ENSEARCH

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UN Millennium Development Goals (MDG), Science, Technology and Innovation (STI), Corporate Sector and Sustainable Development

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1.0 Tribute to Ir. K. Kumarasivam

I am deeply honoured to deliver this public lecture in memory of my friend and partner Ir. K. Kumarasivam.

I first met Kandy as he was then affectionately known in Adelaide South Australia in 1956 when I was admitted to the electrical engineering course in the University of Adelaide. Kandy was my senior but in civil engineering. We were close associates in the United Nations Youth Association (UNYA) of South Australia as we both were rather quixotic in fighting for lost causes. 1956 was the year of the Hungarian revolt that was brutally crushed by the Soviet Union. The UN was widely blamed in the Western world for being impotent! In the then anti-communist Australia, UN was regarded as communist leaning and rather unpopular. Nevertheless, Kandy and I believed that the UN for all its imperfections imposed by the rich and the powerful was (and still is) all that the poor and weak of the world had as the global forum for their hopes and aspirations. We worked many Sundays in Mary Martin's Bookshop on Grenfell Street to produce the UNYA newsletter! On UN Day every 24 October, we stood at the corners of Victoria Square to distribute UN pamphlets and publications to all and sundry. During the first Asia Festival in Adelaide in 1960, our pamphlet on Kashmir nearly caused a diplomatic walkout!

On return to Malaysia, we went our separate ways in professional life, but were fellow members of the Gombak Rotary Club. It was inevitable that in 1993, we as kindred spirits should merge our two engineering consultancy firms to form KTA Tenaga Sdn Bhd. Under Sivam's and my leadership, KTA Tenaga carried on Sivam's mission and vision in trying in our small ways to make the world better. I devoted my extracurricular career to scientific and engineering services through the World Federation of Engineering Organisations (WFEO) and the InterAcademy Council (IAC) of the world of scientific and engineering academies, culminating in the UN Millennium Project. Sivam was a founding father of the Association of Consulting Engineers Malaysia (ACEM). Ir. Rocky Wong rose to become the only Malaysian to have served in the Executive Board of the International Federation of Consulting Engineers (FIDIC) and is still gratefully acknowledged in China for helping to organise and internationalise the consulting engineering profession of China through FIDIC. Ir. Harry Tan also guided ACEM through its formative years. Of course Sivam's unrivalled contribution to ENSEARCH and in environment protection is why we are gathered here this evening. I hope the unique example of the senior

partners of KTA Tenaga can serve as a beacon for Malaysian professional service companies in voluntary and community service.

It is most appropriate that I am able this evening to return to the first love of Sivam and myself in sharing with you some aspects of the global development agenda of the UN.

2.0 The World Today and Tomorrow

By the turn of the 21st Century, world population has exceeded 6.0 billion that can roughly be divided into three classes:

The Rich (0.8 billion),
The Transitional (1.2 billion), and
The Poor (4.0 billion).

Based on the criterion of GDP in US$ per capita (Purchasing Power Parity corrected):
>16,000,
4000-16,000, and
< 4,000 respectively.

The Rich have nine times the wealth, eight times the energy consumption and eight times the carbon emission of the Poor. 20% of the world's richest people account for 86% of world consumption of energy and materials and the poorest 20% account for only 1.3%.

1.3 billion live in abject poverty, subsisting on a daily income of less than US $1.00;
3 billion have a daily income of less than US$ 2.00;
800 million suffer from food insecurity;
50 million are HIV positive;
1 billion suffer from water scarcity; and
2 billion have no access to commercial energy.

It has been estimated that the world population will increase to 9.5 billion by 2050. Since the developed world's population is declining, all the increase will be in developing countries and principally in their urban centres. This will immensely aggravate the global sustainability challenge.

It therefore bears emphasizing our world is a **world of inequity**.

3.0 The UN Millennium Declaration and the UN Millennium Project

The UN Secretary-General Kofi Annan realised that the urgent problems confronting the world at the dawn of the 21st Century, namely poverty, hunger, diseases, illiteracy, environmental degradation etc, could only be solved by collective global political will. In the United Nations Millennium General Assembly, September 2000, the world's leaders adopted the UN Millennium Declaration, committing their nations to stronger global efforts to alleviate poverty, improve health and promote peace, human rights and environmental sustainability. The

Millennium Development Goals (MDGs) that emerged from the Declaration are specific, measurable targets with a timeline of 2015.

Unfortunately the global development agenda was sidetracked by the attacks on the World Trade Centre New York and the Pentagon Washington DC on September 11 2001 and the subsequent wars in Afghanistan and Iraq.

To regain the development momentum, a UN initiative, the Millennium Project (MP), 2002-2005, then proceeded under Project Director Professor Jeffrey Sachs of Columbia University with the overall guidance of UN Secretary General Kofi Annan and then UNDP Administrator Mark Malloch Brown. The purpose of MP was to propose the best strategies for meeting the MDGs. This included reviewing current practices, prioritising policy reforms, identifying means of policy implementation, and evaluating financing options by 10 task forces comprising 250 eminent scholars, policy makers, and practitioners, with broad representation from both developed and developing countries and high-level participation of the United Nations agencies. The MP's ultimate objective is to help ensure that all developing countries achieve the MDGs and meet the associated Targets.

I was honoured to be appointed the co-chair of the Science, Technology and Innovation Task Force No. 10.

4.0 Millennium Development Goals

The MDGs are as follows:

Goal 1: Eradicate extreme poverty and hunger
Goal 2: Achieve universal primary education
Goal 3: Promote gender equality and empower women
Goal 4: Reduce child mortality
Goal 5: Improve maternal health
Goal 6: Combat HIV/AIDS, malaria and other diseases
Goal 7: Ensure environmental sustainability
Goal 8: Develop a Global Partnership for Development

The 8 MDGs and the 18 associated Targets are listed in the Annex.

Correspondingly, the 10 MP Task Forces are constituted as follows:

Task Force 1	Poverty and Economic Growth (Goal 1& 8, Targets 1, 13, 14, 15, 16)
Task Force 2	Hunger (Goal 1, Target 2)
Task Force 3	Education and Gender Equality (Goals 2 & 3, Targets 3, 4)
Task Force 4	Child Health and Maternal Health (Goals 4 & 5, Targets 5, 6)
Task Force 5	Expanding Access to Essential Medicines (Goal 6 & 8, Targets 7, 8, 17)

Task Force 6 Environmental Sustainability (Goal 7, Target 9)
Task Force 7 Water and Sanitation (Goal 7, Target 10)
Task Force 8 Improving the Lives of Slum Dwellers (Goal 7, Target 11)
Task Force 9 Trade and Finance (Goal 8, Target 12)
Task Force 10 Science, Technology and Innovation (Goal 8, Target 18)

5.0 Involvement of the InterAcademy Panel (IAP) of World Science Academies and the World Federation of Engineering Organisations (WFEO) in Sustainable Development

I would like now to give the background leading to my appointment to the MP.

In 1992, the United Nations Conference on Environment and Development (UNCED-popularly known as the Earth Summit) was held in Rio de Janeiro. Agenda 21, an international action plan for sustainable development, was launched.
International Scientific and Engineering Organisations like the International Council of Scientific Unions, now the International Council of Science, (ICSU) and the World Federation of Engineering Organisations (WFEO) made important contributions in the formulation of Agenda 21. Although these contributions were not widely acknowledged, Agenda 21 did accept the premise that science, engineering and technology (SET) are critical input in the global transition to sustainability.

The InterAcademy Panel (IAP) whose members are some 90 national scientific academies is the international forum through which they bring together leading authorities in the natural and social sciences, engineering and medicine to advise international governments and organisations and to inform public opinion on SET aspects of issues of global concern. National scientific academies regularly offer independent advice to national governments. However they only started to offer global advice to the UN Population Summit in Cairo 94. In fact, IAP was born after Cairo. Since then, IAP has interacted with UN Habitat II, Istanbul 96, UNESCO World Science Conference, Budapest 1999, the World Summit on Sustainable Development (WSSD) Johannesburg 2002 and most recently the UN Summit General Assembly, September 2005 on the MDGs.

In view of the growing importance of SET in meeting the challenges of human poverty and environmental degradation in the 21st Century, IAP in 1996 decided to hold a millennium agenda setting conference in 2000. The theme was "Sustainability Transition". Its objectives were to generate systematic analyses of critical issues, to provide information and advice to governments and international organisations, to inform worldwide public opinion, to influence SET research agendas, and to launch new relevant studies and programmes within national scientific, engineering, and medical academies. I represented the Academy of Sciences Malaysia (ASM), then the youngest academy in the world with its establishment in September 1995, in the IAP Millennium Conference Steering Committee. After many months of deliberation and consultation among member science academies nationally, regionally and internationally during 1997-2000, IAP reached consensus for the Millennium Conference to address the six most

important issues confronting the orderly and successful transition to a sustainable future for mankind within the following framework :

"Crucial global goals in the coming decades are to feed, house, educate, nurture, and employ many more people, to reduce hunger and poverty, and to maintain the life support systems of the natural environment. Reaching these goals will require wise use of crucial inputs of land, air, water, natural resources and materials, energy, capital, knowledge, institutions, and social capital. Better understanding of the complex relationships among these goals and inputs is required for effective policies and programmes at national and international levels."

The six inter-related thematic issues were:

- **Population and Health**
- **Food**
- **Water**
- **Energy**
- **Consumption**
- **Knowledge and Education**

IAP assembled some three hundred of the leaders of the global scientific, engineering and medical community in Tokyo, Japan in May 2000 to deliberate on the above challenge to demographic, economic and environmental sustainability in the 21st century and on the role of SET in meeting that challenge.

The findings of the IAP Millennium Sustainability Transition Conference and the subsequent advocacy by member scientific academies throughout the world exerted a significant impact on WSSD and the UN Millennium Declaration and the MDGs.

One of the historic events in Tokyo was the establishment of the InterAcademy Council (IAC) by IAP to conduct global SET studies in depth principally on behalf of the UN. IAC was suggested by Maurice Strong and supported by Kofi Annan. I was a founder Board member of IAC from 2001-2005, representing ASM.

The World Federation of Engineering Organisations (WFEO) is the global organization whose 90 National Members are the national institutions/societies of engineers and whose 10 International Members are the regional federations of engineering institutions/societies. WFEO thus represents some 15 million professional and graduate engineers worldwide. I am the first Asian to be WFEO president from 2003 to 2005. Through my interaction with IAP and ICSU, WFEO's involvement in the UN resumed in earnest with the UN Commission on Sustainable Development (CSD) in its 9th annual meeting (CSD-9) in New York, January 2001 when the International Science and Technology Community (STC) was first invited by CSD as a civil society Major Group. ICSU requested WFEO to help address the engineering and technology aspects of the two CSD-9 thematic topics, energy and transportation. ICSU realized that the topics needed WFEO input for STC to be creditable. WFEO was subsequently recognised by UNCSD as ICSU's co-partner in STC for WSSD Johannesburg, September-October 2002, anchoring the T in STC. Under my leadership, WFEO participated actively in WSSD

Preparatory Committee (Prep-Comm) II, January 2002, New York and Prep-Comm IV, May-June 2002, Bali and in WSSD itself in Johannesburg. I also participated in the sustainability science workshop in Mexico City, May 2002.
In WSSD, STC participated in the Multi-Stakeholders Segment of the WSSD. Leaders of STC addressed the official Plenary Sessions and participated in Roundtables with Heads of State/Government.

WFEO continued in the 11th Session of the CSD in New York April-May 2003. In the 12th Session of CSD in UN, April 2004, I was invited as WFEO president and co-ordinator of UN MP STI Task Force to be an expert panellist to address the delegates from the podium. I also convened and chaired a lunch event during which Professor Jeff Sachs, Director of UN MP and Special Representative of UN Secretary General Kofi Annan, addressed an audience largely consisting of the nine civil society Major Groups on the progress of the MP and the proposed MP recommendations to achieve the MDGs. In CSD-13 April 2005, I was de facto leader of STC. In CSD-14 May 2006, I was invited to address the assembly on electric power grid and sustainable development as a commissioner of the Energy Commission of Malaysia.

6.0 UN MP "Science, Technology and Innovation" Task Force

It was through my active participation in WFEO, IAC, CSD and WSSD that I was appointed co-chair of MP STI Task Force.

I in turn nominated four other leading engineers of WFEO national members as STI Task Force members. With other engineers from academia, industry, government and UN agencies, a majority of our Task Force members were engineers. The UN agencies represented were the United Nations Development Program (UNDP), the United Nations Industrial Development Organisation (UNIDO), the United Nations Conference on Trade and Development (UNCTAD) and UNESCO.

It is no accident that the bias was towards engineering and technology. STI Task Force addressed MDG No.8 "Building Global Alliances for Development" and Target 18 "In cooperation with the private sector, make available the benefits of new technologies, especially information and communications". Thus, STI Task Force would need to engage global business and industry in the application of technology for development in developing countries. Besides ICT, STI Task Force also highlighted the importance of biotechnology, nanotechnology, material science, remote sensing and spatial information technology in achieving the MDGs.

In its Report "Innovation: Applying Knowledge in Development" issued in January 2005, STI Task Force emphasizes the following areas of focus for developing countries:

- Improving the STI policy environment, including STI advice mechanism, technology management training for top policy makers in government, industry and civil society.

- Building STI human capacities, including strengthening STI educational institutions and reorienting the role of universities in development, graduating job creators rather than job seekers.

- Promoting entrepreneurial and innovation activities, with incentives for enterprise development, industrial extension services, government technology procurement, and venture capital market.

- Investing in research and development, building scientific and technological capabilities, supporting under-funded research in design and innovation including research in manufacturing and product marketing.

- Technology foresight for developing countries to find niches in the global production chain.

- Forging regional and international STI partnerships.

STI Task Force also leveraged on important work carried out by others:

- In "Science Advice to Government" on the work of the Inter-Academy Panel (IAP) of world science academies and the Academy of Sciences Malaysia;

- In "Global S&T Capacity Building" on the study of the Inter-Academy Council (IAC);

- In "Technology Foresight" on the work of UNIDO;

- In "ICT for development" on the work of the UN ICT Task Force;

- In "Biotechnology" on the work in genomics for health of the University of Toronto;

- In "Nanotechnology" on the work of the Royal Society and the Royal Academy of Engineering, UK.

STI Task Force scouted the world for success stories and best practices. It was convinced by the successful development processes in Asia Pacific and S.E. Asia that:

For least developed countries to lift themselves out of poverty and achieve MDGs by 2015, they need:

- Basic infrastructure i.e. roads, schools, water, sanitation, irrigation, clinics, telecommunications, energy etc.

- Basic industries, namely small and medium enterprises (SMEs) for supply of goods and services to agricultural and natural resources exploitation industries. This means indigenous operational, repair and maintenance expertise and a pool of local technicians.

Without the SET base, especially the engineering and technology base, indigenous industries cannot upscale, economy cannot uplift and foreign direct investment (FDI) will not come.

To implement the above, the STI advice systems in developing countries need reorientation, with more government support and funding for establishment and nurturing of academies of engineering and technological sciences, professional engineering and technological associations, industrial and trade associations and the like. These human resource and institutional supporting framework in the private sector and in NGOs would spur sector-wide innovations in the development process.

As a Malaysian interacting with African S&T Ministers, top African SET officials and academics, I have been struck by their widespread despondency that the STI chasm between the developed countries in North America and Europe and African countries is too wide to them to bridge. I have advocated strongly to them to look instead to Asia Pacific and Malaysia where macroeconomic stability, self-reliance, hard work, thrift and investment in education have transformed the economic landscape in the short span of three decades. Again official development assistance (ODA) from the North is tied to supply of goods and services from the donors with numerous conditionalities like labour standards and human rights etc. I have as a consequence advocated genuine South-South cooperation with high and middle income countries like Malaysia, China, India, Brazil, Mexico and others as donors in the MDG process. The "Look East and Look South" orientation for Africa is reflected in the STI Task Force Report and in my advocacy to date.

The UN MP report and all MP Task Force reports were launched by the UN Secretary-General Kofi Annan in New York on 17 January 2005 followed by national launches in more than 100 countries. I represented Professor Jeffrey Sachs in the Thailand launch in Bangkok 18 January 2005. The MP and Task Force reports and supporting documents are posted on www.unmillenniumproject.org .

7.0 UN Secretary General's Report "In Larger Freedom: towards development, security and human rights for all" 21 March 2005

The MP reports formed the developmental basis of the above UN Secretary-General's report to UN member states for the UN Summit General Assembly September 2005. I am most gratified by his emphasis on SET in the report, particularly on engineering, infrastructure and SME development:

Quote

The unprecedented combination of resources and technology at our disposal today means that we are truly the first generation with the tools, the knowledge and the resources to meet the commitment, given by all States in the Millennium Declaration, "to making the right to development a reality for everyone and to freeing the entire human race from want".

As the Millennium Project's report makes clear, our agenda is still achievable globally and in most or even all countries — but only if we break with business as usual and dramatically accelerate and scale up action until 2015. Success will require sustained action across the entire decade between now and the deadline. That is because development successes cannot take place overnight and many countries suffer significant capacity constraints. It takes time

to train the teachers, nurses and engineers, to build the roads, schools and hospitals, and to grow the small and large businesses able to create the jobs and income needed.

Sustainable economic growth will require significantly increased investments in human capital and development-oriented infrastructure, such as energy, transport and communications. In addition, small and medium-sized firms require a favourable legal and regulatory environment, and expanded access to financial capital, including microfinance. This is crucial for providing decent jobs that both provide income and empower the poor, especially women and younger people.

To increase countries' indigenous capacity for science and technology, including information and communications technology, Governments should establish scientific advisory bodies, promote infrastructure as an opportunity for technological learning, expand science and engineering faculties, and stress development and business applications in science and technology curricula.

The international community must agree on stabilization targets for greenhouse gas concentrations beyond that date. Scientific advances and technological innovation have an important role to play in mitigating climate change and in facilitating adaptation to the new conditions. In particular, research and development funding for renewable energy sources, carbon management and energy efficiency needs to increase substantially.

To help drive economic development and to enable developing countries to forge solutions to their own problems, a significantly increased global effort is required to support research and development to address the special needs of the poor in the areas of health, agriculture, natural resource and environmental management, energy and climate. Two particular priorities should be to mount a major global initiative on research in tropical diseases and to provide additional support to the Consultative Group on International Agricultural Research (CGIAR) for research on tropical agriculture.

Unquote

The UN Secretary-General's Report is also available also from www.unmillenniumproject.org

8.0 UN Summit General Assembly, September 2005

The UN Summit General Assembly September 2005 endorsed most of the UN Secretary General's recommendations with respect to the MDGs.

The global top science, engineering and technological (S.E.T.) community submitted a joint statement "Science, Technology and Innovation in Achieving the MDGs" to the UN Summit General Assembly dated 13 September 2005. It was issued in the names of IAC; IAP; UN MP; ICSU; the Academy of Sciences for the Developing World (TWAS); the InterAcademy Medical Panel (IMAP); the Council of Academies of Engineering and Technological Sciences (CAETS); and WFEO.

"*We state that stronger worldwide capacities in science and technology will greatly enhance humanity's ability to achieve the UN Millennium Development Goals. Sustained progress in reducing poverty and related problems will require strengthened institutions for science, technology, and innovation within the world's developing countries. We call on the national leaders meeting at the United Nations General Assembly in September 2005 to take urgent action without delay. For our part, we commit ourselves to working with appropriate partners towards these urgent goals*."

During the UN Summit General Assembly September 2005, a high level STI and ICT for Development Roundtable was held. Our Prime Minister was a keynote speaker and I was the co-moderator.

9.0 STI Human Resources Capacity Building in Developing Countries

UN MP STI Task Force report like the IAC STI Capacity Building study report is really about human resource based and institutional and enterprise-related capacity building in developing countries. Since institutions and enterprises are run by human beings, it all boils down to STI human resources capacity building. Priority must therefore be focused on education. There remains only nine short years to 2015, we must talk less and do more. To set an action oriented example, I have been actively pursuing the following initiatives.

9.1 University

Universities in developing countries must act as the fount of knowledge for economic development. For this to happen, policy makers need to realize that knowledge per say does not create wealth. It is the application and commercialization of knowledge, scientific or otherwise, into useful devices, installations, services and systems that create wealth. Therefore, turning out innovative and entrepreneurial graduates must be the mission of the universities in developing countries. In my opinion, staffing universities in developing countries with PhDs is not the route to innovation and competitiveness for the economy. They should not be recruited on PhD degree, research experience and publications only. They must have working experience in industry and in the marketplace if they are to understand the needs of the economy and the community. I would strongly advocate that successful candidates as academics should have demonstrated some prior and continuing involvement in community service, especially MDG-related.

Universities in developing countries must be graduating job creators rather the job seekers. Universities should re-orientate themselves to serve the development needs of their region and their nation. They should establish undergraduate incubators that assist students to venture into knowledge based enterprises suited to the needs of the economy. Such undergraduate enterprises will attract industry participation as they are the most fertile recruiting ground for industry. If such undergraduate enterprises succeed beyond graduation, they will create jobs and add to the successful knowledge enterprises in the country. Even if they fail, the graduates would have been well schooled in the hard knocks of business life and well adapted to the needs of industry.

A very positive trend in recent years has been the blossoming of Engineers Without Borders (EWB) in university campuses across North America and Europe. Whilst the bulk of EWB

members and volunteers are undergraduate engineering students, many EWBs are supported by their universities and engineering faculty members. EWBs from developed countries partner their counterparts in developing countries in MDG-related and infrastructure-based community projects in the latter. EWB projects won quite a few Mondialogo Engineering Awards in 2005. Mondialogo is a joint UNESCO-DaimlerChrysler cross-cultural initiative supported by WFEO that is aimed at fostering North-South collaboration amongst university engineering students in MDG and sustainable development projects in developing countries. Taking the lead from Mondialogo, I am actively promoting with MP "A MDG Project in Every University".

9.2 Primary Education

Innovation is born of the inquisitive and creative mind. There are mounting scientific evidence that the human child is born inquisitive. The most inquiring, acquiring and creative age is between 3 and 10. It is the traditional education of book and rote learning that dampens and in most cases destroys the creative instinct of the child. If the inquiring spirit is gone from the child in primary school, it will be difficult to restore in secondary and higher education.

IAP has made the promotion of hands-on inquiry based primary school science education their top priority. The most successful is the La Main à la Pâte (LAMAP) program of the French Academy of Sciences (www.lamap.fr). LAMAP re-orientated science education in primary schools, with the aim at promoting a hands-on, inquiry based method for teaching science to young children. LAMAP has since spread to many parts of the world. LAMAP owes much of its worldwide success through this imaginative use of ICT. In my opinion, the most valuable aspect of LAMAP is that children learn to doubt and to query. They are taught not to listen to 'prophets' unless their opinion is verified by experiment. It develops future citizens that are conscious of the importance of evidence based decision making as stakeholders in the political and social life of their countries. Of course, IAP hopes that hands-on inquiry based primary science education will also encourage more children to take up science in later schooling and in their career. In Malaysia and ASEAN, I was instrumental for IAP to entrust LAMAP promotion to the Regional Education Centre for Science and Mathematics (RECSAM), Penang.

9.3 Secondary Education

Secondary school science education is much more structured with science graduates as teachers guiding students through well prescribed curriculum. However, the secondary education system in the developing world suffers from excessive book and rote learning for prescribed examinations. Enrolment in science in secondary schools is dropping everywhere. The ongoing challenge is to pervade the curriculum with evidence based enquiry type learning and with more STI content to boost enrolment.

9.4 R&D Institutes

The high end of the STI human resource development is the staffing of R&D institutions in developing countries. However, there exists an almost universal misconception that the necessary path to economic development in developing countries is through more emphasis and investment in science and scientific research. This view has consistently been championed by

development banks and by the scientific communities in developing countries themselves. Postgraduate research departments of universities and basic research institutes have been set up prematurely in the least developing countries with their graduates and researchers finding no local gainful employment and migrating to the developed world, aggravating the brain drain. Yet more of the same are being advocated. What an irony it is that developing countries are training highly skilled manpower for the developed world, whilst insufficient resources are devoted to lift the countries out of poverty!

10.0 STI Brain Drain from Developing Countries

STI human resources capacity building in developing countries faces the critical problem of brain drain.

Currently, there is a disturbing worldwide trend that enrolment in engineering courses in universities is declining. This has been particularly evident in developed countries with the related phenomenon of closure of engineering departments in universities and institutions of higher learning. The situation of science courses is no better. As a result, developed countries have been exercising the prerogative of the "Rich" by recruiting scientists, engineers and technologists from the developing countries. Most developing countries thus suffer on three counts. First, they do not produce enough scientists, engineers and technologists for their own requirement as their education and training infrastructure is inadequate to cope with the growing demand. Secondly, they expend scarce hard foreign currency in sending their students for expensive SET courses in developed countries. Thirdly, there is the constant SET drain, usually the best and the brightest, to the developed countries.

In my opinion, solutions to overcome this critical shortage of STI professionals in the developing world cannot be North-South but must be South-South. However the professional accreditation and certification barriers in developing countries against STI professionals from fellow developing countries are formidable. Nevertheless, it is the only practical and pragmatic solution to offset the brain drain. We must achieve this South-South mobility for the sake of the MDGs, tapping from those countries where large population and large geographical spread or both require the production of large number of STI professionals to satisfy their own development needs. Such countries are South Africa, India, China, Mexico and Brazil to name but a few.

As an example, there are more than 2.0 million engineering students in universities in China with some 600,000 graduating as engineers each year. To increase this number by 10% would not strain the engineering educational resources of China but would be of great help to other developing countries. When the engineering qualifications from the above-mentioned major producers of engineers and technologists are accepted first regionally and then worldwide, these countries will provide accessible and affordable engineering education and training facilities for students from other developing countries. It is thus very much a win-win situation for the whole developing world.

In point of fact, the US National Academies published in October 2005 a report that the US edge in science and technology competitiveness is slipping. It cites as evidence that China is graduating some 600,000 engineers a year, India some 300,000 engineers a year whereas USA is

graduating only some 60,000 engineers a year. With such statistics, the STI South-North brain drain is bound to worsen.

10.1 WFEO and WTO

WFEO national member engineering institutions have been pioneers in promoting cross border mobility of professional engineers for several decades. The outstanding examples are the Washington Accord of English speaking countries, the FEANI Eur-Ing, the APEC Engineers Register and the Engineers Mobility Forum. However, accreditation and certification remain very much within the purview of government in developing countries. In my opinion, South-South and global mobility of engineers and technologists can only be achieved through the World Trade Organisation (WTO), as WTO decisions are binding on member nations. On behalf of WFEO, I have approached WTO offering to work with WTO for worldwide mobility of professional engineers in relation to Agreements on Trade in Engineering and Construction Services. The General Agreements on Trade in Services (GATS) are very much part and parcel of the WTO Doha Trade for Development agenda 2003-2006. Surprisingly this WFEO offer has received absolutely no response from WTO. We urgently need WTO member nations to put the mobility of STI professionals as priority on the WTO negotiating table.

10.2 Declining Enrolment in STI Courses

Developing countries are also facing the serious problem of declining enrolment in science courses in secondary schools and universities. Why is there an aversion to STI amongst the youth in developing countries? Perhaps the courses are too hard and too crammed. I am particularly concerned about the negative attitude of male Muslim youth in this context as they perceive STI as Western.

10.3 Promotion of History of Islamic STI as Heritage of Humankind

With respect to arresting the declining enrolment in STI courses in developing countries, I would like to share with you the following initiative to enlist your support and participation. UNESCO had just mounted an impressive exhibition "Golden Age of the Arabic Sciences" in Paris 29 October 2005-19 March 2006. (www.unesco.org/pao/exhib/islam.htm).The exhibition has been widely praised, including in a special article in Time magazine. In conjunction with the Exhibition, UNESCO has been organizing a series of workshops on Islamic Science and Technology. As WFEO President, I wrote in 2005 to UNESCO with the proposal for an International Symposium on the History of Islamic Science, Engineering and Technology (SET) on the back of the Paris Exhibition, as the developing world has a glorious history and heritage in SET, be it Islamic, China, India, Egyptian or the Incas etc. Indeed, it was Islamic SET with its algebra, astronomy, architecture and medicine etc that sparked the European Renaissance through Islamic Spain. I argued that there is an urgent need to acquaint male Islamic youth of this glorious SET heritage to revitalize their interest in STI as important tools for poverty reduction, economic development and competitiveness. I further asserted that history is most useful when it can be used to point the way to the future. In STI, it is important to also highlight the eminent Islamic scientists, engineers and technological industrialists that are carrying on the

glorious Islamic SET tradition. The Symposium should therefore feature eminent Islamic scientists and engineers as role models for Islamic youth.

UNESCO accepted my proposal. The Symposium on the History of Islamic Science, Engineering and Technology was successfully held in UNESCO, Paris 16-17 March 2006 as the closing event of the Paris Exhibition. The Symposium was strongly supported by IAP, IAC, the World Islamic Academy of Sciences, TWAS, the Nobel Museum, and WFEO. Above all, the Malaysian Minister of Science, Technology and Innovation, YB Dato Seri Dr. Jamaluddin Jarjis threw the support of the Malaysian government behind this initiative. He was the keynote speaker at the Symposium.
The deliverable outcomes from the Symposium are:

- To incorporate the rich Islamic SET heritage and the present day role models into the textbooks and curricula both in the developed world and the developing world, particularly Islamic countries.

- To incorporate historic Islamic SET experiments in the IAP LAMAP hands-on primary science education programme.

- To have a travelling exhibition from the Paris Exhibition to Islamic countries, starting with Kuala Lumpur in December 2006.

- To rescue research centres in History of Islam SET in Western universities from closure.

- To organize subsequent conferences on North East Asian (Chinese, Japanese, and Korean), Indian, African and Latin American SET heritage.

- To encourage developing countries to nominate their significant SET installations for UNESCO heritage listing.

The Ministry of Science, Technology and Innovation, Malaysia has agreed to host an UNESCO International South-South Centre for Science,Technology and Innovation in Kuala Lumpur to promote the implementation of the above outcome and other related aspects of STI for development, together with an UNESCO Chair for Islamic STI History in University Technology Malaysia. The UNESCO Centre is scheduled to be approved by UNESCO in April 2007.

10.4 Employing Military Engineers in Developing Countries

In any developing country, the military engineering divisions and units are amongst the best equipped for basic infrastructure construction and rehabilitation. Yet, such invaluable capacity remains idle in a sea of need.

We forget that there was a fine tradition of Caesar's legions, which built roads, aqueducts, baths and sewers. In more recent decades, military engineering units in China, Taiwan, China and

Korea, have contributed significantly to the construction of infrastructure and laid the foundation of their bludgeoning construction industry.

As an example, there was a worsening famine due to drought in Kenya in 2003-2005, yet the 2004 budget allocation for capital projects of water storage for irrigation was under spent due to lack of indigenous implementation capacity. I have been to Washington DC to request the US Army Corps of Engineers to consider assisting in capacity building of Kenyan military engineering units in water storage projects. The response has been very positive. The Kenyan Ministry of Water and the Kenyan military have since come to agreement that the latter will act as sub-contractors in construction of small dams and in digging of bole holes.

I have also lobbied US and Australian military engineers to document and improve on regional collaboration in disaster relief, based on the Tsunami catastrophe 26 December 2004.

11.0 ICT and SME in Development

The ICT revolution has been transforming social and economic life in the world. This digital revolution is based on the advances of microcomputer technology on the one hand and satellite and wireless communications technology on the other. It has heralded the dawn of the global knowledge economy through the Internet and E-commerce and related applications. This has not only created a brand new global economic sector that simply did not exist before, but also increased the speed and efficiency in business transactions. The capital that matters most in the digital revolution is intellectual capital. Hardware costs are declining. The shift from hardware to software as the cutting edge of the industry helps to overcome what has been a major impediment to development - the shortage of finance. It improves the chances for poor countries to leapfrog some long and painful stages in the development process. Clearly the requisite intellectual capital is not universally available, but it is far more widespread in the developing world than finance capital. ICT is thus not only a great tool to help meet many of the MDGs, but also an essential infrastructure of wealth creation for developing countries in the global knowledge economy by accelerating the growth of sun-rise enterprises in biotechnology, nanotechnology, material sciences and remote sensing etc.

In my opinion, the future of engineering and technology in developing countries lies in small and medium scale enterprises (SMEs) that are engaged in engineering and technological innovations. With available and affordable computer hardware and software, knowledge accessibility through the Internet and robotics and modern instrumentation, product research and development can be carried in any SME anywhere focusing on innovation leading to profitability. This paradigm shift will mostly occur in SMEs with young STI professionals in charge as they are without the traditional baggage of caution and conservatism of the STI profession and the business community. SMEs will spread wealth far more equitably in developing countries than high-tech mega-ventures with multinational corporations.

12.0 UN Global Alliance of ICT and Development

As a consequence of the UN High Level STI and ICT Roundtable of September 2005, the World Summit on Information Society (WSIS) November 2005. Tunis decided to form the multi-

stakeholder UN Global Alliance of ICT and Development (G@ID). At Tunis, I encouraged YB Dato Seri Dr. Jamaluddin Jarjis to take a leading role in G@ID. He offered to host the Launch in Kuala Lumpur. On 19 June 2006, G@ID was duly launched in Putrajaya by YAB Prime Minister of Malaysia in the presence of UN Deputy Secretary-General, Mark Malloch Brown. YB Dato Seri Dr. Jamaluddin Jarjis was elected co-chair of G@ID Steering Committee with Malaysia spearheading the pioneering G@ID initiative, namely the Cyber Development Corps (CyDevCorps).

13.0 Mobilisation of Young Professionals for Development in the UN

In the UN MP and especially in STI Task Force, I have persistently promoting the cause of young STI professionals. An achievement was my successful effort to link Professor Jeff Sachs with the leaders of the Youth Major Group during CSD-12 in 2004. As advisor to the global youth caucus, I helped launch their MDG report "Youth and the MDGs: Challenges and Opportunities for Implementation" during CSD-13, 2005. http://www.un.org/esa/socdev/unyin/documents/youthmdgs.pdf

As stated by UN Secretary-General in his Year 2000 Millennium Report, "More than 1 billion people are between the ages of 15 and 24. Nearly 40 % of the world's population is below the age of 20. Most of the resulting youth bulge, nearly 98%, will occur in the developing world. Young people are a source of creativity, energy and initiative, of dynamism and social renewal. However, UN Secretary-General was sticking to the UN age range for Youth of 15 and 24. In my opinion, UN Secretary-General's very positive remark about youth is much more relevant to Young Professionals above the age of 25. In ICT, billionaires and millionaires are found in their 30s and 40s. Many lead and contribute to advancement of not only the youth of the world, but also to the solution of the critical problems of poverty eradication and sustainable development. I have been promoting the idea of an UN Commission for Young Professionals 26-40 years of age since 2001 through Australia, Malaysia and now USA. Hopefully, the dynamism and idealism of young professionals will be harnessed by UN through such a commission in the not too distant future.

14.0 The Corporate Sector and Consumption

My emphasis on basic infrastructure and development of SMEs in developing countries is predicated on the proactive involvement of the corporate sector in development.

I would however suggest that their greatest contribution to sustainable development would be to restrain their inordinate appetite for profit by the stimulation of excessive and profligate consumption.

Sustainable consumption has seldom been on the global development agenda. It is not addressed by MP for the MDGs. Clearly the "Poor" would need to increase consumption of materials and energy for development. For this consumption to be sustainable, the "Rich" would have to change their excessive consumption patterns. It is however not favoured by corporations in developed countries because it is seen to threaten competitiveness and profitability. Unfortunately, lifestyles of affluent countries in Europe and North America

have become models for new consumers in the more affluent developing countries. If the global consumption of energy and materials were to become as intensive as that of the average American, worldwide usage would increase six-fold and environmental damage would rise similarly. The world cannot sustain such consumption!

Of course, the advances of STI have enabled us to do more with less by improvements in performance, the use of less material and energy, faster processing and more durable products. For example, an office building needing 100,000 tons of steel 30 years ago can now be built with one third as much. In the European Union, manufacturers will be required to recycle 85% of a vehicle's weight by 2005 rising to 95% by 2015. However, unless more developed countries share their new scientific, engineering and technological knowledge with developing countries and enable them to leapfrog to efficient technologies, the increase in environmental damage from increased consumption would actually outpace the improvements in energy and material use.

Ultimately, corporations in the developed world especially MNCs must take the lead to temper their profit motivation with due regard to the sustainability of the global community and the global environment.

15.0 Conclusion

In view of the global support for the MDGs, I am optimistic that poverty reduction through economic development will be achieved, especially if the STI communities in government, academia and industry in developing countries work together to build up the STI human resource and institutional and enterprise-related capacity and make STI innovation as the pathway to achieve the MDGs by 2015 as the essential step to global sustainability transition in the 21st century.

Kuala Lumpur
8 July 2006

ANNEX
Millennium Development Goals and Targets

Goal 1: Eradicate extreme poverty and hunger	**Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day** **Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger**
Goal 2: Achieve universal primary education	**Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling**
Goal 3: Promote gender equality and empower women	**Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and to all levels of education no later than 2015**
Goal 4: Reduce child mortality	**Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate**
Goal 5: Improve maternal health	**Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio**
Goal 6: Combat HIV/AIDS, malaria and other diseases	**Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS** **Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases**
Goal 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 sustainable 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**

Goal 8: Develop a Global Partnership for Development	**Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system** **Target 13: Address the Special Needs of the Least Developed Countries** **Target 14: Address the Special Needs of landlocked countries and small island developing States** **Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term** **Target 16: In co-operation with developing countries, develop and implement strategies for decent and productive work for youth** **Target 17: In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries** **Target 18: In co-operation with the private sector, make available the benefits of new technologies, especially information and communications**