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ENGINEERING INPUTS FOR THE ATTAINMENT OF THE MILLENNIUM DEVELOPMENT GOALS (MDGs) IN LESSER ECONOMIES

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STRACT

This paper highlights the MDGs, their relevance and the role of engineers in achieving the MDGs in lesser economies especially economies in the African continent. It highlights the challenges and the relevant engineering inputs aimed at overcoming these challenges. Finally the paper concludes that sound engineering and technological solutions remain the medium of achieving the MDGs, that is, if the MDGs must be realized: capacity building, energy infrastructure, monitoring and evaluation of the projects, environmental sustainability, maternal health and infant mortality, globalization, cross border partnership and networking must be re-engineered and encouraged by engineers with the support of governments, private sector participation, funding/concerned agencies (WHO, World bank) and the people of lesser economies.

INTRODUCTION

Overview of the MDGs

This section highlights the goals and the targets of the MDGs as shown in Table 1 and other initiatives for African development are summarized as a platform for other lesser economies.

Table 1: The MDGs and Targets

Sl No.	Key Words	Aim	Target
	*Hunger *Poverty	Eradicate extreme hunger and poverty	i) Reduction of the proportion of people with revenue less than \$1/day by 50% between 1990 and 2005 ii) Reduction by 50% the proportion of people who suffer from between 1990 and 2005
	*Basic Education	Achieve Universal primary education	iii) Ensure completion of a full course of primary schooling by children (boys and girls) everywhere by 2015
	*Gender Equality *Women empowerment	Promote gender equality and empower women	iv) Eliminate gender disparity in primary and secondary preferably by 2005 and to all levels of education by 2015
	*Child mortality	Reduce child mortality	v) Reduce by 75% the maternal mortality ratio between 1990 and 2015
	*Maternal health	Improve maternal health	vi) Reduce by 75% the maternal mortality ratio between 1990-2015
	*HIV/AIDS, *Malaria, others	Combat HIV/AIDS, Malaria and other disease	vii) Reduce by 50% HIV/AIDS by 2015 and begins to reverse the spread of HIV/AIDS viii) Halt by 2015 and begin reverse of the incidence of malaria and other major diseases
	*Environment	Ensure environmental sustainability	ix) Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources x) Halve by 2015, the proportion of people without sustainable access to safe

Goal No.	Key Words	Aim	Target
			drinking water
			xi) Achieve a significant improvement in the lives of at least 100million slum dwellers by 2020
8	*Global *Partnership *Development	To develop a global partnership for development	<p>xii) Commerce, Finance and Trade: To develop an open rule based, predictable, non-discriminating trading and financial system</p> <p>xiii) Needs Assesments1: Address the special needs of least developed countries.</p> <p>xiv) Needs Assesments2: Address the special needs of landlocked countries and small island developing states.</p> <p>xv) Debt Issues: Deals comprehensively with the debts problems of developing countries through national and international measures in order to make debt sustainable in the long term.</p> <p>xvi) Youth employment and productivity: In co-operation with developing countries, develop and implement strategies for decent and productive work for youth.</p> <p>xvii) Essential Drugs: in co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries</p> <p>xviii) New Technologies: In co-operation with the private sector, make available the benefits of new technologies</p>

1.2 Other Initiatives For African Development

1.2.1 World Summit on Sustainable Development (WSSD)

These cites the pillars for sustainable development as the economic, Environmental, and Social-Pillars respectively (EES) and recommend for action the building at the national level, of capacities for the elaboration of science and technologies policies and strategies. Mr Desai, the secretary general of the WSSD emphasized, quote "Science and Technology MUST be placed at the heart of policies to promote sustainable development".

1.2.2 The Blair Commission Report

The report identifies professional skills and Leaderships (S&L) as key to achieving development while highlighting the problems confronting African countries in this report. Quoting from the report "Qualified professional staff are essential to all forms of development. The delivery of health, education, and other services depend on them. They special for collecting and managing Data, and Debating and developing good policies, based on the evidence of what works and what does not. They essential to implementing those policies and to monitoring how are put into effect. Scientifically and technically proficient staffs are needed to identify opportunities arising from innovations and scientific discoveries and to develop effective policy in areas such as trade and resource management. Especially in the private sector, these particular skills are key to performance and innovation. Africa has been lacking skilled men and women in all these spheres and fundamentals to this shortage are the loss of much Africa's pool of skills to the developed world. Around 70% of Ghanaian medical officers trained in the 1990s have and it has been estimated that there are more African Scientists and engineers working in the USA than the whole of Africa. This shortage starts with higher education, which ought to be the breeding ground for the skilled individuals whom the continent needsBut many of Africa's higher education

institutions are skill in a state in a state of crisis. They lack physical infrastructure, such as internet access, libraries, textbooks, equipment, laboratories and classroom spaces....demand for higher education is increasing in 2000 Nigeria had the capacity to accept only 12% of qualified candidates. Hit by these pressures and a lack of funding, the Research capacity of Africa's institutes has declined. The capacity that does exist is not being used efficiently, as there is limited collaboration; and human and financial resources are spread thinly.... The science gap between Africa and the rest of the world is widening and under business as usual this gap will continue to grow.

In order to deal with the problem, the report recommended in 2005 that the international community commit US\$ 500 million per annum over a ten year period to revitalize Africa's institution of higher education; specific action for strengthening science, engineering and technology capacity to enable countries to find their own solutions to their own problems, bring about step- changes in areas from Health, water supply, Sanitation, and energy to new challenges of urbanization and climate change; critically accelerate economic growth, and enter the global economy.

1.1.3 The New Partnership For Africa's Development (NEPAD)

This is the socio- economic framework for regional interaction, eradication of poverty and sustainable development aimed at putting back Africa on the worlds development agenda so that Africa truly claims this milleium together with other supportive initiatives such as MDGs and WSSD.

In their inaugural meeting, ministers of science and technology noted that the ability for African countries to create, diffuse and utilize scientific and technical knowledge is a major deterrent of our capacity to take advantage of international trade and effectively compete in the world economy as well as, improve the quality of life of our people. This is based on their conviction that scientific advancement and technological innovations are driving forces for economic growth and sustainable development.

Thus, whether the initiative for development are home grown or international in nature, the key elements of science, technology, engineering, and innovation (SETI) is key to achieving these goal.

In lamenting the MDGS, the former UN Secretary General, Kofi A. Annan, noted: "We will have to reach the MDGs worldwide and in most, or even all, individual countries but only if we break with business as usual. We cannot win overnight. Success will require sustained action across the entire decade between now and the deadline. It takes time to train the teachers, nurses and engineers; to build the roads, schools, hospitals; to grow the small and large businesses able to create the jobs and income needed. So we must start now. And we must more than double global development assistance in the next few years. Nothing less will help to achieve the goals".

2.0 IMPORTANCE OF MDGS TO LESSER ECONOMIES

The MDGs are the most broadly supported, independent and twice-bound specific poverty reduction targets that the international community has established. The Human Development Index (HDI) is poor in lesser economies; hence it is very pertinent that the achievement of the MDGs is very urgent and critical especially when we note that

- about 35% of the populations in these economies live in extreme poverty (consuming about 3000 calories or lower daily).
- 54% of the population are living in relative poverty.
- Proportion of land covered by forest 12.6%
- Slow growth rate in private investment
- 30% personal computers (per 1000 people)
- Insufficient worsened data on carbon emission (per capita) and proportion of total population with access to basic sanitation.

Thus the achievement of all the MDGs would require a more robust and sustained efforts.

Lesser economies will have to deal the following challenges to achieve the MDGs:

Improve their system of information gathering and management.

- Promote/Practice good governance at all tiers of government.
- Domesticcate the MDGs.
- Promote policy coherence and planning process at all levels of government.
- Collaborate and encourage functional partnership with the private sector and civil societies to achieve results.
- Seek donor /humanitarian aid and scale up funding to address the huge funding gaps.

Engineers in the lesser economies must therefore serve as a source of independent, credible and timely advisers to government, policy makers and the public on all issues enshrined in the MDGs. These should include training, evaluation, and improvement of education, of schools, creation of centers of excellence, creation and provision of local entrepreneurs, local infrastructures and services for economic and social growth. Also, local engineering expertise should be encouraged.

3.0 THE ROLE OF ENGINEERS IN ACHIEVING THE MDGS

3.1 Health Care Delivery

About 38% of the MDGs relate directly to health with emphasis on maternal and child health. Also, the remaining 62% have an indirect relationship to health. The involvement of all the technical arms of the UN, international organization, other stakeholders (professional organization: engineers, scientists, planners, health care workers), community leaders, human right organizations and non-governmental organizations have a pivotal role on realization and actualization of the MDGs.

All engineering professionals (engineers, technologists, technicians, craftsmen, artisans) have key roles to play in the attainment of the MDGs in their respective countries enshrined clearly in the seventh MDG.

The target of MDG 5 is to reduce by 75% maternal mortality rate by 2015. In order to achieve this engineers would provide the following:

- Affordable and available energy services, (for medicine storage in cold rooms)
- Efficient communication system for emergency medical services.
- Good road network for easy transportation.
- Collaborative research that will result in the production of cost effective medical appliances, compatible with our environment,
- Information technology (IT) for telemedicine, call duties etc,
- Biotechnology to enhance artificial organ production, surgery etc.

The areas of need to be dealt with to facilitate the health needs enshrined in MDGs and targets include: vaccines for prevention, testing techniques and equipment for diagnosis, new modalities including drugs and radiotherapy for care and treatment, power, clean environment, safe water, good roads, cheap food and affordable housing.

Table 2 shows some innovative biotechnology solutions and health related MDGs

Table 2: Biotech and Health MDGs

MDG	Statistics/Facts About Underlying Problem	Relevant Biotechnology to Address Problem
Goal 4: Reduce child Mortality	About 11million children die annually before reaching their fifth birthday	<ul style="list-style-type: none"> ➤ Molecular diagnostics ➤ Vaccine and drug delivery ➤ Recombinant vaccines ➤ Female control over STD transmission protection ➤ Nutritionally enriched GM crops ➤ Combinatorial chemistry
Goal 5: Improve Maternal Health	Over 500,000 maternal deaths occur per year	<ul style="list-style-type: none"> ➤ Molecular diagnostics ➤ Vaccine and drug delivery ➤ Recombinant vaccines ➤ Female control over STD transmission protection ➤ Nutritionally enriched GM crops ➤ Combinatorial chemistry

Several challenging issues for lesser economies include sustainability, appropriate technology, affordability, and user-friendly technology/equipment, partnership with institutions, private sector, technology companies and governments.

3.2 The Role of Engineering in eradicating Poverty

In lesser economies material poverty (one who has no money or ability to acquire things) is very common and intellectual poverty (a state where one is bereft of ideas and lacks understanding) is insidious and intractable. The principal causes of poverty are ignorance (lack of education) and lack of skills. The problems of poverty and hunger include disease, homelessness, ignorance, depravity, warped values. These are dealt with once poverty and hunger are put in check.

Engineers should be involved in issues of capacity building, employment generation, policy formulation, local content development and industrialization, development of indigenous technology and export oriented industries.

If poverty is radically tackled to success, it will make a great impact on addressing a reasonable percentage of what MDGs set solve.

Engineering being the heart of industrialization, which brings about development and its sustainability, can be a major agent of eradicating poverty in lesser economies through the following ways:

- Encouraging labour intensive industries (Textiles mills, construction industries etc) in which large employment opportunities will be created. This will accommodate large number of unemployed persons and give for improving on professionals, the skilled and the unskilled through training and retaining.
- Development of indigenous technology to be advocated to the various tiers of government so that local technology will be encouraged and improved from which local productions could be made (cottage industries) to boost commercial activities.
- Advocate for sustainable policy to encourage export-oriented industries through indigenous technology. This together with labour-intensive industries will provide a variety of occupational advantages.
- Encourage true and total partnership with multinationals where our engineers and scientists will fully take part in all affairs ranging from design, production, and maintenance to completion.
- Pursuance of labour intensive industries.
- Practicing engineering at the highest level possible by adopting participatory approach to embarked projects.
- Expansion and extension of local content development in the areas of automobile, communication and ship servicing.

3.3 Achieving Universal Primary Education: The Role of Engineering

Primary Education in a nation's development occupies a strategic place. Poor base for primary education undoubtedly has adverse effect on both the secondary and tertiary levels of education. This invariably translates into slow pace of political, technological, economic and social development. Primary education as one of the MDGs, directly or indirectly has influence on the other MDGs. Lack of basic education does a lot of promotion to poverty and hunger, damage to the environment and inaccessibility to information about/on health related issues. Infact, government policies is hardly understood by a vast majority of the citizenry which automatically renders the policies unrealizable.

This 2nd MDGs (Achieving Universal Primary Education) is set to be achieved by the year 2015, and its target is to ensure that by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary school. To achieve this, a concerted multisectoral, multidisciplinary and international inputs is required unlimitedly. In this regard the UN set-up a task force on science, technology and innovation (engineering) with the mandate of outlining elements of global framework for promoting the application of science, technology and innovation towards achieving the MDGs. In response to that, coalition of international scientific, engineering, and medical organization emphasized that stronger worldwide capacities in science and technology are necessary to allow humanity to the UN MDGs.

Engineering as a profession that is bent towards providing solutions to human problems have role to play:

- Producing a variety of safe and cost-effective school structures, with low maintenance cost,
- Participate in its implementation,
- Organizing voluntary inspection visits to schools to asses structures and offer useful suggestions,
- Advocate maintenance culture among school administrators ,teachers and pupils,
- Assist in the design and construction of teaching aids,
- Working to ensure that primary school curricula incorporate range of simple practical engineering and technology principles
- Assist in equipping schools libraries and laboratories
- Contribute in the training of teachers and integrating them by inviting them to participate in certain engineering programmes

Tanzania

GOAL	1990	2004	2015 Target	Towards target
1. Eradicate extreme poverty and hunger				
Proportion of households living in relative poverty	42.7% ¹⁹⁹²	54.4%	21.4%	Fair
Proportion of households living in relative poverty-core poor(1992)	13.9% ¹⁹⁹²	22.0%	7.0%	Fair
Percentage of population below minimum level of dietary energy consumption (based on 2900 calories)		34.9%		Fair but limited data
Percentage of under weight children	35.7%	30.7% ¹⁹⁹⁹	17.9%	Fair
2. Achieve universal primary education				
Primary school enrolment(gross)	67.7%	123.0% ²⁰⁰³	100%	Good
Primary six completion rate	60.0% ¹⁹⁹¹	94.4% ²⁰⁰³	100%	Good
Literacy rate,15-24 years	70.7% ¹⁹⁹¹	76.4%	100%	Fair
3. Promote gender and empower women				
Primary education(girls per 100 boys)	82.0%	79.0%	100%	Worsening
Senior secondary education(girls per 100 boys)	105.5%	78.9%	100%	Worsening
Proportion of seats held by women in non-agricultural sector	66.3% ¹⁹⁹¹	79.4% ²⁰⁰³	100%	Fair
Proportion of seats held by women in National Assembly-Senate and House Rep	1.0% ¹⁹⁹¹	3.9% ²⁰⁰³	30%	
4. Reduce child mortality				
Infant mortality (per 1000 live births)	91	100 ²⁰⁰³	30.3	Worsening
Under-five mortality rate (per 1000live births)	191	201 ²⁰⁰³	63.7	Worsening
Proportion of one -year-old children immunized	46.0%	31.4% ²⁰⁰³	100%	Worsening
5. Improve maternal health				
Maternal mortality ratio		704		Limited Data
Proportion of births attended by trained personnel	45.0%	36.3 ²⁰⁰³	100%	Worsening
6. Combat HIV/AIDS, Malaria, and other diseases				
HIV prevalence among 15-24 year		5.2% ²⁰⁰³		Improving relative to immediate past
Percentage of population aged 15-24 with comprehensive correct knowledge of HIV and AIDS prevention methods		F:40.0% ²⁰⁰³ M:58.4% ²⁰⁰³	100%	Improving relative to immediate past
Prevalence and death rates associated with malaria	1,116982	1.875,380 ¹⁹⁹⁸		Worsening
Prevalence and death rates associated with Tuberculosis		27,840 ¹⁹⁹⁸		Worsening

7. Develop a global partnership for development				
Per capita overseas development assistance to Nigeria (in US\$)	1.2 ¹⁹⁹⁹	2.3		Fair
Debt as a percentage of exports of goods and services	13.6% ²⁰⁰⁰	18.4%		Worsening
8. Ensure environmental sustainability				
Proportion of land area covered by forest	10%	12%	20%	Fair
Proportion of households with access to safe drinking water	30% ¹⁹⁹⁹	60% ²⁰⁰³	100%	Good
Proportion of gas flared	68%	40%	0%	Good
Proportion of households with access to basic sanitation	56.6%	74% ²⁰⁰³	100%	Fair

Source: National Planning Commission (2005)

4.0 CONCLUSION

Table 3 tells the global story of the MDGs journey thus far. It is obvious that without critical engineering inputs, the world's dream of meeting the targets set out to bridge the gap between the sick/healthy, the reach/poor, the developed/developing, literates/illiterates and healthy environments will be a mission impossible. Engineering inputs in governance, healthcare delivery, planning, budgeting, implementation, designs etc remain pivotal and key to sustainable development. The critical areas of need requiring engineering expertise for solutions remains affordable housing, cheap food, safe water, good roads, power, clean environment, vaccines for prevention, testing techniques and equipment for diagnosis plus new modalities (including drugs and radiotherapy) for care and treatment.

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