

## IV. Cultivating a Scientific Culture

**The relationship between technology and economic development is strong.** Sri Lanka's ability to facilitate a scientific culture that encourages innovative thinking will determine the country's ability to effectively use knowledge for growth. The innovation system within a country consists of networks of institutions, rules and procedures, enterprises, universities, research institutes, think tanks, and consulting firms.<sup>20</sup>

**Adopting existing technologies and best practices is the quickest way to grow the economy.** A recent report on innovation in India found that the country could achieve a five-fold increase in output simply from making better use of existing information available in the formal sector.<sup>21</sup> Countries like Korea and Singapore also grew quickly by adopting existing technologies often handed down from Japan before becoming research and innovation hubs in their own right.

In Sri Lanka as in many other countries in South Asia, the primary agenda for Science and Technology (S&T) development remains the progression of institutions and universities and the institutionalization and professionalization of science in order to create a science culture.<sup>22</sup> The general underdevelopment of these national scientific communities within Sri Lanka and most of the South Asia region is a reflection of the low priority accorded to investment in S&T over the past few years.

The most influential innovation systems are those that are able to facilitate a steady production of applied scientific knowledge. This requires a comprehensive university system, national recognition and rewards, full time specialized research institutes in critical areas of national importance, research networks and corresponding journals and professional academic bodies. It also requires a social and political legitimacy for science with steady state support, and the existence of an intellectual climate where individual scientists within national boundaries do not experience a sense of isolation.<sup>23</sup> In order for Sri Lanka to develop its innovation system, it will need to find efficient ways to bolster interactions between the major players: the government, research institutions, universities, and the private sector while assigning Research and Development (R&D) high priority in the near future.

### Benchmarking Sri Lanka's Innovation System

**Although Sri Lanka has made great advances in innovation, particularly in the agricultural sector, the country still lags far behind its more dynamic South Asia counterparts.** Sri Lanka is home to several impressive research institutes with a long history such as the Industrial Technology Institute (ITI) and the National Engineering Research and Development Centre (NERDC). These bodies have played important roles in the development of national and firm level technological capabilities and produced a large number of scientific minds in the process.

**The current innovation system within the country has been unable to make the great strides.** In terms of absolute size, Sri Lanka performs poorly as the country lacks the critical mass of researchers and scientists that some of its regional counterparts (especially India and China) are well endowed with (Figure 15). The trend in the number of world researchers is essentially a result of the low investment assigned to the R&D sector. The developed world houses 71 percent of world researchers while the developing world maintains a mere 29 percent. This low percentage is also substantially made up of researchers from India and China. Sri Lanka currently has a total of 5,254 scientists spread among 13

---

<sup>20</sup> World Bank 2005a

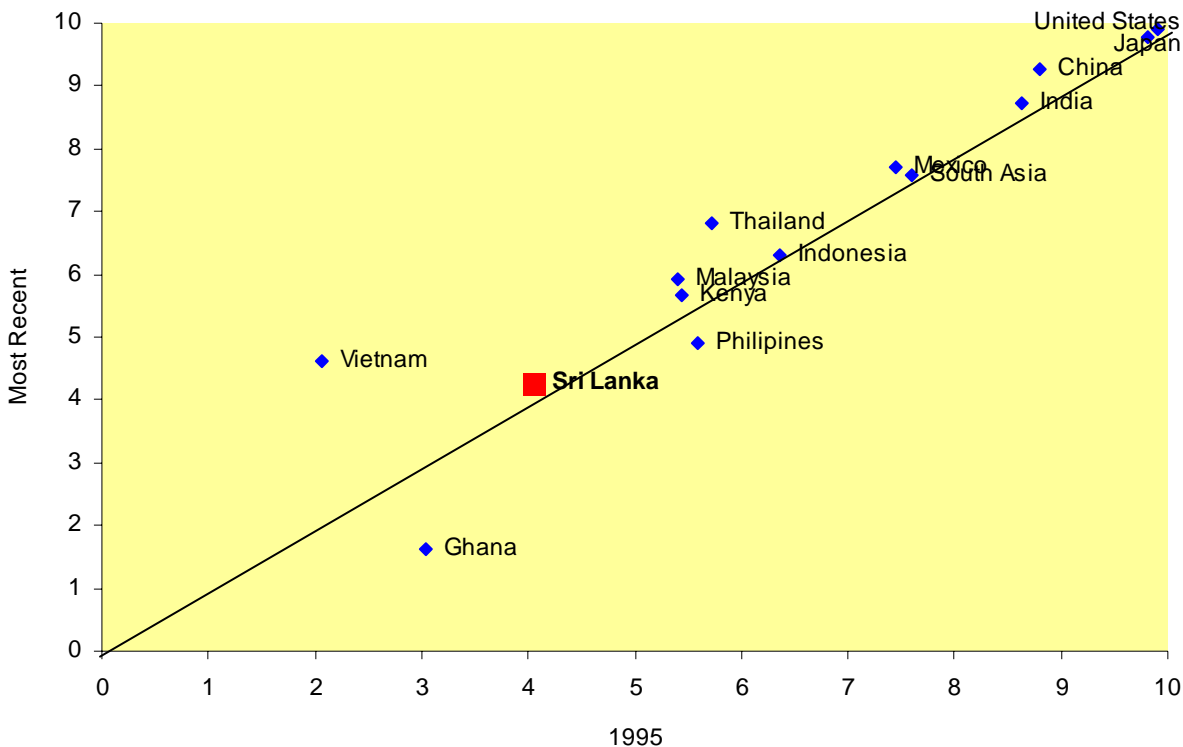
<sup>21</sup> Dutz 2007

<sup>22</sup> UNESCO, 2005

<sup>23</sup> Ibid.

universities and 19 R&D institutes, and more than 60 percent of these R&D institutes are agriculture based.<sup>24</sup> Although Sri Lanka has slightly improved its scientific capacity since 1995, the country still has a long way to go in creating a more research oriented society and producing a larger and more prominent population of innovators.

**Figure 15: Sri Lanka's Innovation is slowly improving**



Source: World Bank Knowledge Assessment Methodology, [www.worldbank.org/kam](http://www.worldbank.org/kam)

### Technology Achievement Index

**Sri Lanka has neglected science and innovation in recent years.** The country has some of the lowest numbers of post-graduate students in the science fields within the South Asia region. It there lacks the human resources needed for innovation. The 2001 Technology Achievement Index (TAI) attempts to capture how well a country is creating and diffusing technology while building a human skill base. It reflects a country's ability to participate in the technological innovations of the network age. The components of the TAI focus on the country's ability to adapt products and processes to local conditions, execute the diffusion of recent and older innovations, and its possession of a critical mass of individuals that are able to adapt and master the constant flow of new innovations. Countries are grouped into four categories in the index: leaders, potential leaders, dynamic adopters, and the marginalized. Sri Lanka finds it place towards the end of the dynamic adopters, ranked 62 out of 72 countries. Yet it surprisingly places just ahead of India (63). The index also shows that Sri Lanka has some of the lowest figures for gross tertiary science enrolment out of the 72 countries indexed.<sup>25</sup>

**A generation ago, Sri Lanka produced an influential group of science and technology graduates,** but over the last few years, due to the unappealing and disadvantageous nature of the current research industry which provides individuals with low salaries and almost no professional mobility, the country

<sup>24</sup> Ibid.

<sup>25</sup> UNDP, 2001

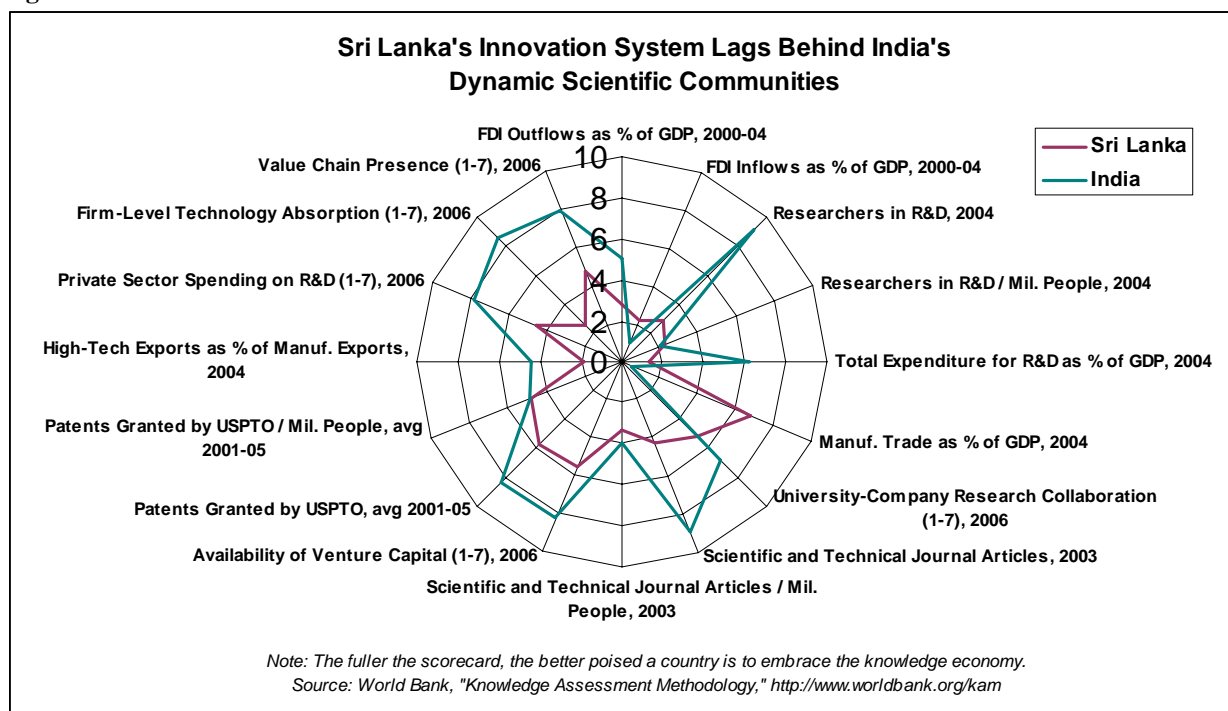
has lost a significant portion of its science-minded individuals to more “practical” professions of administration and business. A large number of the country’s academics have also left for overseas posts. The index is a testament to the popularly held belief that if Sri Lanka wants to embrace the knowledge economy, it will need to craft a scientific culture, one that encourages individuals to participate and find value in innovation and creation.

*National Innovative Capacity Index*

**Sri Lanka has an inadequate scientific environment that is unable to respond to the demands of the industry.** The National Innovative Capacity Index measures a country’s potential, as both a political and economic entity, to produce a stream of commercially relevant innovations. National Innovative Capacity depends on the technological sophistication and the size of the scientific and technical labour force, while reflecting the array of investments and policy choices of the government and private sector that affect the incentives for and the productivity of a country’s research and development activities. The index depends on three broad elements including common innovations infrastructure, cluster-specific environment for innovations, and the quality of linkages.<sup>26</sup> Sri Lanka ranks 57 out of 71 countries indexed, behind India, China, Malaysia, Mexico and the Philippines.

Within the sub-index of innovation policy and cluster innovation environment, Sri Lanka scores slightly below its overall rank at 60 and 62, respectively. However, the country ranks higher in its proportion of scientists and engineers (56) and linkages (48). The index demonstrates that Sri Lanka still struggles to establish a cluster-innovation environment that encourages efficient research and development activities fuelled by domestic buyers, and responded to by specialized research and training institutes.

**Figure 16: Sri Lanka needs more focus on Innovation**



**Sri Lanka spends a small percentage of its GDP on R&D**, amounting to only 0.14 percent in 2004. A National Science Foundation (NSF) Survey found that Gross Expenditure on Research and Development (GERD) was US\$ 18.1 million or 0.19 percent of GDP in 2001, which is not significantly different from

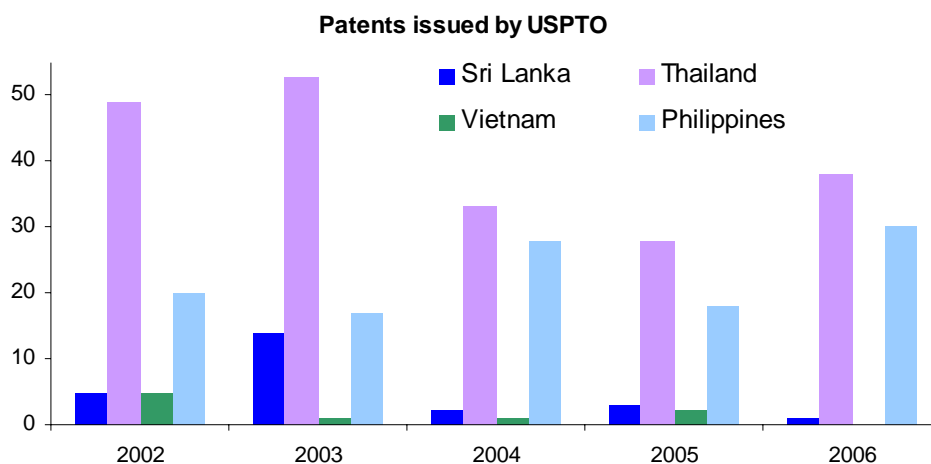
<sup>26</sup> National Innovative Capacity Index

investments in either 1996 or 2004, indicating a relative stagnation in the country's R&D efforts.<sup>27</sup> Since the 1979 Vienna Conference on S&T for Development, when many international and national agencies advocated devoting 1 percent of GDP to R&D, few countries within the South Asia region have been able to meet this goal. China, a clear outlier in this category, allocates 1.44 percent of its GDP to R&D, significantly more than any other comparator country. India has increased its spending on R&D to 0.85 percent of its GDP suggesting the high priority given to the development of the innovation system.<sup>28</sup>

**The Mahinda Chintana: Vision for a New Sri Lanka has a policy goal of progressively increasing both public and private investment in science and technology, up to 1.5 percent of GDP by 2016.** If Sri Lanka wants to become progressively competitive in the innovation era, it will first and foremost, need to assign more value to the capabilities of innovation creation by following through with its policy goal of increasing spending on R&D from all sectors of the economy.

**Sri Lanka has been granted a minimal number of patents over the last few years.** The number of patents granted is one of the most efficient ways in which to measure a country's innovation system. The current intellectual property system in Sri Lanka, based on the Intellectual Property Act No. 36 of 2003, was designed to promote national creativity, to protect such creative efforts, and honor the country's international obligations under the TRIPS agreement. The National Science Foundation of Sri Lanka found that the total number of patents granted in Sri Lanka from 1995 to 2001 was less than 230, with research institutes only generating 7.7 percent of total patents.<sup>29</sup> US Patent and Trade Office (USPTO) patents, in particular, are a good measure of realized national innovative performance because the high costs involved in filing such a patent application deters all but the most determined inventors that have developed innovations with potential economic value. Additionally, the use of US patents helps ensure a standard of technological excellence that is at or near the global technology frontier. The average amount of patents granted by the USPTO to Sri Lanka from 2001-05 was 5.2, one of the lowest averages within the region China and India maintain some of the largest figures for patent grants at 448.2 and 316.4, respectively. However, Vietnam scores lower than Sri Lanka with an average of 1.8 patents between 2001 and 2005 (Figure 3-3).<sup>30</sup>

**Figure 17: Very few patents issued to Sri Lankans**



Source: USPTO Performance and Accountability Report 2006

Publications, high-tech exports, and Sri Lanka's venture capital programs are good indicators of the country's need for modern improvements in its innovation system. Sri Lanka possesses a fair number of

<sup>27</sup> UNESCO, 2005

<sup>28</sup> Ibid.

<sup>29</sup> UNESCO, 2005

<sup>30</sup> Ibid.

researchers who are keen on publishing their findings in academic journals. However, it has been noted by The National Science and Technology Commission (NASTEC) that these valuable findings rarely succeed in being commercialized as researchers are unable to see the value in publicizing such findings, and as a result, many of these works remain gathering dust on shelves.<sup>31</sup>

A country's high-tech exports are another significant measure of a country's ability to innovate and commercialize their findings effectively. Sri Lanka's high-tech exports amounted to 1.5 percent of total manufactured exports in 2004, one of the lowest percentages in the region. The Philippines has some of the highest figures in the region, exporting 63.8 percent high-tech products, figures that surpass even the dynamic innovators of China and India.<sup>32</sup>

Sri Lanka's private sector, which possesses the ability to facilitate contracted innovation, can create liaisons between researchers and the global community, thereby resulting in a greater level of efficiency in the production and distribution of useful knowledge.

Turning good ideas into promising business products and solutions requires start-up or venture capital funding. The availability of venture capital in a country is a good measure of the opportunities that researchers have in seeing profitability in their findings. In this regard, Sri Lanka also scores poorly with a score of 3.4 in 2006 behind Thailand (3.6) and India (4.6).

### ***Issues and Recent Developments in the Innovation System***

#### *Public Sector Support for Innovation*

**The government has a dominant role to play in the cultivation of an influential innovation system through its financing of R&D.** Governments around the world finance R&D to complement the efforts of the private sector. In Sri Lanka, public sector financing of S&T development has come in the form of funding a network of S&T institutes mandated to carry out R&D in various fields. However, gross expenditure on R&D (GERD) has been overshadowed and squeezed by military spending. Military expenditure consumed an average 2.6 percent of GDP between 2003 and 2005. The long neglect of spending on R&D has and will lead to an even greater crisis in the professionalization of national scientific communities, depriving the country of the opportunity to expand its innovation system.

**Funding alone cannot improve the effectiveness of Sri Lanka's innovation system.** The innovation system and its corresponding activities will need to be carefully facilitated by both government and the private sector. Sri Lanka needs to determine an entity that can identify priorities, objectives and goals, and formulate strategies to reach these goals by creating an effective management framework. However, from Sri Lanka's extensive history of creating government bodies to execute such tasks, it has been observed that these types of organizations, on their own, cannot ensure efficiency within the innovation sector. Rather, these responsibilities should be largely assigned to the private sector and the government should take it upon itself to promote the pursuit of R&D by providing the necessary benefits and support in order to assist the private sector in cultivating a more attractive innovation system, a system that is based on competition between the public and private sectors for scarce government resources.

---

<sup>31</sup> De Costa, W.A.J.M, NASTEC

<sup>32</sup> UNESCO, 2005

#### **Box 4: History of Sri Lanka's Innovation System**

Sri Lanka made many technological advances early on in order to meet the needs of its promising agricultural industry. Sri Lanka's modern technology era began with British colonization in the 19th century. During this pre-Independence period, the British intended to develop Sri Lanka as an agriculture base and identified tea, rubber, and coconut as the main produces to be distributed from Sri Lanka to the world market. In order to facilitate the production process, the British created major railways, road networks, engineering and medical research institutes, hospitals, clinics, and various agricultural research institutes. The major technological achievements during this time were made in hydropower electricity generation, transport, telecommunication, and broadcasting fields.

After independence in 1948, a significant amount of influential R&D institutions were established in order to develop Science and Technology in Sri Lanka. The first of this kind was the Ceylon Institute of Scientific and Industrial Research (CISIR), but the institute failed to deliver its objectives due to inadequate staff, lack of research groups, too broad an area coverage and lack of linkages with industry. The Industrial Development Board (IDB) was set up in 1966 to provide technical services to Small and Medium scale Industries (SMI). It was expected that IDB would inform other R&D organizations about the technology needs and capabilities of other industries. However, this initiative was also unsuccessful. In 1974, the National Engineering Research and Development Centre (NERDC) was set up in order to execute and promote research, innovation and commercialization. Under the recommendation of United Nations Center for Trade and Development (UNCTAD), a Centre for Transfer and Development Technology was created as a focal point to link R&D institutions with national economic planning status. The organization's inability to see these objectives through has been one of the greatest failures in the development of Sri Lanka's innovation system.

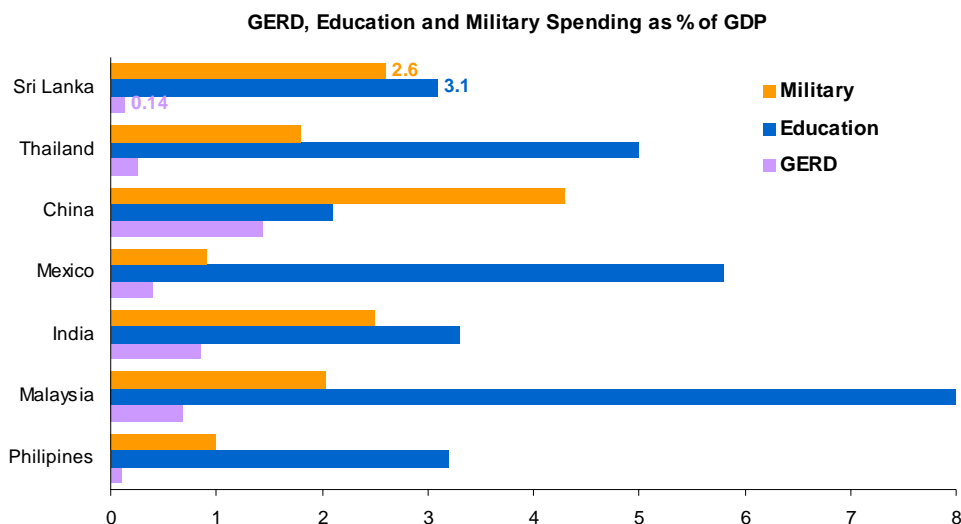
Following the 1977 policy reforms, the private sector was given a leading role in the economy and private R&D activities grew at the industry and firm levels. However, following this brief period of technological and organizational advancement, the escalation of the ethnic conflict in 1983 effectively brought the development of Sri Lanka's innovation system to a standstill, as government expenditure was diverted predominantly to war rather than industrial development. S&T development has been stagnant since 1983. Prior to independence, there were great advancements in agricultural research, but following independence, the most significant reason for failure was the lack of high level political commitment, the lack of support for R&D activities by the government and the private sector, and the poor performance of the scientific community to stimulate innovation.

*Source: Dasanayaka, Sarath. 2003. "Technology, Poverty and the Role of New Technologies in Eradication of Poverty: The Case of Sri Lanka." South Asia Conference for Poverty Reduction, New Dehli, 2003.*

**The government should increase the level of participation in the innovation sector by offering financial incentives that would make the field more attractive.** A 2001 NASTEC study on Sri Lanka's S&T institutions sought to provide insight into the achievements, activities, successes, and failures of some of the country's leading think tanks by conducting interviews with Institute Heads. A few of the institutes surveyed included the Department of Agriculture, Industrial Technology Institute, National Engineering Research & Development Centre, National Science Foundation, and 11 others. The study found that there existed significant shortages of trained and experienced personnel. The institutions attributed these flaws to strict government restrictions on staff recruitment, which led to frozen or delayed staffing of new personnel.<sup>33</sup> The government has the capability of removing these restrictions and implementing ones which seek to improve innovation including offering direct and indirect tax incentives for R&D or providing more funds for scientific training, which it currently does.

<sup>33</sup> De Costa, W.A.J.M, NASTEC.

**Figure 18: Sri Lanka's spends little on R&D compared to its Education and Military spending**



Source: UNESCO Science Report 2005, <http://www.photius.com/ranking> (for military expenditure as % of GDP), [www.unesco.org](http://www.unesco.org) (education expenditure), World Bank, SIMA Database (GERD)

Since 2002, the Sri Lankan government has provided an annual allocation of roughly 40 million rupees to the Council for Agricultural Research Policy for postgraduate training in other South Asian countries. As of 2005, a total of 42 Sri Lankan scientists received MSc training while 38 received training at the PhD level.<sup>34</sup> Training in countries within the region has been advantageous because it is high quality, relevant to local conditions, comparatively cheap, and provides a higher chance of trainees returning to Sri Lanka upon completion of their studies. As the Sri Lankan government's present policy has been a success thus far, seventy-five percent of the scientists are slated for training within the next ten years. Policies such as these should be extended to other research disciplines in order to increase the knowledge of scientists working in institutions and encourage students to pursue academic opportunities abroad.

### *Innovation and the Academic Network*

**As knowledge becomes an increasingly important part of innovation, the university as a knowledge producing and disseminating entity plays a larger role in industrial innovation.** Over the last few years, there has been a realization that the academic sector has the capability of emerging as a major source of scientific innovation. Yet this realization has not been received much attention from policy planners in South Asia. The Vice Chancellor of the University of Ruhuna, argues that in order for the country to improve its global competitiveness and raise living standards, it must create an entrepreneurial mentality within academic institutions, producing unique and creative minds that possess the ability to produce results by commercializing their findings. Universities must see themselves as part of a larger global enterprise of creating, imparting, applying, and commercializing knowledge.<sup>35</sup>

In order to increase the number of students pursuing higher degrees in the sciences, universities must introduce entrepreneurship to the curriculum in order to teach students the ways in which to make their findings profitable. In Sri Lanka, the majority of students who are taught entrepreneurship are pursuing degrees in management and business. In order to produce graduates who can transform new ideas, thoughts, and knowledge into innovative products and services, Sri Lanka will need to build up an entrepreneurial intelligence within all disciplines and train students on how to commercialize their

<sup>34</sup> Stads, Gert-Jan et. Al. 2005.

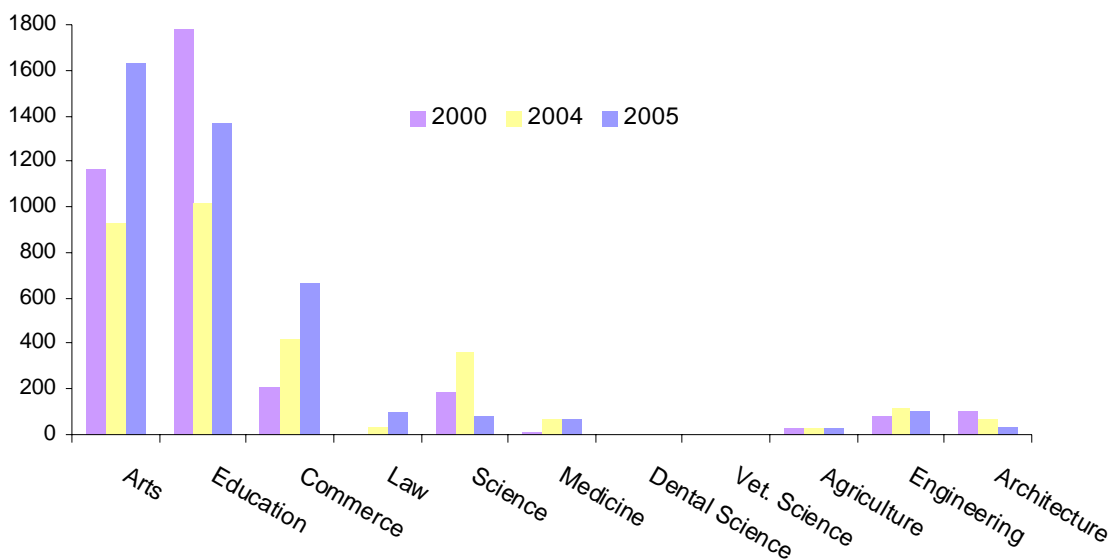
<sup>35</sup> Senaratne, Ranjith. 2006.

findings. “Multidisciplinarity will bring new and diverse perspectives and provides for cross-fertilization of ideas instead of inbreeding.”<sup>36</sup>

**Sri Lanka’s researchers do not have the expertise to commercialize their research findings.** When Sri Lankan researchers publish their works, nothing is done to commercialize them. Some of these findings could potentially be developed into commercial products but because of a lack of entrepreneurial skills and drive, “thousands of valuable findings in many disciplines that could have given birth to new enterprises promoting industrial growth and economic development in the country, are gathering dust on the shelves of libraries”.<sup>37</sup> The national innovation capacity report states that a nation’s university system can provide a bridge between technology and companies and without such linkages, a nation’s upstream scientific and technical advances can diffuse to other countries more quickly than they can be exploited at home.<sup>38</sup>

**Universities can create the linkage between research and industry.** Universities of the 21<sup>st</sup> century should play three roles: deliver quality undergraduate and post graduate education, conduct high impact research, and foster entrepreneurship and links to the private sector. Sri Lanka’s linkages between universities and industry are currently minimal, and in order to increase the flow of knowledge between these two pillars of the innovation system, it will be important to invite industry representatives to develop and conduct courses at the universities. These interactions will help develop the entrepreneurial skills and ignite the entrepreneurial passion of students, thereby helping them develop as researchers with an awareness of modern trends, market requirements and a commercial focus.

**Figure 19: Low Science enrolment in Sri Lankan universities**



Source: Sri Lanka University Grants Commission

### *Innovations and R&D Institutions*

**Sri Lanka needs to create a motivational environment within its S&T institutions to boost innovation.** The country’s research institutions have made great leaps in innovation, particularly in the field of agriculture as the country is home to some of the most dynamic agricultural research institutes in South Asia. Sri Lanka also maintains an impressive number of scientists by South Asia standards (191 per

<sup>36</sup> Ibid

<sup>37</sup> Ibid.

<sup>38</sup> National Innovative Capacity Index

million inhabitants by 2004), although this number has remained stagnant since 1996. The country has also made gradual advances in the production of scientific material, publishing 120 papers in all S&T fields in 1994 and slightly increasing this figure to 141 in 2003.<sup>39</sup> However, the scientific advances within these institutions are not be enough in the innovation era. Thus, institutions and other innovative clusters will need to provide incentives and create a professional climate that will encourage researchers to innovate in an entrepreneurial way. In the aforementioned NASTEC study on Sri Lanka S&T institutions, it was found that low salaries and fringe benefits and demotivating work environments created by a lack of finance, shortage of modern equipment and laboratories, and inadequate logistical support had prompted trained and skilled personnel and promising young personnel to leave the public sector S&T institutes.<sup>40</sup>

**Lack of financial resources was the most commonly cited disadvantage plaguing Sri Lanka's R&D institutions.** A recent study found that many institutions had been suffering from funding shortages including funds for capital expenditure and as a result, there had been a gradual rundown of existing infrastructure facilities including equipment, laboratories, buildings, and vehicles. Even in the rare occasions where finance was present, financial regulations slowed the process with long delays in the release of approved funds from the Treasury.<sup>41</sup>

**Sri Lanka's universities are bogged down in red-tape and bureaucratic procedures.** An online survey was conducted through the Lanka Academic, a journal read by mostly expatriate Sri Lankans, in which 53 researchers who had experience in both foreign and Sri Lankan research environments were surveyed. The survey found that 33 percent of professionals felt that the time consumed by the procurement process in the Sri Lankan university system was more than 20 times that of foreign universities. This delay often made topical research projects irrelevant. About 68 percent of researchers had to go through this long "red-tape" at least five times a year, making the country's R&D significantly inefficient. Even with the funds secured from outside funding agencies like the NSF, the exact item desired cannot be specified when ordered through the university. This means that the supplies department will call for quotations and purchase the cheapest substitute, overlooking the type of item the researcher actually needs.<sup>42</sup> This lack of funds, facilities, and administrative support for conducting meaningful research makes it difficult to maintain motivation, dedication and commitment to research and development work under such poor conditions.

**R&D institutes have not been able to find an efficient way in which to conduct research, leaving researchers with ambiguous goals and objectives.** Although most institutes have a well developed corporate plan, many are not feasible or practical and more importantly there are no benefits associated with attaining the plan objectives. Rather, researchers work in isolation with vague objectives which, aside from creating a demotivating environment, caused an increased duplication of projects that lacked commercial focus, forgoing most of the benefits that ought to arise from such work.<sup>43</sup>

**Public sector research institutes produce very little outputs.** In 2001, individual inventors and private institutions claimed 72 percent and 22 percent of patents, respectively; while a mere 6 percent of patent grants went to public institutions, demonstrating the effects of the lack of direction that exists within the research institutions.<sup>44</sup> It is these inefficiencies that have driven many corporate partners to seek direct collaboration with more organized, foreign institutes. Researchers at the Institute of Fundamental Studies (IFS) maintained one of the few programs that were motivated to publish their research findings as their appointments and promotions were linked to publications. Unlike the IFS, most institutions claimed that

---

<sup>39</sup> UNESCO, 2005.

<sup>40</sup> De Costa, W.A.J.M, NASTEC.

<sup>41</sup> Ibid

<sup>42</sup> Nanayakkara, Thrishantha.

<sup>43</sup> De Costa, W.A.J.M, NASTEC.

<sup>44</sup> USPTO, 2006.

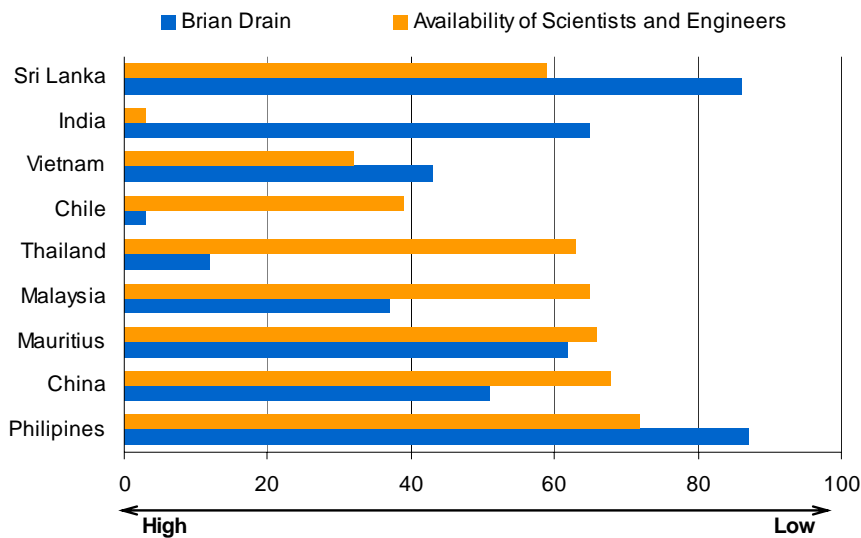
there was little incentive and pressure on researchers from respective institutes to publish their research findings in reputable journals.

**Low salaries and lack of opportunities for higher education and career advancement has led to both internal and external brain drain.** Scientists and researchers working at public institutions have salaries well below individuals working in the private sector, thereby making it difficult to attract a high caliber of staff. Moreover, Sri Lanka’s R&D institutes offer little to no room for career advancement, further adding to the disincentives associated with being employed within the research sector. This has resulted in both an internal and external brain drain within Sri Lankan R&D institutions. Internal brain drain is loss of core competencies within R&D institutions due to a critical mass of professionals leaving the public institutions within a country for private employers. External brain drain is the emigration of professionals whose departures cause a potential loss to the economy. Providing incentives and creating a professional climate to attract and reverse brain drain will be increasingly important for the development of Sri Lanka’s innovation system.

### *Innovation and the Private Sector*

**Sri Lanka’s private sector has contributed a great deal to the country’s innovation system.** At the firm level, Sri Lanka does fairly well for South Asia, scoring 4.7 from 7. Thailand does significantly better with a score of 5.3, while India tops the region with a 5.8.<sup>45</sup> Establishing linkages between the institutes, universities, and other think tanks, while having the private sector set the goals and objectives for the institutions and in exchange assisting researchers market their findings, will produce an industry that encourages innovation, provides individuals with better salaries and opportunities, and makes a significant contribution to the economy.

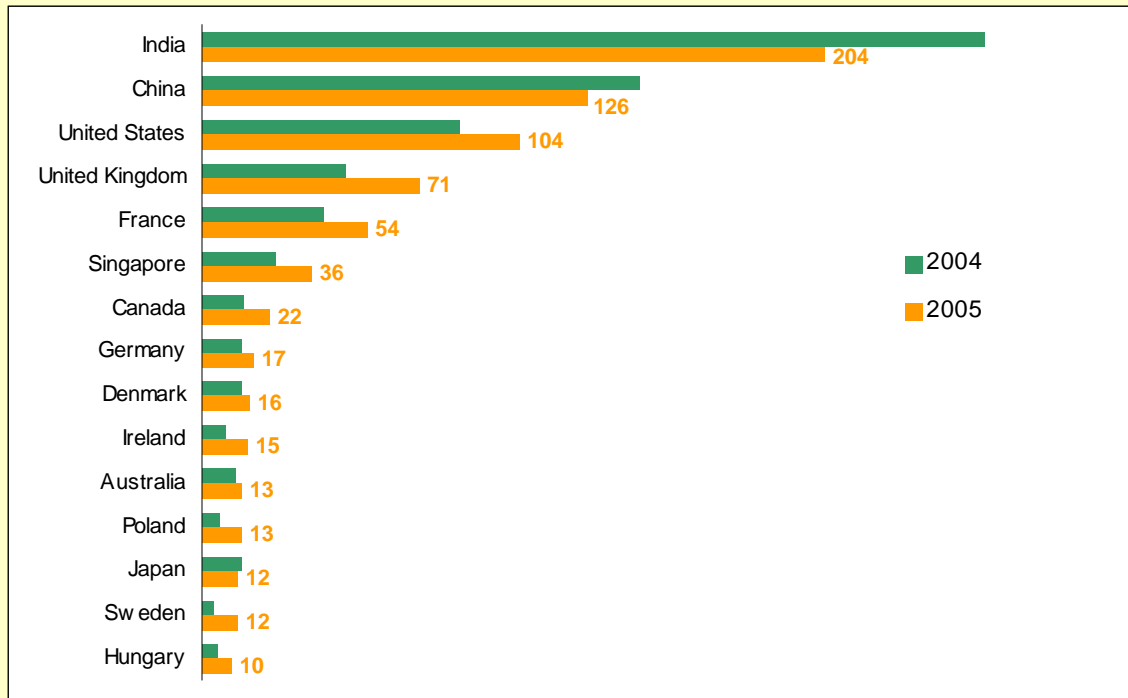
**Figure 20: Sri Lanka is unable to preserve its Science and Engineering talent**



<sup>45</sup> World Bank, KAM.

## Box 5: The New Era in Networking: Global Innovation Networks

**Figure 21: India and China Rank Highest for Number of R&D projects**



Source: Forrester Research Inc., 2006

Even as India and China (“Chindia”) rapidly emerge as major innovation hubs, it will be just one (major) hub within the larger Global Innovation Network. The opportunity for firms and even countries around the world is to network these global hubs, and harness global talent to drive innovation. The core competency of a business becomes “knowledge networking”, no longer “knowledge generation”. The same would apply to a country looking to be a global networking hub. Global Innovation networks will emerge where inventors, transformers, financiers and brokers need to be brought together to catalyze and operationalize innovations.

Taking regional innovations for instance, a country like Sri Lanka could position itself in one of these roles within the regional innovation network. For example, Sri Lanka could be a ‘transformer’ that acts as a liaison to convert inputs from investors into market-relevant and usable products of services and provide feasibility reports and business and marketing plans for projects in the region as well as projects from other networks into the region. It could string together supply chain, sales and marketing operations and contract manufacturers, freelance experts and consultants from a database on behalf of the client firm abroad. Sri Lanka could also position itself as a broker, who finds and connects investors, transformers and financiers and facilitate their interaction. It could handle business development and IP licensing etc. as well as liaise with trade associations, community leaders, NGOs, online IP/talent marketplaces, IT solutions providers and potential customers – all this on behalf of the client company abroad, who is now relieved of having to do the ground work themselves.

For this Sri Lanka will have to build up competencies and capacities in each of the areas required for such this networking advantage, everything from engineering and scientific knowledge in order to handle IP licensing or contract engineers, constructors and manufacturers to accountancy, business development and marketing skills to handle the ‘transformer’ and ‘broker’ role by preparing feasibility reports, cost and profit forecasts, industry reports etc. IT skills will be at the fore of all this, in order to effectively handle a liaison role and communicate with, as well as address the needs of, the client abroad.

## Policy Recommendations

In order for Sri Lanka to create a powerful innovation system, the country will need to formulate specific policies to establish a culture that not only values innovation, but also possesses the means and skills to commercialize and promote new knowledge. NASTEC recently published a proposed National Science and Technology Policy Statement with the intention of providing a consistent long term framework for growth and development in the S&T infrastructure. However, this proposed strategy is yet to be approved and put into action. As a result, the innovation system still lacks structure and direction.

**Spending on R&D needs to increase significantly.** Sri Lanka needs to assign greater priority to innovation within the country in order to meet the ‘historic’ figure of devoting 1 percent of GDP to R&D, advocated by numerous international and national agencies. This spending must not come only from government, but private sector funding and involvement is essential to ensure that the budget is allocated efficiently.

**Linkages between research and industry must improve.** Educational institutes must get market feedback by liaising constantly with employers. Government can encourage this process by inviting the private sector to positions on the boards of academic departments to advise universities on training and research priorities. The flow of information between universities and enterprise sectors needs to be increased. In another sense, this will increase the number of students looking to take part in S&T as they will be exposed to existing opportunities within the field. In order to create a viable innovation system, Sri Lanka’s research institutes will need to pursue research that is relevant to the needs of the private sector and the economy, and this will only happen through establishing a dialogue between researchers and the private sector.

**Government could introduce tax and other incentives to encourage individuals to take part in innovative activities.** Although the government cannot on its own shift people’s minds about the field of research and development, it can fund the public good aspects of research. Government can also establish a financial reward system based on research performance and national prizes that recognize research excellence. Sri Lanka should also enforce and implement IPR agreements to develop the confidence of domestic and foreign innovators in the protection of their innovations. Government should also consider increasing university salaries especially in the S&T fields. Failure to compensate researchers with incentives and competitive salaries will only worsen the brain drain and the country’s innovation system.

**Make entrepreneurship a priority in the sciences.** Introduce entrepreneurship as a course within each discipline, both scientific and non-scientific, in order to teach students how to capitalize and promote their findings, thus making R&D a more attractive field.

**Procurement should be decentralized to individual departments or research centre levels.** The decentralization of responsibilities such as purchasing should be brought to department, research centre, or laboratory levels in order to provide researchers with a level of efficiency in obtaining the equipment necessary to make valuable discoveries within appropriate time frames.