



Analysis of India's Manpower Resources with Respect to Migration Aspect of Resources and Comparative Capabilities

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CSIR - NATIONAL INSTITUTE OF SCIENCE
TECHNOLOGY AND DEVELOPMENT STUDIES

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1. Introduction

Due to globalization, the world has been changing into a global village. In one hand it has increased closeness and interconnectedness between various countries and economies; on the other, it has spawned an intense competition between them. Since 1990s, the information technology emerged as powerful tool for development of economies. It turned the world economy into a knowledge-based economy. Therefore, the progress of an economy today depends on a broad base of intellectual capabilities of human capitals of society. Such human resources, which have ability for innovation and provide unique ideas have become a decisive asset in the global economy¹. In consequence, demand of skilled man power sharply increased in international market. Therefore, knowledge migration has acquired a significant place in the new world order. Developed countries have been facing skilled labor shortage because of ageing population so they have begun to rely on global labor supply. Outflow of scientists, researchers, skilled professionals, and students from developing countries to developed countries witnessed an unprecedented increased. Sometime back, outflow of skilled human resource was considered a loss-'brain drain' for sending countries, while for the receiving country it was 'brain gain'.

However, there has been a change in perception. Now analysts and policy makers began to recognize overseas “knowledge workers” role in science, technology, and innovation development, in increasing remittance inflows, in boosting investments and trade of their origin countries. Returnee migrant students, scientists, and professionals are bridging gaps; they are enhancing interconnections, linkages, and knowledge sharing between sending countries and receiving country. China, India, and Taiwan are significant example of this trend.

1.1 Who are called “Knowledge Workers”?

Along with the transformation of economy, many things have changed in society; there is new technology; new concepts and new terminology. Peter Drucker first used knowledge Workers' term in his work 'Landmarks of Tomorrow' (1959). Later on him and some others, intellectuals developed the concept of 'knowledge workers' and tried to synthesis the definition of knowledge workers. Rosa Daugliene underlined that in the modern economy...“Knowledge worker are individuals, who accumulate, create and disseminate knowledge during the performance of job. They “produce” innovative ideas and use modern technologies in their activity². We may consider knowledge worker as a highly skilled personnel who has the ability to use knowledge and create tangible products or service and who can transfer knowledge to others and they provide leadership socio-economy development of society. Scientists, Engineers, Doctors, Software programmer,

¹Knuth Dohse, *Global Competition for High skill Talents, The Transpacific Knowledge Bridge and the European Migration Patchwork, Migration and Integration; Reflections on Our Common future, CEP EuropäischeVerlasanstalt*

²Rosa Daugliene, *The position of Knowledge workers in Knowledge-Based economy: Migration Aspect, Kaunas University of Technology Institute of Europe, ISSN 1822-8402 European Integration Studies. 2007. No-1*

Lawyers, Lecturers, writers, Architects, Accountant and Researchers are called knowledge workers. Students who go to abroad for doctorate and post doctorate also include in knowledge workers.

India's highly qualified human resources in abroad are highly varied and have entered almost all fields of economy; especially IT and medical sector. In the matter of student migration, India occupies second place with 162,000 international students after China (OECD 2009). Taiwan and South Korea also provide a large number of international students. Migrant flow from India since the 1990 has not only recorded remarkable growth in respect of the traditional destinations like the USA, UK, Canada and Gulf countries but has also expanded to newly emerging migrant destinations including Germany, France, North European countries, Australia, Japan and Singapore.

In this light, the topic of knowledge workers' migration gains new importance and becomes a sensitive issue with developmental implications. For their own interest of national development, both sending and receiving countries, have together taken up are taking up steps for bilateral and multilateral research, innovation, and advanced studies program.

2. Objectives

Since 1991 India's closed economy has transformed into open door economy and Indian economy is now linked with global knowledge base economy. Since then Indian returned Indian migrants are playing a significant role in term of trade, investment, and technology transfer. Therefore, government began showing interest in the overseas Indians migrants and set up a number of policies to attract overseas migrants to facilitate the transfer of their accumulated experience, linkages, and knowledge from destination country to India. Two major aims of this paper:

- First, to examine implemented policies relating to reverse knowledge migration to home country by developing countries especially China, Taiwan, and India.
- Second, to make recommendations to the government to help it restore its international skilled human capital and also facilitate transfer of those technologies / products on which Indian citizens are either involved in joint assignments or are working as independent researchers, in foreign lands.

In this paper, we tried to find out answers of these research questions:

1. What types of network and linkages do returnees develop during their stay abroad?
2. What is the status of the intellectual property rights over the knowledge that is generated during their tenure abroad?
3. What types of problem do knowledge workers face during their stay abroad regarding issues such as health, social security, culturally integration, and family?
4. To what extent do skilled returnees provide help in the development of the Indian innovation system through investments, knowledge, and skills transfer?
5. To understand the policies related to knowledge workers which were exploited (or said to be exploited) by a certain group of countries for their own development.

6. To understand the extent of ownership of intellectual property rights by the various stakeholders (i.e. the knowledge worker, the home organization, the affiliation etc.) when knowledge workers contribute to towards such an effort.
7. Similarly, to understand the ownership / copyright issues in case of publications, manuscripts, books etc.

3. Methodology

The research is based on pre-existing literature, reports and available data / information on the respective websites. Further, a questionnaire has been designed targeting R&D Personnel, academicians, policy makers and students who generally have either experienced or witnessed the effect of such migration. A total numbers of 1500 sample email addresses were collected from individual websites as well as personal visits to the affiliating organizations. A few of the national and international organizations like INSA, DST, CSIR, Indo-French (CEFIPRA), Indo German (BMZ and GIZ) and Indo-US (IUSSTF) were selected to do a detailed interview to understand the various research questions.

4. Literature Review

4.1 Policy frameworks of China, India and Taiwan

In present era, mobility of skilled manpower in international markets has become important not only for receiving countries but also for sending countries, with respect to the development of their economies. In today's globalized economy, the development of any country depends not only its domestic qualified human capital but also on its continuous link with knowledge and new technology acquired by other countries³. The past decade has brought to light some researches or reports which prove that knowledge migration creates a triple-win situation for the sending country, receiving country and the individual too. Through knowledge migration, receiving country gains knowledge workers to fill shortage of workers, individual migrants achieve high salaries, experience, and linkages, while sending countries receive remittance, investment, and skills transfer⁴. So, by recognizing the potential of diaspora in the development of their economies, sending countries have initiated a number of policies aimed at fostering connections with their overseas nationals in order to acquire experience and technology transfer. India China and Taiwan have re-oriented their policies in the areas of education, trade and research & development, so as to benefit from knowledge migration. Here, we present an overview of what these countries have implemented. Figure 1 compares key migration policies in domains of education, business and R&D for these countries.

³Alfonso Giordano • Giuseppe Terranova, *The Indian Policy of Skilled Migration: Brain Return Versus Diaspora Benefits J Glob Policy Gov (2012) 1:17–28 DOI 10.1007/s40320-012-0002-3*

⁴Anja Wiesbrock, *University of Maastricht, The Netherlands, Return Migration as a tool for Economic Development in China and India, Working Paper No. 3*

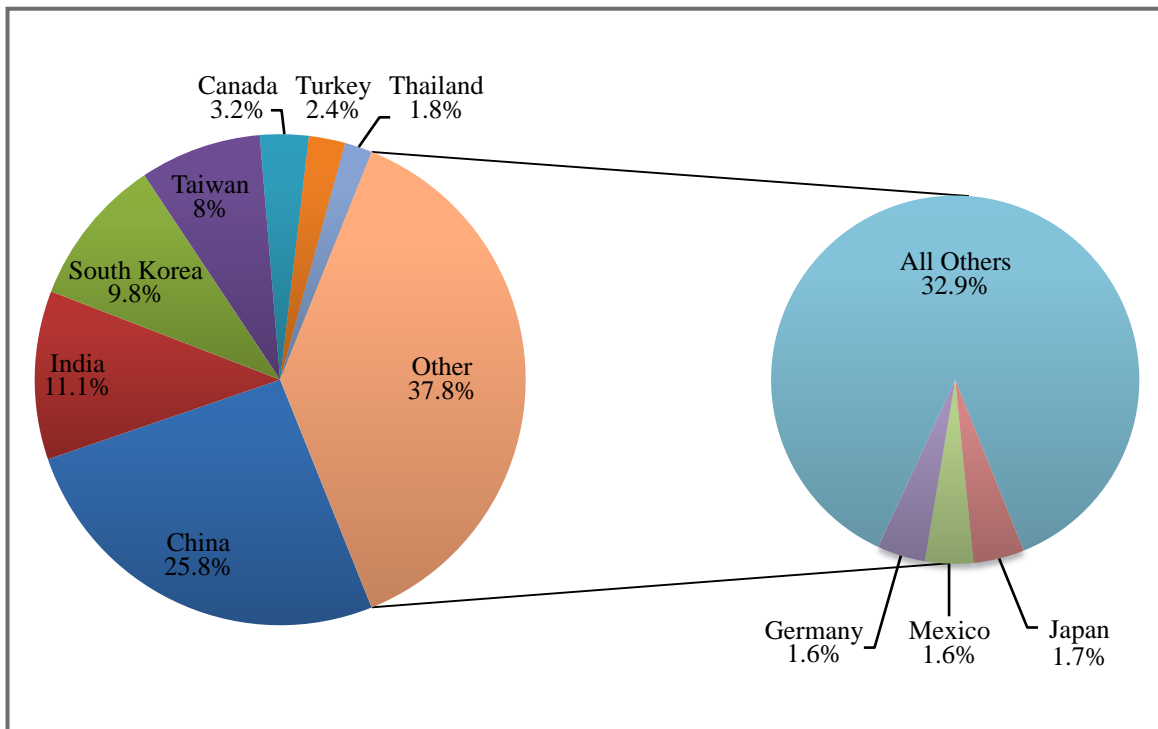
Fig-1 Policies of India China & Taiwan in Different Disciplines

	INDIA	CHINA	TAIWAN
R & D	<ul style="list-style-type: none"> - collaborative programs - Scholarship/Fellowship Schemes - Developing Websites for S&T Professionals - Policy for global India network of Knowledge 	<ul style="list-style-type: none"> - 100 Talent Program - Recruitment Program for Global Experts - CAS Fellowship and Cooperative Programs for Foreign Talent - International S&T Cooperation Award 	<ul style="list-style-type: none"> - MOFA Taiwan Fellowship - MOE short term research award - Grant for Chiang Ching-kuo Foundation for International scholarly exchange - Stanford Taiwan Biomedical Fellowship Program - Visegrad Taiwan Scholarships
E D U C A T I O N	<p>Education Exchange Program Recruitment of Internationally Qualified Faculties UGC Ramanujan Fellowship for Post Doctoral Research</p>	<p>Education Exchange Agreement with Western Countries and Exporting Students Various Scholarship Programs:- Chang Jiang Scholar Program Graduate Student Joint Training Program (CSJT) The Chunhui (Spring Bud)</p>	<p>Department of International & Cross-strait Education Mandarin language enrichment scholarship Taiwan Scholarship Program International Youth Ambassador Exchange Program</p>
B U I S N E S S	<ul style="list-style-type: none"> - Overseas Indian Facilitation Centre - India Development Foundation of Overseas Indians - The Prime Minister Global Advisory Council of Overseas Indian - Hand book on Policies Overseas Indian citizenship card - Special Economic Zone Science Parks & Research Centres 	<p>Establishment of Hightech Development Zones Establishing Migrant Network & Organisations Setting up Multi-entry Visa Scheme</p>	<p>National Youth Council Hsinchu Science Park Free Economics Pilot Zone (FEPZ)</p>

4.2 Return Migration and Education Policy

Every year a large number of brilliant scholars from developing countries migrate to advanced countries for higher studies because of the poor condition of higher education in their countries, but very few of them return to their homeland. 'The US Science and Engineering Indicators 2012' present a classic picture of this trend. Most of the doctorate degree (in science and engineering) acquiring foreign students come from China, India, South Korea and Taiwan (Figure 2). Very few of the US degree holders migrant students are willing to return to their home countries because many of them are absorbed by United States markets and institutions (Table 1). Result, developing countries have been facing brain drain for long time. By recognizing the problem, these countries made new strategies for enhancing quality of their human capital and preventing brain drain and promoting return migration of their overseas nationals to help in the development in higher education system.

Fig-2 Foreign Recipients of U.S. Science & Engineering Doctorates: 1989-2009



Source: The US Science and Engineering Indicators 2012.

Table 1 Plans of U.S. S&E doctorate recipients with temporary visas at graduation to stay in the United States: 1998–2001 and 2006–09

Place of Origin	1998-2001	2006-09
Iran	52.1%	64.3%
India	68.3%	61.4%
China	62.3%	58.6%
Turkey	40.9%	49.4%
Germany	44.0%	47.7%
Italy	43.3%	47.3%
France	42.5%	46.9%
South Korea	40.3%	46.0%
Canada	51.5%	45.9%
Taiwan	37.0%	41.2%
Japan	32.8%	38.6%
Mexico	25.1%	37.7%
Brazil	21.7%	36.1%

NOTE: Rates are proportions of each group reporting firm commitment
To post graduation employment in United States.

Source: *The US Science and Engineering Indicators 2012*.

India

India has the third largest higher-education system in the world with 25.9 million students enrolled in more than 45,000 degree and diploma institutions in the country⁵, behind only the United States and China. But in terms of quality of education, it is considered that Indian higher education is lagging behind international standards and competitiveness. The World Bank considered that Indian higher education institutions and universities have generally not been able to maintain high standards: India has outdated programs with inflexible structures and contents which do not match the demand (labor market needs), there is shortage of qualified and trained faculty and there is poor technology/infrastructure support. Due to this, every year India loses a significant numbers of its trained manpower to the developed countries⁶. Aforesaid trends indicate that majority of students do not return after completing their studies abroad.

⁵Higher Education in India: Twelfth Five Year Plan (2012-2017) and beyond, FICCI Higher Education Summit 2012 (UNESCO-UIS) Education (all levels) profile – India, United States and World Bank (Data/Indicators) – Education

⁶India Scientific and Technical Manpower Development in India World Bank Report No. 20416-IN, August 30, 2000

The Government of India (GOI) recognized the challenge and took up steps in two stages. First, it began to emphasize on strengthening its primary and secondary level education through-increasing private participation in opening new high quality schools and internationalizations of education. Second, it focused on establishing new international higher educational institutions; enhancing use of technology in higher education institutions and improving quality of curriculum. For strengthening its education system India implemented several programs at school and university level:

- (i) ***Internationalization of Indian Education;*** Internationalization of Indian education at both levels - school and university - is taking place. Many private schools have now included foreign languages in their curriculum. They are getting accreditation and affiliation from the international organizations of education like - Council of International Schools (CIS), British Council and New England Association of Schools and Colleges (NSASC) and are adopting their methods of teaching. In addition, many schools organize foreign educational trips in summer vacation for their students and teachers to provide international exposure. Apart from this, government is taking initiatives for internationalization of higher education in India, by increasing international cooperation, collaboration; faculty and student exchange programs with other countries. Initiating doctorate and post-doctorate programs in foreign languages and establishing their offshore campuses abroad, such as - Manipal University is internationalizing its education system by providing global exposure to students and faculty through 'twinning programs'⁷, research collaborations, and teaching forums with international institutes. Beyond these programs, India started Scholarship Program for diaspora Children (SPDC). It is a well-known program launched by MOIA, which was instituted in 2006, in this program, government announced 100 scholarships for diaspora youth (50 for Non Resident Indians and 50 for Persons of Indian Origin) would be awarded each year in order to pursue an undergraduate education in India.
- (ii) ***International Faculty Development Program;*** in the twelfth five year plan the government intends to launch the International Faculty Development Program to provide global exposure to Indian faculty. Indian faculty will be sent to the best universities in the world for 3 to 6 months' internship. Government seeks to setup 50 Teaching and Learning Centers (TLCs) to enhance research activity and training of faculty in the country.⁸
- (iii) ***Educational Exchange Program (EEP);*** The Ministry of Human Resource Development initiated exclusive EEP by signing agreements with many countries, which aim at to increase the focus on bilateral and international cooperation for sharing knowledge and best practices in the field of education for mutual benefit. Under EEP, India and other participating countries established several scholarships which facilitate Indian students to study abroad at the postgraduate, PhD or post-doctoral levels. Some of them are:

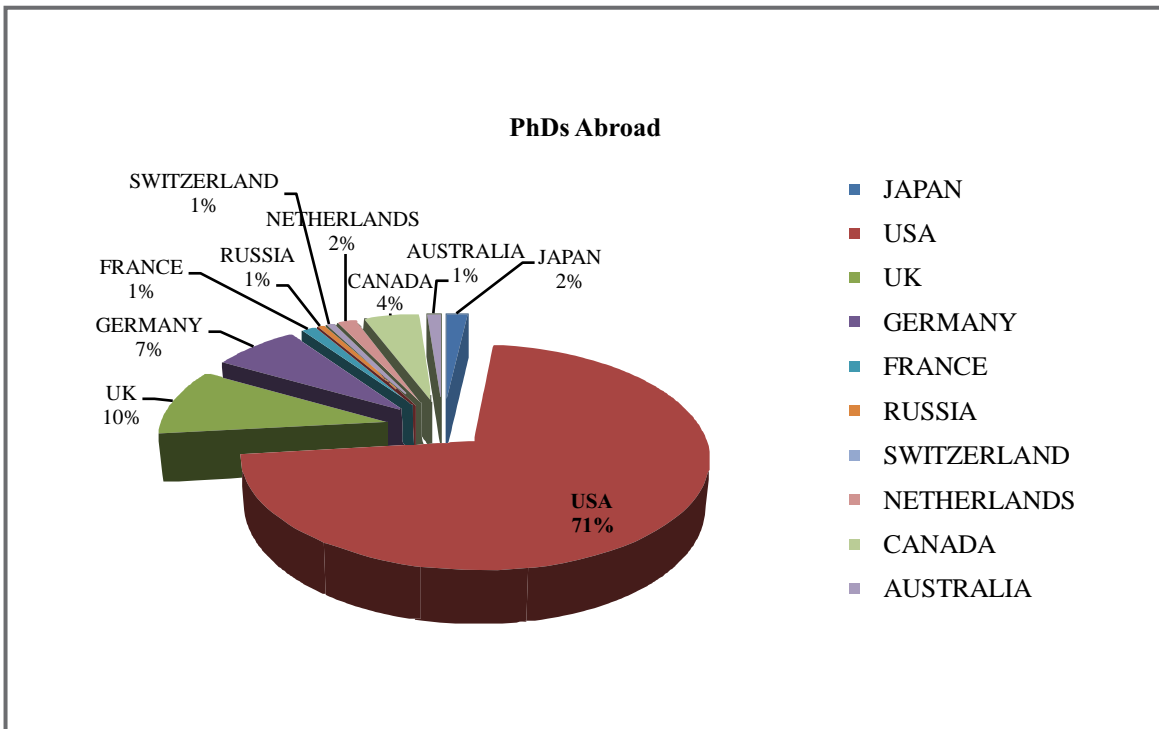
⁷Twinning program started in India in 1995. It's an arrangement under which students can complete part of their studies in India and the rest in a foreign college.

⁸Based on Higher Education in India: Twelfth Five Year Plan (2012-2017)

- a. Shastri Indo-Canadian Institute (SICI): It is a bi-national organization that was founded to promote academic relations and mutual understanding between India and Canada. This organization provides scholarships and grants for study and research such as Shastri Millennium Development Research Grants, Partnership Development Seed Grants, Scholar Travel Subsidy Grants, Study in India Summer Program and others funds.
 - b. United States-India Education Foundation (USIEF): It is the result of signing a bilateral agreement between India and the US to promote mutual understanding between nationals of both countries through the educational exchange of outstanding scholars, professionals and students. It awards Fulbright, Fulbright-Nehru, and other prestigious grants and scholarships in almost every academic discipline for Indian and American students, faculty, and professionals. Besides USIEF fosters linkages between higher education institutions in India and the US through its office of US – India Higher Education Cooperation (USIHEC)
- (iv) ***Recruitments of Internationally Qualified Faculties***

India started to absorb highly qualified returnees in the universities and institutes of higher education. Although there is no data on the exact number of returnees to India, but in order to get an insight, we conducted a study to get an idea of the number of highly skilled returnees (professors with a doctorate degree) in our academic institutions. The dataset contains the University/Institution, A Number of Professors in the University, faculty with PhD degree and the PhD awarding country. The dataset consists of 9044 faculty members, out of which, 830 were non-PhD faculty, and information was not available on 2296 faculty members. Therefore, out of 5918 faculty with doctorate degrees, 4760 completed their PhD in India and the rest 1158-faculty members obtained PhD abroad, which means approximately 19% of faculty possesses a foreign PhD degree. Figure 3 shows that a large number of faculty members, i.e. 71%, completed their PhD in US followed by UK which accounts for 10% and 7% from Germany and 4% from Canada. USA, UK and Germany together account for 88% of the total PhDs. A small number of professors did PhD from countries like Japan, Netherlands, Australia, Switzerland, Russia and France.

Fig-3 Faculty with PhDs awarded abroad



Source: Data collected from various higher educational institution websites.

(v) ***UGC Raman Fellowships for Post Doctoral Research:***

UGC started Raman Fellowships for young Indian permanent faculty (under age 40) to acquaint them with new knowledge and technology and enhance their research capacity and ability. Raman Fellowships provide them an opportunity to have international collaborative research opportunities, training in advanced techniques and technologies in emerging fields; thereby they can contribute to higher education with a global perspective and build long-term relationships with distinguished experts in these fields in USA⁹.

(vi) ***Proposed Bill in Parliament:***

India proposed 'The Foreign Education Institutions (Regulation of Entry and Operations) Bill, 2010' aiming at encouraging reputed foreign higher education institutions to provide their education service in India. If this bill is converted into law, then it will provide opportunity for Indian students that they can receive a foreign degree without going abroad. Besides, some other bills have also been introduced in the parliament that relate to improvements in higher education for example 'The National Accreditation Regulatory Authority for Higher Education Institutions Bill, 2010' aims to establish a responsible institutional mechanism for mandatory accreditation and rating of higher education institutions. The mandatory accreditation would establish uniform standards and norms which would help to enhance the quality of the higher education in Indian; 'Universities for Research and Innovation Bill, 2012' to establish world class universities for research and innovation through public fund or private or public-private partnership. These universities will be emerging as hubs of education, research and innovation, and they may also establish campuses in foreign countries.

⁹University Grant Commission <http://www.ugc.in/pdfindous/default.aspx>

China

From 1949 to 1970's international migration to the west had been restricted by the Republic of China. However, students or researchers could go to the USSR and Eastern European countries through government mediation. After 1978 there was a policy shift; Chinese government realized the importance of its overseas students, professionals, and researchers for enhancing national competitiveness. Therefore China gradually changed its political attitude toward overseas Chinese students and professional and liberalized its policy to enhance migration for increasing the quality of its human capital, technology transfer to China and so that it can be benefitted. In this order China adopted these policies–

Educational exchanges agreement with western countries and exporting students; In 1972-73, China started improving its diplomatic relation with UK, Australia, France, Italy, New Zealand, Canada and other countries and it initiated educational exchanges. It signed agreements with the U.S. such as the Understanding on Educational Exchanges (1978) and Cooperation in Science and Technology (1979). Under these agreements, China dispatched a group of 52 government–funded students to American Universities.¹⁰ Ministry of Education (MOE), the National Science Committee and the Ministry of Foreign Affairs of China made joint regulations for Chinese overseas students and set strict rules/punishments for those students who did not return home on time. In 1981, the government chose four policies to facilitate sending students abroad:

- Increased local involvement in the selection process of outgoing student so that student's chosen field of study could be relevant to China's practical needs.
- Allowing local-sponsored and self-financed students to study abroad.
- Emphasizing on applied science and technology, and economics.
- An emphasis on sending post-graduate students to study abroad for training high level personnel for the country's economic development.

Ministry of Education (MOE), Chinese Academy of Sciences (CAS), the National Natural Science Foundation (NSF), the Ministry of Personnel (MOP), the Ministry of Finance (MOF) and the Ministry of Science & Technology (MOST) launched various kinds of scholarships and programs to lure back top talent. Some of these programs are;

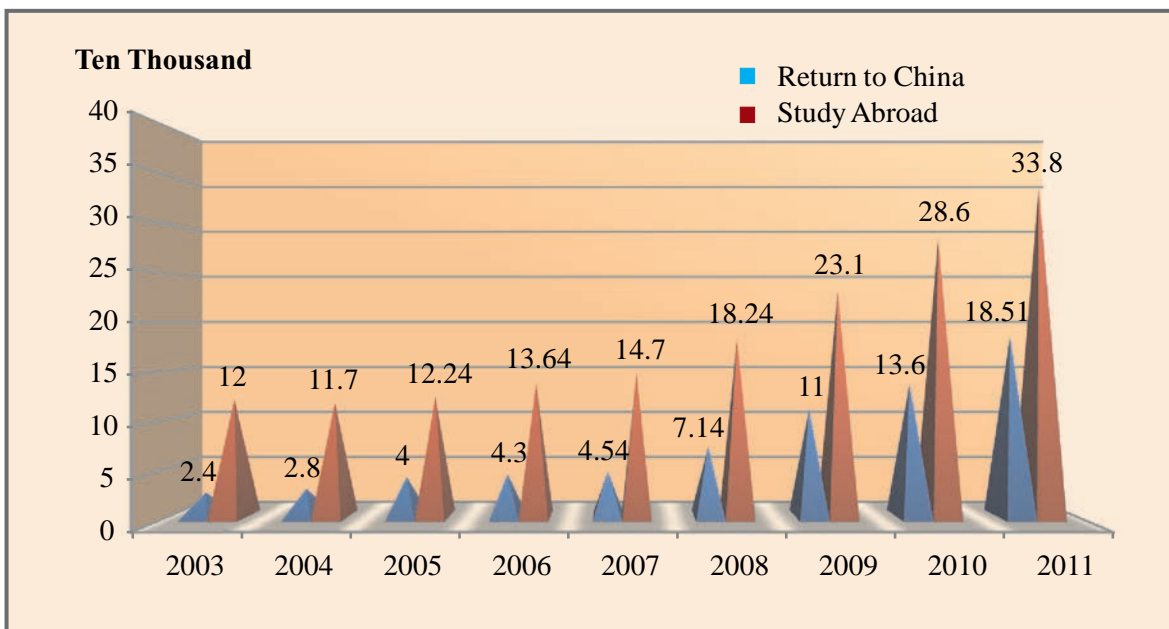
- a. *The Changjiang Scholars Program (1998):* The MOE and Li KaShing Foundation jointly sponsored “Changjiang Scholars Program” begun in August 1998. The Program provides grants for outstanding achievements of overseas students and is ready to serve the State Key S&T projects and academic teams in 115 colleges across China.
- b. *Graduate Students Joints Training Program (GSJT):* China started GSJT program for doctoral students. This program sponsors, first or second year doctoral students of Chinese universities to do dissertation work in a number of designated universities in developed countries for a period of one or two years.

¹Su-Yan PAN, *Education Abroad, Human Capital Development, and National Competitiveness: China's Brain Gain Strategies*, FEDC's space, <http://blog.chinadaily.com.cn/?1142759>

- c. *The Chunhui (Spring Bud) Program*: This program targets those scholars having doctoral degrees and outstanding records. Since 1996 this program has funded 12,000 individuals and 200 group researchers on short-term visits.

Because of China government efforts growth rate of numbers of students returning to China has climbed rapidly high. Figure 3 depicts that rate of students returning to China has increased significantly. In 2003, 2.4 thousand students returned to china while by 2011, number of returning students increased approximately 18.51 lakh.

Fig-4 Number of Chinese Studying of Abroad and returning to China (2003-2011)



Source: Annual Statistical data published by The Ministry of Education of China.

Taiwan

In the beginning, Taiwan focused on subsidizing its basic education and vocational education program rather than focus on higher education, because of the demand for medium-skilled workers for export oriented manufacturing economy. Therefore, those students whose sought higher education and could bear expenditure or who were awarded a scholarship by the destination country went abroad. Around one fifth of Taiwanese college graduates took advantage from this scheme.

In 1979, only 8% of them returned to Taiwan after completing their studies. However returnee students' percentage increased 33% during 1980s to 1990s². These migrants brought high levels of education and significant business experience to Taiwan and gave a valuable contribution in development of economy. The government has realized that improvement and enhancement of their higher education is necessary. Ministry of Education and National Science Council have also recruited hundreds and thousands of migrants as professors and visiting lecturers for the country's growing universities³. Thus, Taiwan recognized the potential of migrants as a resource and accordingly formulated government policy.

(i) ***Department of International and Cross-strait Education:***

Ministry of Education established a separate department in 2012 to promote the export of Taiwan's higher education industry, and to attract outstanding overseas students to study in Taiwan. It works for recruitment of outstanding Chinese students, including students from overseas and the mainland, in university as well as industries of Taiwan; sharing talents with the international peers, including the promotion of Taiwan's export Mandarin Chinese education industry⁴.

(ii) ***Mandarin Language Enrichment Scholarship;***

The Ministry of Education awards international scholarship for foreign students to join Pre-degree Mandarin Language Enrichment Programs (LEP) in Taiwan; This is to promote the mutual understanding between Taiwanese and international community.

(iii) ***Taiwan Scholarship Program;***

In 2004, the Ministry of Foreign Affairs (MOFA) with three other government agencies; the Ministry of Education (MOE), the Ministry of Economic Affairs (MOEA) and the National Science Council (NSC), jointly launched the Taiwan Scholarship program for outstanding international students to undertake undergraduate/master/doctoral degree program in a wide range of disciplines in Taiwan. This program aims to develop academic and educational links with international institution of higher education and develop outstanding professionals and experts to meet the needs of its own economy.

²O, Neil, K., *Brain Drain and Gain the Case of Taiwan* (2003), Migration Policy Institute.

³World Bank. *Fostering Technology Absorption in Southern African Enterprises*. 2011. Pg-174

⁴Ministry of Education of the Republic of China (Taiwan) (MOE)

(iv) ***International Youth Ambassadors Exchange Program:***

It is a MOFA sponsored annual program initiated in 2009 to promote college students of Taiwan to interact with the international community through travel negotiated working holiday agreements, which were signed with developed countries. Under this program students from various fields participate in international aid projects and international non-profit organizations⁵.

4.3 *Return migration and R&D Policy*

A strong R&D sector is important not only for competitive growth, but for more importantly for addressing the key strategic issues of any country. Developing countries like India, China and Taiwan have suffered massive brain drain of skilled professionals over the decades because these countries are the richest source of human reserve. Developed countries provide good opportunities in research and development that's why developing countries have been losing their workforce of scientists, professors because they get better opportunities, handsome salaries and other benefits which they are not able to receive in their home countries. This situation creates brain drain, which has become a major concern in developing countries. Now developing countries realize that R&D sector is the key factor of development. If they want to compete with developed countries they have to enhance their skills in R&D sector, so these countries are making several improvements in their system in order to promote knowledge returns like:

- Providing grants for R&D Projects
- Encouraging public-private partnership
- Strengthening infrastructure for R&D in universities
- Higher allocation to scientific research

India

India, the third largest economy after USA and China is poised to play a leading and expressible role in the global economy. Research is the keystone for widening India's production potential so universities as well as scientific institutions must be the hotbeds for research activity. But, even than India lags far behind in promoting return migration in the field of scientific research and development because a large number of its professionals prefer to work and settle abroad due to non-competitive pay packages, lengthy recruitment procedures, unattractive working environment, poor technology and infrastructure support. Apart from these inadequate levels of intellectual pursuit, limited opportunities for lifelong learning and regional inequalities⁶ also inspire them to move abroad.

Today Indian government recognizes the problem faced in return migration in R&D sector. It has taken various policy initiatives like collaborative programs, bilateral agreements and scholarship/fellowship schemes etc. in order to promote return migration beneficial for our system. Some of these are given below-

⁵*Ministry of Foreign Affairs Republic of China (Taiwan)*

⁶*World Bank report - India S&T Manpower development in India*

Collaborative programs between India & Other Countries

The Department of Science & Technology is actively involved in bilateral and multilateral collaborations with the foreign countries to promote research and development. As per Department of Science and Technology, GoI, it found that in 2011-12, India had 173 S&T bilateral projects in collaboration with 14 countries on 34 miscellaneous disciplines. Out of which, 24 projects were executed with Russia itself on a variety of disciplines followed by Japan (23), Ireland (19) and South Africa (18). With such initiatives, researchers get the exposure of the technology and they return with a new skill-set, which render India high quality research output. Various bilateral research collaborations between India and various other countries under the aegis of DST has been depicted in Figure 5.

India has initiated several other sponsored bilateral and multilateral programs in order to augment the country's R&D stature and to foster return migration in R&D sector.

(i) European Union and India Enhanced Cooperation Framework for Improved Bilateral Dialogue in the Fields of Science and Technology (EUINEC)

The aim of this project is to improve S&T cooperation between India & the European Union by increasing awareness among Indian & European stakeholders about respective research priorities & cooperation opportunities. Indian organizations have participated in 60 projects under sixth framework program (FP6), this no is being increased to FP7 given all new funding opportunities to be promoted⁷.

(ii) Indo-US Science & Technology Forum (IUSSTF)

This is a bilateral agreement between the governments of India and the USA, signed in March 2000. It is an autonomous non-profit society that promotes and catalyzes Indo-US bilateral collaboration in science, technology, engineering and biomedical research through substantive interaction among government, academics and industry. The principle aim of IUSSTF is to provide opportunities to exchange ideas, information, skills and technologies; to collaborate on scientific and technological endeavors of mutual interest that can change the power of science for the benefit of mankind at large.

(iii) CEFIPRA-Indo-French Center for the Promotion of Advanced Research (IFCPAR):

In 1987, foreign ministry of France and The department of Science and Technology of India jointly formed a bi-lateral program. This program comprised of joint projects as well as joint events between India & France. The main objective of this program is to promote bi-lateral scientific cooperation in fundamental and applied research. It also encourages exchange of scientists and postdoctoral researchers between both the countries. Since its origin, CEFIPRA provides a platform to establish a strong partnership between France and India. Under this program, 370 projects being completed and 69 projects are ongoing.⁸

⁷ec.europa.eu/research/iscp/pdf/policy/india_bilat.pdf

⁸ Embassy of India Paris, France. <http://www.ambinde.fr/education-and-technology/science-a-technology>

(iv) DAAD Joint Program between India & Germany

Deutscher Akademischer Austausch Dienst German Academic exchange Service is a cooperative program between India & Germany under which there are two schemes are for R&D:

-DAAD-CSIR Exchange of Senior Scientist: Senior scientist working at the CSIR institutes and laboratories may apply to explore German Universities/Research Institutes for getting their exposure and can stay for up to two months.

-DAAD-UGC Exchange of Senior Scientist: Indian faculty and scientist holding a PhD degree and are affiliated to universities or research institutes may apply for a visit to German universities for 2-4 weeks, in the field of humanities and social science.

-DAAD-DST project-based Personnel Exchange Program: Scientists as well as professors having permanent jobs are able to apply for funding the collaborative projects between Indian and German groups in the area of engineering and natural science.

(v) Scholarship and Fellowship Schemes to enhance return migration

Ministry of Science & Technology, Ministry of Overseas Indian Affairs, Department of Bio-Technology, The Council of Scientific and Industrial Research launched various programs/schemes for attracting knowledge workers to return back to India. Some of these are:

Ramanujan Fellowships:

This scheme has been started by Ministry of Science & Technology. The fellowship program is introduced for the brilliant scientists and engineers from all over the world below the age of 60 years⁹. This scholarship aims to attract bright and talented scientists and engineers all over the world to occupy scientific research positions in India.

Senior fellowship for researchers in India:

Introduced by department of Bio-Technology and sponsored by Wellcome trust - India alliance, this scheme is for any meritorious researcher (science, engineering or medicine) who would like to pursue his career in India¹⁰.

Ramalingaswami Fellowship:

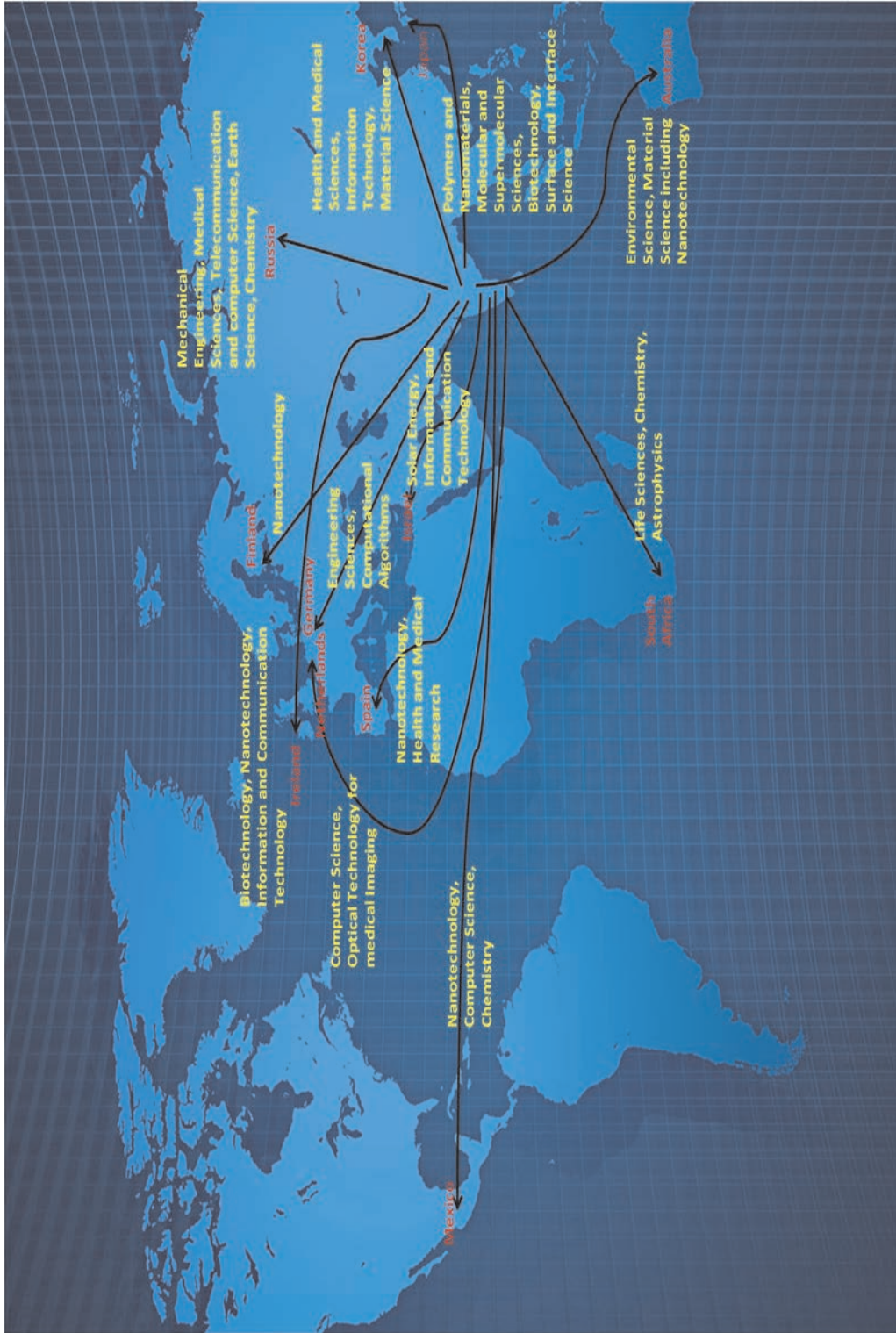
This scheme was also introduced by Department of Bio-Technology. It is conceptualized to attract highly skilled researchers (Indian Nationals) working overseas in various disciplines of Biotechnology (agriculture, bio-engineering, energy, health science, environment, bioinformatics etc), by giving them an attractive path to pursue their R&D interests in Indian institution¹¹.

⁹Annual Report 2012-13 Ministry of science and technology

¹⁰Wellcome Trust-DBT India Alliance

¹¹Department of Bio technology

Fig-5 Map network shows the bilateral projects of India with different countries in various disciplines



J C Bose Fellowship:

This scheme selects active scientists and engineers for their remarkable performance and contributions, Department of Science & Technology Instituted JC Bose fellowships. These fellowships are scientist-specific and very selective. JC Bose fellowship is open for Indian Nationals locating in India, having upper age limit of 68 years for completion of fellowship and is having regular positions in various institutions. The value of the fellowship is Rs. 25, 000 per month in addition to the Fellow's regular income. In addition, it carries a grant of ten lakh rupees per annum¹².

K.S. Krishnan Research Associate ship:

This scheme has been launched by Department of Atomic Energy. Indian Nationals, who are not more than 32 years, are eligible for this program. Research Associates selected under the prestigious KSKRA program are given an opportunity to work on R&D programs of national importance relevant to the DAE mandate and are shown prospects for regular absorption in the DAE¹³.

(vi) Developing Website for S&T Professionals

DST has been set up a website for S&T professionals amongst Indian Diaspora. The aim of this website is to provide a platform to facilitate networking, offer information, & projects and promote interaction between the Indian S&T system and the members of S&T migrant communities, for harnessing human capital development in India, enhancing Indian high-tech entrepreneurship, promoting Indian participation in mega-science projects and promoting India as the location for R&D outsourcing¹⁴.

(vii) Policy of Global Indian Network of Knowledge

An initiative has been taken by Ministry of Overseas Indian affairs in the form of Global Indian Knowledge Network. It provides a dynamic platform for knowledge transfer. This scheme has been supported by programs involving trainings & visits by overseas Indian knowledge partners, which would boost their relation in term of knowledge exchange¹⁵.

¹²Annual Report- Ministry of Science and Technology

¹³Annual Report Department of Atomic Energy

¹⁴Koen Jonkers A Comparative Study of Return Migration Policies Targeting the Highly skilled in Four Major Countries MIREM Project Analytical Report

¹⁵MOIA report moia.gov.in/pdf/global_INK_in_new_size.pdf accessed on 7 march 2014.

China

China is one of the world's major suppliers of skilled human resource. Chinese R&D system is strongly influenced by those scientists who received training as well as education abroad. In 1978 Chinese government started promoting its highly skilled nationals to go overseas and then return to their home country, finally delivering the knowledge and experience which they collect from their work abroad. So the Chinese government plans to modernize its R&D system by exhibiting most dramatic R&D spending growth pattern. Chinese government has placed emphasis on funding reforms and societal status of R&D as a major part of socio-economic development. China has made rapid advances in the areas of infrastructure high-tech manufacturing, patents and commercial applications and has now become a world leader in various fields. China provides good opportunities to the returnees through several policies and programs which help its scientists and scholars to go abroad and then return after getting experience in relevant fields.

(i) 100 Talents Program (1994)

The Chinese Academy of Sciences (CAS) launched its own manpower development scheme named 100 Talents Program for outstanding scientists. To get this fellowship a migrant scholar must return home and present his/her research output or proposed project to CAS panel and convince them that his/her research is internationally cutting edge. Eligible scientists receive generous funding (approximately, 2-3 Million Yuan Renminibi) for a three year period to setup a laboratory and establish a research group¹.

(ii) Recruitment Program of Global Experts

This program is to initiate high level overseas talents and motivate them to inaugurate innovative and entrepreneurial ventures in the country. It includes:

A *Thousand Talent Program (2008)*: To admit 2000 leading talented scholars aged below 55, either professors or on equivalent posts in reputed universities or research institutes over a period of 5-10 years.

B *The Thousand Youth Talents Program (2011)*: To filter about 2000 young overseas scholars, under age 40, by 2015.

(iii) "CAS Fellowships and Cooperative Programs for Foreign Talent"

The China Academic of Sciences initiated these programs for outstanding overseas scholars and international researchers. The objective of the programs is to provide financial support for overseas scholars and researchers to visit, lecture, or conduct collaborative research projects at CAS institutes. The CAS Foreign Talent programs are comprised of various initiatives at different levels of international academics and researches activity, such as;

-*CAS Einstein Professorship Program*; the Einstein Professorship Program was setup in 2004 to invite twenty high-level experts each year from any place in the world to carry out a short term visit (one to two weeks) in China in order to deliver lectures at the host institute of CAS and to hold

¹Jonkers, K., *A Comparative Study on Return Migration Policies Targeting The Highly Skille in Four Major Sending Countries* (2008, Mirem-AR 2008/05, p. 15)

intensive discussions with Chinese researchers. In exchange they receive one or two young CAS researchers from the host institutes sent to awardees laboratories to work for a period of one to three months.

-JUNMA Program; it is a Talent exchange program signed between CAS and Max Planck Society, Germany in 2012. The JUNMA program aims to recruit outstanding young researchers from the Max Planck Institutes (MPIs) to continue their research at CAS.

-Fellowship for Young International Scientist; CAS started the fellowship to invite overseas young scientists aged below 40 to work at CAS institutes. CAS provides 250,000 yuan (US\$39,250) per year in fellowships for scientist level researchers and 150,000 yuan (US\$23,550) per year for postdoctoral researchers to conduct their research at CAS institutes.

-Visiting Professorship for Senior International Scientists; it is CAS's sponsored and funded program. It aims to enhance the innovation capacity of CAS institutes by inviting senior overseas scientists for collaborative research with Chinese scientists. The financial support is for 2-12 months and is potentially renewable².

(iv) *International S&T Cooperation Award*

This is an International Cooperation award established by China in 1992 for remembering and boosting overseas S&T and management experts, who gave their significant input for the country's international S&T cooperation. Along with this, other governmental agencies, such as the State Foreign Experts Administration, Ministry of Agriculture, Shanghai Municipality, and other local authorities, also generate their own international cooperation awards or friendship awards to foster overseas experts³.

Taiwan

Taiwan was the first one in East-Asia who suffers from brain drain as their most of the talented citizen went abroad where they find larger remuneration better working conditions and more above comfortable life style. From 1980s Taiwan start focusing towards their skilled migrants. Thus Taiwan government makes a number of efforts such as making separate department which deal with returning of Taiwanese students in research & development, various scholarship schemes etc; which help them to overcome with this problem.

(i) *MOFA Taiwan Fellowship*:

Is established by the Ministry of Foreign Affairs (MOFA) to promote overseas experts and scholars for conducting research at universities or academic institutions in Taiwan. Overseas professors, assistant professors, post doctoral researcher and doctoral candidates are eligible for this fellowship. Monthly stipends are NT\$ 60,000 for professors/equivalent and NT\$ 50,000 for assistant professors/post doctoral researcher/doctoral candidates. Duration of fellowship is three months to one year.

²Science in the Chinese Academic of Sciences, pg-42, A Sponsored supplement to Science, CAS

³Overview of China's International S&T Cooperation. www.chinaembassy.org.

(ii) MOE Short Term Research Award (STRA):

The Ministry of Education established STRA program for international students studying in an overseas university and following a Ph.D. degree or either they are Post-Doctoral fellows, to undertake short term 2 to 6 month research in Taiwan. The aim of this program is to enhance academic research of Taiwanese culture and its society, and additionally stimulate mutual understanding and link between Taiwan and the international community. The award value is for Ph.D. students and for Post-Doctoral fellow is 25,000 and 40,000 Taiwan New Dollar (TWD) respectively⁴.

(iii) Grants from the Chiang Ching-kuo Foundation for International:

The Foundation initiated international scholar exchange program. In which Foundation provides grants for overseas scholars to conduct and explore their knowledge on Chinese Studies in humanities and social sciences. Most of the grants are given for not more than two years⁵.

(iv) Stanford-Taiwan Biomedical Fellowship Program (STB):

It is multidisciplinary training program sponsored by the National Science Council (NSC) Taiwan. The fellowship came into existence because of a cooperation agreement between the NSC of Taiwan and the School of Medicine Stanford University in November 2007. Under this fellowship program highly qualified Taiwanese scientists and engineers, go for a year-long training program at Stanford's Center of Cardiovascular. Main objective of the program is that returnees contribute their earned knowledge and experience through training program in the medical technology innovation and create an innovative Med-Tech platform in Taiwan⁶. By 2012, a total of 24 scientists/engineers had participated in the program, and 19 had finished their training and returned back to the island with the experience.

4.4 Return Migration and Business Policy

Since countries started globalization, the competition between them increased. Countries need new technology, capital and skilled work force for developing their economies. So it becomes necessary for every country to increase investment, to establish new technology based industries and promote industrial research to develop technology and newer products. Since the few last decades, diaspora made significant contribution to setting up new businesses, business research centers and generating capital in home countries. India, China and Taiwan are best examples of this phenomenon. They are implementing policies that promote their overseas entrepreneurs/professionals to make remittance, technology transfer and investment to their home land.

India

Over the past decades, Indian government began showing interest in the Indian diaspora. India's increasing interest in its overseas migrants is because of two major reasons. Since 1991, India's closed economy transformed into an open economy. India adopted liberalization, privatization, and globalization as policies for its economy. So, diaspora Indians became more useful components for trade, investment, and technology inputs. Second, highly skilled Indian migrants have played a leading role in foreign lands in the development of recipient countries' economy. Indian talent's

⁴<http://www.edu.tw>

⁵<http://www.cckf.org.tw>

⁶http://www.stb.org.tw/Page_About.aspx

contributions have been especially observed in the US IT-led economic boom. Due to which the GOI recognized competency of its international diaspora and set up a high-level commission on the Indian diaspora (HLCOID). On the recommendation of the commission, Indian government initiated several steps to attract skilled migrants and entrepreneurs for contributing in Indian economy development. since 2003, the government started organizing an annual diaspora conference-the 'Pravasi Bhartiya Divas'. It provides a platform for interaction between overseas Indians, Indian government and interested segments of the Indian society. There are annual awards 'Pravasi Bhartiya Samman, for eminent diaspora personalities or entrepreneurs.

(i) *The Ministry of Overseas Indian affair (MOIA):*

In 2004, Indian government establish the Ministry of Overseas Affair to coordinate activities for reaching out to the diaspora. The MOIA deals with all issues concerning overseas diaspora. It coordinates activities related to flow of remittances, investment, and technology including the facilitation of return migration. In addition, MOIA runs 'Know India program' and the 'Study India Program' to connect diaspora youth with the land of their ancestors and enhance their engagement with India. Besides these, the MOIA established an institutional framework that can sustain the engagement and stakeholders can benefit from the network.

a. *Overseas Indian Facilitation Centre:*

The MOIA, along with the Confederation of Indian Industry, jointly formed an Overseas Indian Facilitation Centre (OIFC) in 2007 aimed at promoting of investment by overseas Indians in India, including innovative investment and for allied policy initiatives. This facilitation center is a single window information center for anything related to investment, establishing business and live or work in India.

b. *India Development Foundation of Overseas Indians:*

A trust was set up in 2008 as a single window for leading overseas Indians to engage in philanthropy for human development efforts in India. Its objective is to encourage overseas Indians to invest in education, health, and rural development including innovation projects and allied instruments.

c. *The Prime Minister Global Advisory Council of Overseas Indians':*

Was formed in 2009 to draw upon the experience and knowledge of eminent people of Indian origin in diverse fields from across the world. It develops path for two-way engagement between India and overseas Indians for accessing their skills and knowledge for institution and capacity building in India⁷.

d. *Handbook on Policies:*

The Indian ministry of Overseas Indian Affairs produces a handbook on Policies, Incentives and Investment opportunities for Overseas Indians. It encourages emigrants to have a financial relation with India by investing their money in India. This handbook provide all the necessary information regarding the principles and other necessary terms like taxes,

⁷Ministry of Overseas Indian Affair (MOIA), Annual Report 2007-08

(ii) Overseas Indian Citizenship Card:

Indian government introduced a scheme of Overseas Indian Citizenship Card in 2005 for the engagement of persons of Indian origin with their ancestral land by amending the citizenship act, 1955. This scheme provides registration of all PIOs as overseas Citizen of India (OCI). This scheme has been implemented since Jan 2006 and as on 11 Feb 2013 a total no of 1,252,903 PIOs have been registered as OCIs. Registered PIOs are granted multi-entry multipurpose lifelong visa for visiting India and are exempted from registration with foreigner's regional registration office for any length of their stay in India.

(iii) Special Economic Zone (SEZs):

In 2000, India started a policy to establish SEZs for targeting overseas entrepreneurs. The objectives of establishment of SEZs is to provide a favorable environment for export oriented companies with reduced administrative and tax burden including 100% income tax exemption on income derived from SEZ based activity for a period of five years; fuel subsidies; exemption from customs/excise duties and industry licensing requirements. For this purpose Government passed the Special Economic Zones Act, 2005 in 2005.

(iv) Establishment of Science Parks & Research Centers:

In the early 1990s an initiative had been taken by Indian government to attract professionals, students, entrepreneurs etc. by constructing a network of national software technology parks. These parks were broadband connectivity enabled. They provide a single-window clearance system to software exporters, and incubation services. The objective of the Indian science and technology parks is to promote and foster the spirit of innovation and draw massive return on national expenses of research and training in science and Engineering⁸. Examples are:

1. International Tech Park, Bangalore (ITPB)
2. International Tech Park, Chennai (ITPC)
3. International Tech Park, Pune (ITPP)

China

Since 1978, China started policy change and began to reform its economy. It opted for open door policy for enhancing economic growth through international economic cooperation, investment, trade and exchange. For this purpose China took several steps to attract its overseas nationals for investment, technology transfer and in order to attract other resources. Some of the steps are:-

(i) Establishing New High- Tech Development Zones for promoting return migrants:

In the late 1980s China initiated a nationwide innovation program-called National Torch Program of China. The central and local governments jointly establish New High Tech Development Zones and Technology Incubator Centers for developing new/high tech industries in China. Under Torch Plan, Business Service Park of technology and Innovation Parks has been set up for overseas

⁸M. S. Ananth, *Indian Institute of Technology-Madras, Understanding Research, Science and Technology Parks: Global Best Practice: Report of a Symposium, The National Academy of Sciences.*

students where China offers them a number of facilities such as financial incentives, tax exemptions, and inexpensive office space. In addition, there is support to find out houses, schooling for the returnees children and work for their spouse⁹. Between 1980 and 2007, over 110 parks had been established in which 600 enterprises and over 15,000 returnees work.

(ii) *Establishing Migrants Networks and Organization*

The Bureau of Overseas China Affairs established organizations and networks to strengthen interconnection with overseas community. For example-'Chinese Overseas Educated Scholars Association' (COESA), whose old name was 'The Western Returned Scholar Association (WRS-- established in 1903), was renamed and reorganized in 2003. Alumni networks, Shanghai Overseas Returned Scholars Association and Chinese American Professors/Scholars Network etc. result from its work.

(iii) *Setting up Multi-entry Visa Scheme*

To lure foreign based ethnic Chinese to contribute in China's development, targeting those who want to set up an enterprise in China or want to serve their motherland through their knowledge contribution but are not willing to return permanently, China initiated Multi-entry Visa program for them¹⁰. The multi-entry visa holder moves frequently between China and host country with a foreign citizenship. The municipal government of Shanghai introduced a green card system to allow these people to have the same privileges as locals when working and living in Shanghai.

Taiwan

Returned skilled migrants play a vital role in development of Taiwanese export-oriented industrial sector. By 1987, 20% of the entrepreneurs of major Taiwanese firms were former migrants. Taiwanese brought with them not only capital and technology but they establish a connection with other Taiwanese living overseas, and hired them to work in Taiwan. Thus foreign capital, new technology and managerial expertise were important factors in the booming economy of Taiwan.

The Taiwanese government took notice of the potential of migrants as a resource and formulated government policy to enhance connection with diaspora in order to promote capital inflow, technology transfer and for tapping skilled human resources. Following steps which increased return migration:

(i) *National Youth Council (NYC):*

The Taiwanese government set up the National Youth Council (NYC) in 1970s to increase connection with overseas Taiwanese businesses and skilled nationals and thereby encourage investment and knowledge transfer. The NYC tracks emigrants and records the information in a database. It provides travel subsidies and temporary job placements to potential returnees.

(ii) *Hsinchu Science Park (HSP):*

In 1980s, Taiwan government established Hsinchu Science and Industrial Park (Silicon Valley) to trigger an inflow of high-tech manpower and technology and investment. It aims to foster Taiwan's

⁹Anja Wiesbrock, University of Maastricht, The Netherlands, 'Return Migration as a Tool for Economic Development in China and India. Working Paper No. 31MDS Working Paper Series (2008) JNU, India

¹⁰Jonkers, K., *A Comparative Study on Return Migration Policies Targeting The Highly Skills in Four Major Sending Countries*(2008, Mirem-AR 2008/05, p. 17

technological innovation and development¹¹. The government initiated a number of policies to attract firms into the Park. These included a five-year tax exemption; duty-free imports of machinery, equipment, raw material, and semi-finished products; capitalization of investors' patents and low interest loans. Apart from this, the government provides subsidized western-style houses for Taiwanese living abroad. Taiwan sponsored international science and technology related conferences to give workers in the park special approach to the international scientific community. By 2000, 4,108 employees in the park were returned migrants and 113 companies had been started by emigrants, who were educated in the U.S. Most of these employees and investors have maintained close contact with the country where they studied and worked.

(iii) Free Economic Pilot Zone (FEPZ):

Taiwan government made an announcement in August 2013 to establish a 'free economic pilot zone' to promote free movement of overseas professionals, foreign capital and cutting edge technology into Taiwan. For this purpose the government declared that it would provide visa-free entry for overseas businessmen who carry out business within the zone; relaxation in restrictions on overseas professionals entering Taiwan for work and employing home help; exemptions from various taxes such as commodity taxes, customs tariffs, trade promotion service charges business taxes, and harbor service fees, tariff on raw material and products imported into the zones. Apart from these, there were Income tax exemptions for overseas Taiwanese companies to repatriate overseas profit into the zones and tax exemptions on royalties for advanced technology or patents brought into the zone. In addition, exported goods would be exempted from the profit-seeking-enterprise tax and be subject to export/import procedural adjustment or customs code requirements¹².

5 Discussion on Policy

In a progressively globalised economy where knowledge is augmenting attention, India will have a growing role in international relations. As we know that our country is the most important source of skilled labor for the rest of the world from the last few decades. Over the time government of India realizes that as most of the human resource is going to be sent towards developed countries then it will create a huge loss of human capital & influence the development of India. So that government has implemented various policies in order to reap maximum benefit from migration. Although migration is an important process for the development but along with this it is necessary that those who migrate from their home country must get returned then it will create formidable profit for whole world. We discuss earlier the favorable policies of India China & Taiwan which promote return migration, now we are going to see that at what extent India needs to learn from China and Taiwan

As we saw China is very sincere towards the students who move from china to abroad, made several agreement with the receiving countries and concern that those students who move abroad must take such subjects that has been beneficial for the china's practical needs while India doesn't make any boundations on the students as they are free to study whatever they like and the main problem is most of the students are absorbed by those countries very few get returned to India while china punish those Chinese students who are not returning back to China.

¹¹Hsinchu Science Park Bureau. Ministry of Science and Technology. Taiwan. <http://www.sipa.gov.tw>

¹²<http://www.fepz.org.tw/>

Chinese policies focus towards exchange programs and collaborative programs even India also start focusing towards it but is not effective because China provide attractive incentives same as their country while our countries doesn't paid good incentives to those who come to India in such programs. Like China, India also starts various scholarship programs that play a satisfactory role. When we compare India with Taiwan then we realize that Taiwan make its basic education system in such a way that it will become the backbone of countries development and they have great amount of human resource while India haven't consider its basic education so important, in India school education is extremely mismanaged so that we are not able to produce variety of all-rounder students. China implement multi-entry visa scheme to promote return migration, similarly India starts Overseas Indian Citizenship Card scheme in 2005 which serve nearly all facilities of multy entry visa scheme of China. There is a main difference between Indian policies with China & Taiwan i.e. the main motto of Indian policies is they promote investment opportunities for NRIs & PIOs while the policies of China & Taiwan promote that their students will go abroad and returned back after getting knowledge and experience in relevant field which is beneficial for the countries development and for the development human resources.

6 Primary Data Description

We collected data through an online survey and face-to-face detail interviews to gain an insight into the migration of researchers, students, experts, in the area of R&D. We conducted interviews in CSIR, INSA, DST, Indo-French (CEFIPRA), Indo German (BMZ and GIZ)) and Indo-US (IUSSTF) like national and international organization. The target sample comprised of researchers professors, post doc students, government employees working in R&D sector. The questionnaire divided in five parts. First part of the questionnaire comprised of the personal information about respondents such as returnees' age, employment status, and purpose of migration. Second part dealt with the motivations and benefits of moving abroad. Third part dealt with the experiences the respondents gained during their stay abroad. Fourth part collects information about the impact of migration on their personal and professional life. Fifth part is related to the work done abroad, patents and association with the host country.

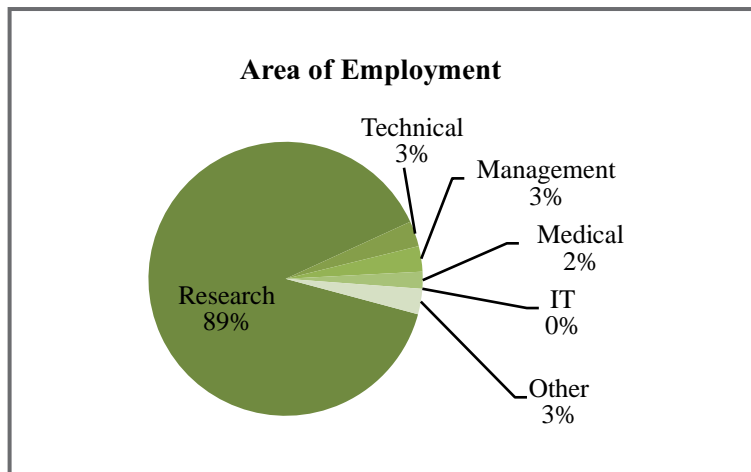
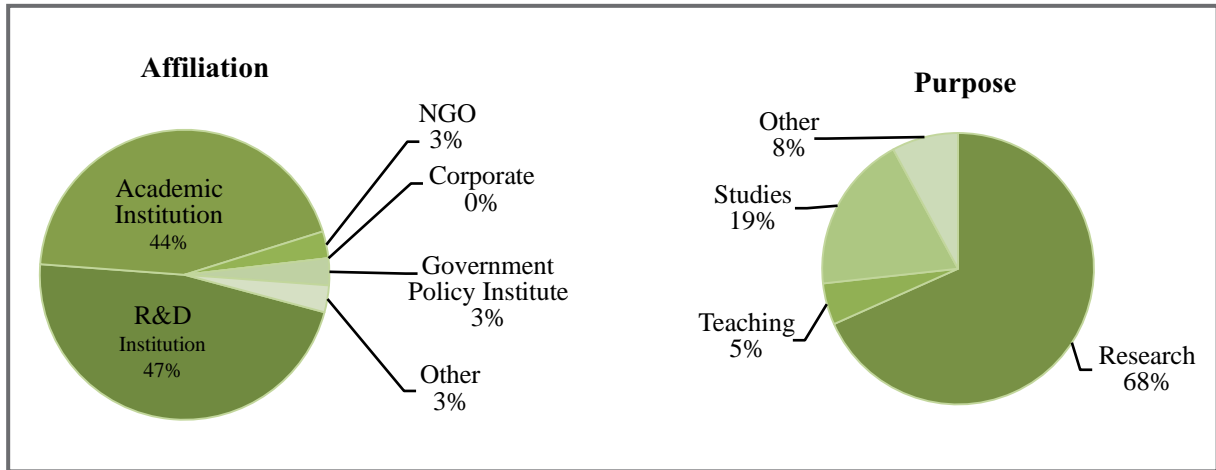
The questionnaire was sent to 1100 S&T professionals, out of which 67 responded. With these 5 percent responses the results obtained are as follows:-

6.1 Results of Online Survey

Profile of Respondents:

The sample comprised of 67 respondents out of which 83 percent were male and 17 percent women. Most of the respondents were middle age group. As we can see in the figure-6a the most of the respondents, 47 percent of returnees were affiliated from R&D institution, 44 percent from academic institutions and others from NGO and government policy institutions. More than 60 percent respondents went abroad for research, 19 percent for studies, 5 percent for teaching and rest 8 percent went for other works.

Fig-6 Profiles of respondents

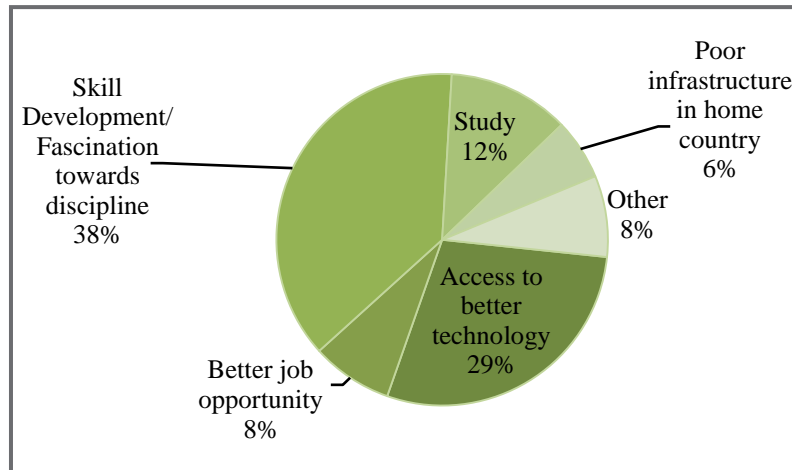


About current employments area as figure-6c shows that maximum numbers of respondents are working in R&D sector. Only 11 percent of respondents are in technical, management, medical, and IT sector. However, most of the respondents (72 Percent) continued to work with their alliance after coming back.

Motives to go abroad, Remittances and other benefits of migration:

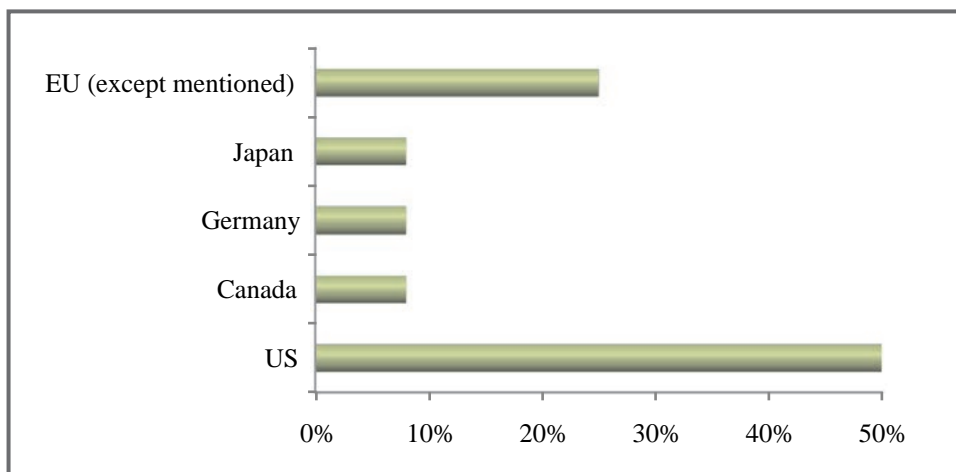
In our primary data, we found that most of the people were motivated to migrate for skill development and access to advance technology while 12 percent motivated for studies, and 8 percent said that a better job opportunity inspired them to go foreign lands.

Fig-7 Motives to move abroad



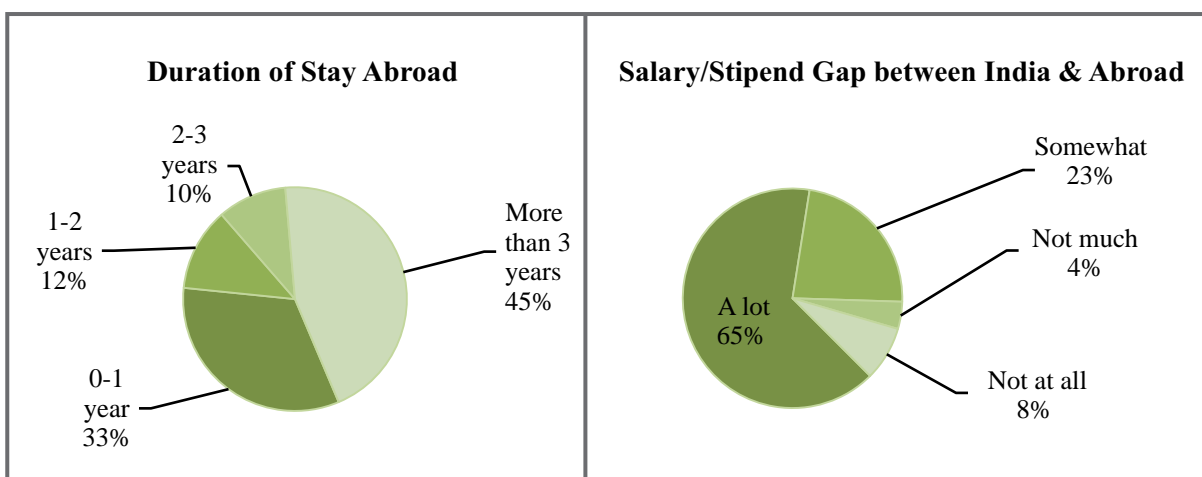
Our study confirms that many returnees travelled to more than one country and maximum respondents said that the US, Japan and Germany had the maximum impact on them respectively. According to sample, 19 percent of respondents were students who left home country to study and chose developed countries for obtaining higher education. In this order, 50 percent student went USA, more than 33 percent EU countries and 17 percent went to Japan and Canada (Fig-8).

Fig-8 Students went to study



The duration of stay abroad is very important part of our study. Length of stay had implication for returnees in term of accumulated working experience, skills, and linkages. 45 percent of total respondents stayed abroad more than 3 years and 10 percent respondents lived abroad for 2 to 3 years. It is noticeable that 33 percent returnees stay in host countries for less than one year (shown by above Fig-9). It is also remarkable that mostly student respondents were abroad more than 3 years. Half of the respondents stay with their family during the visit abroad. Further, more than half returnees—who were professionals—knew government policy regarding migration while 75 percent student returnees did not have not information about it.

Fig-9 Duration of stay abroad & Salary gap between India & Abroad



Maximum numbers of respondents received remuneration as salary or fellowship. The question about remuneration, Fig-9 shows that there is a large gap in salary / stipend giving by India and host countries. The most of the returned back professional (65 percent) had received higher remuneration in host country than India. While 11 respondents mention a little gap in Top recipients of remittances among developing countries India is recognized in major recipient countries of remittance in the world. According to the World Bank in 2012 India was the country among developing country that received highest remittance inflow (US\$70 billion)³⁸. Our study found that more than half returnees sent remittances home while they were abroad, 8 percent of returnees sent more than 50 percent of their remuneration to home (table-1).

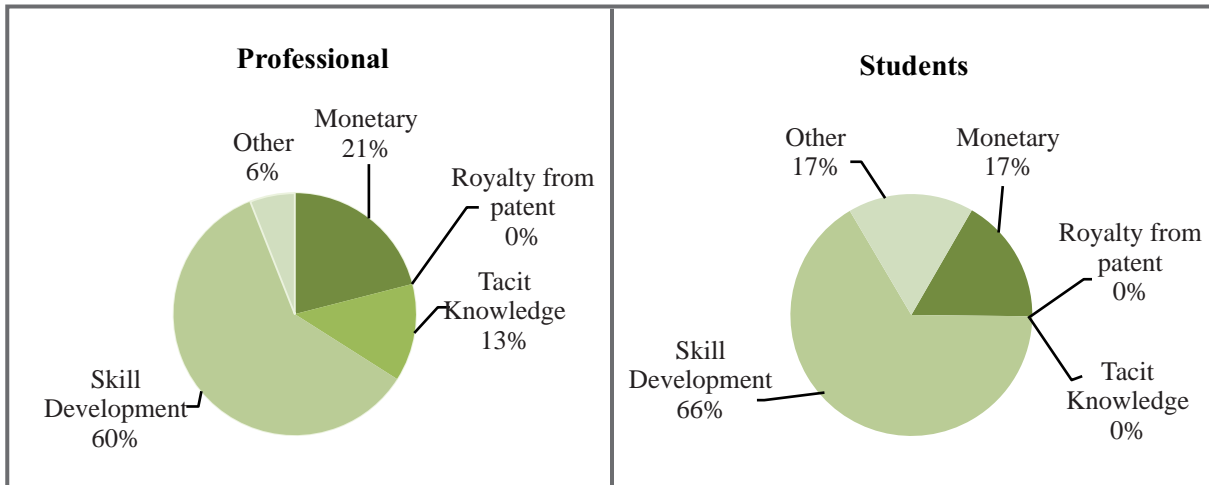
Table-1 Remittances sent by returnees while they were abroad

Numbers of Migrants	Percentage of Remuneration
27	0
20	By 25 percent
23	25 percent to 50 percent
8	More than 50 percent
22	Not Reply

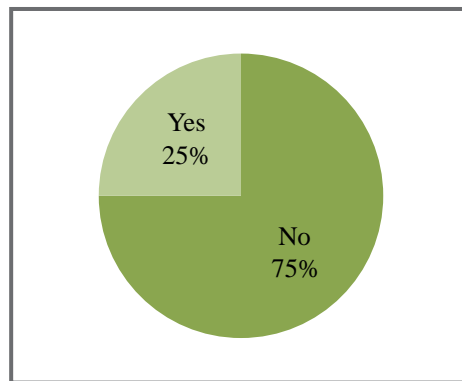
³⁸Ratha, D. and Silwal, A. (2012). Migration and Development Brief 18, Migration and Remittances Unit, Washington DC: The World Bank

Further, as we can see that skill development had been the main reason of knowledge worker's migration. The Fig-10 depict that majority of returnees—61 percent professionals and 66 percent of students—got opportunity to improve their skills, 20 percent returnees received monetary benefits, and 11 percent respondents gained tacit knowledge due to visiting abroad.

Fig-10 benefited the most to go abroad



The developed countries do not only lure students to get foreign degrees in there but also absorb major part of foreign students in its workforce by providing jobs. It is interesting that two-third returnee students got opportunity to go abroad again for further study or job but they were not interested in finding a job in the host country (Fig-11)

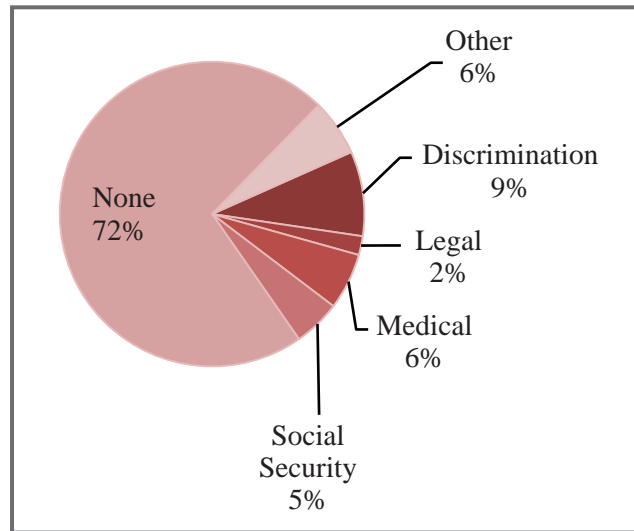


Experiences during stay abroad in terms of infrastructure, work culture and technology:

In this section, we discussed about returnees experiences abroad and tried to comparative study in term of infrastructure, work culture and technology. Furthermore, development of network connection and linkages developed during stay in host country are also a very significant part of our study.

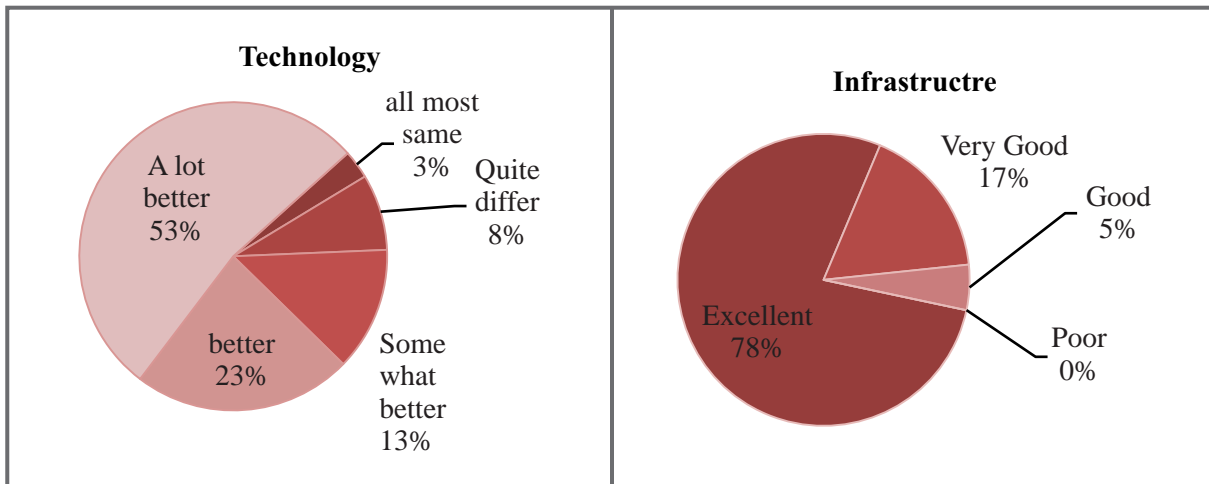
We started with the question on the difficulties that returnees encountered during stay abroad. Around 72 percent of the returnees did not face any difficulty during their stay abroad. This may be attributed to the adaptable work culture and healthy/sturdy bilateral relations with the host nations. Besides this, as depicted in Fig-12, some of the returnees complained of discrimination, social security, legal and medical issues. A very few moaned about language barrier, unfavorable climate, visa and financial issues.

Fig-12 Difficulties face during their stay



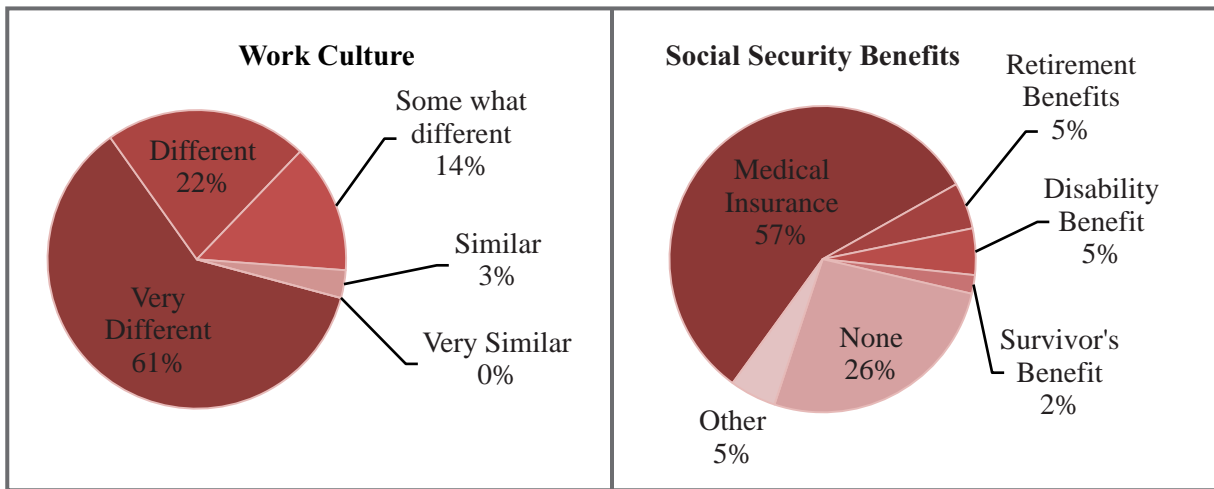
A large number of returnees went to developed nations for their endeavors which is considered as the main reason that 78 percent returnees found excellent infrastructure in the host country. Comparing with host countries, majority of respondents mentioned very difference in infrastructure of host countries and India. It means that infrastructure of host countries were far better than India About technology, more than 75 percent returnees mentioned that the host countries were so forth from India in technology. (Fig-13)

Fig-13 Technology & Infrastructure during their stay



Same reactions we got on the work culture. The Fig-14 shows that more than 60 percent returnees expressed view that the work cultures of the host countries were very different from India in the sense of better. In the case of social security, more than half returnees (58 percent) were medically insured in the host country. While 27 percent did not get any type of social security benefits. It is certain that a few received retirement, disability and other kind of social security benefits.

Fig-14 Work Culture & Social Security Benefits that returnees received during stay abroad

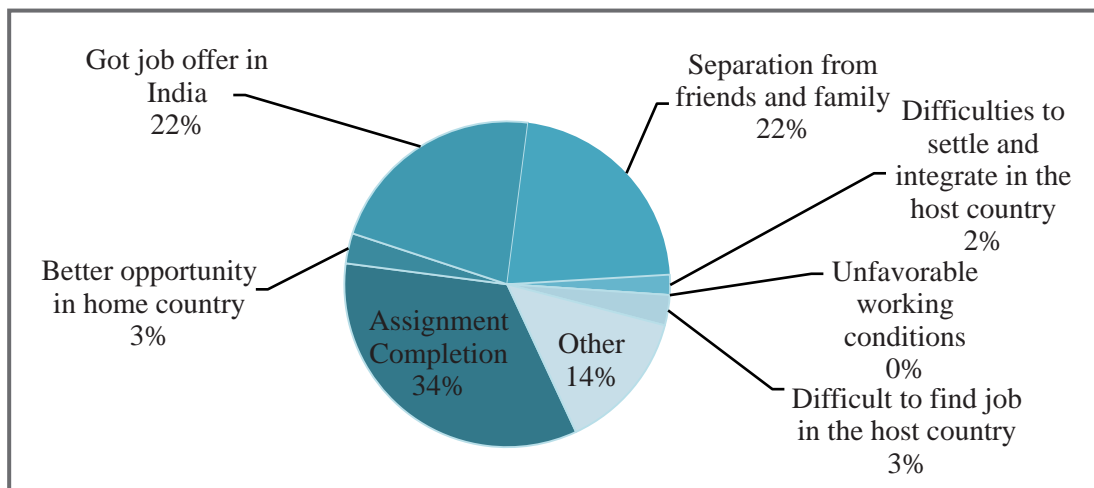


Motivation to return back, experiences after returning back and network & linkages:

Return migration of knowledge worker is generally considered advantageous for both home country and returnees. Returnees' social status lifts up and their experiences gained from abroad benefited them in jobs. Second returned knowledge worker are bearer of knowledge, skill and transnational linkages which could be assets for the development of home country. This section examines the motives to return back, experience after returning and network connection and linkages which they maintained after coming back.

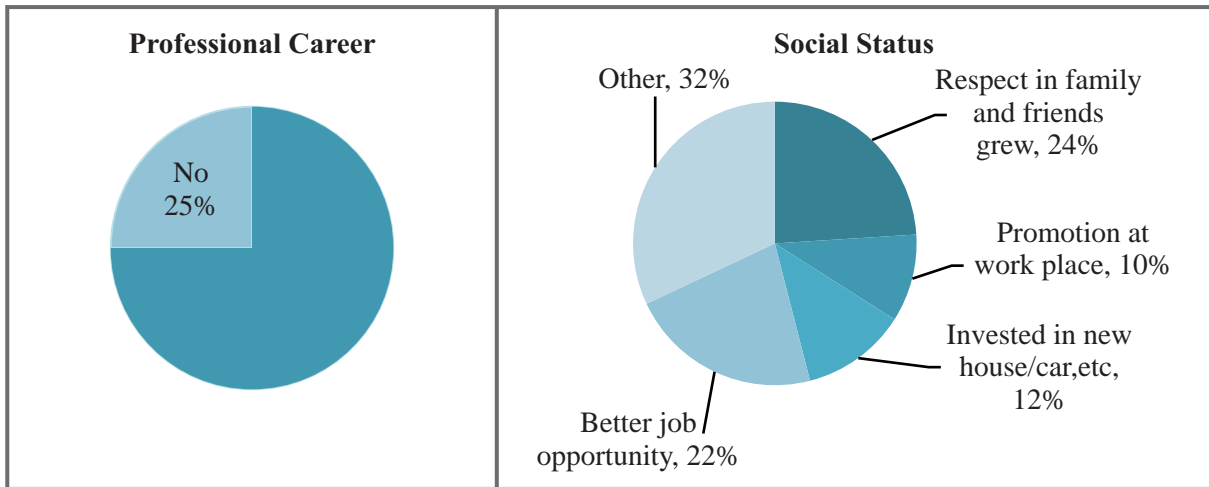
Fig-15 presents picture about reasons to return to the home country of respondents. 34 percent of the returnees cited 'Assignment completion' as the main reason to return to India whereas 22 percent received a job offer in India, around the same number of returnees wanted to be with their family and friends. Some migrants found it difficult to get a job and integrate in the host country.

Fig-15 Motivation to return to India



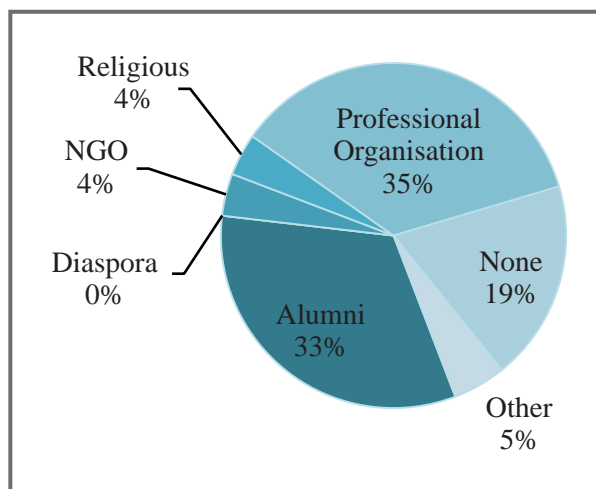
According to our sample, more than 50 percent returnees admitted that their living standard improved after coming back. Almost one forth returnees respect increased in family and friends. Around 75 percent confirmed rise in their professional growth after returning to their home country (Fig-16). Beyond this, other advantages include promotion at work, better job opportunity and investments

Fig-16 Professional career & social status after return



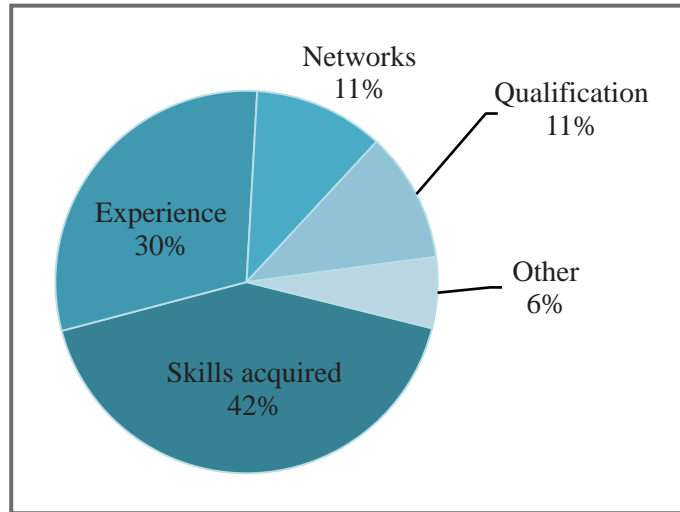
It is evident from the Fig-17 that two- third of returnees have maintained connection with one or the other network. around 68 percent of the returnees joined professional organisations and alumni networks which accounts for an upsurge in the professional career of the returnees and sharing of knowledge. More than half returnees faced difficulty after coming back to India. They shared their experiences in feedback, which would be discussed later.

Fig-17 Networks after return



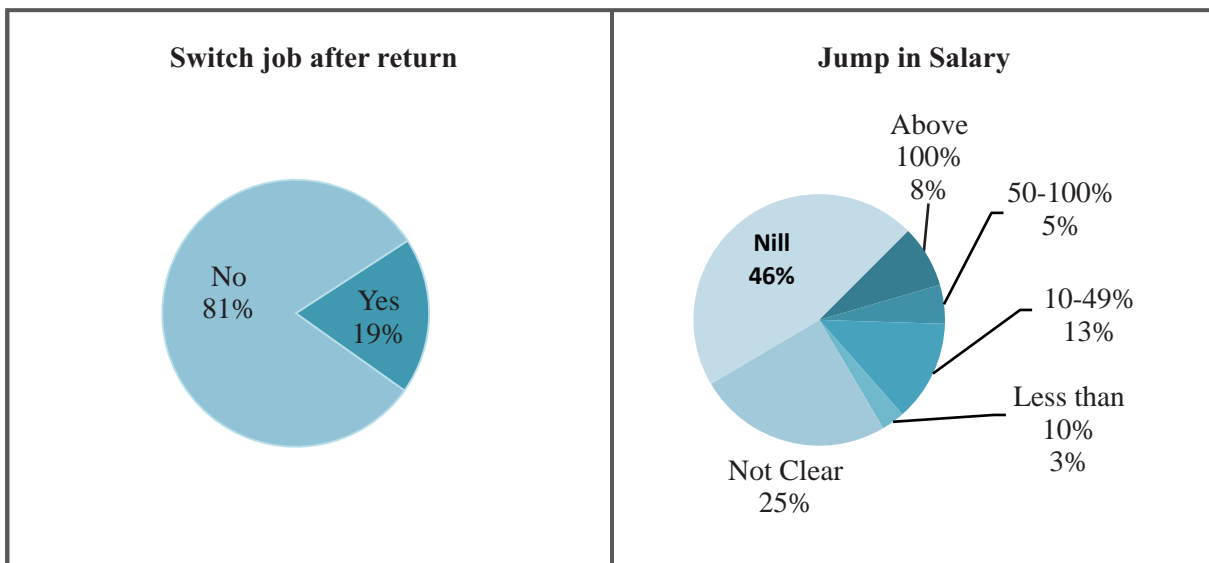
About the question of what thing helped returnees, when they joined their work after coming back. 95 percent of returnees answered that skill, experiences, qualification and network, which they have gained from the host country, helped them widely (Fig-18)

Fig-18 Things helped returnees after coming back



Over 81 percent of the returnees pursued the same job they joined after return, possibly a large number of majorities encouraged by their employer to go abroad for advance knowledge. 19 percent returnees whose had to switch jobs after returning most probably they were students.

Fig-19 Switch job after return & jump in Salary

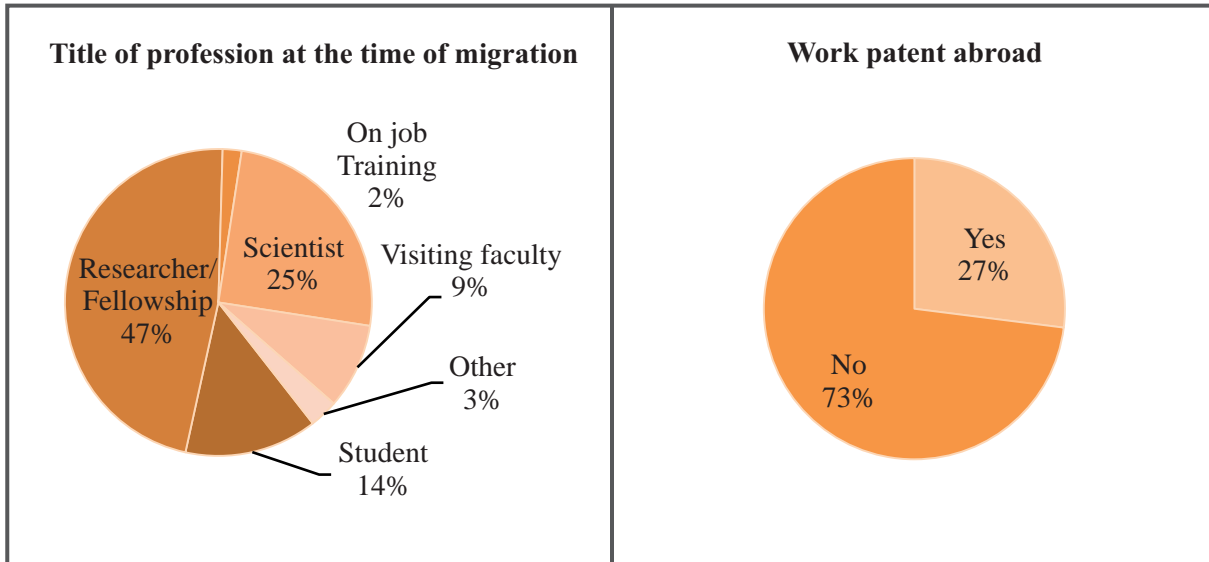


Around 29 percent of respondents benefited through jump in salary after returning whereas 46 percent respondent did not get any increment in their salary. Some of returnees' salaries leap above 100 percent (Fig-19) In addition, 46 percent of returnees would consider moving abroad again if they got an opportunity. They preferred to go USA, Japan, South Korea Malaysia, and EU countries like – Germany, United Kingdom, and Netherland.

Intellectual Property right on the returnees output and connection with host countries

The returnees interviewed held different professions during the time at which they moved abroad which includes Scientists, visiting faculty, students, researchers on fellowship, and others as described in the Fig-20. On the question about patent shows that only 27 percent returnees had patent.

Fig-20 Title of profession & work patent abroad



Around 56 percent returnees confirmed that the work/tasks/patents/research performed abroad was jointly owned by the returnee and the host organization. The host and the parent organization owned 19 percent and 11 percent of the projects respectively (Fig-21). Over 60 percent of the researchers were aware of the ownership issues before leaving for abroad (Fig-22) and 88 percent of the returnees have direct access to the output of their work abroad (Fig-21).

Fig-21 Ownership of work & access to output data

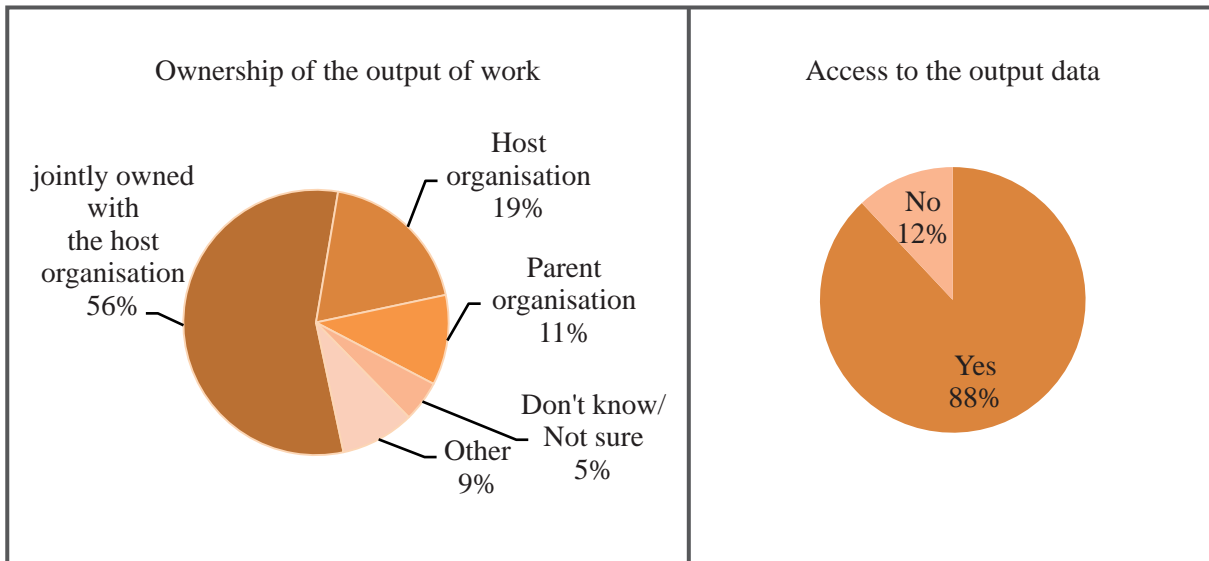
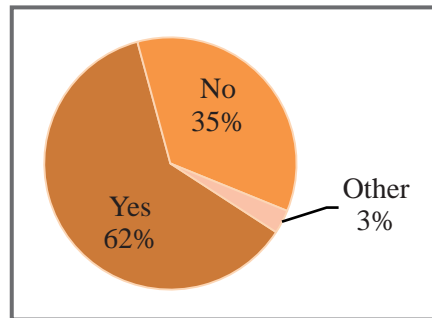
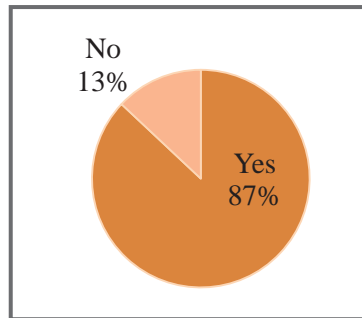


Fig-22 Awareness about ownership issues



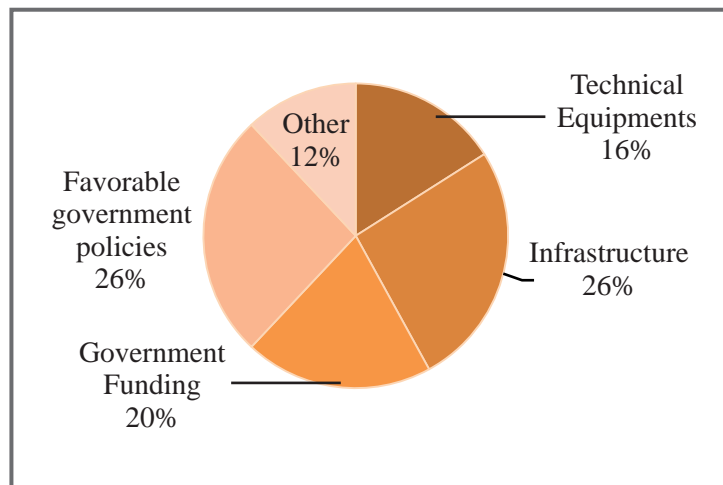
It is considered that connection or linkages with host country of returnees are assets for home country in term of knowledge transfer. The study found that 87 percent of returnees maintained their contacts in host countries after coming back (Fig-23).

Fig-23 Maintaining contacts with the host nation



According to the returnees, there are certain areas/fields in India like government policies, infrastructure, technology, government funding, and others which demand dire improvement.

Fig-24 Fields need improvement in India



6.2 Interviews Result

We have conducted 11 face-to-face detail interviews with scientist and students of various backgrounds and laboratories under CSIR, INSA and DST. Apart from these governmental bodies, we went Indo-French (CEFIPRA), Indo German (BMZ and GIZ)) and Indo-US (IUSSTF) like international organization to understand the various research questions, which results are following.

- I. Maximum numbers of Interviewees joint professional organization or alumni. They consider that these networks are good source of knowledge and platform to exchange valuable ideas and research work. However, a few of them believe that networks are of the importance only when you require them.
- II. All of the research papers and journals published by these scientists were owned by the host university/institute. Though they can use the results but need permission to get their work patented
- III. Many interviewees told that despite being highly qualified and in a high position considered 2nd class citizens in abroad. However, they are not treated as a lower class.
- IV. PD Fellows / Associates were offered \$2000-\$5000, according to the rules. While the locals and individuals from similar countries are directly offered the highest, the rest have to bargain for the maximum. Only a very few people know about this and gladly accept what's being offered.

7 Concluding Remarks

Human migration is an inevitable phenomenon in the modern era. Through a change in strategy, sending countries, now a days, implement policies which might reap benefits through migration. These policies not only invite investment but also focus on skill development and knowledge transfer. As examples India, China and Taiwan have initiated several policies to foster return migration of knowledge workers. China and Taiwan are ahead of India in taking advantage from return migration. Actually, China and Taiwan organized migration in a planned manner. China emphasized on sending post-graduate students to study abroad as a mean of training high level personnel and encouraged migrating students to choose such fields of study which were significant for the development of China. It ran 100 Talents Program, Recruitment Program of Global Experts, CAS Fellowships, and Cooperative Programs for absorbing outstanding returnees in its educational and research institutions. Likewise Taiwan also initiated several scholarships to persuade overseas scientists and post-doctorates to conduct research in Taiwanese Institutes and contribute to the development of Taiwan. Both countries offered major incentives like high salaries, excellent research facilities, duty free imports etc. to highly skilled returnees. They stressed on internationalization of their higher education. On the other hand there is no clear strategy in Indian for reaping maximum benefits through migration. Indian educational institutions and research institutions hardly attract overseas students and scientists because they fail to provide attractive incentives to outstanding talents. India has not been successful in attracting migrants to return back in education and R&D sectors. Our study shows that only 19% faculties in Indian institutions posses foreign PhD degrees. India began to pay attention on its diaspora too late and it focused on investment inflows in business more than in education and R&D.

China and Taiwan not only provide attractive incentives to outstanding returnees, they also provide help in rehabilitation of returnees who bring new technology, tacit knowledge and advance machineries back to their country while India does not have such a program. But on the other hand, learning from China and Taiwan, India took significant steps to increase diaspora contribution in inflow of capital and technology in the business sector. In this order India established Science Parks & Research Centers in the line of New High Tech Development Zones and Technology Incubator Centers of China and the Taiwanese Hsinchu Science Park. Apart from this setup the Indian government has set up several Special Economic Zones which provided tax exemption, subsidies and other facilities to overseas entrepreneurs. India established the Ministry of Overseas Affairs in 2004 to coordinate activities with diaspora related to the flow of remittances, investment, and technology. It launched the Overseas Indian Citizenship Card for persons of Indian origin (the card provides exemption from registration with foreigners' regional registration office for any length of their stay in India) so that diaspora could contribute in the economic development of India. China initiated the Multi-entry Visa Scheme for overseas Chinese.

We conducted an online survey in order to assess Indian migration status. Some of our cardinal findings are:

- Indian knowledge workers' migration is determined by skill development opportunities, access to advanced technology, better job opportunities, and desire of acquiring higher education.
- Most knowledge workers prefer to go to a developed country because they get high remuneration, better working environment and better infrastructure over there.
- Mostly migrants do not get any social security in the host country. However, many migrants receive medical insurance. It may be possible that most of the respondent returnees went abroad in sponsored assignments so they only got this facility.
- In our study we saw that one-fourth of returnees faced various types of problems during their stay abroad like discrimination, medical issues, legal issues and social security. Some returnees also complained about visa issues. Two-thirds of respondent returnees did not face problems abroad. This probably happened due to healthy and strong bilateral relations between India and the host nations.
- Maximum numbers of knowledge workers returned back to the home country because of 'Assignment Completion' but other reasons also stimulated them to come back for example separation from friends / families and better job offer in India.
- Often returnees maintain connection with host countries by joining alumni and other professional organizations that are beneficial for both the individual and home country.
- Return migration of knowledge workers is beneficial for individual returnees. Their social status rises and their experiences abroad benefit their career. However, only 10% of returnees accepted that they got promotion in their jobs.
- Returnee's knowledge, skill, and transnational linkages are beneficial in the development of the home country. It is also recognized that the length of stay abroad is meaningful in the

development of home country. Since, long periods of residence abroad help to acquire new technologies and to develop knowledge network which is very significant for future development. Our study shows that more than half returnees stay abroad for short periods, which probably was not very beneficial. Only 45% went abroad for more than 3 years.

- Most of the returnees join alumni and other professional organizations so that they can update their knowledge and skills. Data shows that maximum number of returnees maintained contact and linkages with host countries but we don't have such data that we may accurately calculate how much India benefited from them.
- Rate of returning knowledge workers in India is very low because returnees face various problems after coming back- poor infrastructure, poor technology, unfavorable working conditions, and lengthy unsupported bureaucratic hassles. Such hurdles leave the Indian knowledge worker uninspired to return back.
- Most migrating knowledge workers do not know about Intellectual Property Right' (IP) before leaving the country. They face IP related issues on their output during the stay abroad. Therefore, they work in host country and come back without exercising ownership right on the output of their work. This means they do not have the right to use their own output. Our study noticed that a number of returnees either don't have patent/copyright on their work or their work is conducted under intellectual property right contracts in which all rights are reserved by host organizations alone or jointly with the parent organization.
- Finally, benefits from return migration in Indian are not substantial as assumed, despite Indian migrants hoisting the flag of success abroad. A wide range of measures and programs need to be implemented to facilitate return migration. As part of the effort the country needs many incentive schemes for returnees and support measures to make flexible the existing administrative barriers so as to initiate or promote the return of knowledge workers. Indian policy-makers and institutional-leaders need good knowledge of host country patent/intellectual property right/copyright laws so that may assure Indian knowledge workers' ownership rights on their work abroad and be able to define ways in which the newly generated knowledge can be used in favor of Indian development. In addition India should learn from China and Taiwan because they have implemented a long term systematic policy to benefit from migrant knowledge workers.

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ANNEXURE 1: Feedback of Respondents

Personal Matters

- I came back to India for my daughter's education. This is one of the important reasons for me to return to India.

Leadership

- The younger generation speed of work is faster than elders and we have many creative skill, knowledge, expertise, and concept, which have to be nurtured. As for as the R&D is concern, in each Institutions, we need creative, competent, enthusiastic and dynamic leaders who ignite and pursue action with mission mode approach.
- Leadership is very important and head of the organization has great role to play for the development, improvement, innovation to compete globally.

Change of Mindset

- Nothing still, we need to change the mind set.
- We need to change our attitude.
- One needs to take responsibility. Need improvement in completing the commitment with dedication and sincerity. Yet, mostly, punctuality is taken it granted and we need changes in most of the system.
- Work honestly.
- The work culture is the biggest issue in India. The problem of politics in science and the fascination for awards is the biggest disincentive here.

Organizational hurdles/Bureaucracy

- The organizational set up in this country is to give due importance to seniority v/s ability. Young people with new ideas are seldom encouraged in government set up and people returning from abroad are seen as competitors to existing staff in scientific institutions and are intentionally suppressed denying them of even the meager facilities that exist here in India.
- Our parent Institution do not recognize our training/experience abroad and try to block us from progressing/keeping contacts by not signing an MOU. They prevent you from writing combined projects/in-house or abroad.
- Dirty bureaucracy prevents us from doing science in India.
- Also there is general confusion in our country on what a faculty member or researcher should do, and he/she is largely burdened with various administrative duties and bureaucracy. This affects the productivity. Hence while opening up funding is a positive step but the system is still very inefficient relative to western countries. Also researchers are compensated according to their "rank", which is benchmarked against the bureaucracy of the country. What is required is a system that is compensates a researcher's worth, estimated in terms of his/her productivity, with a positive reward for doing more.
- In summary, we were two decades backwards some two decades back now may be pushed to three or four. Please cut down the bureaucracy, the sycophancy and the mentality that everything foreign is better.
- Many researchers with high qualifications complain that it is easier to get high standard international funding, even where the success rate is very low, than to get within India. Often, merit takes back seat in India.

- In my case, I have co-ordinate even European Commission projects through call for proposals, where the success rate declared was 5% and review was double blind. However, it is extremely difficult to get funding from MoEF, India or any other Government agencies in India.
- There have been occasions where I have been asked to re-submit proposals when the call is announced only to realize that my proposal has already been sanctioned to other NGOs. Even part of my published work, including a conceptual framework developed by me, has been re-published in a 'State of Environment Report' (of 2009) word by word, without citing any reference to my published work. My complaint regards this have not been entertained. Unless such plagiarism is plugged by government agencies and copyrights of researchers are protected in all seriousness, it is difficult to get good quality, merit based research from Indian researchers. It is not merit but due acknowledgement of merit that we lack. I write this without any hope that I or my statements shall receive any serious consideration.

No freedom of collaboration/ Invitation of foreign scientists/ Free movement S&T workers

- Most government funding in India comes with very strict boundaries of action. For me, a theoretical physicist, perhaps the most problematic thing of being back in India is that I cannot invite my foreign collaborators to visit me at my institute even though I have grants of my own. I think the Government should seriously reconsider the policies that curtail the free movement of foreign scientists in India and show an initiative by having more grants which allow the invitation of foreign scientists by research institutions and universities in India.

Quality of Students/Manpower

- Funding is much less a problem in India compared to what it was 10 years back. I have never been stifled in my work for lack of funding. What is however a problem is QUALITY manpower... research students one can work with?

No reward for acquiring higher skills

- Better facilitation and rewarding for having acquired knowledge does not exist
- Recognition for the work done in India/Abroad and enhancement in wages and change in the stram of grades.

Collaboration, Trust and mutual respect

- The trust levels among Indian researchers are very low and mutual respect for others work is almost non-existent.
- Exposure to international community is still at dismal levels for those doing doctoral research. They can hardly visit any international conferences and the ones organized in our country are of very poor quality.

Vision and Planning

- Lack of vision as well as planned approach in Indian science makes things very difficult for scientists and researchers.
- Return migrants should be taken as assets to the system and should be given opportunity to use their skills they earned from abroad. This is possible by facilitating them by providing congenial and healthy environment. Smooth functionality and less burden from bureaucratic procedures.

Quality of output

- The lack of Indian publications of quality it really going to affect the growth of Indian science.



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