



Chapter 1

SCIENCE, TECHNOLOGY AND HUMAN DEVELOPMENT: SOME BASIC CONCEPTUAL AND DEFINITIONAL ISSUES

HUMAN DEVELOPMENT: A UNIVERSAL PURSUIT

Harnessing S&T for human development is the very essence of investment in building a national S&T capability; it is about expanding the frontiers for human achievement and human development. As a process, it is as old as mankind. From the Stone Age to the Information Age, quantum leaps in human material and physical wellbeing were made possible only through breakthrough scientific and technological innovations: in agriculture, biotechnology, biomedical science, communications, industry and transport amongst others.

Human development is a universal pursuit. Whether rich or poor, human beings, as individuals, as communities, as nations and indeed as a race, are engaged in a constant search for means and opportunities for the betterment of their conditions of life. It is an exceedingly vital process and technology has too often proved to be



Freedom to choose to send children to school

the decisive factor in separating winners from losers. Thus, no nation, including technological laggards, has ever lost sight of the centrality of progress in S&T to the human development process. Building a solid national science and technological capability, one that permeates government, industry and civil society, is thus a strategic development objective for any nation. Botswana, through the Science and Technology Policy enacted by parliament in 1998, and the establishment of the MCST has made bold, its commitment to developing a strong national S&T capability.

Relative progress in S&T is every nation's hope for relative productivity growth, global competitiveness, beneficial integration into the world economy, and above all, improved welfare outcomes for the citizenry. Through S&T, the range of choices open to human beings – for consumption, employment and investment – grow.

The ultimate end of human development is improvement in the multiplicity of 'goods' that enhance human wellbeing. Human development requires that three broad areas of need and capability be satisfied:

First: Adequate provisioning for basic human needs - food, shelter, clothing, health and other necessary services – through both public and private effort.

Second: Development of basic human capabilities. These are, in Sen's conception, the substantive freedoms a person needs to lead "... the kind of life he or she enjoys". They include health, education, knowledge and skills.

Third: Space for people to apply their innate and acquired assets, individually and communally, to achieve higher welfare outcomes. The defining features of such space include an environment of stability (political, social and economic), of democracy, a human rights culture, and freedom for all to operate as political and economic agents.

Human development is a means towards an even higher ideal, human freedom (see Box 1.1). An especially important freedom in the human development process is that of choice. At certain levels of deprivation, people cannot exercise basic choices that are essential for a dignified human existence, choices that every human being should have as a matter of right. For instance, they do not have the choice to seek medical help when sick; to have clean water; to eat decent food; or to send a child to school. Poverty robs people of such basic choices. It is perhaps out of the realisation that the Government of Botswana has put in place a number of policies and programmes to reduce poverty (see Box 1.2) over the years.

Box 1.1 Human Development and Human Freedom

Human rights and human development share a common vision and common purpose – to secure the freedom, wellbeing and dignity of all people everywhere¹

These freedoms include:

- Freedom from want: The dominant objective of human development is to satisfy basic needs, food, shelter, clothing, health and other necessary services as provided for under Article 25 of the Universal Declaration of Human Rights which proclaims everyone's right to "... a standard of living adequate for the health and well-being of himself and his family ...".
- Freedom to develop and realize one's potential: Human development seeks to develop human capabilities and to create quality opportunities so that human beings may achieve the life outcomes they desire.
- Freedom of choice: Human development is about expanding human choices, including the choice of work and consumption choices.
- Freedom to participate in decision-making: Human development requires participation in the politico-socio-economic process as input makers as well as beneficiaries of the development process.
- Freedom of opinion and expression: As an empowering process, human development nurtures and in turn, thrives on the free exercise of mental capabilities by citizens.
- Freedom from discrimination: In every society where a section of society is excluded to any degree from political and economic processes, human development suffers for human beings are also a development resource. Exclusion robs the nation of essential human resource inputs and generates conflicts that can only obstruct development.
- Freedom from injustice: An important objective of human development is human security, which includes protection of individuals and groups from violations of basic human rights e.g. protection from inhuman and degrading treatment and protection of one's property by law.

These freedoms, and many others, which are enunciated in the Universal Declaration of Human Rights, are the ultimate objectives of human development.

Human beings do not go hungry for days, scavenge for food in rubbish dumps, live in shacks and disease infested environments, drink dirty water, keep their children out of school, or watch them die of curable diseases out of choice. They do so out of lack of better options, often through no fault of their own but rather through the failure of governance institutions to provide four public goods that are essential to human development and human freedom. These are:

Human security: In conditions of conflict, human beings are displaced, their assets destroyed and their very physical being threatened in ways that make it impossible for them to provide for their own needs.

Empowerment: This is an essential function of the state. It entails facilitating the development, within individuals and communities, of capabilities that help them to function as agents for the improvement of their own wellbeing. It includes measures to ensure universal access to quality health and education services; improving access to resources such as land, financial services and productivity enhancing technologies; creating new economic opportunities, for instance, through access to new markets and economic growth; and nurturing a culture of participatory, transparent and accountable governance.

¹ United Nations Development Programme. 2000. Human Development Report 2000. Human Rights and Human Development, NY

² According to the human rights approach to development, it is neither permissible nor desirable to disregard or abrogate any human rights - legal, political, social or economic, in order to effect human development.

Creating and/or capacitating institutions competently facilitating people's interaction amongst themselves and with external parties, is an important element of the empowerment process. Institutions of state must provide law and order; define and protect property and intellectual rights; create political space for individuals and organisations to express themselves; and manage the macro-economy, regulatory functions, skills development and knowledge creation in a manner that gives visible impetus to human agency.

Empowerment is not just about the state providing resources and opportunities. It is also about the citizens taking responsibility for self-improvement. As shown in Text Box 1.2, empowerment is a process that needs facilitation through government policy activism by means of properly sequenced short and long term development strategies. It is an integral part of sustainable poverty reduction.

Opportunity: Creating opportunities for people to earn decent livelihoods is another critical government function. Opportunity requires policies that support, amongst others, an efficient balance between allocative and distributive objectives, pro-poor growth, improved access to productive resources (including land and credit) for poor people, access to markets, export growth and new knowledge and technologies.

Incentives: Institutions of state have a responsibility to promote incentives for desirable private behaviour such as incentives for saving, risk taking, investment, and social responsibility by citizens, including corporate citizens. An especially critical incentive in the information age is that for firms to invest in the creation, transfer, diffusion and adoption of new technologies.

HUMAN DEVELOPMENT IN CONCEPT AND PRACTICE: SOME BASIC CONTRADICTIONS

Human freedom is the ultimate expression of human development. In politics and social dynamics, it finds expression in universal acceptance of two basic principles: that human dignity is inherently sacrosanct; and that human beings are born free and equal in dignity and rights. At the economic level, it finds expression in adequate provisioning for human needs through public and private means. Therefore, in its totality, human freedom guarantees the dignity and worth of the human person à la Universal Declaration of Human Rights.

As a concept and as an ideal, human development enjoys universal support, not least because of its affinity to human rights, freedom and justice. Yet, in practice it is fraught with contradictions, and rather paradoxically, also because of its affinity to human rights and justice. Whereas the Universal Declaration of Human Rights proclaims all rights inalienable, universal and ipso facto equal², too often, these principles prove nonviable in practice.

In both policy and development practice, rights are hierarchical. civil, legal and political rights enjoy higher levels of acknowledgement, definition and enforcement compared to social and economic rights. The latter two present practical problems for development management. For example, the right to development is inconsistent with a fundamental economic reality, scarcity. How are resource poor countries to be held to account for not guaranteeing their people the right to development when they lack the fiscal capacity to provide essential goods and services?

The judicial system, which is the dominant mode for challenging violations of legal, political and civil rights, is considerably more dependable and predictable as compared to the political process, which

Box 1.2: Short-term Poverty and Hunger Reduction Policies, Strategies and Programmes³

<i>The Instrument</i>	<i>Objectives</i>
2003, National Strategy for Poverty Reduction (NSPR)	To link and harmonise anti poverty initiatives, provide opportunities for people to have sustainable livelihoods through expansion of employment opportunities and improved access to social investment, and to monitor progress against poverty.
2002, Revised National Policy for Rural Development	To reduce rural poverty, promote sustainable livelihoods, stimulate rural employment and income generation, diversify the rural economy, reduce dependency on government, maintain and improve rural capital, increase agricultural productivity and promote participation in development.
1984 Industrial Development Policy IDP(revised 1998)	To diversify the economy, foster the growth of the private sector, assist small-scale rural entrepreneurs, support growth and employment creation in towns and villages; and achieve higher levels of productivity.
1982-2002, Financial Assistance Policy	To create employment opportunities and encourage investment in a range of economic activities.
2002, Citizen Entrepreneurial Development Agency (CEDA)	To promote citizen entrepreneurship, support economic diversification and create employment opportunities.
1980 Destitute Policy (Revised 200)	To provide income support to people defined as destitute according to criteria used by the GoB.

Policies, Strategies and Programmes to Reduce Hunger

Labour-Based Drought Relief Programme	To provide work and income in rural areas for people whose livelihoods are temporarily disrupted by drought.
1996, National Policy on Disaster Management	To provide a comprehensive framework for disaster management; reduce the potential loss due to disasters; ensure timely assistance to victims and achieve rapid and durable recovery.
The Revised National Food Strategy	To provide a framework for attaining national and household food and nutrition security through (a) the attainment of household income security; (b) physical and economic access of households to adequate supplies of safe and nutritionally adequate food; and (c) availability of food through import and production.
The Strategic Grain Reserve	To store enough grain to meet the national requirement of cereals for at least three months.
The Botswana Agricultural Board	To offer a favourable price regime and extended marketing services to isolated parts of the country through depots and cooperatives.

is the dominant mode for claiming social and economic rights. The judicial system does not, however, have the tools to enforce economic and social rights. These are seldom codified in statutes.

The principles of universality and inalienability are also not always tenable in practice. For instance, in emergencies such as war or health crises such as SARS, Human Immuno Deficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) or Anthrax, civil rights may be temporarily abrogated to secure an outcome such as compulsory testing as an essential component of a strategy for managing the emergency. An 'optimal strategy' for managing HIV/AIDS may thus entail subordinating the individual right to choice in respect of submitting to an HIV test to the public health interest. In such instances, the principles of universality and inalienability are breached, albeit out of a necessity created by an emergency.

An emerging debate in countries that now bear the brunt of the HIV/AIDS epidemic, within the health profession and amongst policymakers, is whether the early focus on protecting the individual's right to test or not to test, may not have been decisive in delaying behavioural change and the containment of the problem. There are concerns that the early focus on individual rights may have been ill-advised. Consequently, pressure is now being exerted from within and outside the health profession for compulsory, or at the very least, routine HIV testing as an important component of a strategy for achieving universal testing. Botswana has, in fact, opted for routine testing.

In countries that practice capital punishment, the commission or non-commission of a capital offence qualifies the right to life. In those that do

not, the right to life is an inalienable birthright, never to be tempered with. South Africa and much of Europe are examples in this regard. Not so in Botswana, some states in the United States of America and many other countries around the world. Thus, the right to life fails to meet the standards of inalienability and universality even within the borders of one federal polity.

There is the paradox of successful development under conditions in which rights are not respected, for instance, social engineering, state paternalism and benevolent dictatorships. The ethical foundations of human development are therefore, frequently tested at a practical level by context problems. These do not however, deal mortal blows to the human rights approach to development for a number of reasons. First, the 'suspension of rights' during periods of great emergencies such as war or disease epidemics is not itself a reflection of the norm in society. It is an aberration that the citizenry would ordinarily tolerate under an emergency. People do develop higher levels of tolerance for disruptions to their normal lives if the objective is known and justifiable. For instance, they may tolerate higher taxes to finance an emergency such as war or an aggressive response to HIV/AIDS, or curfews to support a justifiable security operation.

The human rights approach ultimately derives its strength from an inherent preference for freedom among human beings. Across the world, authoritarian rule, including benevolent dictatorship, has proved unsustainable in the long term. It imposes on people psychic costs that they are not able to sustain indefinitely in the natural course of development. When deprivation is extensive, people may submit to a benevolent dictatorship, perhaps because extensive deprivation is an

³ Table extracted from United Nations Development Programme. 2004. Botswana Millennium Development Goals Status Report, Gaborone

emergency that requires a strong central authority. However, freedom from deprivation inevitably leads to a quest for higher order freedoms.

It is human nature to demand higher order 'satisfactions' as more basic needs are met. One such order of satisfaction is freedom for people to do the kind of things that make their lives complete. No authoritarian system can meet this need consistently for long enough to make authoritarian rule viable. In the end, people will revolt against any such system because in the final analysis, "all human beings are born free and equal in dignity and rights"⁴.

It is for these reasons and the considerable progress made by proponents for an ethical human centred and human rights based approach to development, that over the last two decades, the conception of development has shifted from its focus on economic development to a decisive focus on the more inclusive idea of human development. Appreciation of this concept of development, if not the degree to which it has evolved, can be traced as far back as classical economists and philosophers such as Robert Malthus and Vilfredo Ricardo. It is not that economic development and human development are incompatible. Managed properly, these are mutually supportive processes. Human development is, in part, about translating economic development – growth etc. - more efficiently, into broad-based improvements in human welfare.

HUMAN DEVELOPMENT AND POVERTY

Poverty is a widespread and exceedingly destructive phenomenon. Around the world, an estimated 1.2 billion people, one in every five human beings, subsist on less than \$US1⁵, the equivalent of five pula (BWP5), per day. In Sub-Saharan Africa alone, nearly half of the population live below this threshold. In Botswana, an estimated 47% of the population was income poor in 1993/94, down from 59% in 1985/86. Furthermore 30% (of the total population) subsisted under conditions of extreme poverty in 1993/94, down from 41% in 1985/86. The latest estimates indicate that in 2002/03, 30% of the population was income poor.⁶

Poverty is an exceedingly destructive phenomenon. It is in itself an emergency and the very antithesis of development. But it is a "silent emergency" because despite its extent and impact, it is relatively easier to ignore compared to war and HIV/AIDS for example, by those who do not experience it directly even if they have the power and direct responsibility to do something about it. In Sub-Saharan Africa as a whole, poverty destroys human potential and the human spirit on a scale matched only by HIV/AIDS. It perpetuates itself by creating disease, conflict and hopelessness. And because it is less dramatic than war, or HIV/AIDS, it is a more silent, but no less destructive, emergency.

The Millennium Development Goals (MDGs), developed over the 1990s and adopted as a compact for development by the United Nations General Assembly in 2000, reaffirms poverty as the world's priority development goal in the 21st century. Whereas war, violence and authoritarian rule provide the most dramatic assaults on human development and human freedom, it is poverty and related forms of deprivation that lie at the core of the human development challenge. But what is poverty?

The World Bank⁷ defines poverty as pronounced deprivation in wellbeing. Such deprivation includes hunger, lack of shelter, poor health, lack of education, social exclusion, powerlessness, lack of voice, and vulnerability to disease and natural disasters. So poverty may have several dimensions, the most common being income poverty and

capability/human poverty. Individuals and/or households are considered income poor if their income or consumption falls below some threshold⁶ below which it is impossible to meet basic needs. People are also considered poor if they lack the essential capabilities such literacy, health and basic functional skills for elevating themselves out of poverty.

Human capabilities define the range of things people can be or can do. To earn an income, human beings need good health, some level of functional literacy and some useful skills. The conception of poverty is thus often broadened to cover education, health, participation and vulnerability. Consistent with this broader conception of poverty, UNDP⁸, identifies three levels/types of poverty, viz.,

Overall Income Poverty: This defines poverty as lack of sufficient income to satisfy essential needs beyond food, including shelter, clothing and energy. Since 1995, the global threshold for income poverty has been pegged at \$US2 (about P12) per day per person compared to \$US1 per day per person for extreme poverty.

Human Poverty: This is a more serious condition. It refers to deprivation in the most essential human capabilities and so includes severely circumscribed life expectancy, poor health, illiteracy, and social exclusion. The intense levels of morbidity, mortality, orphan-hood and psychosocial trauma that HIV/AIDS is inflicting on the Southern African population is a measure of the extremes human poverty can reach.

Extreme Poverty: It exists when an individual or household does not have sufficient income to meet basic food needs. Extreme poverty, sometimes referred to as food poverty, inevitably leads to high vulnerability to disease because of malnutrition.

The consequences of poverty are severe. Its greatest cost is the expansive destruction of human potential it causes. About one in five people in the world, 1.2 billion in total, live in poverty. In Botswana, nearly three in ten people subsisted below the national poverty threshold in 2002/03. The opportunity costs these levels of poverty imply for individuals, their societies and the human race in general are incalculable. Many brilliant people who, had they been born under different circumstances, could have sharply altered the course of their nations or even humanity, die illiterate and without having made anything close to their potential contribution. Yet many others die of easily preventable diseases, the so-called diseases of poverty.

The link between poverty on the one hand and S&T on the other is self-evident. The Intermediate Technology for Development Group (ITDG) thus observes:

The lack of access by poor women and men to the most basic technologies and knowledge needed to create sustainable livelihoods has condemned billions of people to an existence of recurrent poverty, disease and hunger.⁹

The point is simple and clear. Poor people are not only deprived of basic resources and capabilities. They are also deprived of access to some of the basic technologies that are relevant to their most basic needs: clean water, modern medicine, high yield seeds, improved farm equipment and access to markets and information. Poverty even denies people access to policies and programmes designed for them.

Poor people and poor countries also lack the basic capabilities that support innovation and the transfer, adaptation and diffusion of technology. In particular low incomes constrain access to education and basic technologies such as the radio, the computer and the internet.

4 State of the Nation Address by His Excellency Mr. Festus G. Mogae, President of the Republic of Botswana, to the first session of the ninth parliament: "Renewed Responsibility", 8th November 2004, Gaborone

5 This is the global threshold for extreme poverty.

6 Oxfam. 1995. The Oxfam Poverty Report. 1995. Oxfam Publishing

7 World Bank. 2001. World Development Report 2001

8 United Nations Development Programme

9 August 2002. <http://www.itdg.org>.

Low fiscal capacity leads to under funded and under performing educational and research and development institutions. The result is that poor people and poor countries are being by-passed by every round of breakthrough technologies. For instance, in contemporary development discourse, the phrase “digital divide” refers to the reality that the current communications revolution has bypassed and is marginalizing poor people and poor countries.

For poor people and poor countries, knowledge, innovation and technology can very easily be instruments of exclusion. The poor are seldom innovators but innovation by others often undermines their production systems and their competitiveness and erodes their terms of trade. Thus, building capacity for innovation and technological diffusion in poor countries and improving poor people’s access to basic life improving technologies - in agriculture, health, manufacturing, transport, communications etc. - could make a difference in the fight against poverty.

On access to technologies, the case has been made for the reform of the current Patent and Intellectual Property Regime (PIPR). Patents, whose main purpose is to encourage innovation, have evolved into powerful instruments for rent seeking and anti-competitive behaviour. Patents, along with unfair trade rules, are the primary building blocks for the technology divide that keeps the human development gap between rich and poor nations wide and growing. Poor people and poor countries need improved access to simple life improving technologies - in areas such as agriculture, health and communications.

HUMAN DEVELOPMENT AND HEALTH

Health is an essential basic human right. It is also one of the areas of human development where progress in S&T has delivered truly great differences in human wellbeing. It continues to be an exceptionally active area of scientific research and innovation. As far back as 8000 BC¹⁰, the history of medicine and health has been replete with revolutionary innovations with high human development impact; some of which have been fairly basic. These include:

- Ambroise Pare’s “Dressing and Bandages” in 1536, replacing hot oil as treatment for wounds.
- James Lind’s discovery of a cure for Scurvy in 1752.
- Edward Jenner’s discovery of a Small Pox Vaccine in 1798.
- Charles Gabriel Pravaz and Alexander Wood independently inventing the Hypodermic Syringe in 1853.
- Wilhelm Rontgen’s discovery of X-Rays in 1895.
- The Discovery of Insulin for treating diabetes in 1921 by Frederick Banting and Charles Best.
- Alexander Flemming’s discovery of Penicillin in 1928.
- Selman Waksman’s discovery of a cure for Tuberculosis in 1943.
- Jonas Salk’s discovery of a Polio Vaccine in 1954.
- Francis H. Crick and James Watson’s co-discovery of molecular structure of nucleic acids in 1962 and
- Paul Lauterbur and Sir Peter Mansfield’ s discovery concerning magnetic resonance imaging in 2003.

S&T still has a lot to offer human development. For example, in Sub-Saharan Africa, a breakthrough in medical innovation that delivers an affordable HIV/AIDS vaccine or cure could create a monumental developmental dividend. With such a breakthrough, the years of life expectancy lost since the beginning of the 1990s could be recovered quickly.

The link between health and human development is self evident and

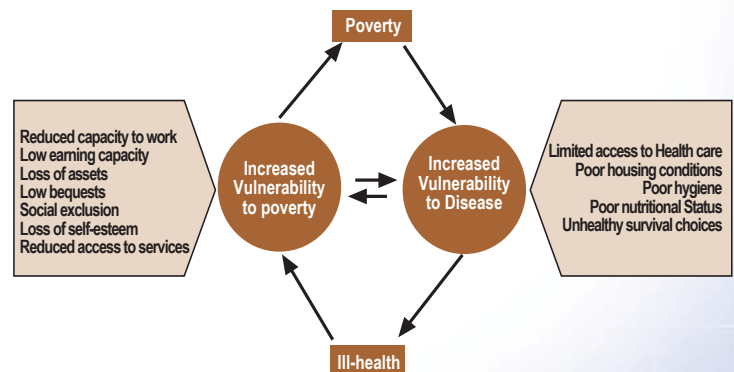
strong. Good health is a sign, a result even, of development success; just as ill-health is often a sign, a result of poverty or lack of human development. Poverty breeds vulnerability to disease. It creates the conditions on which diseases thrive: illiteracy and ignorance, malnutrition; poor sanitation; unsafe water; and high exposure to natural negatives factors such as bad weather and floods. Poverty also creates a predisposition to unhealthy survival strategies - picking waste food from rubbish dumps, commercial sex work, maintaining multiple sexual partners according to economic need and turning to alcohol and drug consumption as coping strategies.

Across the world, particularly in poor countries, poor people are severely deprived of access to health. In some countries, poor people’s access to health is constrained both by weaknesses in supply (lack of state resources to finance health infrastructure, drugs and personnel), and poor people’s lack of ability to pay for medical fees and drugs. Botswana is blessed with a fairly well resourced and financially accessible public health system but access remains an issue because of shortage of personnel, which has become more acute as a result of an increase in demand for health services due to HIV/AIDS and the erosion of delivery capacity, also by HIV/AIDS. It is noteworthy that despite the challenge posed by HIV/AIDS, there is a general trend that shows an increase in both communicable and non-communicable diseases. This puts a further strain on an already burdened health system; this has the potential to compromise the fight against HIV/AIDS.

The poverty health link is also dire in the reverse. Poor health inevitably breeds poverty. HIV/AIDS, the biggest health challenge in Sub-Saharan Africa, is exceptionally devastating in this regard. It erodes capacity to work and reduces earning potential for the sick and those who care for them. It erodes accumulated assets through medical expenses. It also creates a new class of orphans: very young children whose parents died young, often leaving no bequests. This is a growing and exceptionally vulnerable group. In Sub-Saharan Africa, children orphaned by HIV/AIDS have been known to be dispossessed of assets, and to drop out of school to assume parental duties.

Furthermore, as John Hopkins University’s Thomas Quinn argues, being orphaned by AIDS is itself a health hazard¹¹. AIDS orphans are not only deprived of basics such as food, shelter, clothing and health but their condition engenders a higher degree of predisposition to life choices that increase vulnerability to diseases, including HIV/AIDS. These include premature sex, multiple material-based sexual relationships, commercial sex work, crime and alcohol and substance abuse, (see Figure 1.1).

Figure 1.1: The Vicious Circle of Poverty and Ill- Health



¹⁰ When trepanning - boring a hole in the human skull - was used to relieve severe headaches
¹¹ <http://www.aegis.com/news/lupi/2003/UP030904.html>

Because of its nature and extent - nearly 40% of the sexually active populations of Botswana and Swaziland are HIV positive - HIV/AIDS also impoverishes governments and whole nations. A 2000 assessment of the Macroeconomic Impacts of HIV/AIDS in Botswana predicts that HIV/AIDS could account for 10% of the number of poor people by 2010 and that it could cause a 70-270% increase in health spending, a 20% reduction in government revenue and significantly reduce the rate of economic growth. The Burkina Faso 2001 National Human Development Report projects a 15% increase in the prevalence of poverty, from 45% of the population to 60%, by 2010 as a result of HIV/AIDS.

In fact, HIV/AIDS could occasion development failure on a grand scale. An estimated 50-80% of hospital beds in the 20 countries with prevalence rates of more than 10% are occupied by People Living with AIDS (PLWA). Health systems are paralysed by low staff morale, and institutions are experiencing unusual staff attrition rates. HIV/AIDS may cripple institutions of governance and service delivery. In order to address some of these aspects, the National Aids Coordinating Agency (NACA), is developing a new software to be used by the Ministry of Education (MoE), in capturing and analysing data and producing reports on student and teacher absenteeism. These efforts reflect a realisation that the epidemic has evolved into a potent economic and national security threat.

For poor people and poor countries, many of the medical technologies that could make a difference, drugs and condoms for instance, already exist. But these remain largely inaccessible because of low personal incomes and poor state finances. An especially severe constraint on access to these technologies is the patent and intellectual property regime. It locks monopoly rents into the prices of new technologies and keeps them beyond the reach of poor people and poor countries. These life-saving technologies include Anti-Retrovirals (ARVs), for which generic equivalents are available but may be proscribed by the patent and intellectual property regime.

In some instances, poor people are let down by policy failures and weaknesses in institutional delivery capacities. At the global level, a partnership based on new S&T to address the problems of poor people remains elusive. The policies of developed countries continue to deny health systems in developing countries life saving drugs needed to fight AIDS, malaria and tuberculosis. And too little is spent on research into developing biomedical solutions to the health problems of developing countries. And when drugs are available, misguided policies and/or delivery capacity constraints deny poor people access to them. For instance, Botswana still lacks the human resource capacity to make its ARV programme truly national. It does not have enough doctors, counsellors and nurses to effectively implement the programme and manage its risks.

Technology can mitigate the human resource problems that afflict health service in poor countries. Virtual medicine, or telemedicine, is an option already in use in many countries around the world to accord clinics and health centres in remote areas the services of doctors. In an effort to mitigate the effects of HIV/AIDS on education in Botswana ICTs have been put to use. An ICT-based initiative modeled on the television programme Escola in Brazil, the Teacher Capacity Building Programme (TCB), was developed in partnership with African Comprehensive AIDS Partnership (ACHAP), UNDP, United Nations Population Fund (UNFPA), MoE, and MCST. The interactive distance education program is delivered through Botswana Television (BTV).

The objective of the TCB program is to contribute towards prevention

and mitigating the impact of HIV/AIDS by enhancing the response capacity and resilience of the education and communication sectors. It is hoped that through the TCB, stigma associated with the disease will be addressed through discussions about HIV prevention, and living with and caring for adults and children infected or affected by HIV/AIDS. On 20th March 2003, the first TCB broadcast took place countrywide through a weekly programme called "Talk Back"; 400 schools participated in this initiative. Teacher Capacity Building is being used to equip teachers with the skills to effectively deliver to pupils and communities, HIV/AIDS Information, Education and Communication (IEC) services. Teacher Capacity Building also mitigates the effects of HIV/AIDS induced staff attrition on tuition by providing for delivery of tuition through the medium of television.

HUMAN DEVELOPMENT AND THE ENVIRONMENT: ISSUES OF SUSTAINABILITY

"The earth provides enough to satisfy every man's need but not every man's greed"

- Mahatma Gandhi

Nature provides the primary resources for human development - water, air, food, energy, raw materials, shelter, clothing and so on. It also performs invaluable sink¹² functions. This relationship is however tense and fragile because nature's resources are available only in finite quantities, its capacity to absorb waste is limited and it can regenerate lost capacity only if the pace of development so permits. Although it is not by any means the only element of sustainable development, the judicious use of environmental resources is the core of sustainable development. For an overview of sustainable development, see Box 1.3. Given the mismatch between the available stock of environmental resources and the demands placed on them, a destructive contest exists for these resources - amongst nations; between communities; between individuals; between species; and between the present and the future. In this contest, the most powerful - the human species and within it rich nations and rich people - control and consume an unsustainably disproportionate share of nature's resources.

In aggregate terms therefore, nature's capacity to sustain life on earth is eroding much faster than it regenerates. The earth's finite resources are



Nature provides the primary resources for human development

¹² Nature absorbs a lot of the impurities generated by human activity, including carbon dioxide emissions.



being used for the current benefit of a few in a way that encroaches on the entitlements and prosperity of others. Balancing temporal and inter-temporal interests in the use of natural resources is a fundamental challenge in ensuring sustainable human development.

According to Haven (2002), about 25% of the world's top soil and a third of its forest cover have been lost in the last half century to 2002. The irreversible loss of biodiversity now proceeds at rates as high as 1000 species per million per year. Human beings consume, waste or divert an estimated 45% of net biological productivity on land and use more than half of the world's supply of renewable fresh water. Global warming and climate change continue to disrupt arable production systems around the world.

The transition to sustainable development will be difficult without progress in science, engineering and technology¹³ that expands the earth's capacity to support life on earth. The combination of the desire of the rich for higher consumption levels, and the aspirations of the poor for the consumption levels of their richer counterparts makes innovation an important part of the solution to the problem of sustainability. Furthermore, sustainability also requires a fair distribution of the burden of environmental costs and gains from environmental resources in favour of poor people and poor countries. Equally urgent is the need for cleaner and productivity enhancing technologies. Technology can help reduce environmental stress and to raise the earth's carrying capacity.

In the specific case of Botswana, some of the more immediate sustainable development problems are soil erosion and the expansion of farming activity to "virgin" land; the destruction of biodiversity resources in pristine natural heritages such as the Okavango; the contamination of underground water resources, the uncontrolled mining of river sand and the conflict between different forms of land use, in particular, wildlife, farming and human real estate.

Poor people would benefit the most from the effective application of S&T towards optimising the use of land resources for current and future generations. They depend more on land for food, shelter, health, clothing, transport and housing than the non-poor. They suffer the most when nature's resources are degraded or their access to them is restricted. They do not have the resources - money and technology - to access alternative sources of livelihood. For similar reasons, they suffer the most from nature's fury for they are more vulnerable to floods, droughts, hailstorms and other natural disasters. In 2001-02, poor rainfall raised the incidence of hunger and malnutrition in the SADC region. Food insecurity reached famine levels in six countries – Zimbabwe, Malawi, Mozambique, Swaziland, Zambia and Lesotho – where 10.2 million people required emergency food aid. In general, low-income households slip into abject poverty and lose sizeable proportions of their assets, especially livestock, whenever rains fail.

Box 1.3: The Concept of Sustainable Development

The ECA¹⁴ identifies three elements of sustainable development, viz., economic sustainability, institutional sustainability and environmental sustainability.

Economic sustainability: This refers to the maintenance of the long-term health of the economy through human and physical capital formation; knowledge creation; sustained broad-based growth; and equitable access to resources such as education and health. In this context, equity also entails the notion that current generations should not profit through policies that impose an unfair economic burden on posterity. Examples include runaway long-term sovereign debt, inequitable social security systems, and the use of exhaustible resources such as minerals to finance current consumption.

Institutional sustainability: This is about how well institutions and mechanisms of governance and service delivery serve the development needs of current and future generations. It is concerned with whether the political system provides space for all to participate in the formulation of societal choice; whether the judicial system adequately defines and protects individual rights and freedoms; whether institutional capacity exists to manage the economy towards long term growth; and whether markets are allowed to mediate the interaction between sellers and consumers. In short, institutional sustainability is about the viability of governance institutions as mechanisms for minimising both Government and market failure.

Environmental sustainability: At the core of environmental sustainability is allowing nature to recover from human induced damage and using non-renewable natural resources to enhance the wellbeing of both current and future generations. The Economic Communication for Africa (ECA) puts it well:

... it implies a temporal pattern of natural resource use that leads to the conservation of an economy's natural capital base, including its land, renewable and non-renewable natural resources, and climatic conditions. Environmental sustainability therefore involves reducing environmental stress (pollution, deforestation, population pressure and excessive extraction of mineral resources) and maintaining or improving environmental quality (biodiversity, air quality, water quantity and quality) ...

Arguing for an approach to sustainability that addresses both inter and intra generational equity, Nobel Laureate, Robert Solow argued in HDR 1996¹⁵ that:

It is not a good thing that "we" should be well off, or get better off if that entails that our (distant) descendants will be much poorer than we are ... human development should be shared equitably between the present and the future.

But sustainable development is not exclusively an issue of inequality between current and future generations. It is also about temporal inequalities, i.e., whether nations and individuals do in fact use no more than their fair share of nature's resources or contribute more than their fair share to the irreversible damage of the environment. Once again, Solow makes the argument convincingly that:

If the underlying reason has to do with dislike for inequality, there is at least as strong a case for reducing contemporary inequality (and probably stronger) as for worrying about the uncertain status of future generations.

Part of the problem of environmental degradation is that "... natural assets

13 United Nations Conference on Environment and Development. 1992

14 Economic Communication for Africa. 2002. Annual Economic Report.

15 United Nations Development Programme. 1996. Human Development Report 1996. Economic Growth and Human Development, NY

Box 1.3 continued

such as forests, fisheries and water tend to be common property goods for which markets cannot provide basic co-ordination functions – revealing true values, balancing interests over time and providing diversity¹⁶. The unregulated use of a common property resource inevitably results in excessive exploitation of the resource. Communal rangeland may be overstocked, fisheries 'over-fished', forests 'over-logged' and greenhouse gas emissions allowed to run into excess in the face of competitive pressures. Regulation and cooperation – global, national and local – is essential ensure sustainable, efficient and equitable use of nature's resources.

In countries such as Botswana, new technologies that raise input productivity, deliver more drought tolerant crop varieties, and raise crop yields are needed to transform agriculture, improve household food and income security and slowdown agricultural encroachment on more "virgin land". UN Secretary General, Kofi Annan, puts emphasis on "...new seeds and farming strategies that produce hardier, more drought-resistant and higher yielding crops...", and water management strategies that achieve "more crop per drop"¹⁷. More generally, a combination of cleaner and more efficient technologies and tougher environmental standards may slowdown the rate of environmental degradation, including climate change and ozone depletion.

Technology alone will not resolve all the environmental concerns of poor people. Some, especially those revolving around access, security, equity and quality, require political and administrative action. Poor people may have rights of use of environmental resources but these are often poorly defined and poorly protected. For instance, communal land may be privatised without the consent of local farmers or local hunter-gatherer communities who may, through such acts be deprived of access to dependable sources of wild foods and game. River sand may be mined in violation of poor people's rights of access to water and other river-based resources. For instance, sand mining along the Motloutse River in the North and East of Selibe Phikwe is being done at great cost to the local farming community and the environment. In all these instances, the activities of others, rich farmers and/or corporate interests, limit the access of poor people to environmental resources.

Quality and equity issues arise in respect of land resources because too often, poor people subsist on relatively marginal and shrinking land. Because they cannot afford boreholes, poor farmers congregate in overstocked areas where the water table is high enough for low technology hand-dug wells to yield sufficient water for humans and livestock, or along rivers. Rich farmers on the other hand often control the best arable and grazing land and have better defined and more secure ownership or use rights. Equity issues also arise because even though poor people bear the brunt of environmental degradation, they contribute less to the destruction of the environment. Rich people, rich nations, governments and powerful commercial interests are the principal agents for the destruction of the environment.

THE MILLENNIUM DEVELOPMENT GOALS: A GLOBAL FRAMEWORK FOR HUMAN DEVELOPMENT

The quest for human development is a global concern, requiring global coordination, cooperation and accountability. And though this is seldom said, development failure or success generates global externalities. Thus, beyond moral responsibility, it is in the self-interest of the well off to help the poor out of poverty and to make human development a universal outcome. Just as successful development in one country generates positive externalities within its neighbourhood and beyond,

¹⁶ Economic Communication for Africa. 2002. Annual Economic Report

¹⁷ United Nations. 2001. Road Map Towards the Implementation of the UN Millennium Declaration. Report of the Secretary General

development failure generates negative externalities, including cross border criminal activity and international terrorism. Thus, former US Secretary of State, Cordell Hull, argued in 1945 that the battle for peace had to be fought on both the security and socio-economic fronts. In a like manner, former UK International Development Secretary, Claire Short, would, in a post September 11 address to the House of Commons Committee on International Development, argue thus,

"The suicide bombers of September 11 appeared not to come from poor countries. But the conditions that bred their bitterness and hatred are poverty and injustice".

In a reaffirmation of the manifest need and urgency for a more focussed, better coordinated and monitorable approach to international development, the 2000 UN General Assembly adopted the Millennium Development Declaration, which gave rise to eight development goals whose attainment would make the greatest impact on poverty reduction and human development. The Millennium Development Goals were developed over the 1990s through a series of international development conferences held in the 1990s and based on a common set of values and principles, including human dignity, equality and equity.

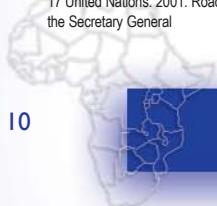
The MDGs are primarily about eradicating poverty but it is a given that without a renewed focus on S&T solutions that address the priority needs of poor people and poor countries, poverty shall not be overcome. The human development gap between rich and poor people, and between rich and poor nations, itself a source of poverty, persists to a large measure because of an innovation divide that has made technological innovators increasingly more competitive. This divide exists and grows because very little of the current research effort is focused on the specific problems of poor countries. New York Times Columnist, Nicholas Kristof, recently lamented in an opinion piece:

AIDS, malaria and tuberculosis now kill a combined six million people per year... "in the developing world"

Meeting the MDGs will require a major increase in the research effort in the developing world. At present, too little of the global research effort is committed to the specific needs of poor countries. Yet, developing countries are in need of basic low cost technologies that raise productivity and competitiveness and those that save lives. Many of these technologies exist and have low supply costs but are rendered inaccessible by steep patent barriers. Some problems require new technological solutions based on new research and innovation. The research effort in developing countries is however stifled by a combination of factors: inadequate funding, poor research infrastructure and low supplies of research expertise. Generally governments in the developing world have a low accepts of the fact that research would benefit mankind. These constraints can be overcome through collaboration between researchers and institutions in developed and developing countries.

As a framework for development, the MDGs are a powerful tool for galvanising countries into action and for rewarding them with clear measures of success. They have inspired progressive initiatives such as the New Partnership for Africa's Development (NEPAD) and national long-term perspective plans such as Botswana's Vision 2016. They have also emerged as a common platform for players in international development, in particular, multilateral institutions such as UNDP, the World Bank, and the International Monetary Fund (IMF) and bilateral agencies such as Department for International Development (DFID) and United States Agency for International Development (USAID).

The Secretary General's maiden MDGs Report shows that the countries



of the UN are serious about the MDGs. For a start, the preparation of the Report was demanded by the General Assembly through Resolutions 55/162 of December 2000 and 56/95 of December 2001. Only two years after the adoption of the millennium development declaration, nation states are already publishing MDG Reports and many have committed themselves to producing them by 2004 – one hundred have already been produced.

In his report, the Secretary General observes that the Millennium General Assembly's vision i.e. the MDGs "...was not focussed on horizons too remote"* and provides evidence for this surmise. According to his report, East Asia and the Pacific had by 1999, halved the prevalence rate of extreme poverty to 14% from 28% in 1990 and had made significant strides in reducing the number of people who suffer from hunger. Overall, the world is on course to halving the prevalence rate of poverty by 2015, thanks to good progress in China and India.

Sub-Saharan Africa is however, off target. Little progress has been made in reducing the prevalence of extreme poverty and hunger in Africa. In fact, over the ten years to the end of 1999, a net 27 million more Africans became malnourished. Furthermore, Africa made the least progress on universal access to primary education and experienced deterioration in mortality rates. Sub-Saharan Africa and South East Asia will not meet the 2015 child and maternal mortality target, mainly because of high HIV/AIDS burdens.

Much like Botswana's Vision 2016, the MDGs are firm statements of intent, with clear time bound targets and process indicators for achieving rapid and measurable human development gains. They spell out the commitments of developed and developing nations to shared principles and values in a global partnership for development. And no less important, they provide a universal framework for measuring progress in development.

In purpose and in substance, the MDGs are similar to Botswana's Long Term Vision: Towards Prosperity for All (Box 1.5). Both perceive the dignity of the human person as the fundamental basis for development. Whereas the philosophical basis for the MDGs can be traced to the United Nations Charter and the Universal Declaration of Human Rights, that for Vision 2016 can be traced to one of the tenets of African culture – Botho in Setswana, or human kindness. This very rich concept embodies all that is good about a human being: respect, character, discipline, success, humility, compassion and justice, and celebrates the dignity and worth of the human person á la the UN Charter.

Box 1.4: The Millennium Development Goals	
GOAL	TARGET
1. Eradicate extreme poverty and hunger	Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than \$1 a day. Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger
2. Achieve Universal Primary education	Target 3: Ensure that by 2015, children everywhere, boys and girls alike, will be able to receive a full course of primary schooling
3. Promote Gender Equality and Empower Women	Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005 and at all levels of education no later than 2015.
4. Reduce Child Mortality	Target 5: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate.
5. Improve Maternal Health	Target 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio
6. Combat HIV/AIDS, Malaria and other diseases	Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS. Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.
7. Ensure Environmental Sustainability	Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. Target 10: Halve, by 2015, the proportion of people without access to safe drinking water. Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.
8. Develop a global partnership for development	Target 12: Develop further, an open, rule based, predictable and non discriminatory trading and financial system. Includes: commitment to good governance, development, and poverty reduction – both nationally and internationally. Target 13: Address the special needs of developing countries. Includes: tariff and quota free access for least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous Official Development Assistance (ODA) for countries committed to poverty reduction.*

Source: Implementation of the United Nations Millennium Declaration: Report of the Secretary General.

LONG-TERM VISION FOR BOTSWANA: TOWARDS PROSPERITY FOR ALL

Botswana's long-term Vision, popularly referred to as Vision 2016, challenges Botswana to work towards broad-based prosperity and a just and compassionate nation by 2016. It invokes and seeks to strengthen in Botswana, individually and collectively, the attributes that will deliver success in seven broad dimensions, viz.:

1. An Educated and Informed Nation,
2. A Prosperous, Productive and Innovative Nation,
3. A Compassionate, Just and Caring Nation,
4. A Safe and Secure Nation,
5. An Open, Democratic and Accountable Nation,
6. A Moral and Tolerant Nation and,
7. A United and Proud Nation.



Botswana needs to enhance S&T capabilities

Botswana will struggle to meet its Vision 2016 goals unless it takes decisive measures to significantly strengthen its S&T capability because the key requirements for the realisation of the vision – quality education, an information society, productivity growth, export competitiveness and industrialisation all require strong technological input. And the vision is both aware of this imperative and explicit in emphasising it. Botswana has no choice but to adopt high technology practices. The pace of international developments means that we will be forced to do so in order to compete in the export markets.

Consistent with this prognosis, the vision emphasises the following in a strategy for building a national S&T capability:

- (a) Sufficient investment in the development of a national S&T capability through a combination of public funding for research and incentives for private research and development.
- (b) Establishment of a S&T Council that would actively promote innovation and invention.
- (c) Reorienting the education system towards S&T.
- (d) Effective adoption and adaptation of foreign technology. This in recognition of the reality that Botswana lacks a tradition of technical research and development that can be used as a basis for developing 'home grown' technology.

No less important in the quest for prosperity for all will be careful investment in infrastructure that supports a technology-enabled society. So building an effective communications network and supporting legislation such as a 21st century Freedom of Information Act are absolute prerequisites.

HUMAN AGENCY AND PUBLIC PROVISIONING

Human development is an internally and externally driven process, concerned with what people can and should do for themselves - human agency - and what should of necessity be provided by a higher authority such as a government or a multilateral institution. Thus, building human capabilities through investment in people i.e. raising their health, knowledge and skill levels, is as important for human development as the provision of public goods, including the creation of an environment of peace, stability and law and order; of development friendly policies; and of freedom so that people may freely engage in their preferred pursuits. Building human capabilities allows human agency to thrive. It empowers people to become the key agents for the improvement of their own wellbeing and simultaneously reduces dependence on the state and its agencies. Effective provision of public goods delivers a development context that is conducive for human agency.

The framework of empowerment, opportunity and human security discussed in this report revolves around building human capabilities and providing public goods. And this has in effect been Botswana's development strategy. The country has sought to strengthen human agency through investment in education and health and a range of economic empowerment initiatives. It has done a good job of providing the institutions and macro management functions that have turned a naturally hostile environment (small market and a poor natural resource base) into a relatively competitive investment. In this regard, the country's greatest assets are peace, law and order, disciplined fiscal and monetary policies and capable public institutions.



Building human capabilities



BOX 1.5:**The Millennium Development Goals and Vision 2016****An Extract From an Address to the Steering Committee on Botswana's Millennium Development Goals Report**

*by Dr Gloria Somolekae
Chairperson, Botswana Vision Council*

It is not an exaggeration to say that the MDGs and the Vision are basically the same thing. Both are concerned about virtually the same issues.

(a) To eradicate extreme poverty and hunger

Vision: By year 2016, Botswana will have eradicated absolute poverty, so that no part of the country will have people living with incomes below the appropriate poverty datum line. Within the next ten years, the percentage of people in poverty will have been reduced to at most 23%, which is half the level in 1994".

(b) To achieve universal primary education

Vision: By 2016, all Botswana will have the opportunity for continued and universal education ... improvements in the relevance, the quality, and access to education lie at the core of the vision for the future".

(c) To promote gender equality and empower women

Vision: The strategies to ensure the full empowerment of Botswana women should be focused on six areas, for which sufficient resources will need to be allocated. First, to eradicate the persistent burden of poverty on women by formulating, reviewing and adopting economic policies, laws and practices which target women's needs to ensure their equal access to and control of productive resources. Second, all laws and practices that discriminate against women should be reviewed, amended or repealed... Third, positive measures, including affirmative action in favour of women should be taken to ensure women's full participation in positions of power, leadership and decision making at all levels of Botswana society".

(d) To reduce child mortality

Vision: ... implied in the text on health

(e) To Improve maternal health

Vision: "Strengthen programmes specific to the health needs of women, particularly adolescents, menopausal and elderly women. There must be a national cervical and breast cancer education, screening and treatment policy, including an in-service training programme for workers".

(f) To combat HIV/AIDS, Malaria and other diseases

Vision: to halt or reverse the rising incidence of the HIV virus, particularly among young people. The task of mitigating the effects of AIDS related illnesses must be given priority throughout the health and education systems.

(g) To ensure environmental sustainability

Vision: "The challenge of preserving the environment and making prudent use of the natural resource base of Botswana is crucial to its survival and prosperity".

(h) To develop a global partnership for development

Vision: "... Botswana will continue to cooperate with other nations for mutual benefit. In particular, it will work with its neighbours to increase the degree of regional integration in trade and other policies, with a view to improving the competitiveness of the region as whole.