidemiology of malaria is driven by the dynamics of the mosquito vectors. Thus, 90 percent of the world's malaria is in Africa because it is home to the three most effective vectors."<sup>137</sup>

**Malaria Prevention—Insecticide treated nets**

Insecticide-treated nets provide both a physical and chemical barrier to the mosquitoes that transmit malaria. The benefits of ITNs extend beyond the individual user as the chemical halo emitted by the net repels and shortens the lives of mosquitoes in the area. Several studies have shown significant reductions in malarial risk and morbidity for children in covered by insecticide treated nets (Curtis and Mnzava 2000)<sup>138</sup>: a cross-sectional study in Afghanistan demonstrated a 59 percent reduction in the risk of *Plasmodium falciparum* among ITN users compared with non-users (Rowland et. al 2003)<sup>139, 140, 141</sup>. In Gambia, under-5 mortality fell by 25 percent after the first year of implementation of the National Impregnated Bednet Program (D'Alessandro 1995)<sup>142</sup>

**Malaria Treatment—Artemisinin-based combination treatment**

The recent rise in resistance to first line drugs in Africa has accelerated the need to transition from single drug therapies such as chloroquine or sulfadoxine-pyrimethamine (SP) to more effective combination therapies, such as artemisinin-based combination treatment (ACT).<sup>143</sup> The possible benefits of ACT have been demonstrated in a number of studies that have shown ACT to enhance clinical efficacy and delay the development

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<sup>134</sup> Bremen, J. "The ears of the hippopotamus: manifestations, determinants, and estimates of the malaria burden." *American Journal of Tropical Medicine and Hygiene* 64(1,2)S, 1-11.

<sup>135</sup> WHO and UNICEF. 2003. *The Africa Malaria Report 2003*.

<sup>136</sup> WHO and UNICEF. 2003. *The Africa Malaria Report 2003*.

<sup>137</sup> National Institute of Allergy and Infectious Diseases. 1997. *Malaria in Africa: Challenges and Opportunities for Cooperation* National Institute of Health, USA. Accessed at <http://www.niaid.nih.gov/dmid/malaria/malafr/entomolo.htm> on 8 March 2004.

<sup>138</sup> Curtis, Christopher F. and Abraham E.P. Mnzava. 2000. "Comparison of house spraying and insecticide-treated nets for malaria control." *Bulletin of the World Health Organization* 78(12): 1389-1400.

<sup>139</sup> Rowland et al. .2002. "Prevention of malaria in Afghanistan through social marketing of insecticide treated nets: evaluation of coverage and effectiveness by cross-sectional surveys and passive surveillance." *Tropical Medicine and International Health*. 7(10): 813-2.

<sup>140</sup> Maxwell, C.A. et al. .2002. "Effect of community-wide use of insecticide treated nets for 3-4 years on malarial morbidity in Tanzania." *Tropical Medicine and International Health* 7(12): 1003-1008.

<sup>141</sup> Lengeler, C.2004. "Insecticide-treated bednets and curtains for preventing malaria." In *The Cochrane Library*, Issue 1.

<sup>142</sup> D'Alessandro et al. 1995. "Mortality and morbidity from malaria in Gambian children after introduction of an impregnated bednet programme" *Lancet*. 345(8948): 479-483.

<sup>143</sup> WHO and UNICEF. 2003. *Africa Malaria Report 2003*.

of resistance (WHO 2001)<sup>144</sup>. A meta-analysis done by the World Health Organization of artemisin-based combinations vs. standard drugs in monotherapy, which evaluated trials in Kenya, Malawi, Uganda, Senegal, The Gambia, Gabon, Sao Tomé, and Côte d'Ivoire plus several non-African countries, showed a clear benefit in terms of reduction of risk of treatment failure, superior pharmacodynamic action (parasite clearance and fever clearance), and reduction in gametocyte carriage (Médecins sans Frontières, 2003).<sup>145</sup>

**(vi) Access to Essential Medicines.**

Essential medicines are those medicines that satisfy the priority health needs of the majority of a country's population (WHO 2002).<sup>146</sup> Since 1977 the WHO has published a model list of essential medicines, countries draft their own definitive national essential medicines lists. Many countries have undertaken to provide these medicines to the public at no charge as part of the basic health system services. However, in practice it has been estimated that one half of Africa's population lacks access to the most basic essential medicinal medicines (Millennium Project Task Force 5 Working Group on Access to Essential Medicines 2004).<sup>147</sup>

Access to essential medicines is not an automatic outgrowth of development, but requires a concerted and focused approach. One way of understanding barriers and entry points to improving access of essential medicines is through the framework of availability, affordability, and appropriateness.<sup>148</sup> Many of the interventions needed to ensure access to essential medicines lie in the realm of international and national policy. These include strengthening drug regulatory authorities in countries to ensure quality, adapting national legislation to use TRIPs flexibilities to permit importation of needed branded drugs, creating national essential medicines lists to make explicit the government's commitment to essential drugs, pre-qualifying quality products and suppliers to streamline procurement, and acknowledging access to essential medicines as a human right. Equally important as the policies are specific investments in roads and transport infrastructure to ensure the drugs reach the populations in need.

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<sup>144</sup> WHO Technical Consultation. 2001. Report on antimalarial drug combination therapy. Geneva, World Health Organization. (document WHO/CDS/RBM/2001.35).

<sup>145</sup> Médecins sans Frontières. 2003. *Malaria & what works: Artemisinin-based combination therapy - the prescription for Africa*. <http://www.msf.org/content/page.cfm?articleid=2F169856-4D66-4E90-B49E02C3EAE4F496>.

<sup>146</sup> WHO. 2002. "Essential drugs and medicines policy: what are essential medicines?" Accessed at <http://www.who.int/medicines/> on 8 March 2004.

<sup>147</sup> Millennium Project Task Force 5 working group on Access to Essential Medicines. 2004. *Interim Report*. New York.

<sup>148</sup> Availability refers to relevant innovation in research on new drugs, production, importation, distribution within the country and assurance of drug quality. Affordability implies that both the national government and the end user can afford to purchase the required drugs—which in effect in many poor countries means that drugs must be free to the patient. Appropriateness tackles the purchasing choices made by governments, the distribution of drugs according to regional need, and correct prescribing and dispensing at the community level. (Millennium Project Task Force 5 Working Group on Access to Essential Medicines 2004)..

**(vii) Nutrition Programs**

The Millennium Development Goal Target 2 focuses on the need to halve the proportion of people living with hunger by 2015. The indicators selected to measure progress towards the target are the proportion of underweight children under five years of age and the proportion of the population below the minimum level of dietary energy requirements (Millennium Project 2003).<sup>149,150</sup> Underweight is defined as low weight for age in children, and body mass index below 18.5 in adults, reflecting a current condition resulting from inadequate food intake, past episodes of under-nutrition or poor health conditions.

As discussed in Section 3.2.1, over 1999-2001 approximately 198 million people in Sub Saharan Africa (SSA) fell in the undernourished category, and therefore comprise the hungry in SSA (SOFI 2003).<sup>151</sup> In addition to the interventions outlined in Section 3.2.1 to increase agricultural productivity, specific nutritional interventions are needed, particularly for vulnerable groups such as infants and children under the age of 5 years, school going children, pregnant and lactating women, and individuals suffering from extreme micronutrient deficiencies (Millennium Project 2003).<sup>152</sup> Some interventions to provide micronutrients such as Vitamin A, Iodine and Iron through food fortification have been shown to be successful on a population wide basis, and should be introduced depending on the micronutrient status in different countries (Mason et al 2001).<sup>153</sup> The following section, however discusses interventions targeted to the specific vulnerable groups described above.

Direct food intake is a critical determinant of nutritional status. In particular, many low-income women are malnourished from childhood, and as malnourished adults, they are married early and go on to have low birth weight infants; low birth weight is the main determinant of childhood malnutrition. Children with normal birth weights can also become malnourished in infancy due to insufficient nutritional intake and poor food absorption (due to diarrheal and helminthic diseases etc.). Data for Africa, Latin America, and Asia demonstrate children becoming rapidly malnourished in infancy between the ages of 4 and 12 months.<sup>154</sup> The critical issue is that the damage occurs

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<sup>149</sup> Millennium Project 2003. "Interim Report of the Task Force on Hunger." Millennium Project: New York

<sup>150</sup> Hunger is defined as a condition in which people lack the basic food intake to provide them with the energy and nutrients for fully productive, active lives. People who are chronically undernourished, that is, without access to adequate consumption of food, are counted among the hungry. Individuals in households consuming less than about 1900 kcal per capita, depending on age, sex, and height, are considered undernourished, using FAO's measure based on distribution of household consumption and availability of dietary energy.

<sup>151</sup> State of Food Insecurity in the World 2003, FAO: Rome.

<sup>152</sup> Millennium Project 2003. "Interim Report of the Task Force on Hunger." Millennium Project: New York

<sup>153</sup> Mason, J., Lotfi, M., Dalmiya, N., Sethuraman, K., Dietchler, M 2001. The Micronutrient Report: Current Progress and Trends in the Control of Vitamin A, Iodine and Iron deficiencies. The Micronutrient Initiative and International Development Research Center.

<sup>154</sup> Millennium Project 2003. "Interim Report of the Task Force on Hunger." Millennium Project: New York.

early, and that it is virtually irreversible, as noted by the leveling off in the graph. After this early damage, a child may grow at a normal pace, but will still remain small for age. Therefore, it is critical that nutritional interventions are provided within the first 12 months of an infant's life.

Interventions for newborn infants include promotion of exclusive breastfeeding for 6 months followed by complementary feeding (along with breast feeding) from 7-24 months<sup>155</sup>. Several studies (reviewed in Allen and Gillespie 2001) have shown the importance of breastfeeding and complementary feeding promotion, though the results are variable depending on the kind of foods provided.<sup>156</sup>

For school going children, meals provided during school hours made from locally sourced foods can serve multiple purposes: they can spur local demand, thereby increasing production and local incomes and improve school attendance and enrollment; they have also been shown to alleviate short term hunger and in some cases, to improve micronutrient status (Del Rosso and Marek 1996)<sup>157</sup>.

It is critical to provide targeted nutritional supplements to women in their reproductive age groups (post-puberty to adulthood) as well as during the pregnancy.<sup>158</sup> These interventions also need to be accompanied by nutrition education, which is critical for changing feeding patterns and attitudes towards nutritional patterns.<sup>159</sup>

Improved child nutrition is also linked to other more indirect interventions such as increased agricultural production and investments in infrastructure, but these links are not automatic (Tefft et al 2000)<sup>160</sup>. Increasing agricultural production can translate into higher rural incomes, which in turn can lead to greater spending at the household level on nutritional foods, though the link is weak. Investments in community infrastructure programs are, on the other hand, shown to be much more strongly linked to improvements in nutritional outcomes. Finally, direct food assistance is critical for providing nutrition supplementation to populations in food scarce areas and during emergencies.

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<sup>155</sup> Complementary feeding is defined as the period during which foods or liquids are provided along with continued breastfeeding. Complementary food is the term used to describe any nutrient-containing foods or liquids, other than breastmilk, that are given to young children during the period of complementary feeding.

<sup>156</sup> Allen, L and S. Gillespie 2001. *What works? A Review of the Efficacy and Effectiveness of Nutrition Interventions*. ACC/SCN: Geneva in collaboration with the Asian Development Bank, Manila.

<sup>157</sup> Del Rosso JM and Marek T. 1996. "Class Action: Improving School Performance in the Developing World through Better Health and Nutrition". *Directions in Development*. World Bank, Washington D.C.

<sup>158</sup> Allen, L and S. Gillespie 2001. "What works? A Review of the Efficacy and Effectiveness of Nutrition Interventions." ACC/SCN: Geneva in collaboration with the Asian Development Bank, Manila..

<sup>159</sup> Dewey KG. 2001. "Approaches for improving complementary feeding of infants and young children." Background paper for the WHO/UNICEF Technical Consultation on Infant and Young Child Feeding. WHO, Geneva.

<sup>160</sup> Tefft, J., C. Penders, V. Kelly, J.M. Staatz, M. Yade and V. Wise. 2000. *Linkages between Agricultural Growth and Improved Child Nutrition in Mali*. International Development Working Paper 79. Department of Agricultural Economics, Department of Economics. Michigan State University

(viii) **Family Planning**

Family planning and contraception are key components of the full package of sexual and reproductive health interventions, which also include maternal health services and the prevention and care of sexually transmitted infections. The importance of investing in the latter two components was discussed above in the sections on maternal health and HIV/AIDS. This section focuses on contraceptive services and the potential impact that providing those may have on helping countries achieve the demographic transition as well as improved health.<sup>161</sup> For the purposes of this section, family planning includes provision of counseling on contraception and family spacing and provision of modern contraceptive methods, including sterilization (male or female), IUD, long-acting hormonal methods (injectable and implant), the pill, the condom, vaginal barrier methods and spermicides.<sup>162</sup>

In Africa 63 percent of women are at risk of unwanted pregnancy. This means that family limiting or spacing is effectively out of reach for nearly two-thirds of Africa's women, with consequent devastating impact on their dignity, health, and economic productivity.

Globally, the provision of family planning and contraceptive services plays an important role in accelerating the demographic transition to lower fertility rates. Although many forces such as education, transition from an agrarian economy, urbanization, and nutrition influence fertility behavior, family planning is clearly an important contributor. The 2002 State of the World Population Report estimates that family planning programs accounted for approximately one third of the global decline in fertility between 1972 and 1994 (<http://www.unfpa.org/swp/2002/pdf/english/swp2002eng.pdf>). Such a demographic transition has been shown to contribute to higher economic growth in several ways. Lower fertility rates: increase women's participation in the workforce; allow a greater human capital investment per child; reduce dependency ratios thereby raising output per person.

Universal access to contraceptives is also an exceptionally powerful intervention for reducing maternal mortality. It is estimated that approximately 10 percent to 20 percent of the pregnancies leading to a maternal death were unwanted at the time of conception. Another recent analysis confirmed the magnitude of the potential impact of full access to

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<sup>161</sup> While family planning is not an explicit part of the MDGs, it is essential to achieving the poverty, health, and gender goals. Reproductive rights, including access to contraception, should also be seen as an end in itself as reinforced by the International Conference on Population and Development Programme of Action: "Reproductive rights embrace certain human rights that are already recognized in national laws, international laws and international human rights documents and other consensus documents. These rights rest on the recognition of the basic rights of all couples and individuals to decide freely and responsibly the number, spacing and timing of their children and to have the information and means to do so, and the right to attain the highest standard of sexual and reproductive health. It also includes the right to make decisions concerning reproduction free of discrimination, coercion and violence, as expressed in human rights documents." (ICPD Programme of Action, Paragraph 7.3)"

<sup>162</sup> From Singh et al (Adding it Up). Access to safe abortion and post-abortion care is included in the maternal health section.



contraception for women with unmet need, concluding that such access would avert 73 percent of unplanned births, 64 percent of induced abortions and 142,000 pregnancy-related deaths (Singh et al. 2004)<sup>163</sup>

Availability of contraception can also significantly reduce child deaths. Evidence from India and Nigeria suggests that extending the interval between births to 2 years can reduce under-five mortality by 19 percent and 11 percent, respectively. (Jones et al, 2003).<sup>88</sup> A recent analysis by Singh et al. for the UNFPA and the Alan Guttmacher Institute indicated that universal access to contraception could prevent 1.4 million infant deaths worldwide (Singh et al. 2004)<sup>163</sup>.

In addition to maternal and child health benefits, family planning improves the status of women by enabling them to participate more fully in education and in paid employment. Women who are able to control their fertility may have an increased sense of their own power in the community and in political life. As women gain time and freedom to become involved in social and political issues, they increasingly advocate for and take advantage of contraceptive services (Sen A. 1999).<sup>164[3]</sup>

### 3.2.3. Education

The Millennium Development Goal Target 3 aims to ensure that all girls and boys are able to complete universal primary by 2015. Progress towards the target is measured by the net enrolment ratio in primary education, the proportion of pupils starting grade 1 who complete grade 5 and the literacy rate among the 15-24 years age cohort. Progress towards universal completion in Sub-Saharan Africa has been extremely slow, and would need to be significantly accelerated to meet the goal of universal primary education by 2015, as seen by Figure 11. Of the 151 countries that reported data to UNESCO in 2000, 14 of the 18 countries that had net enrolment rates of less than 60 percent were in Sub Saharan Africa. In 2000, there were 44 million out-of-school children in Sub-Saharan Africa (UNESCO 2003)<sup>165</sup>. Of the 15 worst performing countries in terms of declining completion rates from 1990 till the most recent year, 12 were from Sub Saharan Africa (Bruns et al 2003).<sup>166</sup>

[FIGURE 11]

Even within countries, there are wide disparities in enrolment and completion based on gender, income and rural/urban differences. Filmer and Pritchett (1999) argue that the 'wealth gap' leads to a significant difference in the mean grade attainment of the rich and poor within countries, ranging from 1-3 years (Eastern/Southern Africa) to 9-10 years (South Asia). This is a clear illustration of the barriers of school-related expenses and

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<sup>163</sup> Singh et al. (2004) *Adding it up: the benefits of investing in sexual and reproductive health care.*

<sup>165</sup> UNESCO 2003. EFA Global Monitoring Report 2003/4, Gender and Education for All: The Leap to Equality. UNESCO: Paris.

<sup>166</sup> Bruns, B., A. Mingat and R. Rakotomalala. 2003. *Achieving Universal Primary Education: A Chance for Every Child.* The World Bank: Washington DC

opportunity costs that the poor face.<sup>167</sup> There are significant differences in enrolment and completion rates between urban and rural areas, with completion rates in rural areas often being half the completion rates in urban areas.<sup>168</sup>

Low rates of enrolment and completion are attributable to a wide range of causes. These can be grouped in the following five categories: lack of physical access to learning facilities (school related infrastructure such as classrooms, toilets, furniture, transportation facilities), lack of human resources (teachers with adequate training, especially women teachers, managerial and administrative staff, supervisors and evaluators), lack of uniforms, textbooks and other incidentals, low quality and relevance of curriculum and the lack of incentives and/or the presence of perverse incentives which dissuade families from sending their children to school. Interventions to increase school enrolment therefore need to focus on addressing all of the five categories to ensure that families have both the incentives, and the ability to send their children to school.

#### **(i) Education Infrastructure**

Evidence on high completion rates has been shown to be correlated to classroom sizes of approximately 40 children.<sup>169</sup> Given that in most developing countries, class sizes are significantly higher, this implies a significant increase in the provision of new classrooms. The World Bank has shown that countries have achieved far greater increases in enrolment than previously thought possible, just by building schools (and providing the accompanying furniture and blackboards). However, schools need to be close to where children live, especially in rural areas.<sup>170</sup> Providing rural schools within local communities has been shown to substantially increase girls enrolments in several African countries.<sup>171</sup> In regions with dispersed rural populations, other interventions may be necessary to provide access to schools; including provision of safe and secure transportation facilities, especially for girls.

Several complementary investments are needed to increase enrolment and attendance. Construction and rehabilitation of rural feeder roads is critical,<sup>172</sup> as is the provision of separate girls' toilets when they approach puberty (Herz and Sperling 2003)<sup>173</sup>. Experience across 30 African countries showed that where there were no private toilet facilities available at school, a majority of young women didn't attend school during their menstruation period due to the lack of ability to ensure personal hygiene (FAWE

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<sup>167</sup> Filmer, D. and L. Pritchett. 1999. "The Effect of Household Wealth on Educational Attainment Around the World: Demographic and Health Survey Evidence". *Population and Development Review* 25(1):85-120.

<sup>168</sup> Millennium Project. 2003. "Interim Report of the Task Force on Education." Millennium Project: New York

<sup>169</sup> Bruns, B., A. Mingat and R. Rakotomalala. 2003. *Achieving Universal Primary Education: A Chance for Every Child*. World Bank, Washington D.C.

<sup>170</sup> World Bank. 2003. "Education for All: Building the Schools." Education Notes:26889. World Bank, Washington D.C.

<sup>171</sup> Millennium Project. 2003. "Interim Report of the Task Force on Education." Millennium Project, New York

<sup>172</sup> Brenneman and Kerf. 2002. *Infrastructure and Poverty Linkages: A Literature Review*. World Bank, Washington D.C.

<sup>173</sup> Herz, B. and G. Sperling. 2003. "What Works in Girls' Education." Unpublished draft.

2001).<sup>174</sup> Similarly, provision of water has also shown to lead to increased school attendance.

**(ii) Human Resources**

Provision of trained teachers is potentially one of the most critical interventions to increase enrolment and more importantly, attendance and completion. Hiring, training and retaining teachers implies a financial cost; a cross section of high performing developing countries show optimum teachers salaries at a norm of 3.5 times GDP per capita. In many cases, retaining teachers in rural areas may require an additional financial incentive, and other incentives such as teachers housing.<sup>175</sup>

In order to increase girls' enrolment and retention, a special focus is also needed on hiring women teachers, who provide useful role models for girls, but also, more critically, for ensuring safety at school.<sup>176</sup> Investments in non-teaching staff, especially administrative staff, teacher trainers, and education officials are also important to improve the quality of education being provided, to interface with parents and local communities and involve them in decision making and to help monitor school performances.

**(iii) Uniforms and Learning Materials**

Studies have shown that the provision of school textbooks and uniforms can have a significant impact on schooling, attendance and learning outcomes; a series of such studies prompted the World Bank to recommend textbook provision as an urgent priority for increasing enrolment and completion (Lockheed and Verspoor 1991)<sup>177</sup>. More recent studies have shown similar increases in enrolment with the provision of free uniforms that are otherwise unaffordable for poor families (Kremer forthcoming)<sup>178</sup>.

**(iv) Curriculum Reform**

Appropriate curriculum, including skills and vocational training, together with specific education on nutrition, HIV/AIDS, health, gender equality and hygiene practices is also important. The curriculum needs to be in the local language of the community and relevant to their immediate needs and contexts for children to be engaged. It also needs to focus on cognitive development in order for provision of quality education (Millennium Project 2003)<sup>179</sup>.

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<sup>174</sup> FAWE. 2001. "Girls Education and Poverty Eradication: FAWE's Response". Presentation to the Third United Nations Conference on the Least Developed Countries, Brussels, Belgium.

<sup>175</sup> United Republic of Tanzania. 2000. Education Sector Development Plan.

<sup>176</sup> In Cameroon, for example, UNICEF reports that teachers had had sexual relations with 27 percent of the girls surveyed (UNICEF 2002)<sup>176</sup>. Data from several countries suggests a positive correlation between gender parity in enrolment and proportion of female teachers (Herz et al 1995). Herz, B., K. Subbarao, M. Habib and L. Raney. 1995. "Letting Girls Learn: Promising Approaches in Primary and Secondary Education" World Bank Discussion Papers. World Bank, Washington D.C.

<sup>177</sup> Lockheed, M.E., A.M. Verspoor & associates. 1991 *Improving primary education in developing countries*. World Bank: Washington DC

<sup>178</sup> Kremer, M, forthcoming. "Randomized Evaluations of Educational Programs in Developing Countries: Some Lessons," *American Economic Review Papers and Proceedings* (forthcoming).

<sup>179</sup> Millennium Project. 2003. "Interim Report of the Task Force on Education." Millennium Project, New York

**(v) Additional Incentives for Primary Education Completion**

Children from poor families are often unable to attend school due to the high direct and opportunity costs of attending school. Direct costs include school fees, cost of books, materials and uniforms. These costs can be a significant barrier for poor households for whom education costs could be as high as 20 percent of household income (Herz et al 1995)<sup>180</sup>. Eliminating school fees has led to a very high increase in enrolment, especially for girls, in several countries such as Kenya, Tanzania and Uganda. (World Bank 2002)<sup>181 182</sup>.

However, for particularly vulnerable groups, removal of direct costs of schooling is not enough; the opportunity costs of attending school are also very high. The value of time spent in household chores for young girls is extremely valuable; these include care of young children and the ill, collecting wood and water, cleaning and cooking and helping in agricultural activities (Herz et al 1995)<sup>183</sup>. In such cases, it may be necessary to provide a subsidy or financial grant that compensates families for the lost wages. Scholarships or stipends for children from low income families and girls have been shown to increase enrolment, particularly in rural areas (World Bank 2001)<sup>184</sup>.

These need to be coupled with the provision of water sources and energy services that reduce the time spent by girls on household activities. As a result, school enrolment and literacy rates can be increased through electrification programs, as demonstrated by several empirical studies cited in Brenneman (2002)<sup>185</sup>.

Conditional cash transfers are another way to incentivize school attendance. Such programs directly subsidize families only when the families keep the children in school. Such programs have had well-documented results in Mexico, Brazil and Bangladesh and enrolments have increased by 20 percent for girls and 10 percent for boys (Morley and Coady 2003)<sup>186</sup>. School feeding programs and take home food rations have also been documented to increase both school enrollment and attendance, and in some cases, learning outcomes as well.<sup>187</sup>

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<sup>180</sup> Herz, B., K. Subbarao, M. Habib and L. Raney. 1995. "Letting Girls Learn: Promising Approaches in Primary and Secondary Education" World Bank Discussion Papers. World Bank, Washington D.C.

<sup>181</sup> World Bank. 2002. "Education for Dynamic Economies: Action Plan to Accelerate Progress towards Education for All". World Bank, Washington D.C.

<sup>182</sup> UNESCO. 2000. Dakar Framework For Action 2000. Available at [http://www.unesco.org/education/efa/ed\\_for\\_all/dakfram\\_eng.shtml](http://www.unesco.org/education/efa/ed_for_all/dakfram_eng.shtml)

<sup>183</sup> Herz, B., K. Subbarao, M. Habib and L. Raney. 1995. "Letting Girls Learn: Promising Approaches in Primary and Secondary Education" World Bank Discussion Papers. World Bank, Washington D.C.

<sup>184</sup> World Bank 2001. Engendering Development. World Bank Policy Research Report. World Bank, Washington D.C.

<sup>185</sup> Brenneman, A. 2002. Exemples de Liens Infrastructure-Pauvrete – Le Cas de l'Energie. Extraits de litterature. World Bank, Washington D.C.

<sup>186</sup> Morley S. and D. Coady. 2003. From Social Assistance to Social Development: Targeted Education Subsidies in Developing Countries. Center for Global Development/International Food Policy Research Institute: Washington DC

<sup>187</sup> IFPRI 2001. "Food for Education: Feeding Minds Reduces Poverty". IFPRI: Washington DC

Finally recent studies have shown that if a secondary school exists close by, parents are more willing to send their children to primary school because they believe that the real returns from education begin at the secondary level (Herz et al 1995)<sup>188</sup>. This implies that increasing provision of secondary education may spur primary school completion.

Achieving the goal of universal primary education requires a range of complementary interventions in other sectors that contribute to building human capital.

While there continue to be technical challenges to establishing causal links (Behrman 1996)<sup>189</sup> between health and educational achievement, recent evidence suggest that poor health does in fact hinder education by hampering cognitive abilities and limiting attendance rates. (Bhargava 1997)<sup>190</sup> (Kremer and Miguel (2003))<sup>191</sup>

The AIDS epidemic is further affecting educational attainment in Sub-Saharan Africa. The rapidly growing orphan population has been shown to be twice as likely to drop out of school than non-orphans (Subbarao et al. 2001).<sup>192</sup> Moreover, the AIDS epidemic is also affecting the supply of education on Sub-Saharan Africa through the loss of teachers.<sup>193</sup> Teacher productivity is also diminished by the disease: in a recent modeling exercise, Bruns et al. estimate that on average teachers would be absent 26 days per year on account of AIDS in Sub-Saharan Africa (Bruns 2003)<sup>194</sup>. Interventions to stem and reverse the spread of HIV/AIDS therefore will contribute to the education goal.

#### 3.2.4. Urban Infrastructure and Slum Upgrading

The prevalence of urban poverty in Sub-Saharan Africa is the highest in the world, and in contrast to many large cities in Asia and Latin America, African cities do not tend to have sizable manufacturing and service sectors beyond the informal sector. As a result these cities do not create formal employment at the scale that is necessary to significantly reduce urban poverty.

Target 11 of the MDGs calls for achieving a “significant improvement in the lives of at least 100m slum dwellers” by 2020. UN-Habitat (2003)<sup>195</sup> estimates that around 160 million people or 77 percent of the urban population in Sub-Saharan Africa are classified

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<sup>188</sup> Herz, B., K. Subbarao, M. Habib and L. Raney. 1995. “Letting Girls Learn: Promising Approaches in Primary and Secondary Education” World Bank Discussion Papers. World Bank, Washington D.C.

<sup>189</sup> Behrman, Jere. 1996. “The Impact of Health and Nutrition on Education,” *World Bank Research Observer*, 11(1), 23-37.

<sup>190</sup> Bhargava, A and others. 2001. “Modeling the Effects of Health Status and the Educational Infrastructure on the Cognitive Development of Tanzanian School Children ” CMH Working Paper Series. World Health Organisation, Geneva.

<sup>191</sup> Kremer, M. “Randomized Evaluations of Educational Programs in Developing Countries: Some Lessons,” in *American Economic Review Papers and Proceedings* (forthcoming).

<sup>192</sup> Subbarao, K. Angel Mattimore, and Kathrin Plangemann, 2001. “Social Protection of Africa’s Orphans and Other Vulnerable Children.” Human Development Working Paper. World Bank, Washington D.C.

<sup>193</sup> Kelly, Michael. “The Impact of HIV/AIDS on Schooling in Zambia” JCTR Bulletin. 42. Available at <http://www.jctr.org.zm/bulletins/impact%20of%20AIDS%20on%20educa.htm>.

<sup>194</sup> Bruns, B, A. Mingat, R. Rakotomalala. 2003. “Achieving Universal Primary Education by 2015: A Chance for Every Child”. World Bank, Washington, D.C.

<sup>195</sup> UN-HABITAT (United Nations Human Settlements Program). 2003. “The Challenge of Slums – Global Report on Human Settlements 2003.” UN-HABITAT, Nairobi.

as “slum dwellers”. On current trajectories, the number of slum dwellers is expected to double during the next generation<sup>196</sup>.

Since Sub-Saharan Africa has 18 percent of the total slum population in developing countries (based on UN-Habitat 2003)<sup>197</sup>, the target can be interpreted as requiring an improvement in the lives of 18 million people. As such it would neither be ambitious, nor could it be easily monitored, since people tend to move in and out of slums frequently. The Millennium Project therefore proposes the following interpretation of the Target: “By 2020, improve substantially the lives of at least 100 million slum dwellers while preventing the formation of new slums”<sup>198</sup>.

A key distinction from rural strategies is the paramount importance of attracting foreign direct investment in manufacturing or service industries and to support the development of strong domestic companies. Hence in addition to providing a supportive policy environment, urban centers in Africa need to ensure that adequate transport, energy, water, and other infrastructure is available to support the private sector.

Meeting the Target and providing the base for private sector led growth in the urban areas requires of course that necessary investments be made to achieve the health, education, water and sanitation MDG targets in urban areas. More specifically, an integrated strategy of urban planning and design is needed to provide (i) improved security of tenure, (ii) adequate housing, (iii) urban infrastructure and basic services.

To execute this strategy of urban planning and design, important investments in the institutional and organizational capacity of local authorities as well as capacity building among community organizations will be required.

### **(i) Security of Tenure**

Improving security of tenure describes a continuum of legal statuses (Durand-Lasserve and Royston 2002<sup>199</sup>, Millennium Project 2004<sup>200</sup>) 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. It can yield substantial improvements in the lives of slum dwellers (UN Habitat 2003<sup>201</sup>). Strategies for improving the security of tenure of slum dwellers may consist of: passing and enforcement of anti-eviction legislation; reform of tenure legislation; interventions to

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<sup>196</sup> Available evidence suggests that official statistics and surveys tend to systematically underestimate the extent of urban poverty (Satterthwaite 2004).

<sup>197</sup> UN-HABITAT (United Nations Human Settlements Program). 2003. “The Challenge of Slums – Global Report on Human Settlements 2003.” UN-HABITAT, Nairobi.

<sup>198</sup> This interpretation of the Target is equivalent 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)

<sup>199</sup> Durand-Lasserve, A. and L. Royston (eds.). 2002. *Holding their Ground: Secure Land Tenure for the Urban Poor in Developing Countries*. Earthscan. London.

<sup>200</sup> Millennium Project. 2004. Interim Report of Task Force 8 on Improving the Lives of Slum Dwellers. New York.

<sup>201</sup> UN-Habitat (United Nations Human Settlement Programme). 2003. *The Challenge of Slums: Global Report on Human Settlements 2003*. Earthscan. London.

provide slum dwellers with recognized addresses; strengthening of land management systems, and legal protection of slum dwellers and enforcement of their rights.

**(ii) Housing and Shelter**

Inadequate housing is a key determinant of slums and a critical cause of ill health in urban areas. Upgrading or reconstruction of housing typically requires improved security of tenure. While slum dwellers can often mobilize significant resources if access to credit is available, targeted subsidies may be required to upgrade the housing stock in slums.

**(iii) Urban Infrastructure and Basic Services**

Urban infrastructure and basic services need to be provided to improve the lives of slum dwellers and to ensure the appropriate management of cities. Of particular concern here are transport services. For example, Howe and Bryceson (2000)<sup>202</sup> showed that walking accounts for 80 to 90 percent of transport among the urban poor in East Africa. To reduce the transport burden of the urban poor investments in footpaths, bicycle lanes, urban roads as well as public transport systems are required.

Urban water supply and sanitation technologies differ from those employed in rural areas. In the case of water supply, a greater emphasis needs to be placed on household connection and standpipes since wells are often more difficult to operate and less hygienic in dense urban settlements. Sanitation systems can be broadly separated into (i) networked sewered technologies, which rely on a centralized trunk infrastructure combined with off-site waste disposal, and (ii) decentralized systems, such as simple pit latrines, ventilated improved pit latrines, and septic tanks. In densely populated urban areas a greater need exists for networked sanitation systems, which tend to be more expensive.

In addition, urban areas often require improved wastewater and sewage treatment to reduce nutrient loads in freshwater ecosystems and to treat industrial effluents to reduce water pollution (Showers 2002)<sup>203</sup>. Waste stabilization ponds offer a cost-effective treatment technology in warmer climates, but they require a lot of open space, which may be in short supply in urban areas. It is particularly important in urban areas to allocate proper human and financial resources to the operation and maintenance of water supply and sanitation infrastructure, including the regular emptying of pit latrines and other decentralized sanitation systems. Annual O&M requirements can amount to 5-10 percent of the initial capital cost.

Access to electricity in urban areas remains very low at 51.3 percent (IEA 2002)<sup>204</sup>. Even people who have access to electricity continue to lack access to modern energy services for cooking and heating. Several studies have documented that improving access to

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<sup>202</sup> Howe, J. and D. Bryceson. 2000. "Poverty and urban transport in East Africa: review of research and Dutch donor experience." A report prepared for the World Bank. International Institute for Infrastructural and Environmental Engineering. Delft.

<sup>203</sup> Showers, K. 2002. "Water Scarcity and Urban Africa: An Overview of Urban-Rural Water Linkages." *World Development*. 30(4).

<sup>204</sup> IEA (International Energy Agency). 2003. *World Energy Outlook 2002*. Paris.

energy can reduce poverty. For example, Lanjouw et al. (2001)<sup>205</sup> estimate the impact of electrification on poverty in Tanzania. They find non-agricultural income in peri-urban areas with access to electricity to be 109 times higher than in surrounding villages that were not electrified.

In summary, specific urban infrastructure and services that need to be provided to meet the MDGs include: solid waste disposal; fire protection services; policing and security services; improving access to credit for slum dwellers and their communities; community facilities, including local markets; storm water drainage; adequate transportation infrastructure (footpaths, kerbing and roads) and transport services; and street lighting.

### *3.2.5. Science and Technology*

To meet Target 18 of the MDGs countries should, “In co-operation with the private sector, make available the benefits of new technologies, especially information and communications”. The two components of the Target call for improving policies and institutions for science and technology, as well as specific investments in information and communication technology (ICT).

Institutions for science advice, research and higher education need to be strengthened across all countries in Sub-Saharan Africa reap the potential benefits of science and technology. The necessary policies and institutions go beyond the scope of this paper and are described in Millennium Project (2004)<sup>206</sup>.

In addition to science and technology institutions ICT is a critical input for achieving many of the MDGs (c.f. Brenneman and Kerf 2002)<sup>207</sup>. 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. (World Bank 2000)<sup>208</sup>

Since virtually all infrastructure for mobile phones is privately financed, the data suggests that no public investments are needed for voice traffic over mobile phones. However, wireless technology is unlikely to be able to cope with rising demand for voice and data traffic between metropolitan centers and across countries. Hence existing wireless networks will need to be complemented by expanded fixed-line communication infrastructure, such as fiber cable. In the near future such investments will not yield a positive financial return and are therefore unlikely to be privately financed. A key constraint is the low population density in Sub-Saharan Africa, low demand for communication services and the lack of international fiber optics backbone infrastructure. For this reason public investments in international and trunk telecommunication infrastructure are likely to be necessary to meet the MDGs.

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<sup>205</sup> Lanjouw, P, J. Quizon, R. Sparrow. 2001. Non-agricultural earnings in peri-urban areas of Tanzania: evidence from household survey data. *Food Policy*. 26(2001): 385-403.

<sup>206</sup> Millennium Project. 2004. “Interim Report of Task Force 10”. Millennium Project, New York.

<sup>207</sup> Brenneman, A. and M. Kerf. 2002. “Infrastructure & Poverty Linkages. A Literature Review.” World Bank, Washington D.C.

<sup>208</sup> World Bank. 2000. “Can Africa Claim the Twenty-First Century? World Bank, Washington D.C.



### *3.2.6. Gender Equity*

The Millennium Development Goal 3 aims at promoting gender equality and empowering women. The recommended target for the goal is gender parity in primary, secondary and tertiary education. A range of interventions, as discussed above, is needed to meet this target. As discussed in Section 3.1, interventions to ensure gender equity form an essential part of all sector-specific interventions, which have been outlined in the previous sections. The following section recapitulates some of the main interventions and presents evidence on how they lead to improved outcomes for women. In addition, it discusses overarching interventions that cut across sectors and are equally essential for achieving gender equity.

Throughout Africa, women and young girls continue to face discrimination in a number of ways. Exclusion begins in early childhood, with differential access for boys and girls to both nutritional intake and basic health services, which leads to both, higher rates of malnourishment and in many countries, higher rates of female child mortality. Girls also face barriers to access to education at the primary level and particularly at the secondary level. This hinders their ability to transition to formal work, though especially in the lower income categories, they contribute to household incomes through participation in the informal sector. Early age of marriage and lack of access to reproductive health services contribute to high fertility rates, high rates of maternal mortality and morbidity. They are excluded, often systematically, from access and ownership of assets and from representation in political and other decision-making bodies.

These various exclusions, which reflect human poverty, are compounded by the time poverty of women through their multiple responsibilities of household chores, reproductive and care responsibilities and contributions to household incomes. In addition, violent abuse against women, both from an intimate partner and from society violate the most basic human rights of safety and security and hinder progress towards all of the other goals. Gender inequality is pervasive across much of the developing world; but, as seen in Table 15, Sub-Saharan Africa stands out in its poor gender-related health indicators.

[TABLE 15]

Efforts to empower women require sector-specific interventions that target women and specifically address their special needs. However, a broader spectrum of actions is also needed, including legislation that protects the rights of women to equal access and opportunities and institutional structures that allow women and women's organizations the space to be part of decision making processes. Underlying all of these efforts is the long-term change in social and cultural norms that are critical for all of the interventions to be successful and sustainable.

**Education:** Provision of primary and secondary education is correlated to the empowerment of women by giving them the skills to improve their own, and their families wellbeing, as reflected in increased income earning potential, ability to bargain

for resources with the household, control over their fertility and increased participation in public and domestic decision making (Malhotra et al 2003).<sup>209</sup> Higher levels of education increase the probability that women will undertake formal paid employment (Birdsall and Behrman 1991; Cameron)<sup>210</sup>. Higher levels of employment increase the gains for women from formal labor force participation more so than they do for men (Deolalikar 1994).<sup>211</sup> Further, women appear to receive higher returns to secondary education (18 percent) as compared to men (4 percent). (Psacharopoulos and Patrinos 2002)<sup>212</sup>

**Reproductive health rights and services:** Interventions to ensure access to sexual and reproductive rights and services include legislation that delays the age of marriage, legislation and delivery services that provide access to family planning services and safe abortion, and awareness campaigns that inform women about their rights and ways of accessing these services.

Legislation that delays the age of marriage is critical in both increasing opportunities to complete secondary schooling, decreasing the risks of pregnancy and improving health outcomes. Studies show that early marriage reduces the access of girls to education; further the expectation of marriage creates a disincentive to educate girls at all (Huq and Amin 2001)<sup>213</sup>.

**Health:** All interventions related to improving child and maternal health necessarily improve health outcomes for women, as outlined below. In the case of infectious diseases, especially HIV/AIDS, special efforts need to be made to ensure that prevention and treatment interventions reach women. Experience with provision of treatment to prevent Mother to Child Transmission has shown that even when the drugs are available, women choose not to access them because the stigma associated with HIV is more severe for women (Nyblade et al 2003).<sup>214</sup>

**Infrastructure:** Women's time poverty is a key driver of gender inequality in Sub-Saharan Africa. Poor access to infrastructure and related services, including transport, energy, water and sanitation requires household members to spend long times each day to carry out basic tasks, as discussed in Sections 3.2.2-3.2.4 above. Household surveys report that 87 percent of trips in rural Africa take place on foot and that women devote

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<sup>209</sup> Malhotra, A., Pande, R. and Grown, C. 2003. "Impact of Investments in Female Education on Gender Equality." ICRW, Washington, D.C.

<sup>210</sup> Birdsall, N. and J. Behrman. 1991. "Why do males earn more than females in urban Brazil: Earnings discrimination or job discrimination?" In N. Birdsall and R. Sabot, eds. *Unfair Advantage: Labor Market Discrimination in Developing Countries*. World Bank, Washington, D.C.

<sup>211</sup> Deolalikar, A. 1994. "Gender differences in the returns to schooling and in school enrollment rates in Indonesia." *Journal of Human Resources* 28(Fall): 889-932.

<sup>212</sup> Psacharopoulos, G. and H.A. Patrinos. 2002. "Returns to Investment in Education: A Further Update." World Bank Policy Research Working Paper No. 2881. Washington, D.C.

<sup>213</sup> Huq, L. and S. Amin. 2001. "Dowry Negotiations and the Process of Union Formation in Bangladesh: Implications of Rising Education." Unpublished manuscript.

<sup>214</sup> Nyblade, L. et al. 2003. *Disentangling HIV and AIDS Stigma in Ethiopia, Tanzania and Zambia*. Washington, DC: ICRW (International Center for Research on Women) and CHANGE

more than 65 percent of the household time and effort spend on transport (Malmberg-Calvo 1998)<sup>215</sup>. The daily transport effort of a typical adult woman was equivalent to carrying a load of 20 kg for 1.4-5.3 km and took 1.0 to 2.7 hours (Barwell 1996)<sup>216</sup>.

While the specific demand on women's time vary from household to household, basic investments in infrastructure can alleviate time poverty considerably. Improved feeder roads and footpaths can reduce travel time and permit the use of handcarts or bicycles, thus allowing women to transport more goods with less effort.

Improving access to water and sanitation reduces time spent on fetching water, which largely accrue to women and young girls who carry out most of the transport tasks in Sub-Saharan Africa. Malmberg-Calvo (1994)<sup>217</sup> reports household time savings resulting from improved access to water supply of 100-120 minutes per day. The time saving means that young girls in particular have more time to study or be economically active. Once the distance to the nearest water source falls below a walking distance of 15 minutes or 1km, the consumption of water per household member increases (Malmberg-Calvo 1994, Cairncross 1990)<sup>218</sup> thus improving the hygiene and health of the household as a whole.<sup>219</sup>

Rural electrification has shown to have a powerful impact on womens ability to lead a more balanced life; in particular access to electricity increases the amount of time reading which has implications for their ability to improve educational outcomes (Barnes and Sen, forthcoming)<sup>220</sup>

The provision of improved cookstoves can reduce fuelwood demand by up to 30 percent with an equivalent reduction in time and effort spent on collection (Malmberg-Calvo 1994)<sup>221</sup>. A shift to modern fuels, such as liquid petroleum gas (LPG) or photovoltaic panels, could further reduce the time spent on collecting firewood.

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<sup>215</sup> Malmberg-Calvo, Christina. 1998. "Options for Managing and Financing Rural Transport Infrastructure." World Bank Technical Paper No.411. World Bank, Washington D.C.

<sup>216</sup> Barwell, Ian. 1996. "Transport and the Village: Findings from African Village-Level Travel and Transport Surveys and Related Studies." World Bank Discussion Paper No. 344. World Bank, Washington D.C.

<sup>217</sup> Malmberg-Calvo, C. 1994. "Case Study on the Role of Women in Rural Transport: Access of Women to Domestic Facilities." SSATP Working Paper No. 11. World Bank, Washington D.C..

<sup>218</sup> Cairncross S, 1990. "Health aspects of water and sanitation." In Kerr C, ed. *Community health and sanitation*. London, Intermediate Technology Publications.

<sup>219</sup> In the absence of improved sanitation facilities, women and young girls are often forced get up before dawn to defecate. Leaving their house at night can further expose them to harassment or violence. In such situations, providing toilets has been shown to lead to substantial improvements in women's safety while at the same time shortening their work days considerably.

<sup>220</sup> Barnes, D. and M. Sen. Forthcoming. "The Impact of Energy on Women's Lives in Rural India." Washington, DC: UNDP/World Bank Energy Sector Management Assistance Programme.

<sup>221</sup> Malmberg-Calvo, C. 1994. Case Study on the Role of Women in Rural Transport: Access of Women to Domestic Facilities. SSATP Working Paper No. 11. World Bank, Washington D.C.

**Property Rights:** Equal access to property rights for land and other assets is critical on the counts of increase welfare (Chadha 1992, Quisumbing and Maluccio 2000)<sup>222</sup> and empowerment (Agarwal 2002)<sup>223</sup>. Access to land rights leads to enhanced bargaining power, increased economic potential and security and increased role in decision making within the family.

**Participation:** Another area of action is around increased participation by women at all levels of government. Increased female participation in the political system has been shown to be associated with lower corruption levels (Kaufmann et al 1999)<sup>224</sup> and with policies sensitive to women's needs, especially at the local level (Chattopadhyay and Duflo 2001)<sup>225</sup>. Gender quotas and reservations have been shown to be the most effective ways of increasing women's representation in political bodies (Millennium Project 2003)<sup>226</sup>

In addition to political representation, women's organizations at the grassroots level can be a powerful mechanism for ensuring that their voice gets heard and reflected in the design and implementation of projects at the local level. It has been found in the water sector for example, that women's participation was among the variables most strongly associated with project effectiveness (Fong et al 1996)<sup>227</sup>. A World Bank review also found that the success rates of its projects which included gender goals were higher than those that did not, underlining the need to involve women from the planning and design stage to the implementation and monitoring stage (World Bank 1997)<sup>228</sup>

### *3.2.7. Cross-National Transport and Energy Infrastructure*

The sets of interventions outlined above fall predominantly under the purview and responsibilities of individual governments. A particular challenge in Sub-Saharan Africa is the extremely low level of investment in cross-country and continent-wide infrastructure, which hamper intra-African trade and pose a major constraint towards attracting private foreign direct investment in the continent. The corresponding investment needs have been a priority for the African governments participating in the

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<sup>222</sup> Quisumbing, A.R. and J. Maluccio. 2000. "Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries." FCND Discussion Paper No. 84. Washington, DC: IFPRI (International Food Policy Research Institute).

<sup>223</sup> Agarwal, B. 2002. *Are We Not Peasants Too? Land Rights and Women's Claims in India*. SEEDS Volume 21. New York, NY: Population Council

<sup>224</sup> Kaufmann, D., A. Kraay and P. Zoido-Lobaton. 1999. "Governance Matters." Policy Research Working Paper 2196. World Bank, Washington D.C.

<sup>225</sup> Chattopadhyay, R. and E. Duflo. 2001. "Women as Policy Makers: Evidence from a India-Wide Randomized Policy Experiment." NBER Working Paper No. w8615. Cambridge, MA: National Bureau of Economic Research.

<sup>226</sup> Millennium Project 2003. "Interim Report of the Task Force on Gender Equality." Millennium Project, New York.

<sup>227</sup> Fong, M.S., W. Wakeman, and A. Bhushan. 1996. "Toolkit on Gender in Water and Sanitation." Gender Toolkit Series No. 2. World Bank, Washington, D.C.

<sup>228</sup> World Bank. 1997. "Mainstreaming Gender in World Bank Lending: An Update". Report No. 16409, Operations Evaluation Department. World Bank, Washington D.C.

New Partnership for Africa's Development (NEPAD) since its inception (NEPAD 2003)<sup>229</sup>.

**(i) Transport infrastructure**

Studies consistently show that transport costs in Sub-Saharan Africa are extremely high. For example, between 1986 and 1988 long-distance freight transport tariffs in Francophone West Africa were over five times higher than comparable tariffs in Pakistan, India, and Vietnam (Rizet and Hine 1993)<sup>230</sup>. More recent studies suggest that long distance freight rates in Tanzania are three times higher than in Indonesia with much less variation observed across Sub-Saharan Africa (Hine and Ellis 2001)<sup>231</sup>. The overall economic impact of high transport costs on trade within Africa and with other continents is also severe. In their analysis of intra-African trade flows Limao and Venables (1999)<sup>232</sup> estimate an elasticity of trade flows with respect to transport costs of 2.5, implying that halving transport costs could increase the volume of transport by a factor of five.

Excluding South Africa, Sub-Saharan Africa's density of railroads is only 2.1km per 1000 km<sup>2</sup> compared to 17.4 km per 1000 km<sup>2</sup> in South Asia (calculated from International Railway Statistics 2003)<sup>233</sup>. In addition to low per capita densities of transport infrastructure, the rail and road transport systems in Sub-Saharan Africa were largely designed under colonial rule to transport natural resources to the nearest port for export to Europe. Hence international surface transport connections within Africa tend to be extremely poor. For example, no railroad connections existed between the former British and French-administered countries (Howe 1975)<sup>234</sup>.

No cross-country data exists on the capacity and state of ports across Sub-Saharan Africa, but available case studies suggest important capacity constraints. In particular the capacity to process containerized shipments is limited in most ports. While urgent investments are required in rail and port infrastructure, the lack of data makes it difficult to quantify the needs.

**(ii) Energy infrastructure**

Most countries across Sub-Saharan Africa need to invest in petroleum refining, storage and distribution infrastructure, including pipelines to lower transport costs and ensure the continuous availability of fuel in all parts of the region. In particular cross-country energy infrastructure for the export of electricity, oil and gas within each region needs to be

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<sup>229</sup> NEPAD (New Partnership for Africa's Development). 2003. Infrastructure Short-Term Action Plan (SATP): Review of Implementation Progress and the Way Forward.

<sup>230</sup> Rizet C. and J. Hine. 1993. A Comparison of the Costs and Productivity of Road Freight Transport in Africa and Pakistan. *Transport Reviews*, Vol. 13, No. 2

<sup>231</sup> Hine, J.L. and S.D. Ellis. 2001. "Agricultural Marketing and Access to Transport Services." TRL Limited

<sup>232</sup> Limao, N. and A.J. Venables (1999) Infrastructure, Geographical Disadvantage and Transport Costs. Mimeo. Department of Economics London School of Economics. Cited in Booth, D., L. Hanmer, E. Lovell. 2000. Poverty and Transport. Overseas Development Institute. London.

<sup>233</sup> International Railways Statistics. 2003. Available at [http://www.uic.asso.fr/d\\_stats/stats\\_en.html](http://www.uic.asso.fr/d_stats/stats_en.html).

<sup>234</sup> Howe, J. 1975. "The Future of Surface Transport in Africa." *African Affairs*. 74(296): 314-325.

improved (c.f. EIA 1999)<sup>235</sup>. An important example is the West African Gas Pipeline (WAGP), which will transport gas from Nigeria to Benin, Ghana, Togo. The EIA cites a studies from Chevron and the World Bank, according to which the pipeline can create 10,000 to 20,000 primary sector jobs and generate energy cost savings of \$500 million over a 20-year period in the importing countries (EIA 2003)<sup>236</sup>. According to the World Bank study, Ghana could save between 15,000-20,000 barrels per day of crude oil by taking gas from the WAGP to run its power plants. In East Africa, a planned \$80 million Kenya-Uganda oil pipeline connecting Mombassa to Kampala is expected to cut fuel prices in Uganda by nearly 50 percent (WEC 2004)<sup>237</sup>.

Using today's technologies, East Africa has the potential to produce 2,500MW of energy from geothermal power compared with a total installed capacity of 65MW (Business Council for Sustainable Energy 2003)<sup>238</sup>. For comparison the combined electricity generation capacity of Djibouti, Eritrea, Ethiopia, Kenya, Tanzania, and Uganda is 2,448MW (EIA 2003)<sup>239</sup>. Capital costs of geothermal energy plants are \$2-3 million per MW<sup>240</sup>. Hence exploiting East Africa's geothermal energy potential might require investments of approximately \$5-7 billion.

### **3.3. MDG Needs Assessment: Ghana, Tanzania, and Uganda**

#### *3.3.1. Needs assessment methodology*

Our needs assessment methodology follows the five steps outlined in Figure 5 (Section 3.1):

#### **Step 1: Develop list of interventions**

Drawing on the work of the Millennium Project Task Forces and existing sector-specific intervention models<sup>241 242 243 244 245 246</sup>, we have developed a detailed list of interventions

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<sup>235</sup> EIA (Energy Information Administration). 1999. Energy in Africa. Washington D.C.: EIA.

<sup>236</sup> EIA (Energy Information Administration). 2003. West African Gas Pipeline (WAGP) Project. Available at <http://www.eia.doe.gov/emeu/cabs/wagp.html>.

<sup>237</sup> WEC (World Energy Council). 2004. <http://www.worldenergy.org/wec-geis/publications/reports/africa/cooperation/east.asp>

<sup>238</sup> Business Council for Sustainable Energy. 2003. Eastern Africa Geothermal Market Acceleration Conference – Market Acceleration Report 2003. Washington D.C.

<sup>239</sup> EIA (Energy Information Administration). 2003. available at <http://www.eia.doe.gov/pub/international/iealf/table64.xls>.

<sup>240</sup> Personal communication Vijay Modi, Columbia University.

<sup>241</sup> Bruns, B, A. Mingat, R. Rakotomalala. 2003. "Achieving Universal Primary Education by 2015: A Chance for Every Child". World Bank, Washington D.C.

<sup>242</sup> World Bank. 2002. "Achieving Education for All by 2015: Simulation Results for 47 Low Income Countries." Human Development Network, Africa Region and Education Department. World Bank, Washington D.C.

<sup>243</sup> Delamonica, Enrique, Santosh Mehrotra and Jan Vandermoortele. (2001). "Is EFA Affordable? Estimating the Global Minimum Cost of 'Education for All.'" Innocenti Working Paper No. 87. Florence: UNICEF Innocenti Research Center.

<sup>244</sup> FAO. 2002. "Anti-Hunger Programme: Reducing Hunger through Sustainable Agricultural and Rural Development and Wide Access to Food." First Draft. FAO, Rome.

<sup>245</sup> CMH (Commission on Macroeconomics and Health). 2001. *Macroeconomics and Health: Investing in Health for Economic Development*. World Health Organization, Geneva.

required for the MDG production function, as summarized in Annex I.<sup>247</sup> In developing detailed lists of interventions, we aimed to address all required investments while avoiding double counting of interventions. Local unit costs were used wherever possible. Where these were not available, we used regional proxies. In some cases, current unit costs are assumed to increase over current levels to achieve the intervention targets. Thus, health worker salaries were doubled from the national baseline to recruit and retain sufficient numbers of doctors and nurses by 2015.

### **Step 2: Specify targets for each set of interventions**

Wherever possible, coverage 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. Referring to the theoretical section above, we assume these targets to serve as capital stock  $k_{MDG}$ . In cases where no international consensus on targets exists, the Millennium Project secretariat worked with the Task Forces to derive targets analytically. For example, best available evidence suggests that the provision of integrated child health interventions to 99 percent of the population in need would reduce child mortality by approximately two thirds as required to meet the child health MDG Target. Consequently we recommend that countries adopt a 99 percent coverage target for those interventions.

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)<sup>248</sup> medium population forecasts have been used. In cases where more recent data is available at the country level, we used this in lieu of the UN estimates.

### **Step 3: Estimate synergies across interventions**

It is likely that over time some interventions will reduce resource requirements for others. 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.

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<sup>246</sup> Global Water Partnership. 2000. "Towards Water Security: A Framework for Action." Paper prepared for the Second World Water Forum, 17-22 March, The Hague.

<sup>247</sup> Additional details on these interventions are available at Millennium Project (2004).

<sup>248</sup> UN (United Nations). 2003. *World Population Prospects 1950- 2050: The 2002 Revision*. Database. Department of Economic and Social Affairs, Population Division. United Nations, New York.

Despite these data limitations we felt it important to include potential cost savings resulting from synergies across interventions. We have therefore identified links across and within sectors that 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. 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 that can be realized through implementing this integrated package of investments.

#### **Step 4: Develop investment model and estimate resource requirements**

Using the country-specific intervention lists and targets, we approximate an MDG production function by projecting the gradual scaling up of investments and resource requirements<sup>249</sup>. A number of critical assumptions and choices have been made with respect to the financial analysis. First, our models calculate capital as well as operating costs of meeting the MDGs. 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. Second, the analysis is based on *total* rather than *incremental* costs for required interventions. 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.

Third, since marginal costs cannot be observed and data that could be used to estimate them is extremely sparse, we use average rather than marginal costs. Average costs might be expected to differ from marginal costs for several reasons. While marginal costs may rise as services are extended to increasingly hard to reach populations, the scaling-up of interventions can also yield improvements in delivery mechanisms, technologies, and operational management that decrease marginal costs. The dearth of examples of large

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<sup>249</sup> 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.



scaling-up of interventions in Sub-Saharan Africa makes it very difficult to predict how these evolve over time. We have, however, allowed for differential marginal costs by (i) disaggregating target populations based on relative unit costs (e.g. urban vs. rural populations for water and sanitation, transport infrastructure and energy services), and (ii) including interventions that specifically target hard-to-reach population, such as subsidies for girls' education.

Fourth, we use financial cost estimates without discounting or annualizing future expenditures as opposed to economic cost estimates that include non-monetary components, such as the opportunity cost of time. Our preference for the financial cost approach is motivated by our focus on estimating budget outlays required for meeting the MDGs.

### **Step 5: Develop financing strategy**

On the basis of the calculated resource requirements for meeting the MDGs, we developed a basic financing strategy for each country, distinguishing among three sources of funding: (i) domestic government resources, (ii) out-of-pocket expenditure by households, and (iii) external finance.

#### *Government spending*

We project that domestically-financed government 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. GDP per capita in 2015 is estimated as the income level required to reduce the prevalence of extreme poverty in half from 1990 levels, as required by MDG Target 1. Using an average elasticity of poverty reduction to income growth, estimated from existing literature at  $-1.4$ <sup>250</sup>, we calculate GDP per capita growth until 2015.

#### *Private out-of-pocket spending*

Household contributions are estimated based on the incentive effects of user fees, and households' overall ability to pay. User fees can play a critical role in preventing the poor from accessing basic services. So we assume none for basic health and education (CMH 2001)<sup>251</sup> (World Education Forum 2000)<sup>252</sup> 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.

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<sup>250</sup> Several studies have estimated these elasticities for low-income countries. Bruno et al (1998) estimate a global average of  $-2$ , while Besley and Burgess (2003) cite a low value of  $-0.49$  for Sub-Saharan Africa. In the case of Uganda, the Economic Policy Research Center estimates a value of  $-1.39$  (Okidi et al 2000) while Tanzania's elasticity for basic needs poverty has been estimated at  $-1.45$  (TAKWIMU 2000).

<sup>251</sup> "Experience has taught repeatedly that user fees end up excluding the poor from essential health services, while at the same time recovering only a tiny fraction of costs", p. 61 CMH (2001).

<sup>252</sup> World Education Forum. 2000 Dakar Framework for Action 2000. Dakar.: 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." Available at [www.unesco.org/education/efa/ed\\_for\\_all/dakfram\\_eng.shtml](http://www.unesco.org/education/efa/ed_for_all/dakfram_eng.shtml).

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 after basic minimum needs have been assured. 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 improving access to clean drinking water.

Based on the incentive effect, 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 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 of each country into three segments using WDI 2003 quintile income shares in conjunction with data from national household budget surveys. It is assumed that the poorest segment of the population living below the national poverty line will not contribute to the cost of meeting the MDGs. In turn the less poor segments of the population will contribute higher shares of operating and capital costs.<sup>253</sup>

#### *External finance gap*

Even substantial increases in domestic governments expenditures and households will not cover the full cost of interventions required to meet the MDGs in Sub-Saharan Africa. Hence 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.

#### *Dutch disease*

Increased inflows of aid can result in real exchange rate appreciation and shrinkage in the relative size of the traded goods sector ('Dutch disease') if domestic supply is constrained or if demand does not match the increase in foreign exchange. Using real black-market effective exchange rates, Prati et al. (2003)<sup>254</sup> show that appropriate monetary sterilization can help contain real exchange rate appreciation and thereby limit the negative impact of increased resource flows into the country.. 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.

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<sup>253</sup> Details are outlined in Millennium Project. 2004. *Millennium Development Goals Needs Assessment: Country Case Studies of Bangladesh, Cambodia, Ghana, Tanzania, and Uganda*. Working Paper. Millennium Project, New York.

<sup>254</sup> Prati, Alessandro, Ratna Sahay, and Thierry Tresselt. 2003. "Is There a Case for Sterilizing Foreign Aid Inflows?" Working Paper preliminary draft. Presented at the 18th annual EEA Congress and the 58th European ESEM meeting, August 2003, Stockholm.

The Dutch disease effect can be further reduced if external finance relieves supply constraints in the non-tradable sector. For example, Foster and Keith (2003)<sup>255</sup> cite the example of Mozambique, where the positive impact on competitiveness of aid-financed investments in transport and infrastructure appears to have outweighed any potential Dutch disease effects – despite aid receipts in excess of 50 percent of GDP (Falck 2000)<sup>256</sup>.

### *Results*

Preliminary results of the MDG needs assessment in Ghana, Tanzania and Uganda are presented in Tables 17 to 19, which summarize total resource requirements for each country in 2005, 2010 and 2015. The scaling up of interventions to achieve the specified targets is assumed to start in 2005 and continue through to the end of 2015. We assume a linear scale-up of interventions during the course of the 11 years.<sup>257</sup>

It is important to note that the analysis summarized here is extremely preliminary, and that results are likely to change in the light of improved information. In addition, a number of important interventions have so far not been included in the resource estimates because the necessary data was unavailable (c.f. Annex 1). Some of the potentially expensive sets interventions that have not been addressed are:

- 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.

The needs assessment for each sector projects infrastructure, human and financial resource needs across a broad range of interventions. For example, Table 16 summarizes key infrastructure and human resource requirements to scale up primary and secondary education in Tanzania. It shows that the country will need to increase the number of teachers by approximately 60 percent between 2005 and 2015 while at the same time increasing the number of classrooms by over 90 percent.

[TABLE 16]

Hence an MDG-based PRSP would need to include a detailed strategy for raising the number of teachers over the medium term including the construction and operation of additional teacher training facilities as required. Similarly, a needs assessment along the

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<sup>255</sup> Foster, M. and A. Klein. 2003. *The Case for More Aid*. Final Report to the Department for International Development. Essex.

<sup>256</sup> Falck, H. 2000. *Dutch Disease in Mozambique?* Swedish International Development Co-Operation Agency. Country Economic Report. Stockholm.

<sup>257</sup> Millennium Project. 2004. *Millennium Development Goals Needs Assessment: Country Case Studies of Bangladesh, Cambodia, Ghana, Tanzania, and Uganda*. Working Paper. Millennium Project, New York.

lines proposed here can guide infrastructure development plans for the primary and secondary school sector.

[TABLE 17]

[TABLE 18]

[TABLE 19]

The results suggest that annual investment needs average between \$1.96 billion for Ghana and \$4.20 billion for Tanzania during the period from 2005 to 2015. On a per capita basis this is equivalent to \$81.4 in Ghana and \$99.8 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 25.9 percent of projected GDP in Ghana to 27.6 percent in Tanzania.

The simple financing analysis suggest that each of the three countries will be able to finance between 38 to 47 percent of total investment needs through domestic sources. This translates into an average total need for external development assistance equivalent to \$47.9 to \$61.7 per capita. Points of interest for each country are drawn from Millennium Project 2004)<sup>258</sup> and summarized below:

### *3.3.2. 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 \$1.96 billion per year or \$81.4 per capita. At \$1.19 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 that 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 comparatively 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.

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<sup>258</sup> Millennium Project. 2004. *Millennium Development Goals Needs Assessment: Country Case Studies of Bangladesh, Cambodia, Ghana, Tanzania, and Uganda*. Working Paper. Millennium Project, New York.

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.

### *3.3.3. Tanzania*

Of the three 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 \$99.8 and \$61.7, respectively. These figures are equivalent to aggregate investment of \$4.20 billion per year and external finance of \$2.59 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.

### *3.3.4. 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 \$2.97 billion per year to meet the Goals. More than half of these investments will likely need to be financed externally, requiring an average of \$1.59 billion (or \$47.9 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.

#### *3.3.5. Implications for Development Assistance*

It is important to note that the external financing requirements presented in Tables 17 through 19 are distinct from the implied total ODA needs. The results in these three tables include only MDG-oriented investments. They do not include the costs of programs that are not directly linked to the MDGs, such as support for judiciaries or other democratic institutions. To calculate the three countries' total ODA needs, one needs to add MDG-focused ODA plus other important forms of ODA. In doing so, one can then identify the total incremental ODA need for each country.

Table 20 presents the current and estimated incremental ODA needs for Ghana, Tanzania and Uganda. The first column indicates current aid levels per capita. The second shows the estimated level of current ODA that is focused on MDG-related activities, using a decomposition accounting methodology developed by Brian Hammond of the OECD DAC. The actual results produced through that methodology were actually in the range of 33 to 59 percent, but it is difficult to allocate aid flows precisely to the Goals, so for simplicity we assume the high side of that range, that 50 percent of current aid flows are directed towards the MDGs. The per capita equivalent is in column (c). We assume perfect delivery mechanisms and so do not distinguish between currently efficient and inefficient aid dollars. Note that this biases upward the estimate of current MDG-related aid and biases downward the implied aid gap. Column (d) repeats the per capita external finance gaps from Tables 17 to 19. Column (e) then assumes that the current non-MDG aid spending will remain constant as MDG-based investments are scaled up, so the total per capita ODA need is a product of MDG-targeted ODA and complementary ODA. Column (f) presents the implied shortfall in ODA per capita, indicating that roughly a doubling of ODA is needed in each country.

Column (g) then presents the average per capita GDP that is coarsely assumed by our financing model, and used to calculate column (h) the total ODA required as a share of GDP in each country. The results, 0.20 – 0.24 percent of GDP, present a lower bound for estimates of the aid required for these three countries to achieve the MDGs. These are lower bounds because the costing model excludes several “big ticket” items, namely railways, ports, and large scale irrigation systems. It also assumes perfect aid delivery and neglects the inherent overhead costs of managing aid delivery, which is likely in the neighborhood of 15 to 20 percent of total aid. Overall, the results thus suggest that these countries will require average ODA equivalent to 20 to 30 percent of GDP through to 2015, as shown in Table 20.

[TABLE 20]

### **3.4. Africa in 2015**

The investment packages are predicted to be sufficient to achieve the MDGs in African countries. An important next question is how does Africa look once the MDGs are met? Table 21 provides a possible answer to this question, showing several key population-weighted MDG indicators for Sub-Saharan Africa in the baseline year (1990) and extrapolated outcomes 2015. Notably the education and health outcomes are dramatically improved, although even after tremendous improvement they are worse than what one sees today even most middle income countries.

[TABLE 21]

A subsequent important question is whether Sub-Saharan Africa's capital stock by 2015, with the help of at least a doubling of ODA, will be above  $k_T$  and thus spring countries out of the poverty trap. To estimate an answer, we return to the AK model:

$$\gamma = sA - (n+d)$$

A rough answer to this question can be calculated using GDP per capita (in constant dollars), the saving rate (11.5%), the UN's low-projection population growth-rate for the next 10 years (2.0%), and the fixed capital depreciation rate (10.0%), a capital-output ratio of 3, and an assumption that savings increases by 1 percentage point per year when income increases by 1 percentage point.<sup>259</sup> Based on the above calculations of an ODA inflows equivalent to 20 percent of GDP,  $s$  then increases by 20 and the above equation yields that over the next ten years (2005-2015), Sub-Saharan Africa would go from having an average GDP per capita of \$323 to \$616, reaching a saving rate of 21.5% and a

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<sup>259</sup> Loayza, N, Schmidt-Hebbel, K and Serven, L. 2000. “Saving in Developing Countries: An Overview.” The World Bank Economic Review. World Bank, Washington, D.C.

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*This Version - March 22<sup>th</sup>, 2004*

growth rate of 8.5% in 2015. Although these figures are preliminary, an investment package of this size would likely translate into a trajectory of sustained positive growth.

As a consistency test, we also calculated dollar-a-day poverty rate implied by a \$616 per capita income level (which Sub-Saharan Africa would achieve in the above model). Using the simple correlation between poverty rates and GDP per capita in 2000, then the fitted value for the poverty rate at a \$616 per capita income is 27%. Since the starting poverty rate is 55% for Sub-Saharan Africa, then this represents a halving of the poverty rate, which is, in fact, MDG 1, thus confirming the consistency of the investment package of 20% with the Millennium Development Goal target.



## **4. A New Framework of Donor-Recipient Country Relations**

### ***4.1. The Need for System Coherence at the Country Level***

The package of public investments proposed in this paper implies a significant increase in ODA transfers to Africa, perhaps a doubling or more. This will read as an excessively bold proposal to many, since there is frequent skepticism among policymakers and voters regarding the efficiency and level of coordination in aid delivery. Although there is much evidence that aid works, it is true that a lack of coordination and goal orientation leave the current system far from adequate to the task. Nonetheless, the pieces of the solution are now floating in the policy ether. There is now broad conceptual agreement on the need to focus on poverty as an outcome rather than on pure macroeconomic stability. Likewise there is recognition of the need to provide development assistance through common financing arrangements that allow recipient countries to define their own poverty reduction strategies. Donors also now generally agree on the need to harmonize their own ODA practices.<sup>260</sup> These need to be brought together in one coherent framework. With this goal in mind, we here describe a new approach that draws upon existing recent international agreements, both aspirational and operational, that could be implemented in countries where governments are committed to breaking out of the poverty trap.

#### *4.1.1. Guidelines for Converting Goals into Plans*

Perhaps the most fundamental problem in today's development policy is that, even though the MDGs have been the beneficiary of considerable rhetorical attention and commitment in recent years (including at the 2001 WTO Ministerial at Doha, the 2002 UN Conference on Financing for Development, and the 2002 World Summit for Sustainable Development), the real policy processes through which African countries interface with the international community are not aligned with the MDGs. As just one example, the IMF Executive Board does not yet receive any systematic information on progress or lack of progress towards the MDGs in low-income countries that have an IMF Poverty Reduction Growth Facility (PRGF).<sup>261</sup> Nor does the IMF staff conduct an analysis of how the country's budget framework should be altered to achieve the MDGs.

To implement the scale of investments laid out in the previous section, a revamped and much more coherent international development system will need to build on a common approach to the poorest countries that meet minimum standards of good governance relative to the per capita level of income. While the precise operational details will differ from country to country and likely evolve over time, a core set of country-level processes could be used to allow developing country governments, multilateral institutions,

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<sup>260</sup> As evidenced by, for instance, the Rome Harmonization Agenda of 2003.

<sup>261</sup> There has, however, recently been an indication that in early 2004 IMF staff reports will begin to include standardized country-specific MDG evaluations.

developed country governments, and civil society organizations to align their work in a way that permits African countries to reach the Goals.

These processes should be guided by four core principles. First, policies must be framed by 2015 time horizon, with that MDG target date serving as the minimum planning timeline for both recipient countries and donors. In a longer-term horizon, developing countries can begin to ask fundamental questions of long-term needs, such as human resources and infrastructure, and can begin to plan how to address those needs. Countries can also ensure that their long-term investments are made in a coordinated way across sectors. This is critical since, for instance, long-term education scale-up needs to be planned in coordination with water and sanitation scale-up; which in turn needs to proceed in step with health sector scale-up, and so on.

The international adoption of a 2015-based planning horizon would amount to an enormous shift in development policy. Currently PRSPs and Medium Term Expenditure Frameworks, the primary vehicles for development assistance in Africa, adopt a 3- or 4-year time horizon that is continuously rolled over. Short-term capacity constraints are thus seen as fundamental impediments, suppressing ambition and long-range policy thinking. On the donor side, the implementation of real long-term financial commitments are essential for recipient country governments to make plans for scaling-up public investments without the risk of external finance shocks that result from frequently inconsistent donor disbursement patterns.

Second, plans need to be guided by MDG-oriented bottom-up assessments of *needs* rather than ex ante budget constraints. In development policy today, the first point of discussion is to identify the resources available and then to decide how those resources can be deployed. Moving ahead, for countries in poverty traps the discussion must begin with an assessment of the specific sets of investments needed to get the country out of its poverty trap. As this paper has outlined, the MDGs provide a useful shorthand for identifying those conditions.

This goal-driven, needs-based approach would constitute a fundamental shift in development policy. Goal-setting remains somewhat haphazard relevant to the rhetorical ambition of the MDGs. Moreover, when goals are set they are often not linked to a clear plan for achieving them. The PRSPs are the core development assistance framework for Africa, and the World Bank's own assessment shows these documents are not consistently aligned with the MDGs (Harrison *et al.*, 2003).<sup>262</sup> This is because, in the typical case where existing development assistance flows are insufficient to achieve the MDGs, developing country governments are encouraged not to be too ambitious in aspiring to the MDGs but instead to be more "realistic" in their targets. Formalistically,

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<sup>262</sup> Although the text in Harrison, Klugman and Swanson (2003) suggests that PRSPs are closely aligned with the MDGs, the tables tell a very different story. Most fundamentally, the text compares only among PRSPs that refer to MDGs, ignoring those that don't. For example, 13 of 14 PRSPs are described as being at least as ambitious as the MDGs, but Figure 1 of Harrison *et al.* indicates that only 14 of the 32 PRSPs evaluated include child malnutrition targets with sufficient data to be compared to the MDGs. See "Are Poverty Reduction Strategies Undercutting the Millennium Development Goals? An Empirical Review." World Bank mimeo, September 17, 2003.

they are encouraged to “accelerate progress towards the MDGs” rather than to achieve the MDGs.<sup>263</sup> Thus PRSPs encourage progress but the rate of acceleration could be marginally more than zero and it would still be interpreted as success.

A related and perhaps deeper problem within the current approach to goal-setting is that targets in many PRSPs have been set based solely on ambition rather than on a rigorous assessment of investment needs and how the targets will be achieved. According to the World Bank's own PRSP sourcebook, “[PRSP] targets tend to be too optimistic, and the cost of reaching them tends to be underestimated.” (Christiansen *et al.* 2002).<sup>264</sup> A rigorous MDG-oriented process must therefore include not just outcome goals, but also specific paths that will lead to those goals, with clear and monitorable input targets, including adequate financing.

Third, donor assistance needs to be harmonized and coordinated around budget support, particularly in countries like Ghana, Uganda and Tanzania where governance structures are not a limiting factor to MDG progress. While project-based assistance might be most appropriate in conflict settings or in countries with extremely weak governments, a large number of well-governed low-income countries need dramatic increases in straight budget assistance. Uncoordinated and supply-driven development assistance from, among others, the 23 bilateral donors that are members of the OECD Development Assistance Committee, places unnecessary transaction cost burdens on recipient country governments. Asking low-income African countries with scarce human resources to prepare separate funding proposals, monitoring plans, procurement strategies, and evaluation procedures for each donor results leads to at least an order of magnitude of extra and unnecessary administrative resources being allocated to donor requirements. In the common situation where assistance is directed towards projects rather than government budgets, the projects might not even be aligned with recipient country priorities. Public sector resources in developing countries will be much better utilized in drafting and leading plans and policies to achieve the MDGs.

Major reforms towards increased budget support have already begun through sector-wide approaches (SWAs) to development financing, with health budgets at the fore, but much more progress is needed. As presented in Table 22, the DAC's International Development Statistics database shows that in 2002 only approximately 30 percent of total net bilateral ODA to sub-Saharan Africa took the form of budget support. As hinted by the “technical cooperation” line of this table, tied aid, the practice of linking development assistance to the purchase of donor country services or goods, also remains a significant issues for many developing countries.

[TABLE 22]

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<sup>263</sup> The language of “accelerating progress towards the MDGs” rather than “achieving the MDGs” is used, for instance, in the recent World Bank staff paper for the Development Committee, entitled “Supporting Sound Policies with Adequate and Appropriate Financing,” September 13, 2003. Paper available online at [http://siteresources.worldbank.org/DEVCOMINT/Resources/Fall-2003/DC2003-0016\(E\)-Financing.pdf](http://siteresources.worldbank.org/DEVCOMINT/Resources/Fall-2003/DC2003-0016(E)-Financing.pdf).

<sup>264</sup> See, for instance, the critique of “too optimistic” PRSP targets in Luc Christiansen, Christopher Scott, and Quentin Wodon (2002), “Chapter 4: Development Targets and Costs” in *A Sourcebook for Poverty Reduction Strategies*, Jeni Klugman ed. Washington, DC: The World Bank.

Fourth, donor financing requires a new notion of sustainability, one that relies on grants rather than loans. It is analytically unsound to expect an economy a low-income economy at \$200 per capita income to “sustain” programs after initial capital investments are made. Likewise it is impractical to extend loans to that country’s government with any expectation of repayment. Truly sustainable policies need to focus on funding the recurrent costs inherent in managing programs. If ODA budget support is required at 20 to 30 percent of GDP, that support needs to come in the form of grants. Countries in poverty traps cannot afford loans. If the question is how much debt a country can sustain if it is to achieve the MDGs, the answer tends quickly to zero since all domestic resources should be allocated to financing MDG investments. This implies canceling debt accordingly. Unlike current practice, it also implies discontinuing the accounting practice of counting grants as deficits.

The need for sustained grant support is perhaps most vivid in the health sector. Medical professionals are integral to a functioning health system but, particularly in a global labor market, they are typically too expensive for low-income countries to afford at anywhere near a scale required to achieve the MDGs. Training and employing these health professionals will require external assistance. While the need to support human resources in a health system might seem trivial, it is crucial to stress how new this idea is to development policy and practice. Salary costs are recurrent in nature, and those costs have not historically been supported by development assistance. The World Bank does not even keep data for the recurrent unit costs in projects it has supported through its tens of billions of dollars of assistance programs implemented over several decades.

#### *4.1.2. National Planning Processes*

In practical terms, African governments can implement these principles through a three-stage process. First, each country should convene a planning team comprised of its key stakeholders and technical advisors – the bilateral and multilateral donors, UN specialized agencies and civil society leaders – to conduct an MDG needs assessment. This assessment should compare the country’s current situation with MDG targets and identify the combination of public investments that would enable the country to achieve the MDGs by 2015. The needs assessment then forms a key input to a second step of policy design. Whereas the needs assessment answers the question of “how many” inputs are needed to achieve the desired targets – how many schools to build, teachers to train, family subsidies to allot, and so forth – the policy design question needs to answer “how to” build the schools, train the teachers, administer the subsidies, and manage the school system. So the second stage of the process will require each country to develop a long-term (10-year) policy plan for achieving the MDGs. Policies identified in this stage will need to be developed through domestic consultative processes so civil society participation is crucial. The third step will then be for each country to construct its medium term (3 year) PRS and, where appropriate, its PRSP based on the long term MDG plan. Both the long-term and short-term plans will then need to be periodically reviewed and revised as countries learn from their scale-up experiences and fine-tune policies towards the MDGs. To be clear, this approach of working backwards from 2015–based plans does *not* suggest creating new poverty reduction processes. It does imply re-

formulating the *content* of current approaches based on MDG horizons and transparent bottom-up needs assessments.

Developing multi-sector 10-year scale up plans will require a great deal of technical work. In the poorest countries, UN agencies already provide vital support in almost every sector, so they can play a crucial role in assisting national governments as they develop their MDG plans. The challenge will be to coordinate this work around the specific Goals and long-term planning horizons. Within most low-income countries, the resident representatives of all agencies now meet regularly as UN Country Teams to discuss the development challenges facing the country. These Country Teams report to the UN Development Group (UNDG), which was established in 1997 by the UN Secretary-General in 1997 as the overall mechanism for coordination between development-oriented UN agencies.

The UNDG needs a revised mandate to take on this added responsibility of assisting with MDG planning processes. Its key limitation is the lack of operational engagement between the specialized agencies (*e.g.*, the Food and Agricultural Organization, the UN Children's Fund, the UN Population Fund, the World Food Program and others) that provide technical assistance and the international financial institutions (*i.e.*, the IMF, the World Bank, and the regional development banks) that set the budgetary and financing priorities for developing countries. Three main issues need to be addressed here. First, members of UN Country Teams will in many instances need to develop new skills. It will be a new task for many staff to assist in the development of technically rigorous national scale-up plans and budgets, since they are typically not asked to participate in the national budgeting process. Nonetheless, these staff are precisely the people with the sector-specific technical knowledge that is typically missing from core budgeting processes. Second, the UNDG needs to work more closely with the International Financial Institutions. UNDG-World Bank cooperation is increasing, but the disconnect is greater between the IMF and the specialized UN agencies. The IMF works with low-income countries to set their budget framework, including levels of public investments and social outlays. In order to fulfill its responsibility of fiscal stewardship, the IMF needs to have a clear understanding of the levels of public spending needed in key sectors in order for a country to achieve the MDGs. In theory, IMF staff determine this information through consultations with the national government and with the relevant specialized UN agencies. In practice, though, this is not done. Moving forward, core IMF documents need to be based on sector-specific technical evaluations produced by the government in collaboration with other relevant specialized agencies. The sectoral specialists need to develop the technical scale-up plans and then need to work with the budget specialists to cost them.

The third issue is the need for practical coordination among bilateral and multilateral agencies. On the bilateral side, in most African countries, a committee of bilateral donors exists and is typically organized by the UNDP or the World Bank. The committee of donors is well positioned to support the MDGs, but few have been organized yet to do so. Bilateral agencies need to play a core contributing role to the government-led needs assessment exercises, also contributing technical assistance wherever possible.

The need for the IMF to draw upon the work of specialized technical agencies does not suggest anything less than a critical role for the IMF's own staff in this process. In order to accommodate the higher aid inflows required to achieve the MDGs, recipient countries will need to develop their macroeconomic frameworks accordingly. Formulating, executing and monitoring expenditure plans around increased aid flows will present new budgetary challenges for developing country governments. These will need to be surmounted through active collaboration between recipient country governments and the IMF, since the latter typically provides the international community's professional review of national macroeconomic frameworks before endorsing inflows of financial assistance.

Partially to address the challenges of macroeconomic planning for the MDGs, the Development Committee of the IMF and World Bank recently proposed to support countries requesting the development of "alternative scenarios to reach the MDGs,"<sup>265</sup> suggesting one in which sufficient resources are available to meet the MDGs and another in which countries must continue under current resource constraints. Although such a two-scenario approach still falls far short of coherent planning to achieve the MDGs, it clearly represents a step forward in recognizing and making explicit the key resource constraints faced by many low-income countries.

In developing an explicit MDG-based macroeconomic planning scenario, MDG-based increases in ODA inflows will raise a number of issues to be considered carefully. First are the structural macroeconomic issues. Governments should not spend what they do not have -- especially through domestic credit expansion. The expenditures instead need to be financed through increases in ODA grants. Even concessional loans will probably prove to be prohibitive, given the scale of ODA needed relative to GNI. This will require a change in the financing rules for IDA and some other multilateral creditors. Countries will need to have exchange rate systems compatible with these increased inflows.

Closely related, governments and the IMF will need to assess carefully the impact of the aid inflows on fiscal and external debt sustainability, as well as the implications of the higher aggregate spending on the medium-term fiscal outlook and the recurrent cost implications of such spending within the context of a multi-year public expenditure framework. Debt cancellation will need to be deepened accordingly (Sachs 2002).<sup>266</sup> Looking forward, countries must also maintain their efforts to mobilize domestic revenue and foster domestic savings and investment in order to support long-term economic growth.

Underlying this discussion of macroeconomic programming is the consideration of what to do if donor funds are not forthcoming to meet the needs of the MDG-based PRSSs. For its part, the IMF will need to assume a new role in evaluating and approving a MDG-

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<sup>265</sup> See Paragraph 11, Joint Ministerial Committee of the Boards of Governors of the Bank and the Fund on the Transfer of Real Resources to Developing Countries, "Development Committee Communique," September 22, 2003.

<sup>266</sup> Jeffrey D. Sachs, 2002, "Resolving the Debt Crisis of Low-Income Countries." *Brookings Papers on Economic Activity*, 2002:1.

consistent budget that satisfies conditions for macroeconomic stability, *even if the donor resources have not yet been committed*. Pending substantial increases in donor commitments, IMF sign-off on the government's MDG-consistent plan will be necessary to outline the fiscal feasibility of an MDG investment strategy, even if a less-than-fully MDG-consistent plan ends up being implemented. Without IMF sign-off on the macroeconomic feasibility of scale-up, the government will be guaranteed not to receive the ODA it needs.

All of these processes of course presume a high level of coordination between national and international institutions. Although coordination of international agencies presents a notoriously difficult task within developing countries, the MDGs provide a revolutionary framework for reconciling differences. Since the targets have been agreed upon by all member states of the United Nations and all major development agencies, no one needs to argue about the goals. Instead people need only argue about how best to achieve them. In a government-convened approach to planning, the government can work directly with the UN Resident Coordinator (the local chair of the UN Country Team) to divide tasks among the participating agencies in a way that aligns work streams with the Goals. Stated otherwise, the MDGs provide an organizing principle around which agencies can (and may often need to) justify their work.

#### *4.1.3. National Implementation Processes*

Government-led coordination will be crucial not just for crafting plans but also for implementing them. As their part of the bargain, recipient governments will need to implement a clear and transparent system for monitoring and evaluating the implementation of plans, building in regular check-points through which plans can be fine-tuned or adjusted as necessary. Public evaluation of plans will need to take place within the context of the African Peer Review Mechanism (APRM) of the New Partnership for Africa's Development. The APRM, which is beginning its first evaluations in 2004, entails African countries publicly reviewing each other's performance under four categories: democracy and political governance; economic governance and management; corporate governance; and socio-economic development.

To ensure that ODA resources are being used effectively, monitoring and evaluation mechanisms will need to be included in the MDG-based PRS. These systems will need to evolve as scale-up proceeds, but they will need to be consistently guided by key principles of fiscal accountability; institutional strengthening, substantive goal-orientation, and benchmarking progress. Importantly, progress will need to be measured with respect to *both* financial management and MDG-based development outcomes. Too often development evaluations focus on assessing the procedural outcomes of projects and processes rather than the development outcomes of programs. More importantly, intermediate input targets will be required en route to long-term outcome goals. For instance, bed nets use needs to be measured as an input en route to reducing the incidence of malaria. Before PRS implementation begins, such intermediate and outcome benchmarks need to be developed and proposed by the recipient governments and then agreed upon by the donors.

Domestically, successful implementation will require African to work closely with civil society organizations for three reasons: to ensure public trust is maintained in the accountability of public expenditure managers; to identify best mechanisms for service scale-up; and to help with service delivery where appropriate. Procedures for public accountability include the opportunity for consultation in policy planning processes, the release of budgets for public review, and the release of independent audit reports on public expenditures. In large countries where it is difficult to transmit information to remote rural areas, distributive mechanisms of budget disbursement and community-based oversight can be most appropriate both for maintaining accountability and for identifying best means of service delivery. For instance, targeted block grants can be given to rural communities, allowing them to decide how those resources should best be spent. There is considerable evidence to suggest that women's community organizations should be given key oversight roles, since they make household investment decisions that yield higher community benefits than those made by men.<sup>267</sup>

In many instances procedures for service delivery are more complicated and need to be tailored to existing public service delivery systems, including forms of government decentralization. In countries where public sectors are extremely weak and community organizations are better placed than government to begin immediate delivery of services, the government might decide to support those organizations as an interim measure en route to public sector expansion. However, governments will need to be careful not to invest in community organizations at the expense of investing in public service delivery.

#### **4.2. The Role of Global Trade Reform**

Much of this paper has focused on the quantity and direction of ODA needed for African countries to break out of poverty traps. The implied aid flows are large, equivalent to 20-30 percent of recipient countries' GDP. An important related issue is how these costs compare to the benefits of increased international trade. This question is particularly relevant in the context of the current Doha round of WTO negotiations, which are focusing in large part on developing country needs.

Although the long-term trading ambition for African economies needs to be a diversification away from commodity dependence and the related long-term decline in terms of trade (World Bank, 2000)<sup>268</sup>, an immediate item on the African trade agenda is progress in agriculture.<sup>269</sup> Importantly, there is considerable heterogeneity among countries in what would define progress. The African countries that are net agricultural exporters will naturally seek greater access to protected industrialized countries markets. Those that are net agricultural importers, particularly food importers, are at risk of

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<sup>267</sup> Quisumbing, A.R. and J. Maluccio. 2000. "Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries." FCND Discussion Paper No. 84. IFPRI (International Food Policy Research Institute), Washington, D.C.

<sup>268</sup> One World Bank estimate indicates that the cumulative loss non-oil-exporting countries from terms of trade decline from 1970 to 1997 was equivalent to 119 percent of combined GDP. World Bank, 2000, *Can Africa Claim the 21<sup>st</sup> Century?* World Bank, Washington, DC.

<sup>269</sup> Agricultural trade reform is of course a less pressing concern for fuel-exporting countries such as Angola, Equatorial Guinea, Gabon, Nigeria and the Republic of Congo,



immediate adverse welfare shocks if, for instance, developed countries' export subsidies are quickly removed, resulting in major price increases for core foodstuffs.<sup>270</sup> Some countries are net food importers but net exporters of non-food agriculture, so their welfare outcomes from trade liberalization will be mixed. Given these countervailing forces and existing data limitations, it is difficult to estimate the country-specific effects of trade liberalization. That challenge is compounded in the context of this paper's proposal for doubling or tripling agricultural productivity, since most trade modeling exercises are limited to comparative statistics and hold agricultural productivity constant when examining changes in trade regimes.

Nonetheless, one can begin to evaluate the differing effects of trade liberalization by distinguishing between the impact of liberalization of food commodities and non-food commodities. Among non-food commodities, cotton is likely the most common topic of policy debate, particularly since there is such a direct perceived link between production in the US and West Africa. Protection is high in many cotton-producing countries. The United States is estimated to spend nearly \$4 billion per year on cotton subsidies – or more than three times the entire annual US bilateral development assistance budget for Africa – to maintain a roughly \$4 billion per year level of production (Baffes, 2004).<sup>271</sup> China exports much less than the US, but supports its domestic cotton production with \$1.2 billion in subsidies while the EU directs roughly \$0.7 billion per year to support cotton producers in Greece and Spain (Baffes, 2004).

Although the precise global impact of these protective measures is not known, they clearly have a deleterious effect on West African economies, especially Burkina Faso, Benin, Chad, Mali and Togo, where cotton production amounts to a significant portion of GDP and a large share of agricultural export earnings. In Mali, for instance, cotton production was 9 percent of GDP in 2000-2001 and 38 percent of merchandise exports. In Benin, it was 5.3 percent of GDP in the same period and fully two-thirds of merchandise exports (UNCTAD 2003, *Economic Development in Africa*).<sup>272</sup> Estimates vary on the cost imposed on West Africa by cotton protection, but Oxfam has estimated that 24 African countries lost more than \$300 million in export earnings due to cotton subsidies in 2001/02 (Oxfam, 2003, p.31)<sup>273</sup> Other estimates suggest that global cotton liberalization would raise the world price by 10 to 12 percent over what it would be without reforms (Baffes, 2004). This would present a clear benefit to West African cotton producers, whose exports under liberalization would also be estimated to increase by 13

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<sup>270</sup> Hoekman et al. (2003) have usefully outlined the country-specific effects of export subsidies and tariffs. See Bernard Hoekman, Francis Ng, and Marcelo Olarreaga (2003) "Agricultural Tariffs versus Subsidies: What's More Important for Developing Countries?" World Bank Working Paper. World Bank, Washington, D.C.

<sup>271</sup> John Baffes, 2004, "Cotton: Market Setting, Trade Policies, and Issues," World Bank Policy Research Working Paper 3218. World Bank, Washington, D.C.

<sup>272</sup> UNCTAD, 2003, *Economic Development in Africa: Trade Performance and Commodity Dependence*, United Nations, New York and Geneva.

<sup>273</sup> Oxfam. 2002. "Cultivating Poverty: The Impact of US Cotton Subsidies on Africa, Oxfam Briefing Paper 30.

percent annually.<sup>274</sup> The precise welfare implications of these figures are not certain, but they imply that West African cotton exporters could enjoy as much as a 1 or 2 percent increase in GDP from cotton trade liberalization.

The liberalization story is much more complicated for food commodities, among which sugar and ground nuts are two of the most important products for Africa. Notably, these two foodstuffs are subject to very different global trade dynamics. As is well known, sugar is one of the world's most protected industries. In the EU long-standing domestic subsidies and quotas have maintained prices for producers at roughly double the world price, resulting overproduction and limited access to low-cost producers like Australia and Brazil. Similar levels of price supports are in effect in the US. Even larger supports are in place in Japan. However, many African countries benefit from the Sugar Protocol, a series of bilateral sugar-trading agreements the EU has signed with developing countries, including Cote d'Ivoire, Kenya, Madagascar, Malawi, Mauritius, Republic of Congo, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe (Niemi and Niemi, 2003).<sup>275</sup> The Sugar Protocol gives these countries preferential access to sell sugar at vastly inflated European prices. In absolute terms, this is extremely lucrative to the most successful African exporters, yielding nearly \$200 million per year to Mauritius, roughly \$165 per capita, and more than \$60 million per year for Swaziland, or roughly \$55 per capita. Those are, of course, middle-income countries and thus not ones currently stuck in the poverty trap. Within the latter category, the Sugar Protocol yields benefits of roughly \$10 million per year to Malawi, or 90 cents per Malawian (Borrell and Pearce, 1999).<sup>276</sup> Of less significance for African countries, the US also has a quota system in place, which tends to prefer Latin American sugar producers. As of 2000/01, however, the US quota system did include allocations for Congo, Cote d'Ivoire, Gabon, Madagascar, Malawi, Mauritius, Mozambique, Swaziland and Zimbabwe.

Independent of the Doha round, the EU and the US are slowly beginning to open their sugar markets. Although sugar is one of the few products exempted from the EU's Everything But Arms initiative, the EU is scheduled to start reducing sugar tariffs in July 2006, with full phase out complete by July 2009. The US will also be opening gradually to sugar imports from Mexico, which as of 2009 will be able to export sugar to the US without restriction. It is estimated that full liberalization of developed country sugar

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<sup>274</sup> Quirke (2002) finds that removing EU and US cotton protection would increase prices by 10.7 percent. FAPRI (2002) estimates that full global commodity liberalization would yield a 12 percent world price increase over 10 years. Tokarick (2003) estimates the change in price of 10 commodities resulting from the combined effects of removing market price supports, removing production subsidies and removing input subsidies, to find significantly smaller world price increase of only 2.8 percent.<sup>274</sup>

See Quirke, Derek. 2002, *Trade Distortions and Cotton Markets: Implications for Global Cotton Producers*. Canberra, Australia: Cotton Research and Development Corporation, Center for International Economics. See also Food and Agricultural Policy Research Institute, 2002, "The Doha Round of the World Trade Organization: Liberalization of Agricultural Markets and its Impact on Developing Economies." Paper presented at the IATRC Winter Meetings.

<sup>275</sup> Huan-Niemi, Ellen and Jyrki Niemi, 2003, "The Impact of Preferential, Regional and Multilateral Trade Agreements: A Case Study of the EU Sugar Regime." European Network of Agricultural and Rural Policy Research Institutes. Working Paper No. 1.

<sup>276</sup> Borrell, Brent and David Pearce, 1999, "Sugar: The Taste Test of Trade Liberalisation." Centre for International Economics.

markets would yield a 40 percent increase in the world price. However, that new price would still be less than the current one available through preferential access, so many African sugar producers would not necessarily gain from that world price change (Mitchell, 2004).<sup>277</sup> Moreover, a removal of import quotas in Europe, Japan and the US would benefit the low-cost sugar producers such as Australia and Brazil much more than the African producers. All told, the net liberalization effect for African sugar producers are unclear and, if positive, likely to be extremely small (Borrell and Pearce, 1999).

Groundnut products, on the other hand, follow very different patterns of production and protection since China and India together produce nearly two thirds of all world's groundnuts. Yet those countries' high-levels of domestic consumption and market protection result in very thin international markets, equivalent to only 5 percent of global production. Among exporters, the major traders are China, with 32 percent of total exports, the US at 19 percent, and Argentina at 11 percent. Collectively, the groundnut exporters of sub-Saharan Africa – Gambia, Malawi, Nigeria, Senegal, South Africa and Sudan – account for only 5 percent of the traded market (Diop et al. 2004)<sup>278</sup>. Since the groundnut markets of Argentina, China, India and the USA are all protected, one might think that full liberalization would produce a major opportunity for African producers to gain. However, the results again differ by country. Diop and colleagues estimate that the African winners would be Senegal, slated to gain \$21 million per year or \$2 per capita (in \$1995), and Nigeria, which would gain \$13 million per year, or roughly 10 cents per capita (Diop et al., 2004, p.30). On the neutral side, Gambia would be estimated to gain less than half a million dollars per year, or 35 cents per capita, while Malawi would lose roughly \$1 million per year, or 9 cents per capita.

Although we only discuss three commodities here, these product-by-product assessments are instructive for pinpointing who wins and who loses from specific components of trade policy. The evidence is also important for highlighting that the benefits from liberalization in particular commodities are not enormous, if positive at all. A key question thus hinges on how the benefits of trade liberalization aggregate across products. Ianchovichina et al. (2001)<sup>279</sup> focus on the benefits of full access to the “Quad” markets of Canada, the EU, Japan and the US, estimating that this would yield a \$2.5 billion, or 14 percent, increase in non-oil exports and a \$1.8 billion, or 1.2 percent, welfare enhancement for 37 sub-Saharan African countries (excluding members of the Southern African Customs Union plus Angola, Malawi, Mauritius, Mozambique, Tanzania, Zambia and Zimbabwe). Most of these benefits would accrue through access to EU markets. Of course, liberalization through Doha is unlikely to be unilateral. Ianchovichina and colleagues estimate that, in addition to full Quad access, a 25 percent cut in non-preferential levels of tariffs across all countries would remove more than \$500 million of the same African countries' benefits. Thus full rich country access and

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<sup>277</sup> Mitchell, Donald. 2004, “Sugar Policies: Opportunity for Change.” World Bank Policy research Working Paper 3222, February 2004.

<sup>278</sup> Diop, Ndiame, John Beghin, and Mirvat Sewadeh, 2004, “Groundnut Policies, Global Trade Dynamics, and the Impact of Trade Liberalization.” World Bank Policy Research Working Paper 3226.

<sup>279</sup> Ianchovichina, Elena, Aaditya Mattoo, and Marcelo Olarreaga, 2001, “Unrestricted Market Access for Sub-Saharan Africa: How much is it worth and who pays?” World Bank Policy Research Working Paper 2595. World Bank, Washington, D.C.

significant global tariff liberalization would result in less than a 1 percent net welfare increase for most of Africa.

Using different modeling assumptions, other estimates have produced benefits of a similar order of magnitude. Anderson *et al.* (2001)<sup>280</sup> calculate that SACU countries gain nearly \$1.4 billion per year (in \$1995) from full global trade liberalization, while the rest of sub-Saharan Africa gains \$3.2 billion (in \$1995). UNCTAD (2003)<sup>281</sup> meanwhile distinguishes between the benefits to Sub-Saharan Africa of a global reduction in agricultural tariffs, at \$226 million in \$1997, and the high costs of a removal of developed countries' export subsidies, \$355 million in \$1997 (UNCTAD, 2003, pp.43-44). When UNCTAD models a scenario of comprehensive 50 percent cross-the-board cuts in tariffs for manufacturing in addition to agriculture, the terms of trade loss to Sub-Saharan Africa yields a regional outcome that is effectively welfare neutral (UNCTAD, 2003, p.48). Somewhat more positively, Tokarick (2003)<sup>282</sup> estimates the net effects of global agricultural liberalization for the members of the Southern Africa Customs Union (Botswana, Lesotho, Namibia, South Africa and Swaziland) at \$1.8 billion per year or 1.3 percent of GDP. Meanwhile, for the rest of Sub-Saharan Africa, he estimates the total benefits at \$1.0 billion, or roughly 0.5 percent of GDP.

Despite the variance across models, these estimates underscore a key point. Even if the Doha trade negotiations yield African countries the most optimistic outcomes, these countries' benefits will likely not exceed 1 or 2 percent of GDP per year. This level of welfare increase would amount to remarkable progress, but the economic benefits are at least an order of magnitude less than the level of resources required to achieve the MDGs in the poorest countries. So while the benefits of trade are real and non-trivial, they are not a substitute for sustained increases in ODA needed to fund the public investments described in this paper.

The diversity of commodity-specific and thereby country-specific trade scenarios underscores a second crucial point for macroeconomic planning. Just as a local needs assessment approach is necessary to identify a country's public investments, a similar approach must be taken in order to identify how a country's macroeconomic frameworks will evolve in step with changes to the global trade system. Some net exporters might be major winners while their net food importing neighbors suffer tremendously. The MDG-based PRS process will need to be developed, and constantly updated, within a process that systematically anticipates how the poorest countries are affected by international trade policy changes. Those slated to suffer losses from trade liberalization will in particular need their levels of external assistance adjusted upward accordingly.

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<sup>280</sup> Anderson, Kym, Betina Dimaranan, Joe Francois, Tom Hertel, Bernard Hoekman, and Will Martin, 2001, "The Cost of Rich (and Poor) Country Protection to Developing Countries." Center for International Economic Studies Discussion Paper No. 0136.

<sup>281</sup> United Nations Conference on Trade and Development, 2003, *Back to Basics: Market Access Issues in the Doha Agenda*. New York and Geneva: United Nations.

<sup>282</sup> Tokarick, Stephen. 2003, "Measuring the Impact of Distortions in Agricultural Trade in Partial and General Equilibrium," IMF Working Paper WP/03/110.

### **4.3. Global implications for Global Development Assistance**

Planning, investing and coordinating to achieve the MDGs in African countries stuck in poverty traps forms an undoubtedly ambitious agenda. This paper has also outlined that it is also feasible. Technology is not the limiting factor, as evidenced by the litany of known interventions that can be successfully deployed at a large scale. Short-sighted and poorly coordinated institutional mandates are currently a limiting factor, but these can be realigned and well coordinated fairly quickly through the implementation of more focused institutional mandates. Financing is also a limiting factor, but it need not be either. Although the financing model presented in this paper is structured around the loosening of budget constraints in order to identify and meet actual needs, preliminary analysis suggests that the budget loosening need not be outlandish. The rich countries have committed development assistance up to 0.7% of gross national income (GNI), or about \$175 billion dollars per year as of 2003.<sup>283</sup> This would represent an increase of \$120 billion over the current levels of roughly \$55 billion in annual official development assistance (ODA).

The UN High-Level Panel on Financing for Development, chaired by former President of Mexico Ernesto Zedillo, estimated that at least \$50 billion in extra annual ODA will be required to achieve the MDGs. Our own very preliminary analysis indicates a larger amount is needed, but still less than 0.7% of GNI. The total incremental amount of development aid needed over current levels might be in the range of \$75-100 billion per year, for a total aid flow of around \$130-155 billion per year, which is equal to roughly 0.5 – 0.6% of the donor countries' GNI. For Africa, the incremental need might be in the range of \$35 billion per year, if an incremental \$55 per capita is needed across 600 million people. Notably, if the advanced economies continue to grow at a real per capita annual rate of two percent, the high end of the range, \$155 billion per year, will only be equal to 0.5% of advanced economy GNI in 2015.<sup>284</sup> This would allow a window of \$60 billion per year, or more than total current ODA, to be spent on development assistance not directly related to the MDGs in low-income countries and also on development assistance for middle income countries, while still remaining under the 0.7 percent ODA ceiling. Fortunately, these costs are incredibly modest compared to the value of what can be achieved. Millions of lives per year could be saved, perhaps 3 million children per year by 2015, adding up to tens of millions of total lives saved in the meantime. It would also result in the development of a basis for sustained economic growth in the world's poorest economic region.

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<sup>283</sup> Total GNI of the rich countries was approximately \$25 trillion in 2003.

<sup>284</sup> Note that \$155 billion is 0.5 percent of \$31 trillion.

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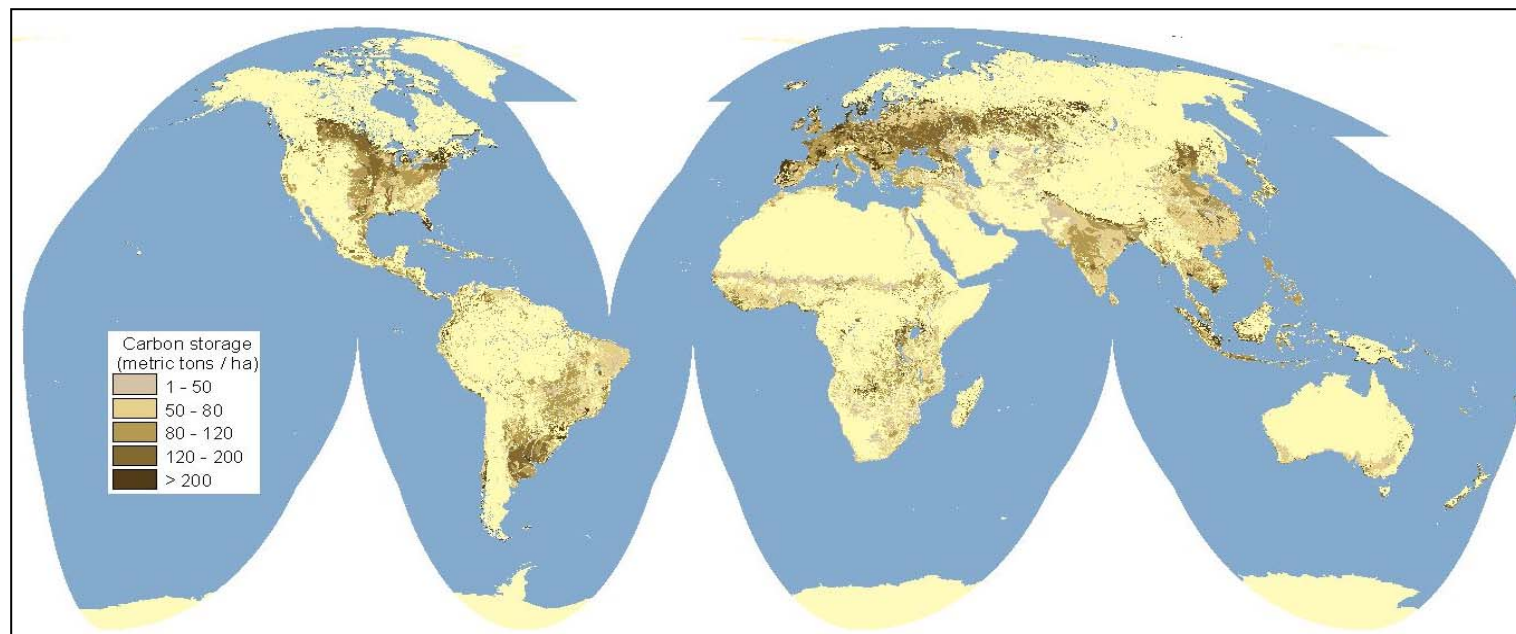
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**Figure 1: Carbon Storage in Soils (0-100cm) within the PAGE Agricultural Extent**



**Source:** Wood, S., K. Sebastian and S. Scherr, "Pilot Analysis of Global Ecosystems: Agroecosystems," World Resources Institute, Washington DC, 2000.

**Projection:** Interrupted Goodes Homolosine

**Note:** The PAGE agricultural extent includes areas with greater than 30 percent agriculture, based on a reinterpretation of GLCCD 1998 and USGS EDC 1999a, plus additional irrigated areas based on Doell and Siebert 1999. Batjes (1996) estimated the average soil organic carbon (SOC) content at a depth of 100cm by soil type based on individual soil profiles contained in the World Inventory of Soil Emission Potentials (WISE) database compiled by the International Soil Reference and Information Centre (Batjes and Bridged 1994). The authors calculated the global estimate of SOC storage by applying Batjes' (1996 and 2000) SOC content values by soil type area share of each 5 x 5 minute unit of the Digital Soil Map of the World (FAO 1995).

**Figure 2: Capital-labor ratio dynamics in the AK Model**

$dk/dt$

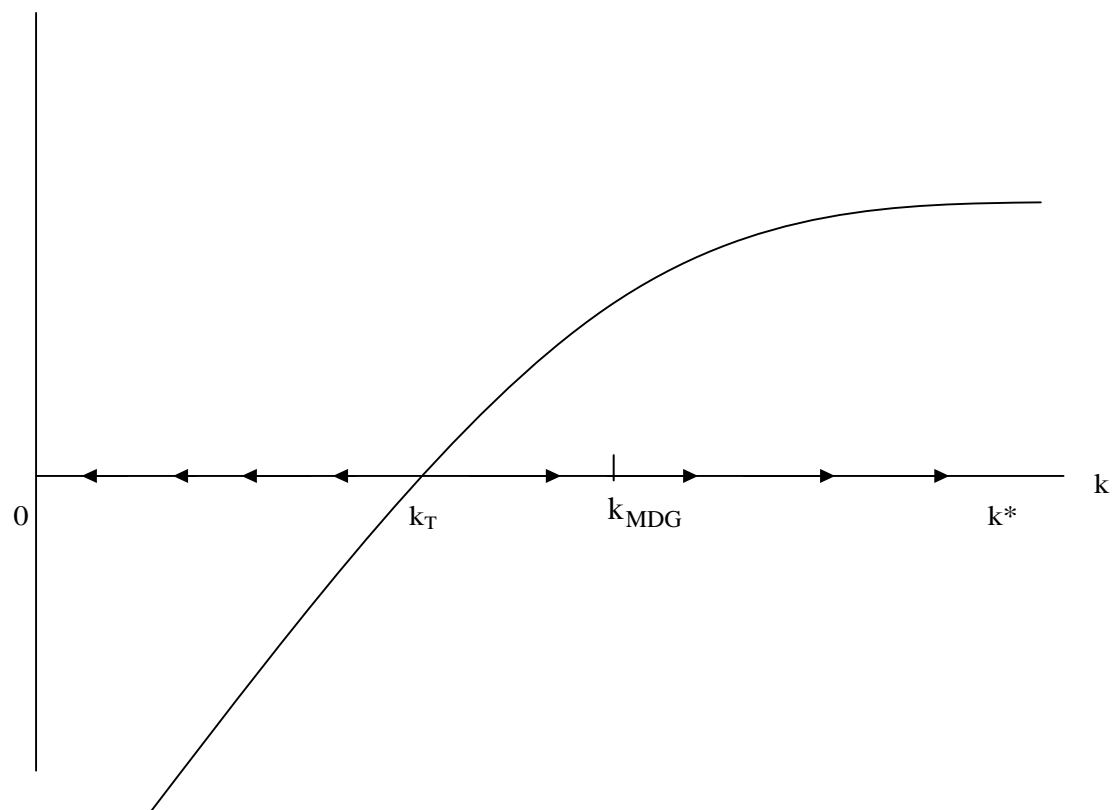
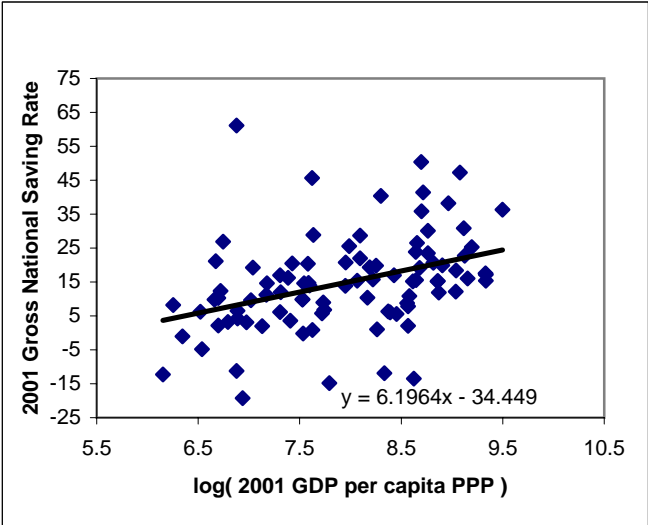
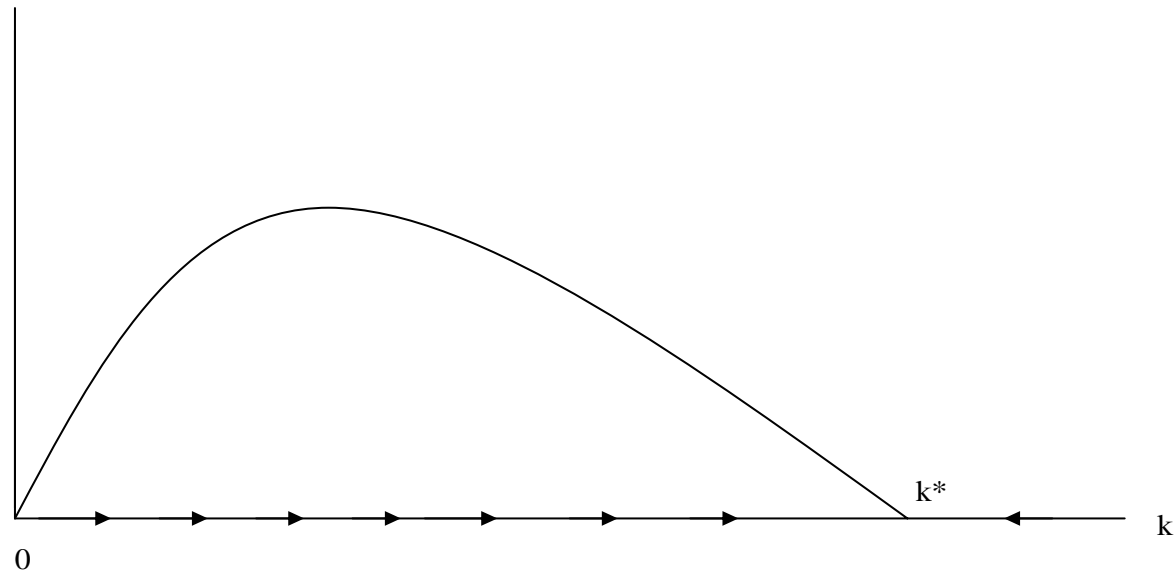


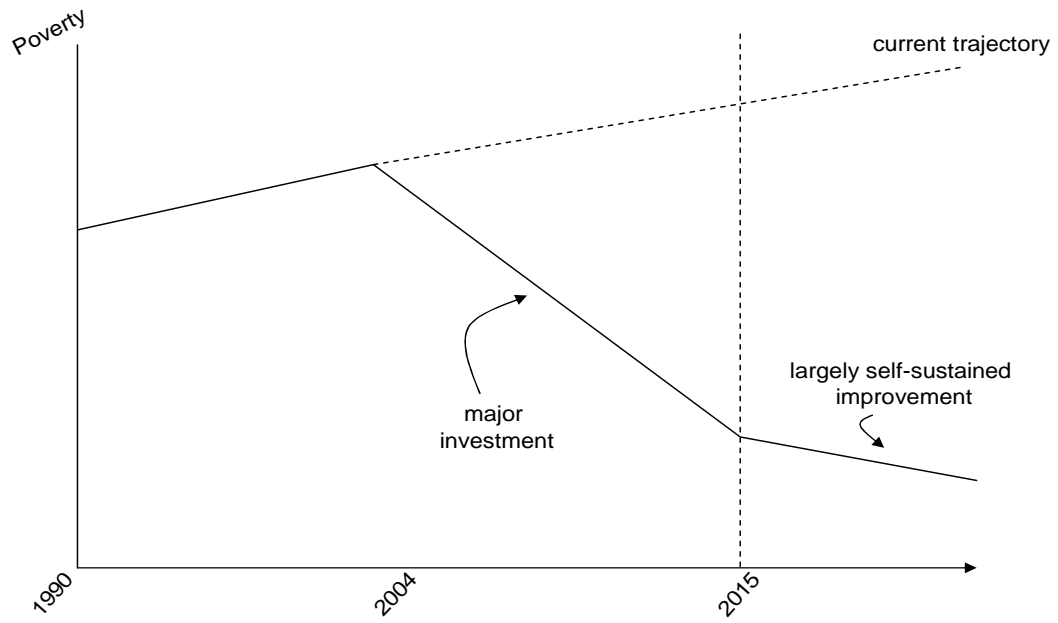
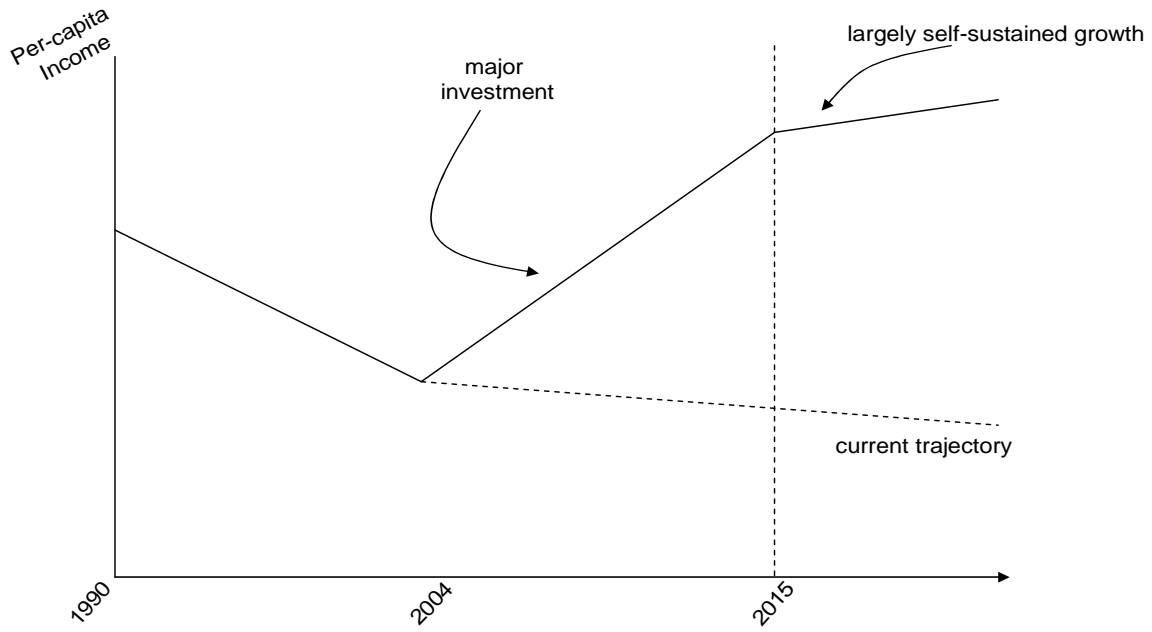
Figure 3: Income vs. Saving Rate



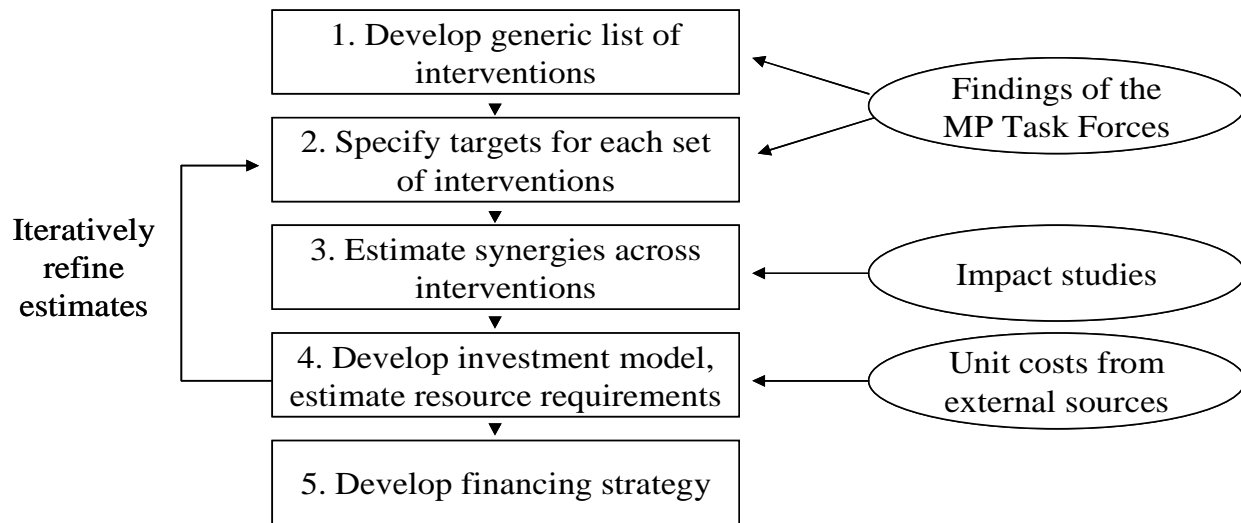
**Figure 4: Capital-labor ratio dynamics in the Solow Model**  
 $dk/dt$



**Figure 5: Trajectories for Income and Poverty**

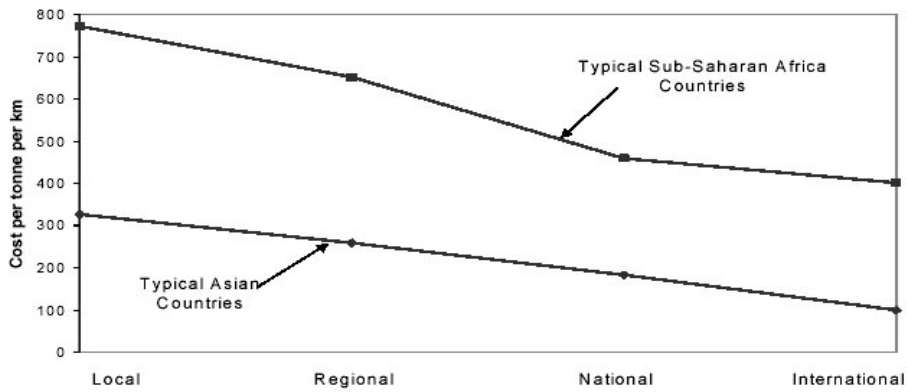


**Figure 6: Summary of needs assessment methodology**



**Figure 7**

**Relative transport costs of typical Sub-Saharan Africa and Asian countries**

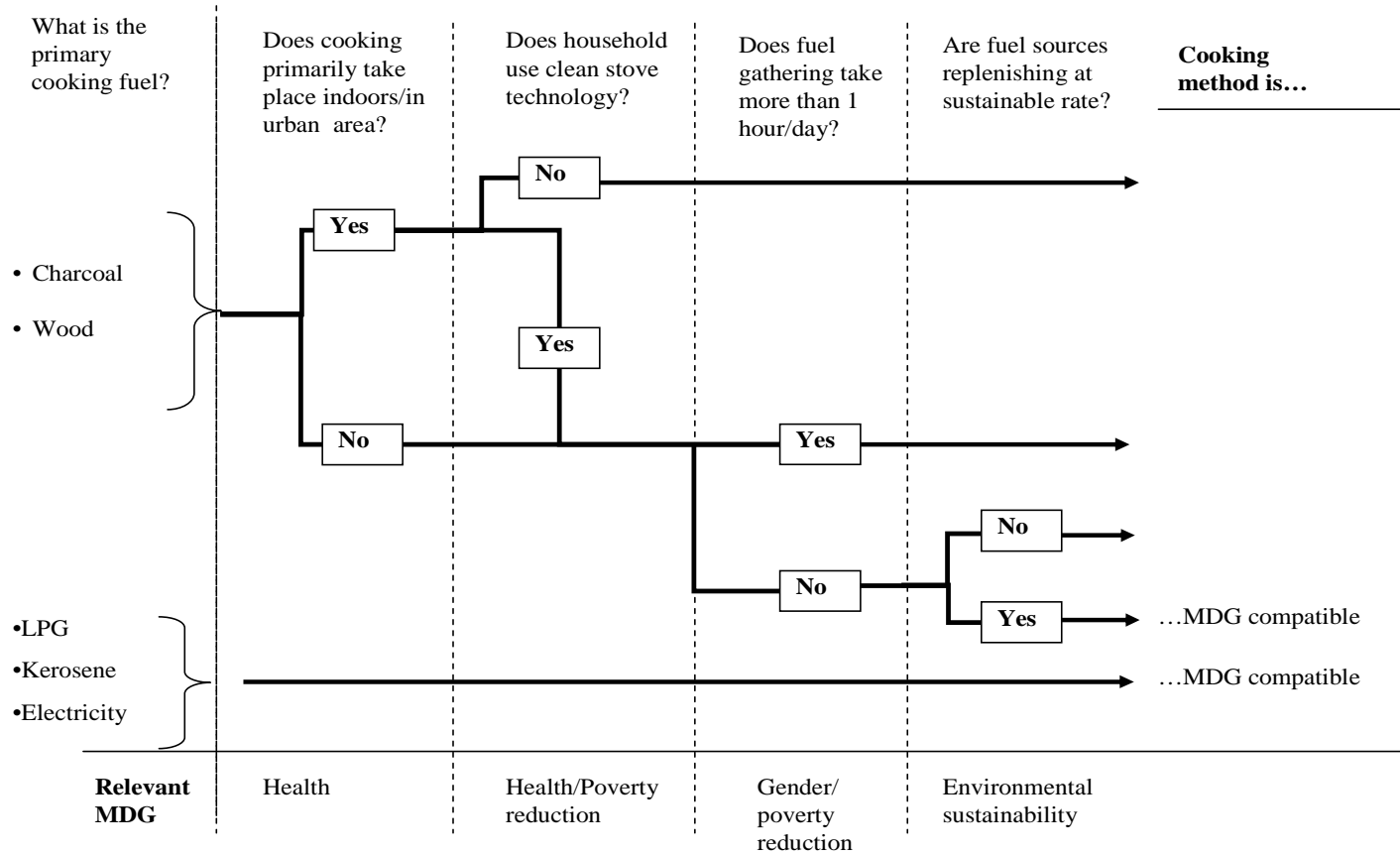


Source Starkey, P, S. Ellis, J. Hine and A.. Ternell. 2002. Improving Rural Mobility – Options for Developing Motorized and Nonmotorized Transport in Rural Areas. World Bank Technical Paper No. 525. Washington D.C.: World Bank.



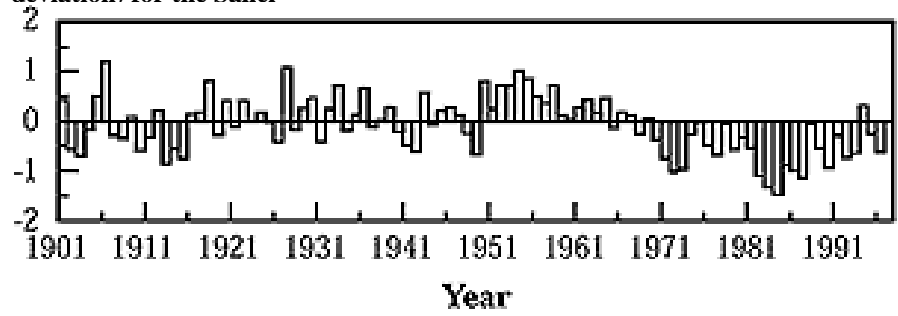
**Figure 8: Decision Tree for choice of cooking fuel**

Some cooking fuels are only MDG-compatible under specific conditions:



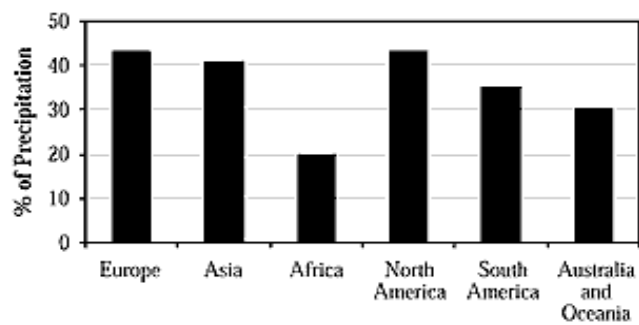
Source: McKinsey & Co.

**Figure 9: Rainfall fluctuations, 1901-1998, expressed as regionally averaged standard deviation (departure from long-term mean divided by standard deviation) for the Sahel**



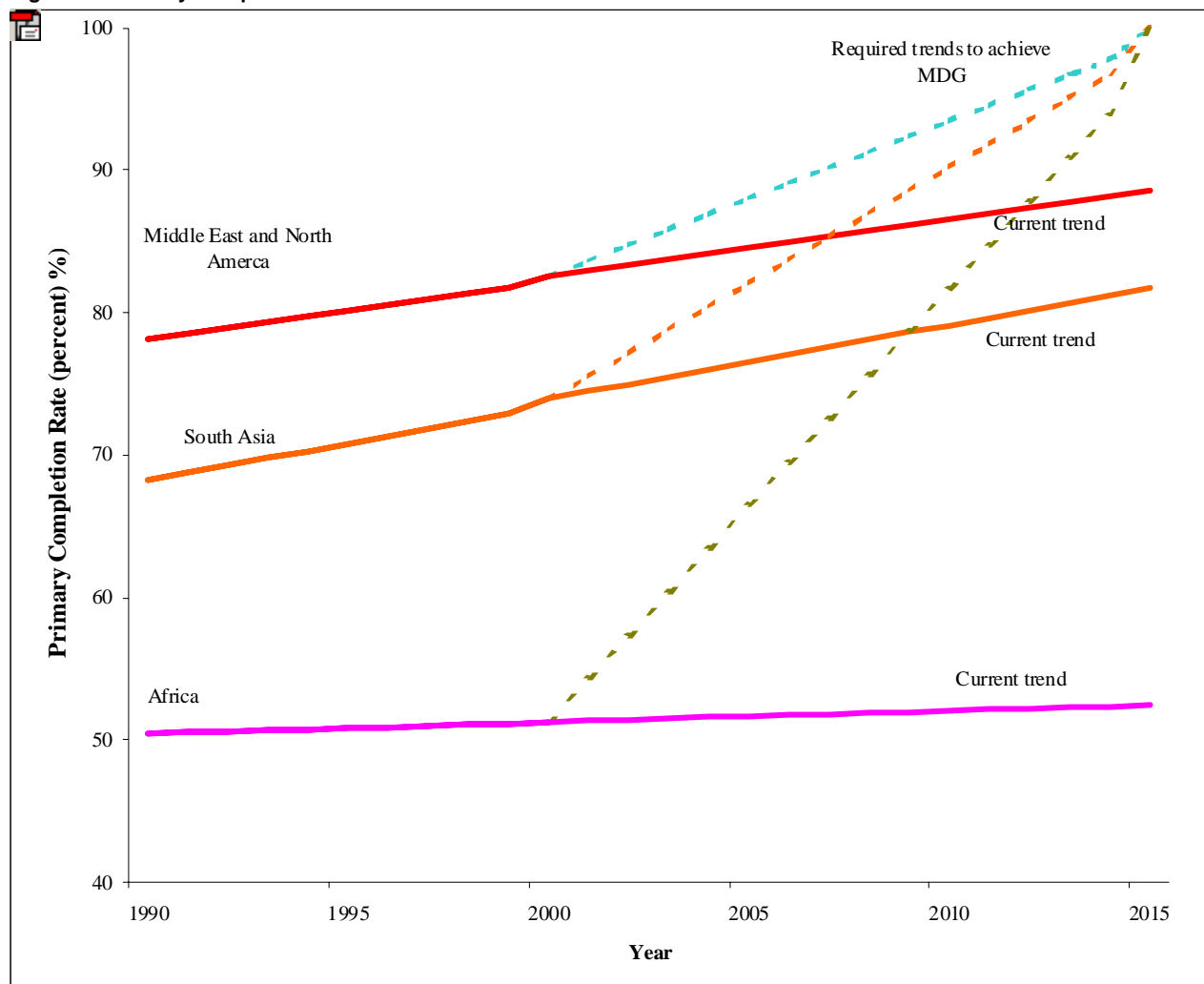
Source: IPCC 2001. Working Group II: Impacts, Adaptation and Vulnerability

**Figure 10: Comparative hydrology in world regions—total runoff as percentage of precipitation**



Source: GEMS, 1995. "Environmental Data Report. Global Environmental Monitoring and Assessment Research Center, Blackwell Publishers.

Figure 11: Primary Completion Rate



Source: Bruns, B., A. Mingat and R. Rakotomalala. 2003. Achieving Universal Primary Education: A Chance for Every Child. World Bank, Washington D.C.

**Table 1: Comparative Indicators**

	Per capita growth (1980-2000)	Life expectancy at birth (2001)	Under 5 mortality rate, per 1000 live births (2001)	HIV prevalence, % adults 15-49 (2001)	Children under weight for age, % under age 5 (1995-2001)	Cereal yield (kg per hectare) (2000)
Sub-Saharan Africa	-1.0%	46.1	171.1	7.5	28%	1155
South Asia	3.3%	62.6	95.3	0.6	46%	2411
Latin America	0.5%	70.6	32.7	0.6	7%	2965
East Asia and the Pacific	6.7%	70.2	38.3	0.2	16%	4598
Middle East and North Africa	1.0%	68.4	50.0	0.1	11%	2676

Sources: Calculated from World Development Indicators 2003; Human Development Report 2003; FAOSTAT Database

**Table 2: Growth Decomposition, 1980-90 and 1990-2000**

		Growth in Output per worker	Physical capital per worker	Education per worker	Total factor productivity
Africa	1980 - 1990	-1.1	-0.1	0.4	-1.4
	1990 - 2000	-0.2	-0.1	0.4	-0.5
Latin America	1980 - 1990	-1.8	0.0	0.5	-2.3
	1990 - 2000	0.9	0.2	0.3	0.4
Middle East	1980 - 1990	1.1	0.6	0.5	0.1
	1990 - 2000	0.8	0.3	0.5	0.0
East Asia	1980 - 1990	4.4	2.4	0.6	1.3
	1990 - 2000	3.4	2.3	0.5	0.5
China	1980 - 1990	6.8	2.1	0.4	4.2
	1990 - 2000	8.8	3.2	0.3	5.1
Industrial countries	1980 - 1990	1.8	0.7	0.2	0.9
	1990 - 2000	1.5	0.8	0.2	0.5

Source: Bosworth, Barry P. and Susan M. Collins, "The Empirics of Growth: An Update", Brookings Papers on Economic Activity, 2:2003

**Table 3:**  
**UN Millennium Development Goals (MDGs)**

<b>1</b>	<b>Eradicate extreme poverty and hunger</b>	Reduce by half the proportion of people living on less than a dollar a day
		Reduce by half the proportion of people who suffer from hunger
<b>2</b>	<b>Achieve universal primary education</b>	Ensure that all boys and girls complete a full course of primary schooling
<b>3</b>	<b>Promote gender equality and empower women</b>	Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015
<b>4</b>	<b>Reduce child mortality</b>	Reduce by two thirds the mortality rate among children under five
<b>5</b>	<b>Improve maternal health</b>	Reduce by three quarters the maternal mortality ratio
<b>6</b>	<b>Combat HIV/AIDS, malaria and other diseases</b>	Halt and begin to reverse the spread of HIV/AIDS
		Halt and begin to reverse the incidence of malaria and other major diseases
<b>7</b>	<b>Ensure environmental sustainability</b>	Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources
		Reduce by half the proportion of people without sustainable access to safe drinking water
		Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020
<b>8</b>	<b>Develop a global partnership for development</b>	Develop further an open trading and financial system that is rule-based, predictable and non-discriminatory. Includes a commitment to good governance, development and poverty reduction—nationally and internationally
		Address the least developed countries' special needs. This includes tariff- and quota-free access for their exports; enhanced debt relief for heavily indebted poor countries; cancellation of official bilateral debt; and more generous official development assistance for countries committed to poverty reduction
		Address the special needs of landlocked and small island developing States
		Deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term
		In cooperation with the developing countries, develop decent and productive work for youth
		In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
		In cooperation with the private sector, make available the benefits of new technologies—especially information and communications technologies

**Table 4: Poverty Indicators, Individual African Countries (ranked by GNI per capita)**

	<u>GNI per capita (2001)</u>	<u>Fuel Exporter</u>	<u>Least Developed Country</u>	<u>Life Expectancy at Birth (2001)</u>	<u>Under-5 Mortality Rate (2001)</u>
Congo, Rep.	640	X		51.5	108
Cote d'Ivoire	630			45.5	175
Cameroon	580	X		49.2	155
Angola	500	X	X	46.6	260
Senegal	490		X	52.3	138
Zimbabwe	480			39.4	123
Guinea	410		X	46.2	169
Benin	380		X	52.8	158
Mauritania	360		X	50.9	183
Kenya	350			46.3	122
Sudan	340		X	57.9	107
Zambia	320		X	37.5	202
Nigeria	290	X		46.1	183
Ghana	290			55.9	100
Togo	270		X	49.5	141
Tanzania	270		X	43.7	165
Uganda	260		X	42.8	124
Central African Republic	260		X	42.7	180
Mali	230		X	41.5	231
Rwanda	220		X	39.9	183
Burkina Faso	220		X	43.5	197
Mozambique	210		X	41.7	197
Chad	200		X	48.4	200
Niger	180		X	45.7	265
Malawi	160		X	38.2	183
Eritrea	160		X	51.0	111
Sierra Leone	140		X	37.3	316
Liberia	140		X	47.1	235
Ethiopia	100		X	42.2	172
Burundi	100		X	41.8	190
Congo, Dem. Rep.	80		X	45.5	205
Somalia			X	47.3	225

Source: World Bank World Development Indicators 2003



**Table 5: National Poverty Rates, Urban and Rural, Selected Countries**

	<u>National Poverty Rate</u>	<u>Rural Poverty Rate</u>	<u>Urban Poverty Rate</u>	<u>Rural Share of National Poverty</u>	<u>Urbanization Rate (1999)</u>	<u>Employment in Agriculture (% of total employment)</u>
Angola					33.5	74.5
Benin	33.0				41.5	63.5
Burkina Faso	45.3	51.0	16.5	94.1	16.2	92.4
Burundi	36.2				8.6	
Cameroon					48.0	69.7
Central African Republic					40.8	80.2
Chad	64.0	67.0	63.0	77.6	23.5	83.2
Congo, Dem. Rep.						67.8
Congo, Rep.					64.5	48.7
Cote d'Ivoire	36.8				43.2	60.0
Eritrea	53.0				18.4	80.5
Ethiopia	44.2	45.0	37.0	87.2	15.2	
Ghana	31.4	34.3	26.7	69.7	35.8	
Guinea	40.0				27.1	87.2
Kenya	42.0	46.4	29.3	76.8	32.3	19.1
Liberia					44.3	72.3
Malawi	65.3	66.5	54.9	87.8	14.4	
Mali					29.5	85.8
Mauritania	46.3	61.2	25.4	65.2	56.3	55.2
Mozambique	69.4	71.3	62.0	72.1	30.8	82.7
Niger	63.0	66.0	52.0	83.5	20.1	7.8
Nigeria	34.1	36.4	30.4	61.2	43.1	
Rwanda	51.2				6.1	91.7
Senegal	33.4	40.4			46.7	76.7
Sierra Leone					35.9	67.4
Somalia					27.1	75.3
Sudan					35.1	69.5
Tanzania	41.6	49.7	24.4	81.9	31.1	
Togo					32.8	65.5
Uganda	55.0				13.8	
Zambia	72.9	83.1	56.0	69.4	39.5	74.7
Zimbabwe	34.9	48.0	7.9	92.0	34.6	24.3

Source: World Bank World Development Indicators 2003

Urban poverty rate, rural poverty rate, and national poverty rate are for most recent available year (between 1990-2001)

**Table 6: Structural Features of Sub-Saharan Africa**

	<u>32-country sample average</u>	<u>Rest of developing world average</u>	<u>Statistical Significance</u>
<b>Geography</b>			
% Population within 100 km of coast	24.9	65.7	***
% Population in tropical ecozones	61.2	35.9	***
% Population in sub-humid and arid ecozones	82.6	39.4	***
% Percent population living at low density	45.0	27.0	***
<b>Health</b>			
Malaria ecology	13.2	2.5	***
Infant mortality rate	108.3	44.2	**
Under-5 mortality rate	178.2	58.9	***
Total fertility rate	5.4	3.4	**
<b>Agriculture</b>			
Irrigated land (% of agricultural land)	0.4	10.5	***
Cereal yield (kg per hectare)	1081.4	2356.6	***
Fertilizer consumption (100 grams per hectare of arable land)	96.9	1585.5	***
<b>Infrastructure</b>			
Paved Roads (km per 1000 people)	0.3	1.6	
Electric power consumption (kwh per capita)	177.0	1268.5	
Traditional Fuel Use (% of total energy use)	75.9	30.1	**

Averages are not weighted by population

For Geography variables, third column refers to statistical significance of the difference in the two averages

For other variables, third column refers to statistical significance of 32-country sample dummy in the following regression:

structural variable = a + b<sub>1</sub>(log GDP per capita PPP) + b<sub>2</sub>(dummy for 32-country sample)

Tobit regression used when structural variable is a percentage, otherwise OLS used taking the log of the dependent variable

\*\*\* 1% significance, \*\* 5% significance, \* 10% significance

High-income and ex-soviet countries excluded throughout

Sources: Calculated from World Bank World Development Indicators 2003; Center for International Earth Science Information Network ; Kiszewski, Anthony, Andrew Mellinger, Pia Malaney, Andrew Spielman, Sonia Ehrlich, Jeffrey D. Sachs. "A Global Index of the Stability of Malaria Transmission Based on the Intrinsic Properties of Anopheline Mosquito Vectors." American Journal of Tropical Medicine and Hygiene, forthcoming.

**Table 7a: Governance Indicators Analysis**

Independent variables:	GDP pc 2001	Sub-Saharan Africa dummy	R-squared	N
Dependent variable				
Corruption Perception Index 2003, Transparency International	0.33 (5.78)	0.15 (1.39)	0.43	67
2001 Index of Economic Freedom	-0.11 (-4.14)	-0.04 (-0.71)	0.24	83
2000 Average Kaufman, Kraay, Zoido-Lobaton indicators	0.20 (2.54)	-0.22 (-1.38)	0.22	93
1982-1997 Average ICRG Indicators	0.15 (4.12)	0.04 (0.52)	0.29	73

t-statistics are indicated in parentheses, coefficients for dummy never significant

All variables are in log form in the regression.

All regressions are ordinary least-squares and include a constant term (not reported)

Regressions do not include high-income and ex-soviet countries

Notes: **The Corruption Perception Index** relates to perceptions of the degree of corruption as seen by business people, academics and risk analysts, and ranges between 10 (highly clean) and 0 (highly corrupt); the **Index of Economic Freedom** ranges from 1 to 5, where 5 indicates greatest level of government interference in the economy and least economic freedom; the **Kaufman, Kraay, Zoido-Lobaton indicators** are six governance indicators measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes; the **ICRG indicators** include the average of six governance indicators from 1992-1997, where higher scores reflect better governance (ranging from 1 to 6).

**Table 7b: Governance Indicators Analysis**

Dependent variable:	1980-2000 Growth of GDP per capita			
Independent variables				
Sub-Saharan Africa dummy	-2.39 (-4.53)	-2.33 (-4.76)	-2.43 (-4.98)	-2.88 (-5.66)
Corruption Perception Index 2003, Transparency International	0.87 (4.77)			
2001 Index of Economic Freedom		-1.19 (-2.96)		
2000 Average Kaufman, Kraay, Zoido- Lobaton indicators			2.00 (5.12)	
1982-1997 Average ICRG Indicators				1.99 (6.09)
log( GDP pc in 1980)	-1.34 (-5.41)	-1.04 (-4.61)	-1.24 (-5.64)	(1-.42) (-5.97)
R-squared	0.46	0.33	0.48	0.53
N	61	73	83	68

t-statistics are indicated in parentheses, all coefficient are significant

All regressions are ordinary least-squares and include a constant term (not reported)

Regressions do not include high-income and ex-soviet countries

Notes: **The Corruption Perception** Index relates to perceptions of the degree of corruption as seen by business people, academics and risk analysts, and ranges between 10 (highly clean) and 0 (highly corrupt); the **Index of Economic Freedom** ranges from 1 to 5, where 5 indicates greatest level of government interference in the economy and least economic freedom; the **Kaufmann, Kraay, Zoido-Lobaton indicators** are six governance indicators measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes; the **ICRG indicators** include the average of six governance indicators from 1992-1997, where higher scores reflect better governance (ranging from 1 to 6).

**Table 8: Comparative indicators (c.1965)**

	Life expectancy at birth (1965)	Under 5 mortality rate, per 1000 live births (1965)	Illiteracy rate, % adult (1970)	Average Schooling years in total population (1965)	Electricity production kwh per capita (1971)	Cereal yield (kg per hectare) (1965)
Sub-Saharan Africa	41.5	241.5	76%	0.9	95	804.5
South Asia	46.5	223.8	68%	1.4	106	969.0
Latin America	58.5	134.1	27%	3.0	566	1365.5
East Asia and the Pacific	55.1	153.8	42%	4.0	502	1994.4
Middle East and North Africa	49.6	228.7	70%	0.8	251	1602.1

Sources: World Development Indicators 2003, FAOSTAT Database

Note: The index of food production portrays the output (after deduction for feed and seed) of a country's agriculture sector relative to the base period 1989-91. The food production index covers all edible agricultural products that contain nutrients; coffee and tea are excluded. For a given year and country, the index is calculated by taking the disposable average output of all food commodities in terms of weight or volume during the period of interest and dividing that year's output by the average of the 1989-91 output. This index is then multiplied by 100. The index represents the total amount of food commodity for that period in terms of the 1989-91 average amount of food commodities.

**Table 9: Commodity Real Prices Index, 1965-1969 = 100**

	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-2001
Coffee	100.00	105.92	166.02	112.47	108.36	55.19	72.57
Cocoa	100.00	108.77	191.87	116.30	94.63	48.35	53.79
Tea	100.00	84.21	104.01	111.58	90.29	65.20	68.34*
Sugar	100.00	104.76	78.07	63.25	44.21	41.90	37.94
Bananas	100.00	340.57	236.22	196.91	109.56	119.14	112.75
Palm oil	100.00	83.38	77.54	82.66	83.39	77.01	76.98
Cotton	100.00	124.86	106.99	88.68	56.60	44.90	57.40
Jute	100.00	115.90	104.63	93.15	72.09	60.90	62.15
Rubber	100.00	81.82	54.93	41.77	40.07	27.94	28.90
Copper	100.00	86.50	47.58	41.47	46.01	42.96	38.26
Tin	100.00	103.83	131.91	134.00	76.91	40.99	40.79
Petroleum	100.00	145.45	308.08	491.82	276.21	211.46	243.84

Sources: Calculated from United Nations Conference on Trade and Development data

\* Data for tea goes only through 1998

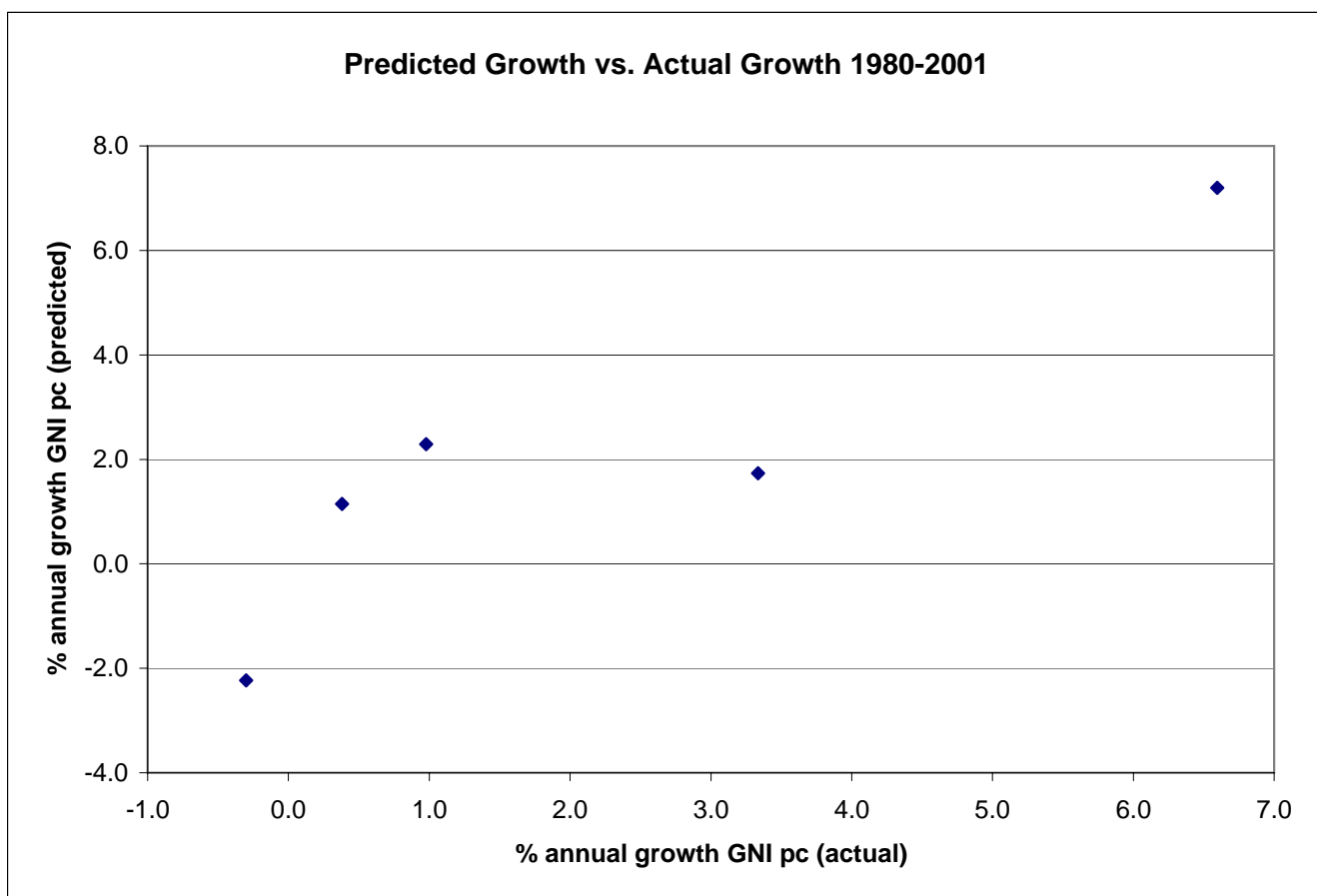
Specific variable information:

- Coffee, other mild Arabicas, ex-dock NY (¢/lb.)
- Cocoa, average daily prices NY/London (¢/lb.)
- All teas, London auction prices (¢/kg)
- Sugar in bulk, Caribbean ports, f.o.b. (I.S.A.) (¢/lb.)
- Fresh bananas, Central America and Ecuador, f.o.b. US ports (¢/lb.)
- Palm oil, 5% ffa, Indonesia/Malaysia, c.i.f., N.W European ports
- Cotton, US Memphis/Eastern, Midd.1-3/32", c.i.f. (¢/lb.)
- Jute BWD, Bangladesh, f.o.b. Mongla
- Rubber in bales, Singapore n°1 RSS, f.o.b. (¢/kg)
- Copper, grade A, LME, cash (\$/t)
- Tin, ex-smelter price, Kuala Lumpur (\$/kg)
- Petroleum Dubai/Brent/Texas (\$/barrel)

**Table 10: Predicted growth 1980-2001**

	Gross National Savings (% of GNI)	Population Growth	Consumption of fixed capital (% of GNI)	Predicted per capita annual growth	Actual per capita annual growth
Sub-Saharan Africa	11.5	2.7	10.0	-2.2	-0.3
South Asia	20.0	2.0	8.7	1.7	3.3
Latin America	18.7	1.8	9.8	1.1	0.4
East Asia and the Pacific	35.1	1.3	9.6	7.2	6.6
Middle East and North Africa	23.5	2.5	9.2	2.3	1.0

Sources: Calculated from World Development Indicators 2003;



**Table 11: Savings rates**

	Gross national saving 1980-2001 (% of GNI)	Adjusted gross saving 1980-2001 (% of GNI)	Adjusted gross saving minus soil depletion (% of GNI)
Sub-Saharan Africa	11.4	4.0	2.0
South Asia	20.0	22.6	22.6
Latin America	18.5	16.3	16.3
East Asia and the Pacific	34.5	32.9	32.9
Middle East and North Africa	20.9	10.6	10.6

Sources: World Development Indicators 2003; Soil nutrient depletion calculated with 1999 Sub-Saharan Africa nutrient balance midpoint of 60-100 NPK kg/ha from (Henaio, J. & Baanante, C. 1999. Nutrient depletion in the agricultural soils of Africa. 2020 Brief 62, October 1999. Washington, DC, IFPRI. (<http://www.cgiar.org/ifpri/2020/briefs>)) using 1982-1984 Sub-Saharan Africa N-P-K depletion ratio of 22-2.5-15 from (Stoorvogel, J. J., E. M. A. Smaling, and B. H. Janssen. 1993. Calculating soil nutrient balances in Africa at different scales. Fertilizer Research. No. 35: 227-335). GDP figures taken from World Development Indicators (2003); prices taken from African Agricultural Market Information Network accessed at [http://www.afamin.net/regionalenglish/reg\\_mis\\_en.asp](http://www.afamin.net/regionalenglish/reg_mis_en.asp) on 8 March 2004.

Notes: Adjusted net savings are equal to net national savings plus education expenditure and minus energy depletion, mineral depletion, and net forest depletion.



**Table 12: Overview of the Intervention Package**

Target	Agriculture	Nutrition	Primary & secondary education, adult literacy	Gender (not covered in other areas)	Health	Environment	Water and sanitation	Slum upgrading and urban planning	Science and Technology	Energy services	Transport infrastructure
<b>Poverty</b>	<ul style="list-style-type: none"> <li>Increasing agricultural productivity directly raises the income of the rural poor and reduces rural poverty.</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition interventions help build human capital by making people more productive</li> </ul>	<ul style="list-style-type: none"> <li>Education leads to higher levels of human capital formation</li> <li>Education provision is linked to lower fertility rates, which in turn can increase economic growth</li> </ul>	<ul style="list-style-type: none"> <li>Awareness of and access to reproductive health rights and services allow women to plan their families leading to lower fertility rates and higher growth</li> <li>Empowerment through access to work, property rights, political representation and safety from violence leads to higher contributions from women in economic activities</li> </ul>	<ul style="list-style-type: none"> <li>Preventing HIV/AIDS, would increase life expectancy in many African countries and boost the size of the most productive segment of the population (15-49)</li> <li>Treating HIV/AIDS and TB and preventing and treating malaria increases overall worker productivity by decreasing absenteeism and improving job performance</li> <li>Reproductive health services accelerate the demographic transition to lower fertility rates, which can increase economic growth.</li> </ul>	<ul style="list-style-type: none"> <li>Many poor people depend on natural resources for their livelihoods. Improving natural resource management can sustain or even raise their incomes.</li> </ul>	<ul style="list-style-type: none"> <li>Improved water supply for productive activities can raise economic growth through the urban manufacturing and service sector.</li> </ul>	<ul style="list-style-type: none"> <li>Providing security of tenure can improve labor market participation and provides access to credit markets, thus raising incomes.</li> <li>Higher education opens new employment opportunities thus reducing poverty.</li> <li>ICT facilitates communication, which creates new employment opportunities and reduces poverty.</li> </ul>	<ul style="list-style-type: none"> <li>Science &amp; technology institutions improve technological learning in society and improve adoption of technology in private sector, which raises incomes.</li> <li>Higher education opens new employment opportunities thus reducing poverty.</li> <li>ICT facilitates communication, which creates new employment opportunities and reduces poverty.</li> </ul>	<ul style="list-style-type: none"> <li>Access to electricity and improved thermal energy systems is necessary for manufacturing, service or cottage industries, which raise incomes and reduce poverty.</li> </ul>	<ul style="list-style-type: none"> <li>Roads, railways and ports lower transport costs and thereby increase the real incomes of the poor.</li> <li>In particular they reduce the cost of inputs for agricultural production and raise farmgate prices for outputs, thus reducing rural poverty.</li> <li>In urban areas improved transport infrastructure support manufacturing and service industries.</li> </ul>
<b>Hunger</b>	<ul style="list-style-type: none"> <li>Increasing agricultural productivity increases food sufficiency for subsistence farmers and enables the rural poor to spend more on food.</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition interventions provide people with adequate dietary intake and therefore directly contribute to reducing hunger</li> <li>Direct assistance in food scarcity areas alleviates hunger in the short term</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition education contributes to improved nutritional outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Land rights allow women to increase agricultural production and incomes</li> <li>Increased access to work and higher incomes enables women to purchase adequate food for themselves and their families</li> </ul>	<ul style="list-style-type: none"> <li>The health system can help diagnose and treat malnutrition, contributing to a reduction in the proportion of malnourished children</li> </ul>	<ul style="list-style-type: none"> <li>Improved water resource management and protection of water catchment areas can improve water availability for agriculture to raise crop yields and combat hunger.</li> <li>Biodiversity protection sustains pollination and seed dispersal mechanisms, which are necessary for agricultural production.</li> </ul>	<ul style="list-style-type: none"> <li>Drinking water supply through wells and boreholes can help irrigate fields during unforeseen droughts, which raises agricultural output</li> <li>Access to sanitation improves health and increases nutrient uptake</li> <li>Integrated water resources management ensures adequate water supply for agriculture</li> <li>Water storage &amp; water management infrastructure improve water management for agriculture and increase yields</li> </ul>	<ul style="list-style-type: none"> <li>Slum upgrading and accompanying interventions help raise incomes, which reduces urban hunger.</li> <li>Improved transport infrastructure lowers cost of food products further reducing hunger.</li> </ul>	<ul style="list-style-type: none"> <li>Increased agricultural research is critical for improving seed varieties, cropping systems, pest control, water management, etc. to increase agricultural productivity thus reducing hunger.</li> <li>Increased access to higher education can help train agricultural extension workers.</li> <li>ICT reduces farmers' marketing costs, which raises their incomes and agricultural production.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to electricity and liquid fuels can power diesel pumps for irrigation, facilitate mechanization and power agro-processing machinery thus increasing agricultural output and reducing hunger.</li> <li>Improved energy services lower transportation and marketing costs, which reduces food prices.</li> <li>Access to improved cooking fuels is necessary to ensure appropriate cooking of food.</li> <li>Modern energy services increase incentive for teachers to work in rural areas.</li> </ul>	<ul style="list-style-type: none"> <li>Footpaths, feeder, district and national roads lower cost of agricultural inputs, increase farmgate prices and facilitate marketing, which can increase agricultural production.</li> <li>Improved transport infrastructure reduces post harvest losses through accelerated transport of products to markets.</li> <li>Improved transport infrastructure increase incentive for teachers to work in rural areas.</li> </ul>

Primary education	<ul style="list-style-type: none"> <li>Agricultural interventions of improved soils, seeds and water provision can reduce the time young children spend in the field, freeing them to attend school</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition interventions for infants improve cognitive development and prepare infants for better learning outcomes in the future</li> <li>Nutrition interventions in schools increase school enrolment and attendance</li> </ul>	<ul style="list-style-type: none"> <li>Secondary education provision acts as an incentive for parents to send children to primary school</li> <li>Maternal education is linked to higher rates of primary enrolment</li> </ul>	<ul style="list-style-type: none"> <li>Maternal education contributes to higher primary enrolment</li> </ul>	<ul style="list-style-type: none"> <li>Improved health enhances children's educational attainment by improving cognitive abilities and attendance rates.</li> <li>AIDS prevention and treatment reduces the impact of this disease on total teacher numbers and attendance.</li> <li>AIDS prevention and treatment will reduce the number of orphans who are less likely to complete primary education.</li> </ul>	<ul style="list-style-type: none"> <li>Improved natural resource management can free up children's time and increase school attendance.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to water reduces frees up children's time thus allowing them to attend school – particularly girls.</li> <li>Improved health through sanitation and hygiene reduces school absenteeism.</li> <li>Girls' toilets in schools can increase their enrolment and completion rates.</li> </ul>	<ul style="list-style-type: none"> <li>Security of tenure and a fixed address are often necessary for children to be allowed to attend school.</li> </ul>	<ul style="list-style-type: none"> <li>Tertiary education helps train secondary school teachers and provides additional incentive to complete primary and secondary school.</li> <li>ICT infrastructure can improve the quality of school education</li> </ul>	<ul style="list-style-type: none"> <li>Access to electricity and improved cooking fuels lowers time spent by children (especially girls) collecting fuelwood thus facilitating school attendance.</li> <li>Improved access to liquid fuels is necessary for rendering mechanized school transport more affordable.</li> <li>Electrification permits studying and reading for longer hours, thus improving school outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>Feeder roads and footpaths reduce the time it takes for children to reach school and allows them to travel longer distances, which can raise enrolment rates.</li> <li>In addition, the time required by households to fetch fuel, water, and to carry out other tasks is reduced. This lowers the opportunity cost of children attending school.</li> </ul>
Gender equality	<ul style="list-style-type: none"> <li>Agricultural interventions (improved soils, seeds and water provision) can reduce the time girls spend in the field, freeing them to attend school</li> <li>Increased agricultural production increases income of women farmers</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition interventions for pregnant women leads to higher nutritional status of babies</li> <li>Nutrition interventions for infants and girl children lead to better health and education outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Education interventions contribute directly to women's empowerment</li> </ul>		<ul style="list-style-type: none"> <li>Family planning services appear to improve employment opportunities for women, strengthen partner relationships and provide a greater sense of well-being.</li> </ul>	<ul style="list-style-type: none"> <li>Women benefit disproportionately from improved management of natural resources through timesaving, reduced transport burden, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to water generates time savings for women and girls.</li> <li>Improved access to water obviates the need to carry heavy loads over long distances thus improving women's health.</li> <li>Ending the need to defecate in the open reduces exposure to harassment and Improves personal hygiene and well-being.</li> </ul>	<ul style="list-style-type: none"> <li>Women benefit disproportionately from slum upgrading since it reduces their transport burden and time poverty, improves their health and provides them with additional income generating opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Science and Telecommunication create employment opportunities for women.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to electricity and fuels reduces time poverty of women and lowers their daily transport burden.</li> <li>Improved access to energy offers additional employment opportunities for women.</li> <li>Reducing indoor air pollution through improved cooking fuels and stoves improves women's health.</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure reduces women's time poverty and transport burden</li> <li>Roads improve communication and lower transaction costs, thus increasing employment opportunities for women</li> <li>Transport infrastructure reduces relative isolation of women and thereby enhances their safety.</li> </ul>
Child mortality	<ul style="list-style-type: none"> <li>Increased rural incomes lead to improved health outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition interventions help reduce child mortality in cases where undernutrition contributes to mortality</li> </ul>	<ul style="list-style-type: none"> <li>Secondary education interventions increase the age of marriage, contributing to safer pregnancies and lower fertility rates</li> <li>Adult literacy programs increase awareness of child mortality causes and prevention</li> </ul>	<ul style="list-style-type: none"> <li>Women's empowerment leads to greater awareness of child health issues</li> </ul>		<ul style="list-style-type: none"> <li>Reducing pollution of water and air can lower child mortality.</li> </ul>	<ul style="list-style-type: none"> <li>Access to sanitation and improved hygiene reduce waterborne diseases, which lowers child mortality.</li> </ul>	<ul style="list-style-type: none"> <li>Slum upgrading, improved urban infrastructure and access to basic service (including solid waste disposal) can reduce child mortality rates.</li> <li>Road kerbing and street lighting can reduce traffic deaths.</li> </ul>	<ul style="list-style-type: none"> <li>ICT improves hygiene education and thereby lowers child mortality.</li> </ul>	<ul style="list-style-type: none"> <li>Reducing indoor air pollution through improved cooking fuels and stoves lowers child mortality rates.</li> <li>Improved access to energy allows households to boil water thus reducing incidence of waterborne diseases, which can kill children.</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure reduces women's time poverty and transport burden</li> <li>Roads improve communication and lower transaction costs, thus increasing employment opportunities for women</li> </ul>

<b>Maternal mortality</b>	<ul style="list-style-type: none"> <li>Increased rural incomes lead to improved health outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Nutrition for women in reproductive age group reduces risk during pregnancy</li> </ul>	<ul style="list-style-type: none"> <li>Secondary education interventions increase the age of marriage, contributing to safer pregnancies and lower mortality</li> <li>Adult literacy programs increase awareness of maternal mortality causes and prevention</li> </ul>	<ul style="list-style-type: none"> <li>Women's empowerment leads to greater awareness of maternal health issues</li> </ul>			<ul style="list-style-type: none"> <li>Improved access to water obviates the need to carry heavy loads over long distances thus improving women's health during pregnancies.</li> <li>Access to sanitation and hygienic behavior improve women's health.</li> </ul>	<ul style="list-style-type: none"> <li>Slum upgrading and security of tenure improve women's access to health systems and emergency obstetric care.</li> </ul>	<ul style="list-style-type: none"> <li>ICT is critical for providing adequate access to emergency obstetric care.</li> <li>ICT can reduce transport burden of women.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to energy lowers women's time poverty and transport burden, which reduces physical strain during pregnancy.</li> <li>Improved access to energy services improves communication and transport that are critical for emergency obstetric care.</li> <li>Modern energy services increase incentive for healthcare workers to work in rural areas</li> </ul>	<ul style="list-style-type: none"> <li>Feeder roads and improved footpaths are critical for providing effective and timely access to emergency obstetric care.</li> <li>Reduced transport burden of women through improved transport infrastructure further improves maternal health.</li> <li>Improved transport infrastructure increases incentive for healthcare workers to work in rural areas</li> </ul>
<b>HIV/AIDS</b>	<ul style="list-style-type: none"> <li>An increase in agricultural incomes improves access and information to ways of preventing and treating HIV/AIDS</li> </ul>		<ul style="list-style-type: none"> <li>Education interventions and literacy programs increase awareness of HIV/AIDS prevention and treatment</li> </ul>	<ul style="list-style-type: none"> <li>Women's empowerment leads to greater awareness of HIV/AIDS prevention and treatment</li> </ul>			<ul style="list-style-type: none"> <li>Improving access to water and sanitation improves general health of HIV/AIDS patients.</li> </ul>	<ul style="list-style-type: none"> <li>Slum upgrading and security of tenure improve people's access to HIV/AIDS treatment and prevention.</li> </ul>	<ul style="list-style-type: none"> <li>Science research can improve diagnosis and treatment of HIV/AIDS</li> <li>ICT is critical for effective HIV/AIDS prevention</li> </ul>	<ul style="list-style-type: none"> <li>Electricity and modern energy services improve health care</li> <li>Modern energy services increase incentive for healthcare workers to work in rural areas</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure facilitates HIV/AIDS prevention and treatment</li> <li>Improved transport infrastructure increases incentives for healthcare workers to work in rural areas</li> </ul>
<b>Malaria and other major diseases</b>	<ul style="list-style-type: none"> <li>An increase in agricultural incomes improves access and information to ways of preventing and treating malaria</li> </ul>		<ul style="list-style-type: none"> <li>Education interventions and literacy programs increase awareness of malaria prevention and treatment</li> </ul>	<ul style="list-style-type: none"> <li>Women's empowerment leads to greater awareness of malaria prevention and treatment</li> </ul>		<ul style="list-style-type: none"> <li>In some instances environmental control can contribute towards containing malaria</li> </ul>	<ul style="list-style-type: none"> <li>In some instances improved water management in urban areas can contribute towards containing malaria</li> </ul>	<ul style="list-style-type: none"> <li>Improving housing &amp; urban water management infrastructure can reduce incidence of malaria.</li> <li>Slum upgrading improves access to appropriate malaria treatment</li> </ul>	<ul style="list-style-type: none"> <li>Research is necessary to develop new anti-malarials and reduce drug resistance.</li> </ul>	<ul style="list-style-type: none"> <li>Electricity and modern energy services improve health care</li> <li>Modern energy services increase incentive for healthcare workers to work in rural areas</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure reduces cost of distributing bednets</li> <li>Improved transport infrastructure increase incentive for healthcare workers to work in rural areas</li> </ul>
<b>Access to essential medicines</b>	<ul style="list-style-type: none"> <li>An increase in agricultural incomes makes essential medicines affordable</li> </ul>		<ul style="list-style-type: none"> <li>Education interventions and literacy programs increase awareness of how to access essential medicines</li> </ul>						<ul style="list-style-type: none"> <li>Research improves essential medicines</li> </ul>		<ul style="list-style-type: none"> <li>Improved transport infrastructure lowers cost of essential medicines and improves access.</li> </ul>
<b>Reverse loss of environmental resources</b>	<ul style="list-style-type: none"> <li>Investments in soil health replenish soils and prevent further land degradation</li> <li>Small scale water management can restore water tables and prevent runoffs</li> </ul>			<ul style="list-style-type: none"> <li>Equal access to property rights allows women, as primary users, to manage natural resources in a sustainable manner</li> </ul>	<ul style="list-style-type: none"> <li>Family planning reduces total fertility rates thus mitigating population pressures on the environment</li> </ul>		<ul style="list-style-type: none"> <li>Improved sanitation and sewage treatment can reduce environmental pollution.</li> <li>Integrated water resources management can ensure sufficient 'green water' necessary for ecosystem functioning</li> <li>Hydrological monitoring systems can help protect aquifers and freshwater ecosystems from excessive withdrawals</li> </ul>	<ul style="list-style-type: none"> <li>Slum upgrading and improved urban water and waste management infrastructure reduce environmental pollution.</li> </ul>	<ul style="list-style-type: none"> <li>Research can improve natural resource management (e.g. management of freshwater ecosystems &amp; wetlands, biodiversity conservation, etc.)</li> <li>ICT reduces costs of natural resource management</li> </ul>	<ul style="list-style-type: none"> <li>Access to modern cooking fuels reduces demand for biomass, thus reducing pressure on marginal lands and forests.</li> <li>Improved energy services reduce outdoor air pollution.</li> <li>Improved energy services can reduce carbon emissions.</li> </ul>	

s | runoffs | | | manner | environment | [REDACTED] | withdrawals | pollution. | management | emissions. |

Water and sanitation	<ul style="list-style-type: none"> <li>Small scale water management increases water availability for rural farmers</li> </ul>		<ul style="list-style-type: none"> <li>Education interventions and literacy programs increase awareness on hygiene education</li> </ul>	<ul style="list-style-type: none"> <li>Political representation allows women to ensure access to water is a priority in local decision making</li> </ul>		<ul style="list-style-type: none"> <li>Improved management of wetlands, water catchment areas and freshwater ecosystems is critical for ensuring access to drinking water.</li> <li>Control of industrial pollution improves drinking water quality.</li> </ul>		<ul style="list-style-type: none"> <li>Slum upgrading reduces water pollution and improves drinking water quality.</li> <li>Improved urban infrastructure ensures the separation of sewage from drinking water supplies.</li> </ul>	<ul style="list-style-type: none"> <li>Research can help improve sanitation and water management techniques</li> <li>Higher education is necessary to install and operate water supply and sewer infrastructure.</li> <li>ICT lowers cost of O&amp;M for water supply and sanitation infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Electricity and improved access to liquid fuels is necessary to power water supply infrastructure and water treatment systems.</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure facilitates provision, operation and maintenance of water supply and sanitation systems.</li> <li>Improved transport systems reduce costs of hygiene education.</li> </ul>
Improve the lives of slum dwellers		<ul style="list-style-type: none"> <li>Nutrition interventions improve health outcomes of urban populations</li> </ul>		<ul style="list-style-type: none"> <li>Equal access to property rights, political representation and security for girls and women allows women to improve the lives of their families and themselves in slums</li> </ul>	<ul style="list-style-type: none"> <li>Access to health services is a central component of a decent life. Slum dwellers are particularly vulnerable to health risks due to poor living conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Improving solid waste disposal and water treatment can improve the lives of slum dwellers.</li> </ul>	<ul style="list-style-type: none"> <li>Improved access to water supply and sanitation can reduce household expenditure on water.</li> <li>Sewerage treatment can further improve health outcomes in urban areas</li> <li>Stormwater drainage systems are improved through sanitation infrastructure, thus minimizing risk of flooding</li> </ul>		<ul style="list-style-type: none"> <li>Higher education provides new employment opportunities for the urban poor.</li> <li>ICT reduces the cost of income generating activities</li> </ul>	<ul style="list-style-type: none"> <li>Improving access to electricity and modern fuels lowers indoor air pollution</li> <li>Access to electricity and modern fuels can lower household expenditure on energy services, thus raising incomes.</li> <li>Improved energy services lower the cost of urban transport</li> </ul>	<ul style="list-style-type: none"> <li>Improved rural transport infrastructure reduces cost of food in urban areas, thus increasing real incomes.</li> <li>Improve urban transport infrastructure is critical to enhance income generating opportunities as well as access to social services.</li> <li>Proper sidewalks and kerbing is critical to reduce traffic deaths.</li> </ul>
Information and Communications Technology			<ul style="list-style-type: none"> <li>Secondary education interventions prepare students for ability to provide, use and manage ICT</li> </ul>							<ul style="list-style-type: none"> <li>Electricity is necessary to power ICT applications and to operate research institutions</li> </ul>	<ul style="list-style-type: none"> <li>Improved transport infrastructure facilitates deployment of ICT.</li> <li>Improved transport infrastructure facilitates higher education.</li> </ul>

**Table 13: Land to Person Ratio (10 year average) in Selected Countries**

	<b>1960-69</b>	<b>1970-79</b>	<b>1980-89</b>	<b>1990-99</b>
<b><i>Sub-Saharan Africa</i></b>				
<b>Ethiopia</b>	0.508	0.450	0.363	0.252
<b>Kenya</b>	0.459	0.350	0.280	0.229
<b>Mozambique</b>	0.389	0.367	0.298	0.249
<b>Rwanda</b>	0.215	0.211	0.197	0.161
<b>Zambia</b>	1.367	1.073	0.896	0.779
<b>Zimbabwe</b>	0.726	0.664	0.583	0.525

Source Jayne, T.S., T. Yamano, M. Weber, D. Tschirley, R. Benfica, D. Neven, A. Chapoto and B. Zulu 2001. Smallholder Income and Land Distribution in Africa: Implications for Poverty Reduction Strategies. MSU International Development Paper No. 24. Department of Agricultural Economics, Department of Economics, Michigan State University

**Table 14: Access to improved water supply and sanitation in Sub-Saharan Africa**

	<b>1990</b>	<b>2000</b>
Rural access to water supply (%)	40	46
Urban access to water supply (%)	86	83
Total access to water supply (%)	53	58
Rural access to sanitation (%)	45	45
Urban access to sanitation (%)	75	76
Total access to sanitation (%)	54	53

Source: WHO/UNICEF JMP. 2000. World Health Organization and United Nations Children's Fund, Global Water Supply and Sanitation Assessment 2000 Report.

**Table 15: Gender Indicators**

	Gender Development Index	F/M primary enrolment ratio 2000 (UNESCO)	F/M secondary enrolment ratio 2000 (UNESCO)	Maternal mortality ratio 1985-2001 (per 100,000 live births)	Total fertility rate, 2001	Fertility rates for 15-19 yr. (2000)	F/M labor force participation ratio, 2000	Share of women in national parliament, 2003
Sub-Saharan Africa	0.61	0.84	0.85	695	5.34	121	0.72	9.80
South Asia	0.57	0.85	0.73	517	3.24	61	0.47	9.44
Latin America	0.82	0.97	1.08	122	2.54	57	0.57	14.10
East Asia and the Pacific	0.77	1.01	0.91	100	2.03	17	0.79	18.49
Middle East and North Africa	0.59	0.93	0.95	126	3.39	45	0.23	5.14

Sources: Calculated from UNESCO, ILO, Human Development Report 2003



**Table 16: Human resource and infrastructure needs for education sector in Tanzania**

<b>Human Resource and Infrastructure Needs</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>Total 2005-2015</b>	<b>Average 2005-2015</b>
<b>Number of teachers</b>					
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
<b>Total</b>	<b>134,353</b>	<b>170,269</b>	<b>215,122</b>	<b>1,887,904</b>	<b>171,628</b>
<b>Number of classrooms</b>					
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
<b>Total</b>	<b>110,435</b>	<b>152,888</b>	<b>215,122</b>	<b>1,720,883</b>	<b>156,444</b>

Source: Millennium Project 2003. "Millennium Development Goals Needs Assessments: Country Case Studies of Bangladesh, Cambodia, Ghana, Tanzania and Uganda." Working Paper. Millennium Project: New York.

**Table 17: Preliminary needs assessment Ghana**

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

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>Total Cost (Sum of A+B+C below)</b>										
Hunger	56	2.6	134	5.5	249	9.4	1,554	141	5.9	1.9%
Education	347	15.9	424	17.6	516	19.6	4,695	427	17.7	5.6%
Gender Equality	38	1.8	54	2.2	59	2.2	565	51	2.1	0.7%
Health	358	16.4	604	25.0	804	30.5	6,578	598	24.8	7.9%
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	2.4%
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	270	12.4	346	14.3	404	15.3	3,790	345	14.3	4.5%
Roads	222	10.1	223	9.2	224	8.5	2,452	223	9.2	2.9%
<b>Total</b>	<b>1,407</b>	<b>64.4</b>	<b>1,958</b>	<b>81.2</b>	<b>2,502</b>	<b>94.9</b>	<b>21,597</b>	<b>1,963</b>	<b>81.4</b>	<b>25.9%</b>

Summary of projected sources of financing in Ghana

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>A. Household Contributions</b>										
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	24	1.1	21	0.9	24	0.9	244	22	0.9	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	50	2.3	77	3.2	112	4.3	874	79.5	3.3	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	76	3.5	108	4.5	146	5.5	1,199	109	4.5	1.4%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
<b>Total</b>	<b>150</b>	<b>6.9</b>	<b>207</b>	<b>8.6</b>	<b>282</b>	<b>10.7</b>	<b>2,317</b>	<b>211</b>	<b>8.7</b>	<b>2.8%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>B. Domestically Financed Government Expenditures***</b>										
Hunger	13	0.6	38	1.7	83	3.8	447	41	1.7	0.5%
Education	83	3.8	119	4.9	173	6.6	1,352	123	5.1	1.6%
Gender Equality	9	0.4	15	0.6	20	0.7	163	15	0.6	0.2%
Health	86	3.9	170	7.1	269	10.2	1,895	172	7.1	2.3%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	28	1.3	49	2.0	82	3.1	565	51.4	2.1	0.7%
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	65	3.0	97	4.0	135	5.1	1,091	99	4.1	1.3%
Roads	53	2.4	63	2.6	75	2.8	706	64	2.7	0.8%
<b>Total</b>	<b>337</b>	<b>15.4</b>	<b>551</b>	<b>22.9</b>	<b>837</b>	<b>31.8</b>	<b>6,220</b>	<b>565</b>	<b>23.5</b>	<b>7.5%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>C. Required Total External Budget Support</b>										
Hunger	43	2.0	96	3.8	166	5.6	1,106	101	4.2	1.3%
Education	240	11.0	283	11.7	320	12.1	3,099	282	11.7	3.7%
Gender Equality	29	1.3	39	1.6	39	1.5	402	37	1.5	0.5%
Health	273	12.5	434	18.0	535	20.3	4,684	426	17.7	5.6%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	39	1.8	47	2.0	51	1.9	524	48	2.0	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	129	5.9	140	5.8	123	4.7	1,500	136	5.7	1.8%
Roads	169	7.7	160	6.6	149	5.7	1,746	159	6.6	2.1%
<b>Total</b>	<b>921</b>	<b>42.2</b>	<b>1,200</b>	<b>49.8</b>	<b>1,382</b>	<b>52.4</b>	<b>13,060</b>	<b>1,187</b>	<b>49.2</b>	<b>15.7%</b>

\* 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 18: Preliminary needs assessment Tanzania**

**Summary of projected financial resources required for meeting the MDGs in Tanzania**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>Total Cost (Sum of A+B+C below)</b>										
Hunger	187	4.9	470	11.2	826	18.0	5,333	485	11.5	3.2%
Education	377	9.8	499	11.9	686	14.9	5,575	507	12.1	3.3%
Gender Equality	82	2.1	100	2.4	118	2.6	1,086	99	2.4	0.6%
Health	842	21.9	1,483	35.4	1,999	43.5	16,073	1,461	34.8	9.6%
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	1.5%
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	488	12.7	606	14.4	708	15.4	6,645	604	14.4	4.0%
Roads	750	19.6	815	19.4	879	19.1	8,960	815	19.4	5.3%
<b>Total</b>	<b>2,875</b>	<b>74.9</b>	<b>4,197</b>	<b>100.1</b>	<b>5,521</b>	<b>120.3</b>	<b>46,154</b>	<b>4,196</b>	<b>99.8</b>	<b>27.6%</b>

**Summary of projected sources of financing in Tanzania**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>A. Household Contributions</b>										
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	18	0.5	27	0.6	40	0.9	305	28	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	66	1.7	102	2.4	143	3.1	1,134	103.1	2.5	0.7%
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	151	3.9	203	4.8	251	5.5	2,226	202	4.8	1.3%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
<b>Total</b>	<b>236</b>	<b>6.1</b>	<b>332</b>	<b>7.9</b>	<b>434</b>	<b>9.5</b>	<b>3,665</b>	<b>333</b>	<b>7.9</b>	<b>2.2%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>B. Domestically Financed Government Expenditures***</b>										
Hunger	48	1.3	137	3.6	289	7.5	1,612	147	3.5	1.0%
Education	97	2.5	146	3.5	240	5.2	1,686	153	3.6	1.0%
Gender Equality	21	0.5	29	0.7	41	0.9	328	30	0.7	0.2%
Health	216	5.6	433	10.3	699	15.2	4,860	442	10.5	2.9%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	38	1.0	65	1.6	107	2.3	750	68.2	1.6	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	125	3.3	177	4.2	247	5.4	2,009	183	4.3	1.2%
Roads	193	5.0	238	5.7	307	6.7	2,709	246	5.9	1.6%
<b>Total</b>	<b>739</b>	<b>19.3</b>	<b>1,224</b>	<b>29.2</b>	<b>1,930</b>	<b>42.0</b>	<b>13,955</b>	<b>1,269</b>	<b>30.2</b>	<b>8.3%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>C. Required Total External Budget Support</b>										
Hunger	139	3.6	333	7.6	537	10.5	3,720	338	8.0	2.2%
Education	262	6.8	327	7.8	406	8.8	3,584	326	7.8	2.1%
Gender Equality	61	1.6	71	1.7	77	1.7	758	69	1.6	0.5%
Health	625	16.3	1,050	25.1	1,300	28.3	11,213	1,019	24.3	6.7%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	45	1.2	57	1.3	56	1.2	597	54	1.3	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	211	5.5	226	5.4	209	4.6	2,410	219	5.2	1.4%
Roads	557	14.5	577	13.8	572	12.5	6,251	568	13.5	3.7%
<b>Total</b>	<b>1,901</b>	<b>49.5</b>	<b>2,641</b>	<b>63.0</b>	<b>3,158</b>	<b>68.8</b>	<b>28,533</b>	<b>2,594</b>	<b>61.7</b>	<b>17.0%</b>

\* 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 19: Preliminary needs assessment Uganda**

**Summary of projected financial resources required for meeting the MDGs in Uganda**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>Total Cost (Sum of A+B+C below)</b>										
Hunger	78	2.8	187	5.7	346	8.8	2,161	196	5.9	1.7%
Education	338	12.2	445	13.5	644	16.4	5,069	461	13.9	4.1%
Gender Equality	48	1.7	78	2.4	108	2.7	854	78	2.3	0.7%
Health	632	22.9	1,050	31.8	1,548	39.3	11,756	1,069	32.2	9.4%
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	1.1%
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	164	5.9	433	13.1	654	16.6	4,743	431	13.0	3.8%
Roads	563	20.4	612	18.5	660	16.8	6,730	612	18.4	5.4%
<b>Total</b>	<b>1,898</b>	<b>68.7</b>	<b>2,926</b>	<b>88.7</b>	<b>4,138</b>	<b>105.2</b>	<b>32,673</b>	<b>2,970</b>	<b>89.5</b>	<b>26.2%</b>

**Summary of projected sources of financing in Uganda**

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>A. Household Contributions</b>										
Hunger	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
Education	60	2.2	63	1.9	68	1.7	697	63	1.9	0.6%
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	32	1.2	53	1.6	80	2.0	601	54.6	1.6	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	63	2.3	130	4.0	206	5.2	1,457	132	4.0	1.2%
Roads	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0%
<b>Total</b>	<b>156</b>	<b>5.7</b>	<b>247</b>	<b>7.5</b>	<b>355</b>	<b>9.0</b>	<b>2,755</b>	<b>250</b>	<b>7.5</b>	<b>2.2%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>B. Domestically Financed Government Expenditures* **</b>										
Hunger	26	0.9	69	2.5	150	5.4	823	75	2.3	0.7%
Education	112	4.0	165	5.0	279	7.1	1,931	176	5.3	1.6%
Gender Equality	16	0.6	29	0.9	47	1.2	325	30	0.9	0.3%
Health	209	7.6	388	11.8	670	17.0	4,479	407	12.3	3.6%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	25	0.9	45	1.3	77	2.0	518	47.1	1.4	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	54	2.0	160	4.8	283	7.2	1,807	164	5.0	1.5%
Roads	186	6.7	226	6.8	286	7.3	2,564	233	7.0	2.1%
<b>Total</b>	<b>627</b>	<b>22.7</b>	<b>1,081</b>	<b>32.7</b>	<b>1,791</b>	<b>45.5</b>	<b>12,449</b>	<b>1,132</b>	<b>34.1</b>	<b>10.0%</b>

	Year 2005		Year 2010		Year 2015		Over the full period 2005-2015			
	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
<b>C. Required Total External Budget Support</b>										
Hunger	52	1.9	118	3.2	196	3.4	1,338	122	3.7	1.1%
Education	166	6.0	218	6.6	297	7.5	2,440	222	6.7	2.0%
Gender Equality	32	1.2	49	1.5	61	1.6	528	48	1.4	0.4%
Health	423	15.3	662	20.1	878	22.3	7,277	662	19.9	5.8%
Environment	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.	tbd.
Water Supply and Sanitation	18	0.7	23	0.7	21	0.5	241	22	0.7	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	46	1.7	142	4.3	165	4.2	1,479	134	4.1	1.2%
Roads	377	13.6	386	11.7	375	9.5	4,166	379	11.4	3.3%
<b>Total</b>	<b>1,114</b>	<b>40.3</b>	<b>1,599</b>	<b>48.4</b>	<b>1,993</b>	<b>50.7</b>	<b>17,468</b>	<b>1,588</b>	<b>47.9</b>	<b>14.0%</b>

\* 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: Estimated ODA Requirements for Ghana, Tanzania and Uganda to Achieve the MDGs**

Country	ODA p.c. in 2001 (\$)	Estimated % of current ODA estimated as going to MDGs	Implied current p.c. ODA going to MDGs (\$)	MP estimate of ODA p.c. required to meet MDGs (\$)	Implied total ODA required p.c. (\$)	Implied current shortfall in ODA p.c. (\$)	Average estimated GDP p.c. over 2004 - 2015	Minimum estimated ODA as % GDP
	(a)	(b)	(c)=(a)*(b)	(d)	(e)=(c)+(d)	(f)=(e)-(a)	(g)	(h)=(e)/(g)
Ghana	29	50	14.5	49	63.5	34.5	313	<b>0.20</b>
Tanzania	41	50	20.5	62	82.5	41.5	362	<b>0.23</b>
Uganda	43	50	21.5	59	80.5	37.5	340	<b>0.24</b>

Sources: Simon, David. 2003. "Official Development Assistance and the Millennium Development Goals." A report prepared for the Millennium Project Secretariat. (Authors' calculations)

**Table 21: Sub-Saharan Africa in 2015**

	<b>1990</b>	<b>2000</b>	<b>2015</b>
Population living below \$1/day (%)	55	..	28
Undernourished People (as % of total population)	32	33	16
Net primary enrolment ratio (%)	49	57	100
Ratio of girls to boys in primary school (%)	75	83	100
Under five mortality rate (per 1,000 live births)	180	171	61
Maternal mortality rate	695	..	123
People with access to improved water sources (%)	50	56	75
People with access to adequate sanitation(%)	51	51	75

Source: Human Development Report 2003

**Table 22: Estimated Budget Support as a Portion of Total Bilateral Official Development Assistance (ODA) to Africa**

	Dollar Amount in 2002	Percentage of Total
Total Net Bilateral ODA to Sub-Saharan Africa	11,398.70	100.00
<i>Subtract</i>		
Debt Forgiveness Grants	-2,961.50	-26.00
Equity Investment	-3.30	-0.03
Technical Cooperation	-3,344.10	-29.30
Development Food Aid	-362.90	-3.20
Emergency Aid	-1,272.20	-11.10
Administrative Costs of Donors	-19.40	-1.70
Support to NGOs	-33.30	-2.90
<b>Estimated Budget Support</b>	<b>3,402.10</b>	<b>29.80</b>

Source: DAC online Database on Annual Aggregates, accessible at <http://www.oecd.org/dataoecd/50/17/5037721.htm>.

## ANNEX 1

### LIST OF INTERVENTIONS BY COMPONENTS OF MDG INTERVENTION PACKAGE

(\* denotes interventions that have not been addressed in the needs assessment)

#### Agricultural Productivity and Rural Infrastructure

Category	Intervention Packages	Description
<b>Farm production</b>		
Increasing agricultural productivity	Investments in soil health	Application of chemical fertilizers, agroforestry (use of trees to replenish nutrients into the soil), green manure and/or cover crops in combination, as appropriate, depending on soil characteristics
	Improved inputs	Application of improved seeds, livestock feed and implements (such as ploughs* etc.)
	Small scale water management	Application of water conservation techniques and structures, pumps, drip irrigation, wells etc. as appropriate
	Extension services and agricultural research	Provision of comprehensive extension services combining principles of technical support with farmer participation, investment in agricultural research
	Special interventions to reach women farmers	Recruitment and training of women extension workers, provision of inputs (seeds, fertilizers etc.) targeted to reach women on an equitable basis with men
Linking farmers to markets	Storage and agro-processing facilities	Construction of warehouses to reduce post harvest losses, provision of training and equipment to encourage small scale agro-processing industries in rural areas*
	Access to credit	Extension of the formal banking system and/or provision of micro credit services to enable farmers to access funds.*
<b>Rural Transport Infrastructure</b>		
Roads	National highways and international transport corridors	Upgrading, construction and maintenance of paved national highways for bulk transport
	District roads	Upgrading, construction and maintenance of paved secondary or district roads
	Urban roads	Upgrading, construction and maintenance of urban roads
	Feeder and community roads	Upgrading, construction and maintenance of small paved roads connecting villages and farmers to the nearest district road
	Footpaths*	Extension and improvement of footpaths connecting individual rural farmers to feeder roads
<b>Rural Energy Services</b>		
Thermal energy systems	Improved stoves	Distribution and maintenance/replacement of appropriate cooking stoves (e.g. ceramic stoves, liquid petroleum gas (LPG) stoves, ethanol stoves, charcoal, etc.)
	Improved fuel inputs	Production and distribution system for appropriate improved fuels (e.g. LPG, ethanol, dimethylsulfoxide (DMSO), kerosine, etc.) including safe containers - depending on specific fuel mix available in the country
Electricity	Electricity generation capacity	Extension, upgrading and maintenance of electricity generation capacity (e.g. thermal energy plants, hydropower or geothermal, as appropriate) to supply
	Electricity grid	Extension of electricity grid through high-voltage lines (including international connections), medium to low-voltage lines (including end-user connections) and other related infrastructure (e.g. transformer stations) in urban as well as rural
	Off-grid electricity systems	Provision of diesel generators, hybrid systems or solar home systems together with necessary wiring to remote rural communities
<b>Access to Water Supply and Sanitation &amp; Water Management Infrastructure</b>		
Water	Water supply infrastructure	Provision and operation of infrastructure for water supply (e.g. standpipes, boreholes, dug wells, rainwater harvesting)
	Water storage and other infrastructure for water management*	Construction and operation of water storage infrastructure for drinking water supply, agricultural water use and hydropower. Extension of large-scale water harvesting



	Integrated Water Resources Management*	Protection and allocation of water resources to agricultural, domestic, and industrial uses ('blue water'), as well as environmental needs ('green water') based on comprehensive assessment of renewable and non-renewable water resources
	Hydrological monitoring*	Operation and extension of hydrological monitoring systems
Sanitation	Sanitation infrastructure	Construction and operation of toilets (e.g. simple pit latrines, ventilated improved pit latrines, septic tanks, flush toilets, etc.) including emptying of pits and safe disposal of sullage
Hygiene	Awareness building	Targeted awareness building measures accompanying the provision of new sanitation infrastructure to ensure the choice of the adequate technology option and proper use by all household members
	Hygiene education	Awareness campaigns (e.g. in primary schools, through community-based organization, media, etc.) to promote hygienic behavior with particular focus on hand washing and personal hygiene, as well as appropriate use of sanitation facilities and safe water storage.
<b>Investments in Environmental Sustainability</b>		
Natural resource management	Prevention of desertification*	E.g. improving land husbandry through soil erosion control and soil fertility improvement
	Forest management*	E.g. implementation of sustained-yield forest management techniques; forest plantation to satisfy demand for forestry products; tree seedlings and other measures to support afforestation.
	Watershed management*	E.g. promotion of afforestation and other investments to protect selected water catchment areas
	Management of coastal ecosystems and fisheries*	To be specified in each country
	Other protected areas*	To be specified in each country
	Environmental monitoring systems	To be specified in each country

## HEALTH, NUTRITION, AND FAMILY PLANNING

Category	Intervention Package	Description
<b>Health</b>		
Child health	Neonatal integrated package	Clean delivery, newborn resuscitation, prevention of hypothermia, kangaroo care (skin-to-skin contact), antibiotics for infection, tetanus toxoid, breastfeeding education, hygiene education.
	Immunization	Vaccines for polio, diphtheria, pertussis, tetanus, measles, hepatitis B, Hib and yellow fever
	Integrated Management of Childhood Illness (IMCI)	Integrated approach to child health that focuses on the well-being of the whole child. IMCI aims to reduce death, illness and disability, and to promote improved growth and development among children under 5 years of age. IMCI includes both preventive and curative elements to address top causes of child mortality including: diarrheal disease, acute respiratory infection, measles, malaria, and malnutrition.
Maternal health	Antenatal care	Routine care during pregnancy which includes preventive and curative interventions such as blood pressure and weight monitoring, treatment of infections, nutrition and smoking counselling, intermittent preventive treatment for malaria, nevirapine for HIV+ women.
	Skilled attendance and clean delivery	Presence of trained and registered midwives, nurses, nurse/midwives or doctors at birth with ability to diagnose and refer emergent complications.
	Emergency obstetric care (EmOC)	Rapidly accessible treatment for delivery complications such as eclampsia, haemorrhage, obstructed labor, and sepsis.
	Safe abortion	Access to abortion counselling, safe abortion services, and post-abortion care
HIV/AIDS	<b>Prevention</b>	

	Behavior change programs	Programs to encourage safer sexual behavior including condom social marketing, peer-based education, mass media campaigns and school based AIDS education.
	STD control	Routine screening and effective treatment of sexually transmitted diseases (e.g., syphilis, gonorrhea, chlamydia)
	Voluntary counseling and testing (VCT)	Pre and post test counseling and HIV testing.
	Harm reduction for injecting drug users	Actions to prevent transmission of HIV and other infections that occurs through sharing of non-sterile injection equipment and drug preparations. Specific programs include provision of sterile syringes and needles and drug substitution treatment.
	Prevention of mother to child transmission	Prevention of transmission of the HIV virus from infected women to their infants during pregnancy, labour and delivery, as well as during breastfeeding. Includes short-term antiretroviral prophylactic treatment, infant feeding counselling and support, and the use of safer infant feeding methods..
	Blood safety interventions	Measures to reduce the risk of receiving infected blood through a transfusion. Includes HIV antibody screening, avoiding unnecessary blood transfusions and excluding high risk donors.
	<b>Care and Treatment</b>	
	Antiretroviral therapy	Combination drug therapy to treat HIV infection.
	Treatment of opportunistic infections	Treatment of any infection caused by a microorganism that would not normally cause disease in individual but occurs in persons with abnormally functioning immune systems (as in AIDS patients)
	Orphan support	Provision of support to orphans to minimize the impact of AIDS on their lives. Includes school fee support, provision of orphanages and community support.
TB	BCG vaccine	Bacillus of Calmette and Guérin vaccine for TB.
	Directly Observed Treatment--Short Course (DOTS)	Internationally-recommended TB control strategy combining five elements: political commitment, microscopy services, drug supplies, surveillance and monitoring systems, and use of highly efficacious regimes with direct observation of treatment.
Malaria	Insecticide treated nets/curtains	Mosquito nets that are treated with insecticide, which can provide a physical and chemical barrier to mosquitos. The chemical halo that extends beyond the mosquito net itself also shortens the mosquito's life span.
	Artemisinin combination treatment	Combination of drugs used to treat first-line drug resistant falciparum malaria, which is now widespread in Africa
<b>Nutrition</b>		
Nutrition	Nutrition for infants	Complementary feeding for infants in the 7-24 months category
	Nutrition for school going children	Provision of school meals with locally produced foods
	Nutrition for women in reproductive age group	Introduction of community-based programs to provide micronutrient supplementation for adolescent girls and women in the child bearing age group
	Food fortification	Introduction of fortification for the entire population (i.e. adding micronutrients to foods e.g. iodized salt)
Emergency Food Assistance	Direct assistance in food scarcity areas	Food for work programs and/or direct food aid
<b>Family Planning</b>		
	Counselling on contraception and family spacing	Information and education on benefits and methods of family planning
	Provision of modern contraceptive methods	Universal access to modern contraceptive methods including sterilization (male or female), IUD, long-acting hormonal methods (injectable and implant), the pill, the condom, vaginal barrier methods and spermicides.

## EDUCATION

Category	Intervention Packages	Description
Primary Education	School Infrastructure	Provision of schools, including classrooms, toilets, (especially girls toilets), furniture and transportation facilities
	Teachers	Recruitment of teachers, especially female teachers, with provision of incentives (e.g. housing in rural areas where applicable, adequate salaries) and ensuring regular pre-service and in-service training
	Learning materials	Provision of textbooks and other learning materials (e.g. stationery) per student
	Curriculum Reform	Implementation of curriculum reform, where necessary, to make education content relevant*
	Demand side incentives	Provision of uniforms, school meals (and/or take home food rations where needed) and special targeted subsidies to girls and other vulnerable populations (e.g. HIV/AIDS orphans) and conditional cash transfers to parents (if appropriate) to reduce the opportunity cost of children attending school and increase attendance.
Secondary Education	School Infrastructure	Provision of schools, including classrooms, toilets, (especially girls' toilets), furniture, transportation facilities, and other facilities such as libraries, laboratories and sports facilities.
	Teachers	Recruitment of teachers, especially female teachers, with provision of incentives (e.g. housing in rural areas where applicable, adequate salaries) and ensuring adequate pre-service and in-service training
	Learning materials	Provision of adequate textbooks and other learning materials (e.g. stationery) per student
	Curriculum Reform	Implementation of curriculum reform, where necessary, to make education content relevant, with a focus on vocational and/or non-formal training as necessary to prepare students for transition to work*
	Demand side interventions	Provision of uniforms, school meals (and/or take home food rations where needed) and special targeted subsidies to girls and other vulnerable populations (e.g. HIV/AIDS orphans) and conditional cash transfers to parents (if appropriate) to reduce the opportunity cost of children attending school and increase attendance
Adult literacy	Adult literacy programs	Implementation of adult literacy programs through trainers and volunteers and accompanied by mass media campaigns to increase awareness of the importance of literacy
Hard to reach children	Special packages for hard-to-reach populations	Introduction of distance education and emergency schooling in conflict areas*

## SLUM UPGRADING AND URBAN MANAGEMENT

Category	Intervention package	Description
<b>Urban Infrastructure and Slum Upgrading</b>		
Slum upgrading	Shelter*	Upgrading and construction of houses
	Urban infrastructure*	Upgrading and extension of roads & sidewalks, street lighting, storm drainage, and communication infrastructure within slums
Tenure	Security of tenure*	Improving the security of tenure through non-eviction legislation, legitimized occupancy or formal titles
	Enforcement of improved land tenure legislation*	Legal protection and enforcement of slum dwellers' rights
City-wide urban planning and management	Urban infrastructure*	Provision of urban infrastructure (roads, footpaths, sidewalks, street lighting, stormwater drainage, bus lanes and other transport infrastructure)
	Basic services*	Provision of basic services (e.g. refuse collection & solid waste disposal, policing and security, fire protection)
	Pollution control*	Controlling pollution of air and water
	Transport system*	Operation of bus, train and other mass transport systems
<b>Urban Transport Infrastructure</b>		

Roads	National highways and international transport corridors	Upgrading, construction and maintenance of paved national highways for bulk transport
	Urban roads	Upgrading, construction and maintenance of urban roads
	Feeder and community roads	Upgrading, construction and maintenance of small paved roads connecting villages and farmers to the nearest district road
	Footpaths*	Extension and improvement of footpaths within cities
<b>Urban Energy Services</b>		
Thermal energy systems	Improved stoves	Distribution and maintenance/replacement of appropriate cooking stoves (e.g. ceramic stoves, liquid petroleum gas (LPG) stoves, ethanol stoves, charcoal, etc.)
	Improved fuel inputs	Production and distribution system for appropriate improved fuels (e.g. LPG, ethanol, dimethylsulfoxide (DMSO), kerosine, etc.) including safe containers - depending on specific fuel mix available in the country
Electricity	Electricity generation capacity	Extension, upgrading and maintenance of electricity generation capacity (e.g. thermal energy plants, hydropower or geothermal, as appropriate) to supply
	Electricity grid	Extension of electricity grid through high-voltage lines (including international connections), medium to low-voltage lines (including end-user connections) and other related infrastructure (e.g. transformer stations) in urban as well as rural
<b>Urban Water Supply and Sanitation</b>		
Water	Water supply infrastructure	Provision and operation of infrastructure for water supply (e.g. standpipes, boreholes, dug wells, rainwater harvesting)
	Integrated Water Resources Management*	Protection and allocation of water resources to agricultural, domestic, and industrial uses ('blue water'), as well as environmental needs ('green water') based on comprehensive assessment of renewable and non-renewable water resources
	Hydrological monitoring*	Operation and extension of hydrological monitoring systems
Sanitation	Sanitation infrastructure	Construction and operation of toilets (e.g. simple pit latrines, ventilated improved pit latrines, septic tanks, flush toilets, etc.) and sewers, including emptying of pits and safe disposal of sullage
	Sewerage treatment	Construction and operation of simple sewerage and other wastewater treatment (e.g. waste stabilization ponds or other forms of primary treatment) where needed in dense urban settlements or because of specific environmental concerns (e.g. eutrophication of freshwater lakes)
Hygiene	Awareness building	Targeted awareness building measures accompanying the provision of new sanitation infrastructure to ensure the choice of the adequate technology option and proper use by all household members
	Hygiene education	Awareness campaigns (e.g. in primary schools, through community-based organization, media, etc.) to promote hygienic behavior with particular focus on hand washing and personal hygiene, as well as appropriate use of sanitation facilities and safe water storage.
<b>Urban Environmental Management</b>		
Pollution control	Air pollution control*	To be specified in each country
	Water pollution control*	E.g. industrial wastewater treatment to complement sewage treatment covered under the water and sanitation section as necessary
	Solid waste and soil pollution control*	Construction and maintenance of technically sound landfills.

## SCIENCE, TECHNOLOGY AND INNOVATION

Category	Intervention package	Description
Science and technology institutions	Science and technology advice*	Creation of independent body charged with providing scientific advice and technology forecasting to policymakers
	Tertiary education*	Extension and maintenance of tertiary education system with a particular focus on science and engineering education

	Science and technology research*	Extension and maintenance of centers of excellence for scientific research, including the financing of research at universities
Information and communication technologies (ICT)	Telecommunication infrastructure*	Provision of telecommunication infrastructure including international and trunk fiber infrastructure. Provision of ICT connectivity to hospitals and schools

### GENDER (n.e.s.)

Category	Intervention Packages	Description
Reproductive Health Rights and Services	Awareness of and access to reproductive health rights and services	Legislation, awareness campaigns and provision of services to decriminalize and allow safe abortions, to protect the rights of women to plan their families, to enable access to safe contraceptives, to discourage female genital mutilation and other harmful practices
Access to Property Rights and Work	Equal access to and treatment in work	Provision and enforcement of equal opportunity legislation, legislation promoting gender-sensitive policies such as provision of maternity and dependent care leave and training and support programs for women entrepreneurs and young girls training to transition to work
	Equal access to Property Rights	Legislation and administrative support to provide and protect women's equal rights to property and other inherited and acquired assets.
Security	Security for girls and women from violence	Legislative and administrative actions to prevent women against violence, promotion of awareness of women's right to seek redress, protection from perpetrators (through access to shelters, services etc.) and mechanisms to dispense justice to the perpetrators
Participation and Institutional Reform	Political representation	Mechanisms (quotas, reservations) to allow for adequate representation at all levels of government along with adequate training
	Involvement of women's groups at the village level	Recognition and support to women's groups organized at the village level to be partners in the design and delivery of public services*
	National Women's Machineryes (NWMs)	Legislative and financial support to NWMs (defined by the UN as "a single body or complex organized system of bodies, often under different authorities, but recognized by the government as the institution dealing with the promotion of the status of women")*
Data Collection and Monitoring	Gender-disaggregated data	Collection of 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*

### CROSS-NATIONAL TRANSPORT AND ENERGY INFRASTRUCTURE

Category	Intervention package	Description
<b>Transport Infrastructure</b>		
Roads	International highways*	Upgrading, construction and maintenance of paved national highways for bulk transport
Rail	Railroads infrastructure*	Extension, upgrading and maintenance of railroads including rolling stock
Ports	Port infrastructure*	Construction and modernization of container port facilities, dredging and other maintenance of ports
	Integration of transport systems*	Construction and maintenance of railroad and truck terminals for containerized freight
<b>Energy Infrastructure</b>		
Thermal Energy Systems	Petroleum refining & storage*	As appropriate, rehabilitation and extension of petroleum refining, pipeline and storage systems
	Gas and oil pipelines*	Construction and maintenance of regional pipelines to improve supply of fossil fuels (e.g. West African Gas Pipeline, Kenya-Uganda oil pipeline)
Electricity	Geothermal electricity plants*	Construction of geothermal electricity plans in East Africa and parts of Southern Africa
	Regional Electricity Pool*	Extension of international electricity grid through international high-voltage lines and pooling of electricity grids to reduce need for peak generation capacity

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