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A New Paradigm of Siberia's Scientific and Technological Resources

The future of Russia and the world is intertwined with the growth and development of Siberia.
Banking on the resource strengths, the region if developed optimally could help in solving energy problem of the world. The region possesses close geographical proximity to the economically and strategically important countries. Siberia's locational strengths are being developed as a transport and trade corridor through various projects. Ambitious energy and infrastructure projects cannot be properly implemented without scientists and technical specialists who are aware of the regional peculiarities. Developing human capital of the region would require a long-term focus to integrate the region as a scientific hub of Russia and the world instead of a mere resource appendage.

Key words: Knowledge economy, Siberia's Scientific and Technological Resources, Policy Implications, the educational and professional potential of Siberia, Russian Academy of Science, The science capital of Siberia, Akademgorodok.

Objectives of the research:
To explore and understand possibilities of how Siberia in 21st century could leverage its scientific and technological resources to integrate to the new paradigm of knowledge economy.

Methodology:
Primary and secondary insights gathered and analysed as a part of the doctoral research work titled "Socio-Demographic Factors in Siberian Development" at Jawaharlal Nehru University, New

Delhi, India. It includes expert interviews, review of reports and state documents of both erstwhile Union of Soviet Socialist Republics (U.S.S.R) and present day Russia. This work has also made use of the write-ups in the international press about the scientific potential of Siberia. It is based on a scan of information from various sources such as reports of various conferences and trends in Siberia or studies conducted by various research institutes.

Findings:

Siberia is a critical region for Russia and the World:

Source: http://www.bionet.nsc.ru/meeting/chromosome2009/img/akadem/map.png

Siberia[1] is often referred to as the "Treasure Chest" of natural resources. The Siberian regions produce 30 percent of Russia's GDP. Siberia holds important energy resources, including 80 % of Russia's proven natural gas reserves (or 30 % of the global share), 75 % of its oil (4 % of global reserves), and 90 % (19 %) of its coal (Cornelius and Story, 2007). These regions generate more than 30 % of all electric power in Russia. As the source of most of Russia's oil and natural gas, Siberia plays a major role in the country's modern but struggling market economy. At the same time, the region is climatically cruel — during the winter, average temperatures in Siberia range from –23°C to below –45°C. Siberia has long been a neglected resource-rich region because of a harsh climate.

The role that Siberia has played in the world has always centered on its location and resource potential. Today's Russia is banking on Siberia to become its shining star in energy arena. The development of such Siberian resources can either result as threat or appear as a promise to the world.

[1] Siberia covers a territory of 13,488,500 sq km. which comprises 7.5 % of the total territory on Earth. The entire region is extraordinarily rich in minerals, energy raw materials, hydropower, and forests.

Russia 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.

According to the Russian embassy's report, President 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 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 billion-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's Scientific Resources

Probably the most pressing reason about why Siberia is the future focus of the world is its scientific-technological resources: its concentration of academia and students devoted to specialized scientific disciplines, universities and a resource-based economy.

"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 harness, but Russia turns out 200,000 science and technology-graduates each year which are a powerful human resource for development of the 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."*

The Siberian region has moved from a mere mercantilist 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 XX 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 U.S.S.R'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 Academy of Sciences of the U.S.S.R, Academy of Medical Sciences of U.S.S.R, Lenin All Union Academy of Agricultural Sciences, present day Russian Academy of Sciences (R.A.S.), Russian Academy of Medical Sciences (RAMS) and Russian Academy of Agricultural Sciences (R.A.A.S.). Universities at Irkutsk and Tomsk are one of the oldest and most respected universities.

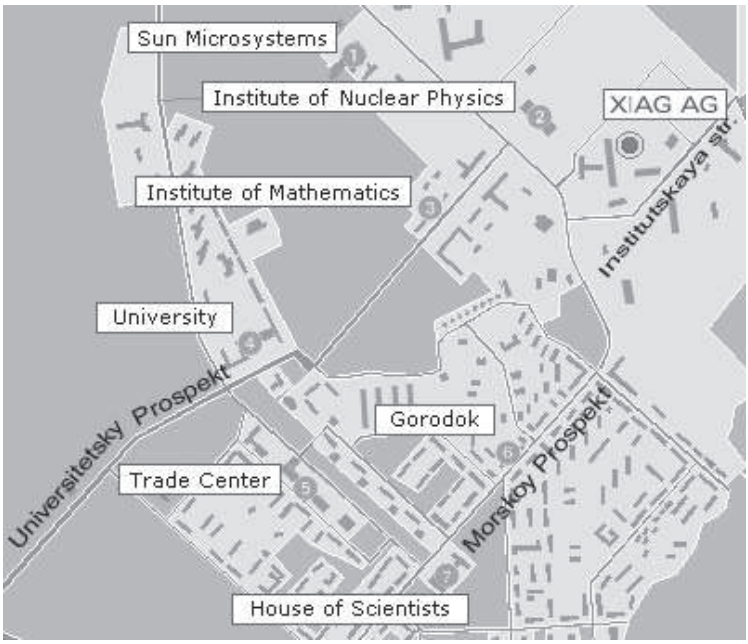
Siberia has prominent and modern universities throughout its spread: Novosibirsk State University, Vladivostok State University of Economics and Service, and Khabarovsk State University of Technology.

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 USSR Academy of Sciences and it was his efforts that Academic Town near Novosibirsk became the first born of the Siberian Branch.

He also pioneered organisation of 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 the 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 U.S.S.R) 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 the 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(Sansone, 1980).



Some of the Institutes at Akademgorodok
Source: http://www.xiag.ru/about/lageplan/

The science capital of Siberia, Akademgorodok, 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.

The prospects for development of technology seem bright as the economy of the 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 colossal and it has major industrial and research centres and defense industries."*

A. Fursenko, acting Minister of Education and Science, 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."*

Harnessing Siberia's Scientific Resources-Opportunities and Challenges:

The most important intangible resource is knowledge, a step ahead of 'information'. Information when processed and disseminated by competent manpower results in knowledge. Human capital is a key component of value in a knowledge-based society. Social structures, cultural context and means of communication are fundamental to knowledge flows.

Siberia's economy is primarily based on extraction and utilization of raw materials. It is here that a knowledge economy can also benefit the greatest by supplementing a classic resource economy. However, there are some relevant challenges amidst the potent opportunity to develop human capital and consequently foster knowledge economy. The result of various policies followed through the years has been that the present gap between the manpower resources of Siberia and its economic potential is really very large. Means of communication are underutilized. Therefore the most prominent barriers that come in the way of utilizing fully Siberia's scientific and technological resources are:

Demographic Challenge

The present conditions in Siberia leave much to be done on the manpower front. Siberia is plagued by a sharp drop in the birth rate, the drastic rise in the death rate especially among men, out-migration. It is also facing the situation where productive workforce is leaving the region. Current demographic and migration trends show that large numbers of Siberians are leaving the region permanently due to its harsh conditions, and in search of high earnings, to other parts of the world and are even keen to settle down there (Kashepov, 2004).

In 2000, President Vladimir Putin met with regional heads of the Siberian Federal District. The meeting focused on the social-economic development of Siberia. He emphasized the need to create a favourable environment for attracting highly knowledgeable specialists to Siberia.

"Brain Drain" Phenomena

Firstly, the educational and professional potential of those indigenous to Siberia is not being tapped efficiently. The pattern of demographic exchange has changed dramatically over these years. Between 1992 and 1997 the education levels of immigrants from the former Soviet republics is found to be higher than those of Siberians as a whole (Kumo, 2001). Their educational levels are reflected in their professional profiles. A large percentage of their population is civil servants, well-qualified specialists in the areas of education, public health, culture and science. Difficulties involved in finding work lead many migrants to take jobs that do not match their educational or professional qualifications. This is one of the factors hindering a smooth or quick adaptation process. It is also delaying development of Siberia's human-resource potential and hence future economic growth.

Secondly, China (and now the U.S.) is sourcing research and development work or 'local brains' from Russia especially Siberia. Akademgorodok, a Soviet-era suburb of Novosibirsk in Siberia which houses 52 scientific institutes and some 18,000 scientists is one such 'outsourcing hub' for the Chinese. Microsoft has decided to invest heavily and build a $500 million datacenter in Irkutsk, one of Siberia's largest cities (Fried, 2007).

This has been a cause of anxiety in the scientific circles of Russia. Lounev (2008) terms this phenomenon as "Idea Drain". He elaborates: Tens of thousands of scientists are now working for foreign companies and huge numbers of scientists have fled the country. Russia's real contribution to the world market of science based products, know how, and technology is several times more than the registered statistics (In the world market of science based products only 0.3 per cent of the market belongs to Russian know-how).

Weak Framework of Intellectual Property Rights in Russia

Lounev (Lounev, 2008) compares Russia's ability to build a new society based on scientific research compared to other Asian giants. He feels that the socio-economic situation of these countries stand in the way, which is aggravated by presence of huge unqualified population. *"There is no sense for applying new resource-preserving technology because of low-cost manual labour and the necessity to provide jobs to the huge population".* He adds that the Asian giants lag behind Russia in the sphere of fundamental research. However currently, Russia suffers from a weak state and influential bureaucracy as a result of which science based production functions in an extremely distorted legal space, hardly facilitating development of scientific activities. He specifically points to the lack of protection of intellectual property. Sale of intellectual property presupposes its prior formatting as a property and Russia lags behind other countries in this field. *"The state does not fulfill its functions in the sphere of unification of science and business, as it happens in not only in the developing nations but also developing countries whose experiences are very interesting."* He cites the example that in developing countries for each prospective scientific idea, there are on an average 10 managers who push the product in the market while the number is several times less in Russia.

Policy Implications:

Shinkarev in his book 'The Land beyond the Mountains' recalls his meeting with Decembrist N. Basargin to quote him: *"Siberia which covers such a vast area has so much of interest that it can look forward to a brilliant future, if only the people and the government have wisdom to use sensibly the resources with which nature has so richly endowed it with".* Shinkarev prognosticated about what Siberia will be like in the year 2000 in 1973. His prognosis mainly revolved around the likely climatic changes that Siberia could be through. He goes on to ponder about the economic and geographic changes and the implications of exploitation of Siberia's resources. He forecasted that the manpower problem will be solved by "more rational use of the available labour reserves and by training a wide variety of experts in Siberia's own colleges and universities and at local industrial enterprises". Presently, there are no concrete proposals for addressing labour-force shortages. The resource potential of Siberia can be a major stimulus for its development and has the capability to integrate the Russian economy.

Migration policies developed in conjunction with stake holder institutions and academicians should keep in view the long term implications. One of the aims of the migration policy should be encouraging competition on the labour market.

Qualified migrants from over populated Asian countries could be the answer to labour shortage in Siberia, especially if the policies are well-regulated. Furthermore, a suitable enterprise friendly environment can ensure the creation of conditions for attracting foreign investments and advanced technologies to Russia via the Asian regions. Diverse labour with diverse skill-sets will spruce up the flickering flame of Siberia.

Fresh talent, management techniques and technology will flow in, and in time, local human resources of Siberia will become productive and globally competitive. The state should ensure that the expatriate workers hold rights as well as duties, in the light of which responsibilities of the local and national governments should be clearly defined. Protection of intellectual property rights has to be ensured.

These characteristics require new ideas and approaches from policy makers, while planning future development of Siberian region. What is required is a comprehensive strategy to attract and develop talent in the new centers in Siberia. Distance education modes like e-learning potentially have wide application in Russia. The sheer size of the country and the remoteness of many communities from major centers of learning will probably soon become a much more serious obstacle than in the past to many who want to pursue science and technology. What remains to be seen is how well Siberia adapts to the changing paradigms of scientific methods, new ways of transfer of knowledge and techno-scientific human resources.

Conclusions:

The future of Russia and the world cannot ignore Siberia's important role. Banking on the resource strengths, the region if developed optimally could help in solving energy and connectivity problems of the world. The region possesses close geographical proximity to the economically and strategically important countries. Siberia's locational strengths are being developed as a transport and trade corridor. These ambitious projects cannot be properly implemented without scientists and technical specialists who are aware of the regional peculiarities and the global "big picture". Developing human capital of the region would require a long-term focus to integrate the region as a scientific hub of Russia and the world instead of a mere resource appendage. Federal government, local policymakers, industry and academicians play a part in preparing regions for the requirements of the knowledge economy. In this regard these stakeholders should co-formulate strategies for the region which would facilitate the creation of an "outward-looking" economy and society for Siberia.

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