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NEW HORIZONS: POSSIBLE STRATEGIES TO PROMOTE PARTNERSHIP IN RESEARCH BETWEEN INDIA AND SIBERIA*

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В статье рассматриваются возможные сценарии сотрудничества между российскими и индийскими учеными, при этом особое внимание уделяется научному потенциалу Сибири. Среди главных предпосылок будущего партнерства автор называет создание новой «экономики, основанной на знаниях»; подчеркивается тот факт, что в Индии и России рост экономики все больше обеспечивается за счет развития науки и инноваций; что в обеих странах реформируются системы образования, что задачи научного сотрудничества решаются на самом высоком межгосударственном уровне.

Исторически сложилось так, что Индия и Россия в течение длительного времени были партнерами в научно-технической сфере. Изначально сотрудничество в этой области обеспечивал специальный договор, заключенный между СССР и Индией в 1972 г. Непосредственное взаимодействие отдельных ученых и целых научных институтов получило значительную поддержку после того как в 1987 г. на самом высоком уровне было принято решение о введении Комплексной долгосрочной программы сотрудничества. В 1992 г. в Москве работала 5-я сессия Совместного Совета программы, по итогам которой Россия была признана в качестве государства-правопреемника СССР, а сама программа получила статус российско-индийской. В 1994 г. в Москве был подписан новый российско-индийский договор о научно-техническом сотрудничестве, пришедший на смену соглашению 1972 г. Принимая во внимание выгоды взаимного сотрудничества, которые обеспечивались Комплексной программой, срок ее действия был продлен до 2010 г. Одновременно были расширены возможности Программы, обеспечивающие внедрение достижений науки и техники в производство.

С учетом растущего экономического и научного потенциала двух стран, а также наличия устойчивых и дружественных межгосударственных связей Россия и Индия могут продолжать и расширять сотрудничество в сфере науки и техники. По мнению д-ра Кханна, Сибирь может играть очень важную роль в таком сотрудничестве. Автор отмечает, что регион, несмотря на богатые запасы природных ресурсов, в течение долгого времени не получал должного внимания и развития, прежде всего, из-за сурового климата. Современная Россия уповает на Сибирь как на «яркую звезду», горящую на «энергетическом небосклоне», и намерена с помощью мировых держав превратить этот обширный, но недостаточно развитый регион в глобального поставщика природного газа, угля, нефти, а также возобновляемых энергоресурсов следующего поколения, например в сфере гидроэнергетики. Параллельно существует еще один план, в соответствии с которым связь региона с остальным миром должно обеспечить сооружение трансконтинентальных железных дорог. Таким образом Россия надеется сделать Сибирь не столь изолированной от мировых рынков.

Важно отметить, что в современном мире наиболее важным и при этом неосязаемым ресурсом являются знания, а они – шаг вперед по сравнению с «информацией» (информация становится знанием после того, как ее обработали и распространили квалифицированные специалисты). Экономика и общество, основанные на знаниях, отличаются большей восприимчивостью – особенно в условиях глобализации. Именно поэтому д-р Кханна полагает, что, возможно, самой главной причиной, по которой Сибирь должна играть ключевую роль в мировом развитии, является ее научно-технический потенциал. В Сибири в течение многих десятилетий действуют научные институты трех академий – РАН, РАМН и РАСХН. Сибирские университеты являются одними из наиболее уважаемых и известных в стране. Но и теперь в регионе необходимо создавать новые научные центры, занимающиеся фундаментальными и прикладными исследованиями.

Автор приходит к выводу, что Сибирь, с ее природными богатствами и концентрацией научных кадров, должна стать одним из центров будущего развития России и мира. Регион способен дать индийским ученым очень многое и открывает перед ними новые возможности в сфере научного и энергетического сотрудничества.

THE SIBERIA OPPORTUNITY

"Frightening or amazing, luring or astounding, Siberia exists. People who know nothing about Siberia are ignorant of the planet's future." Pierre Rondier, the prominent French publicist wrote after visiting Siberia

Siberia[1] is the world's most critical regions in terms of resource concentration. It covers a territory of 13,488,500 sq. km which comprises 7.5 % of the total territory on Earth. The whole region is extraordinarily rich in minerals, energy raw materials, hydropower, and forests. At the same time, the region is climatically cruel – during the winter, average temperatures in Siberia range from –23 °C to below –45 °C.

In the recently concluded International Arctic Forum in Moscow, Prime Minister Putin emphasized that 70% of Arctic territory falls with Russia including the oil rich regions of North Siberia[2].

According to the Russian embassy's report, Vladimir Putin at a press conference for the Russian and Foreign Media held in January 2006 described the importance of the region for Russia. «Siberia is a very important region for us, a region with immense natural resources. Eastern

[1] There are several versions of the coinage of the name of the region as "Siberia". According to one, Siberia in the language of the ancient nomads, who roamed the wilderness many centuries ago, meant "The Sleeping Land" (sib-to sleep, ir-land).

[2] *Harding, L* (2010), "Vladimir Putin calls for Arctic claims to be resolved under UN law // The Guardian, 2010, 23 September. accessed on 1 November 2010 at. URL: http://www.guardian.co.uk/world/2010/sep/23/putin-arctic-claims-international-law

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Siberia is a veritable storehouse of natural resources, and as yet unopened storehouse of the world's energy resources. Russia's energy potential is underestimated. I'm not even talking about Western Siberia. We are going to draw on the Yuzhno-Russkoye [deposit] to feed the North-European gas pipeline. We estimate production there of 22–25 billion cubic metres a year. We also have the Shtokman deposit right nearby in the Barents Sea and there we can expect production of 90 billion cubic metres a year for the next 50 years, this is all calculated. As for Eastern Siberia and Siberia in general, the world will certainly have need of its immense resources, and of its huge scientific potential».

Siberia has long been a neglected resource-rich region because of a harsh climate. Today's Russia is banking on Siberia to become its shining star in energy arena. It wants to develop the vast yet economically impoverished region as a world supplier of natural gas, coal, petroleum and next generation renewable energy resources like hydropower with the participation of the global powers. Another related plan is to develop connections to the 'mainstream' world by the way of transcontinental railway lines. This way it attempts to bring the market closer to the isolated Siberia. Probably the most pressing reason about why Siberia is the future focus of the world is its scientific-technological resources. «We simply mustn't waste this chance», Russia's President Vladimir Putin declared in Akademgorodok following his 2005 trip to India. Siberia's other resources are tough to tap, but cashing in on the 200,000 science and technology- graduates that Russia churns out each year, Kremlin can plan ahead about developing the Siberian region. In another instance, President Putin at a press conference for the Russian and Foreign Media held in January 2006 reaffirmed his faith in the people of the region: «I am sure that given the high level of education in Siberia, and also the purity there, the moral purity, Siberia's human resources will be of great importance for the country»[3].

The development of Siberia's resources could develop as a threat or promise for the entire planet. The Siberian region has moved from a mere trading colony of Russia to a region of strategic importance on the world map. Siberia continued to be the last stop for criminals and political prisoners throughout much of the 20th century and came to epitomize all that was worst about Russia under the communist rule. Subsequently, a period of intensive industrialization followed and Siberia became a 'communist wonder'. It was fortified as USSR's military and scientific base. Even today, reputed institutions in pure sciences, engineering and technologies remain to be organized in Siberia. It has been home to the Science complexes of the Academy of Sciences of the USSR, Academy of Medical Sciences of the USSR, Lenin All Union Academy of Agricultural Sciences, present day Russian Academy of Sciences (RAS), Russian Academy of Medical Sciences (RAMS) and Russian Academy of Agricultural Sciences (RAAS). Universities at Irkutsk and Tomsk are one of the oldest and most respected universities. Siberia has prominent and modern universities throughout its spread: Novosibirsk State University, Vladivostok State University of Economics and Service, and Khabarovsk State University of Technology.

Mikhail A. Lavrentiev was instrumental in the creation new scientific centre in the east of the USSR. An exposition dedicated to Lavrentiev which I witnessed at Akademgorodok described Lavrentiev as a «world-famous scientist, untiring investigator and scientific manager». He laid the foundation of the Siberian Branch of the USSR Academy of Sciences and it was his efforts that Academy Town near Novosibirsk became the first born of the Siberian Branch. He also pioneered organisation of the Novosibirsk Scientific Centre and the further development of the Siberian Branch: the election of place for construction of Academy town, first years of the construction, served as the first President of the Siberian Branch, vice-president of the USSR Academy of Sciences and Director of the Institute of Hydrodynamics, M.A. Lavrentiev had spread great care to these problems by organizing of the Novosibirsk University, Physical Mathematician School (first in the USSR) for talented Siberian and the Far East children. Young Technicals Club was the results of indefatigable activity by Lavrentiev.

«Harsh climatic conditions are the primary cause of the low population density. Therefore, automation and application of technology on the widest possible scale–that is, more active participation by science in the immense task of opening up the Asian part of the soviet union–represents the only means of exploiting the natural resources of this region» – that was how Laverentiev, speaking in 1967, explained the thinking which lay behind the establishment of the Siberian division of the USSR Academy of Sciences. By then, Akademgorodok «academicity» set up in the face of widespread skepticism was already rising amid the larches and cedars of the Taiga, 25 Kilometers from Novosibirsk[4].

The prospects for development of technology seem bright as the economy of Siberia is based on the natural resource utilization. President Putin at a Meeting on Social and Economic Development in the Siberian Federal District on April 26, 2006 in Tomsk quoted the Governor [of Kemerovo Region] Tuleyev to highlight the fact that regions in Siberia and the Far East that have based their development over these last decades primarily on raw materials. «Our colleagues are already beginning to introduce new methods for developing these resources and developing their regions as a whole. This is because modern raw materials production and refining methods are directly linked to advanced technology. Without question we must make use of the possibilities this technology offers for our country as a whole and for the regions of Siberia and the Far East», he added.

Furthermore the scientific community has learned to manage the rigmarole of economic and climatic constraints. In a speech at a Security Council Meeting on National Security in the Siberian Federal District, 2003 President Putin explained the paradox in Siberia – «While labour in Siberia is short, Siberia's natural riches are co-

[3] Transcript of the Press Conference for the Russian and Foreign Media (January 2006) URL: http://www.russian-embassy.org/Press/01_02_06_eng.htm

[4] Sansone, Vito, Moscow: Progress Publishers, 1980.

lossal and it has major industrial and research centres and defense industries»[5].

A. Fursenko, Acting Minister of Science and Education, in an interview in Russian with Ekspert on 16th February, 2004 «...our limited resources mean that we must select not 10–15, but just three or four state priorities. So it is not just a question of identifying and eliminating weak or unpromising research directions, but selecting the strongest of the strong. We have to look for intersection points, where good prospects for a technological breakthrough combine with markets that will dominate the world in 10 or 15 years time. And we must make best use of our competitive advantages, both those related to our large territory and rich mineral deposits, and the immense science and technology base created in earlier years of our history – the results of huge investments in space exploration and nuclear technologies, study of materials...

Take the example of space research. This is a sphere where we still have leading positions. Combine that advantage with the natural advantage of Russia's location, and there is huge potential for synergy effect, which can generate money, e.g. by providing an intercontinental air freight corridor and using space technologies to control the traffic. The global space-logistics markets provide lots of ways for us to make money: by launching tracking satellites, by installing equipment on those satellites, by supplying transponders for each cargo, by developing software for freight transportation. The same applies for atomic energy. I believe that we have a role to play in international development of hydrogen power engineering».

SIBERIA: A MODERN SCIENCE AND TECHNOLOGY HUB

Jan Hospers (2003)[6] explores the function of cities in the knowledge economy. The knowledge economy asks for «creative cities» i.e. competitive urban areas that combine concentration, diversity, instability and a positive reputation. He has reached the conclusion that knowledge, creativity and innovation cannot be planned from scratch by local governments. However, creative cities par excellence such as Austin (USA), the Öresund (Sweden) and Barcelona (Spain) demonstrate that local policymakers in fact can play a part in preparing cities for the requirements of the knowledge economy. He concludes that local governments can increase the chance that urban creativity emerges by providing the appropriate underlying framework conditions.[1]

In this context we can also envisage 'scientifically creative cities'. Novosibirsk, in this regard, comes particularly close. It is the largest city in Siberia and an industrial and scientific capital of the region. In fact it is often referred to as 'Chicago of Siberia'. Novosibirsk Science Centre is the headquarters of the Siberian division of the Russian Academy of Sciences where almost 5000 researchers reside and function. The institutes of the Russian Academy of Sciences work closely with the Novosibirisk State University, the institute for higher professional training for providing advanced training to its staff and executive of the planning bodies of ministries and government departments. They also work in conjunction with the city's enterprises which are tackling the problems of introducing the results of scientific research into production. The Novosibirisk Science Centre has become widely recognized center for contacts and collaboration between scientists.

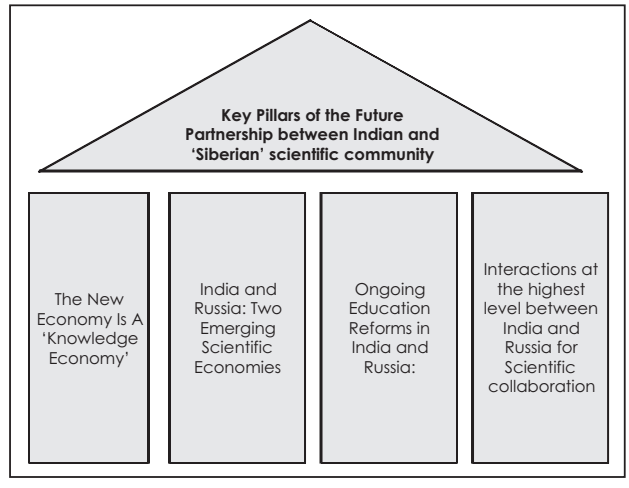
The science capital of Siberia possesses hidden gems in the form of specialized scientific institutions.

- Institute of Semiconductor is a niche academic institute in Novosibirsk for research in physical processes that form the basis of new technologies in microelectronics;
- The Institute of Mining is the largest mining research institution in Siberian division of the Russian Academy of Science;
- The Institute of Catalysis (an affiliated department of the Institute in Omsk) established in 1957, has been a major institute in the world dealing with the problems of catalysis. It has been awarded the "Gold Mercury" international prize for a major contribution to scientific collaboration;
- The Institute of Cytology and Genetics has been instrumental in many important molecular- biotechnological methods and ideas. The institute has developed "Albidium-12" a highly frost resistant variety of wheat;
- The Altai experimental biological station of the Siberian division is dedicated to the preservation and accumulation of genetic stock of the domestic and wild animals.

KEY PILLARS OF THE FUTURE PARTNERSHIP:

1. The New Economy Is A 'Knowledge Economy':

The concept of a Knowledge Economy as popularised by Drucker (1969) was the title of Chapter 12 in his book, *The Age of Discontinuity*. The transition requires that the rules and practices that determined success in the industrial economy need rewriting in an interconnected, globalised economy where knowledge resources such as know-how, expertise, and intellectual property are more



[5] Speech at a Security Council Meeting on National Security in the Siberian Federal District on June 21, 2003, accessed online at. URL: http://www.kremlin.ru/eng/speeches/2003/06/21/0003_type82912type82913_159565.shtml

[6] *Jan Hospers*, Gert Creative cities: Breeding places in the knowledge economy, Knowledge, Technology, and Policy. 2003. Vol. 16 (3).

critical than other economic resources such as land and natural resources. The most important intangible resource is knowledge, a step ahead of 'information'. Information when processed and disseminated by competent manpower results in knowledge.

An economy and society based on knowledge is more responsive especially in a globalised scenario. It can be argued that the knowledge economy differs from the traditional economy in the following key respects:

- The new economics is not of scarcity, but rather of abundance. Unlike most resources that deplete when used, information and knowledge can be shared, and actually grow through application.
- The effect of location is either diminished, in some economic activities by using appropriate technology and methods, virtual marketplaces and organizations that offer benefits of speed, agility, round the clock operation and global reach can be created or, on the contrary, reinforced in some other economic fields, especially by the creation of business clusters around centres of knowledge, such as universities and research centers. Given the changing paradigms where locational advantage gives way to technological competence
- Restrictions and taxes are difficult to enforce on solely macro-levels. Knowledge and information «leak» to where demand is highest and the barriers are lowest. Knowledge enhanced products or services can command price premiums over comparable products with low embedded knowledge or knowledge intensity.
- Knowledge when locked into systems or processes has higher inherent value than when it is retained in the human minds.
- Human capital is a key component of value in a knowledge-based society.
- Means of Communication is fundamental to knowledge flows. Therefore establishing and maintaining efficient communication channels is of utmost priority. At the same time gaining leverage from a 'flat' world depends on the degree of level of exchange between the scholars, academicians and the industry experts of the two regions.

These characteristics require new ideas and approaches from policy makers, while planning future development of the partnership.

2. India and Russia: Two Emerging Scientific Economies

India is an emerging economic power. Investment bank, Goldman Sachs, in its 'Dreaming with the BRICs'[7] report Goldman Sachs predicts that India's GDP will reach $2 trillion by 2020 and $27 trillion by 2050- becoming the third largest economy after USA and China. By 2032, India's GDP will outstrip Japan's [8].

The same report also predicts that Russia is all set to experience the highest GDP per capita by 2050 to be among the four largest developing economies. From 2002-2006, Russia's GDP has almost trebled, from $345bn in 2002 to $984bn in dollar terms (partly due to economic growth, but also because the value of the rouble has soared). The economy is now growing at almost 7% per year - up from less than 5% four years ago[9].

The Central Intelligence Agency of the United States of America (USA) notes that Russia is one of the nations belonging to G8, possessing large strategic resources. Russia has the world's largest natural gas reserves, the 2nd largest coal reserves and the 8th largest oil reserves. It is the world's leading natural gas exporter and the 2nd leading oil exporter. Oil, natural gas, metals, and timber account for more than 80% of Russian exports abroad. In the speech President of the Russian Federation, Putin at the Expanded Meeting of the State Council on Russia's Development Strategy through to 2020 held on February 8, 2008 "*We are in third place in the world for the number of scientists and we are one of the world leaders for state spending on science*[10]*".* With large reserves of precious metals, oil and gas being exploited commercially, Siberia is the newly emerging economic and strategic hub of economic development in the Russia of the 21st century.

At the same time, India has the third largest scientific and technical manpower in the world; 162 universities award 4,000 doctorates and 35,000 post-graduate degrees and the Council of Scientific and Industrial Research runs 40 research laboratories which have made some significant achievements. India produces 200,000 engineering graduates and another 300,000 technically trained graduates every year.

The tradition of Science and Technology in India is over 5000 years old. A renaissance was witnessed in the first half of the 20th century. Science and technology infrastructure has grown from about Rs. 10 million at the time of independence in 1947 to Rs. 30 billion. Significant achievements have been made in the areas of nuclear and space science, electronics and defense[11].

- India is among six countries that launch satellites and do so. India's INSAT is among the world's largest domestic satellite communication systems. Its Geosynchronous Satellite Launch Vehicle (GSLV) was indigenously manufactured with most of the components like motor cases, inter-stages, heat shield, cryogenic engine, electronic modules all manufactured by public and private Indian industry.
- Over 100 MNCs have set up R&D facilities in India in the last decade. These include GE, Bell Labs, Du Pont, Daimler Chrysler, Eli Lilly, Intel, Monsanto, Texas Instruments, Caterpillar, Cummins, GM, Microsoft and IBM.

[7] BRIC is the acronym for the world's 4 largest and fastest growing economies – Brazil, Russia, India and China.

[8] Goldman Sachs, "Dreaming with the BRICS: The Path to 2050", [Online:web], Accessed on 23 April 2008. URL: http://www2.goldmansachs.com/ideas/brics/book/99-dreaming.pdf

[9] *Madslien, J.* Russia's economic might: spooky or soothing?, [Online: web], Accessed on 24 April 2008, URL: http://news.bbc.co.uk/go/pr/fr/-/2/hi/business/6265068.stm

[10] Speech at Expanded Meeting of the State Council on 'Russia's Development Strategy through to 2020' held on February 8, 2008 Accessed online URL: http://www.kremlin.ru/eng/speeches/2008/02/08/1137_type82912type82913_159643.shtml

[11] Embassy of India, Atomic Energy, Space, Oceanography, Bio-Technology & Electronics, accessed on 25 December 2008 URL: http://www.indianembassy.org/dydemo/science.htm

- India's telecom infrastructure between Chennai, Mumbai and Singapore, provides the largest bandwidth capacity in the world, with well over 8.5 Terabits (8.5Tbs) per second.
- India is among the 3 countries in the world that have built Supercomputers on their own (the other two countries being USA and Japan). India's 'PARAM Padma' Terascale Supercomputer (1 Trillion processes per second.) makes its amongst only 4 nations in the world to have this capability

In a Question and Answer session that followed Putin's speech at the APEC Business Summit 2003, the Russian President expressed the need for Russian economy to diversify. «We will work towards diversifying the Russian economy. We are going to focus more on the modern sectors of the economy, the new economy based on information technology. But we will also continue to do everything within our power to make effective use of our natural advantages, one of which is without doubt the large energy resources that Russia possesses».

According to the Eurasian report, published in January 2008, the structure of Russia's economy is changing as the share of energy constantly declines and share of innovative industry constantly rising. The share of hi-tech and innovative industry constituted almost 9 per cent though it was less than planned targets. Its share is expected to rise to 15 per cent by 2010. Furthermore, it notes that Russia is building massive state corporations in ship building, aviation, space, nuclear energy, and nano-technology with huge state investments.

According to the Institute of Complex Strategic Studies, Russia's cumulative innovation index is 0.59 of that of the EU, which is taken to be unity. The method of calculation and the parameters of this index are based on data collected by experts of the World Economic Forum and published in its annual reports. They show that Russia is above the average European level measured by two indicators, which are the share of new graduates working in science and technology and government expenditure on R&D as a percentage of GDP. Russia is gradually catching up with Europe measured by the ratio of innovation spending to total industrial spending and by the development level of information and communication technologies. However, it is far behind others by patent applications per million people, innovation spending in services, and the share of people with access to the Internet and effectiveness of government policy in research and innovation. The structure and priorities of financing are obsolete, and reduction of government allocations to research has not led to their rationalization. Scientific communities in both India and Russia face similar challenges and can find common synergies to address issues for mutual benefit.

3. Ongoing Education Reforms in India and Russia:

Post-1990 reforms have been significant in both the countries. Both India and Russia woke up to a new system geared towards capitalistic ideas than communism or socialism.

India's education system, especially higher education sector witnesses liberalization and privitisation. The void created by the paralysis and drift of the conventional university system is being filled by private entrepreneurial initiatives. Thus, significant educational innovations and experiments are currently taking place in institutions outside the university orbit and in the private sector. In view of the rapid expansion of and increasing variety in knowledge and skills, there is enormous scope for educational innovations and initiatives (Jayaram, 2002)[12] . Global exchanges and collaborative opportunities are shaping up between governments, educational institutions and organizations.

President Putin and Prime Minister Medvedev favour structuring the educational systems in Russia. In the speech President of the Russian Federation Putin, at the Expanded Meeting of the State Council on 'Russia's Development Strategy through to 2020' held on February 8, 2008, mentioned the importance of education in the Russian context. «*Developing the national education system is a key part of global competition and one of the most important values in life*».

The DAAD (German Academic Exchange Service) observes in a paper titled «*The Russian Federation Higher Education Development Priorities*»: «Geographically and traditionally Higher Education Institutes are concentrated in European Russia: Central Federal District has 347, North-Western Federal District has 136, Southern Federal District has 146 and Volga Federal District has 42. Whereas the remote Federal Districts (Siberian, Urals, and Far East) count 14-29 Higher Education Institutes each.» However, winds of change are evident, as development of Siberian universities is being prioritized at the highest levels.

The [new] Russian leadership's priorities is to concentrate on a few and carve out universities of excellence, Russia wants to emulate the European education system to concentrate on quality not quantity (Voskresenski, 2008).

The federal government of Russia allocated almost 5.5 billion roubles for two universities in 2007 and 4.7 billion roubles will be allocated in 2008. President Putin, in his opening remarks at a meeting with teachers and students at the Siberian and Southern Federal Universities on November 13, 2007 justified the allocation: «Our aim is to raise the quality of education services, raise the quality of education and create a new and innovative environment. Our aim is to put in place the required conditions for integrating science, education and the economy in order to create synergy out of these different areas of activity. Our aim is to produce a quality education product that will help us to tackle our main development objective, that of giving our economy an innovative character, and, of course, we also seek to bring major educational centres closer to the parts of the country that have such great potential and importance for

[12] *Jayaram.* Higher Education in India: The Challenge of Change'. Conference on 'The Past and Future of Asian Higher Education, organised by Center for International Higher Education, Boston College, Massachusetts (USA) and Center for the Studies of Higher Education, Nagoya University (Japan) with the support of The Toyota Foundation, The Japan Foundation Asian Center and the Ministry of Education, Culture, Sports, Science and Technology, Government of Japan, at the Nagoya University. Nagoya, Japan, 16-17 December 2002; accessed online on 4 January 2009. URL: http://www.cshe.nagoya-u.ac.jp/seminar/kokusai/jayaram.pdf

our nation's future. Our goal is to ensure that the specialists trained within the walls of these new universities will meet the demands of the regional and national economy and make sure that these universities will be able to respond flexibly to changes on the labour market and supply needed specialists at the right moment. Looking at the region we are in today, the Siberian region, Krasnoyarsk, we see that there are very large and ambitious projects underway, projects in the mining and minerals industry and in high technology. These ambitious projects cannot be properly implemented without people who take the right decisions to reach the set objectives. This is our main goal. We need to ensure that our economy has a supply of qualified local professionals. This is a goal that we can achieve and I have no doubt that not only will these universities become leading centres of learning in the Russian Federation but will also take a worthy place in the international education system.»

Creation of a new type of innovation system is only just beginning in Russia. New innovation structures, capable of commercially attractive projects, are gradually developing (small business, industry research bodies and academic institutes) and are starting to receive financial support from efficient companies with large-scale investment programs. The two main poles of innovative activity in Russia's economy are the defense industry and fuel and power. Most science intensive companies are in the defense sector, but their R&D potential is under used due to reduction of state orders, which has made it impossible to fund large scale projects. Fuel and power are not high-tech industries, but they are among a few flourishing segments of the Russian economy, and they are building a completely new innovation model, mainly by the efforts of private fuel and power companies, which badly need to improve their levels of technology. Given the scenario, Indian companies and academia can find suitable niches to build business and academic relations.

4. Interactions at the highest level between India and Russia for Scientific collaboration

India and Russia is witnessing an ongoing active dialogue in the last few years on building up an innovative economy. Historically India and Russia have been partners in cooperating in areas of Science & Technology for a long period. Initially the Science & Technology Cooperation was pursued under the Science & Technology agreement between India and Soviet Union concluded in 1972. Direct interaction between scientists and scientific institutes received a major boost when Integrated Long Term Programme of Cooperation (ILTP) was concluded at the highest level by the then Prime Minister of India and General Secretary of the Communist party of the Soviet Union in 1987. During the 5th session of ILTP Joint Council held in Moscow in 1992, considering that Russia was the successor State of USSR, ILTP was termed as Indo-Russian programme. Later, Indo-Soviet S&T agreement (1972) was replaced by a new Agreement on Science & Technology between India and Russia signed in 1994 in Moscow. Considering the benefit of ILTP, the programme was extended up to year 2010 with additional mandate of technology transfer to industry. The two governments have also concluded a Protocol on Protection and Usages of Intellectual Property arising out of bilateral scientific cooperation[13].

In view of the established mechanisms and diplomatic channels between both the nations, the partnership is all set to strengthen in the future and offers tremendous scope for niche collaboration. These could take the form of regional cooperation with Siberia specifically or private initiatives that take-off from government assistance to enhance science and technology research.

CONCLUSIONS

Given that Russia and India are two emerging economic and scientific powers and share an amicable and long standing relationship both nations can exploit greater avenues in areas of scientific and technological cooperation. In a rapidly liberalising world, they face the similar challenges and should find synergies to tap their opportunities.

Siberia, a resource rich region of Russia possessing a concentrated scientific community is all set to be the future focus of the Russia and the world. It offers tremendous scope for Indian scholarly community in terms of understanding and researching for new opportunity especially in areas of modern sciences, fuel and power.

[13] Embassy of India in Moscow (2008), «Indo-Russian Working Group on Science & Technology» , [online: web]; accessed on 2 January 2009. URL: http://indianembassy.ru/cms/index.php?Itemid=520&id=60&option=com_content&task=view