

Science & Technology Scoping Study: Identifying Areas of Cooperation between Ireland and India

Department of
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Science & Technology Scoping Study: Identifying Areas of Cooperation between Ireland and India

Report submitted to:
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Contents

Foreword	
Acknowledgements	
Executive Summary	7
Background	9
India - An Outline	11
The European Union and India	16
Modes of Cooperation: Learning from Experience	22
India - Ireland Cooperation	26
Prospects for Collaboration	39
Recommendations	43

Appendices

1 Objectives and Methodology	47
2 Questionnaire	49
3 Other Collaborations	52
4 Prominent Indian S&T Institutions	53
5 Central Universities in India	68

Foreword

Much has been written about the traditional educational links between Ireland and India, but whenever one falls back on the word “tradition” it usually implies that there is not quite so much taking place in the here-and-now.

The purpose of this report is to focus attention on the fact that India and Ireland are at a critical moment in our S&T and educational relationship. While Irish people are proud of the input which Irish teachers made in India over the last two centuries to education and the furtherance of the spirit of scientific enquiry, and many Indians are proud to have attended schools run by Irish men and women, these links are dwindling with the passage of time. Unless Ireland and India can invent new forms of cooperation which are in keeping with our own times and the global and digital economy, the whole concept of educational exchange, and the immense goodwill that went with it, will soon become only a fond memory.

India is very actively engaging in scientific cooperation with many countries around the world. Global interdependence and environmental challenges are such that it is in the direct interest of Ireland and other countries to help India overcome the problems associated with sustainable development.

Despite the advances which India has achieved in many areas of science and technology, and the stature attained by its IT, life sciences and other industries, it still faces serious challenges to its development. India is a very large and populous country as well as the world's largest democracy. Its leaders have rightly and implacably identified the country's economic development and inclusive and sustainable growth as their main priority. Ireland is in a very good position to assist. We have the added advantage that we can also easily identify with India's ambitions: not so many years' ago, Ireland was an underdeveloped country and we know the cost in terms of lost human potential, emigration and wasted lives.

We are convinced that India can learn a great deal from Irish scientific research, our knowledge economy, and the close symbiotic relationship between Irish educational institutions, and entrepreneurial and industrial development. This exercise is far, however, from being a one-way street. Ireland can also benefit from cooperation with the wide spectrum of cutting-edge research taking place in Indian Institutes of Technology, Universities and laboratories, and draw inspiration from the commitment of many thousands of Indian scientists to individual excellence. Ireland now has a unique opportunity to form a close bond with a rising scientific and technological star.

The Irish Government has commissioned this report from the National Institute for Science, Technology and Development Studies. It studies the capacity of the scientific establishments in both countries to work together, identifies specific areas of future scientific cooperation and sketches out the kind of mechanisms we need to make it work. I would like to thank NISTADS and in particular the author of the report, Dr Praveen Sharma, for focusing so unremittingly on the task they were assigned.

I would also like to pay tribute to the Indian Ambassador to Ireland, Mr P.S. Raghavan, who has worked indefatigably to develop the educational and scientific links between our two countries. Without his efforts, we would not have come as far as we have.

Kenneth Thompson

Irish Ambassador to India

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I am grateful to the Embassy of Ireland, New Delhi for giving me the opportunity to carry out this project. I am especially obliged to His Excellency Mr. Kenneth Thompson, Ambassador of Ireland in India for his constant support and able guidance during the study.

I would like to express my special appreciation for the contribution of all the Irish and Indian respondents who have provided valuable inputs through the questionnaire survey and personal/telephonic interviews.

I would particularly like to thank Mr Prashant Shukla of the Ireland India Council, Dublin; Dr. Satheesh Krishnamurthy, Dublin City University and Ms. Marie Heraughty, formerly also of DCU; Dr. Michael Loftus, Dr Niall Smith, Dr. Clair Nadkar, all from Cork Institute of Technology; Dr Mani Ramaswami and Dr Kenneth Irvine of Trinity College Dublin; Dr Satish Kumar of Queen's University Belfast; Dr Ruth Freeman of Science Foundation Ireland; Dr Sanjay Aggarwal of the Indian Institute of Technology, Kanpur; Dr Eoin Gahan of Forfás; Prof Patrick Cunningham, the Chief Scientific Advisor to the Irish Government, Mr Aidan Hodson of the Department of Enterprise Trade and Innovation and Dr Philippe De Taxis Du Poet, Delegation of the EU to India, for all their support and comments.

I am also grateful Dr Vasudha Garde, Dr (Mrs) K P Adhi, Dr. A. Shaligram, Dr P. B. Vidysagar and Dr. C. V. Dharmadhikari for their guidance and valuable inputs during my discussions with them at the University of Pune.

Finally, I gratefully acknowledge the help extended by my Institute, NISTADS for facilitating my work by providing administrative and other support.

Praveen Sharma

New Delhi - Year 2011

Executive Summary

To achieve leadership in niche technology areas, relying totally on domestic expertise and competence may not be enough. For global leadership, we need to expand the programme by getting hold of international expertise. This can be in the form of expert advice at various stages of project development and implementation, involving international companies for commercialization on a global scale, and engaging research institutions across the globe where needed. It is increasingly felt that bilateral cooperation can help introduce sophisticated technologies into the scientific and industrial infrastructure of a country.

NISTADS was tasked to carry out a Science & Technology (S&T) Scoping Study: "Identifying areas of cooperation between Ireland and India" by the Embassy of Ireland in India. The underlying objective was to identify apparent and practical opportunities for cooperation.

A report by the Irish Advisory Science Council on Ireland's International Engagement in Science, Technology and Innovation was done in 2008 (www.forfas.ie). One finding of the Forfas report is that scale and scope of existing Ireland-India research linkages is lower as compared to other countries, with a small number of partnerships/activities focused on India. Respondents of a survey done for the above report mention India as a potentially important partner country. But the funding mechanism and other frameworks for the bilateral collaboration are not very clear to Irish researchers. One recommendation of the report is that reviews should be undertaken to facilitate Science Technology Innovation (STI) collaboration between Ireland and countries like USA, China and India.

Despite many visits and agreements at Government and Institute level, the S&T relationship between Ireland and India has been limited to sporadic collaboration of the most elementary kind. Reasons for slow-moving advancement in collaboration could be:

1. Concerned S&T community in both countries is not aware of the collaboration potential.
2. Dissemination of opportunities has not taken place.
3. Research funds are not available / allocated.

We need to develop knowledge partnerships resulting in bilateral collaborative S&T projects. It is apparent that Irish S&T workforce can gain a lot from access to the Indian know-how and Indian counterparts can likewise gain from European expertise by interacting with Irish S&T.

The Indian workforce is also one of the world's youngest, adding to India's attractiveness. The working age population is estimated to rise to 70% of the total population by 2030. By then, the country is expected to have an additional 200 million people entering the job market. In India, the large English speaking workforce is a benefit to collaborators. India's diverse cultural heritage is also an advantage; Indians are at ease with people from other cultures.

As identified from agreements signed, recent visits by delegations from Universities and the few bilateral workshops that have been held, the following research areas emerge as potentials for future research programmes:

- Life Sciences and Bio Technology.
- Information and Communication Technologies.
- Sustainable Energy and Energy-Efficient Technologies.

A few key recommendations of this study are:

1. There is a need to revive/stimulate the earlier MoUs with DST, INSA and NASSCOM. Efforts should be made towards extending the scope of the collaborative research programmes so that they are socially and economically beneficial to both countries [Forfas Report].
2. A small team of 2-3 persons should monitor the activities promoting Ireland-India S&T collaboration. Apart from acting as a regular agency to highlight each other's S&T strengths, this may function as a repository of data on S&T infrastructure and personnel. This can be created within existing structures and resources, with a dedicated nodal cell.
3. Educational interweaving should be promoted through mutual recognition of degrees/certificates, student / faculty exchanges, research tie-ups etc.
4. Step up the level of funding for bilateral S&T collaboration through enhanced government support coupled with fund raising from the industry and expatriate communities of both countries. Activating funding in already existing projects will boost the prospects.
5. Participation in international research programmes like Seventh Framework Programme (FP7) could strongly complement bilateral efforts as well as generate tri-national collaborations. The European Union has prioritised Science and Technology in its Strategic Partnership and Joint Action Plan with India.

Report - Forfas Country Review- India, 2010 entitled '*Key Economic Partnerships*'

Background

The 'Ireland-India S&T Cooperation Agreement' was signed in January 2006 during the visit of the then Taoiseach to New Delhi. It was ratified in 2008 and is now in force.

In May 2009 a high ranking delegation led by Dr. Ramaswami, Secretary Indian Department of Science and Technology (DST) including senior representatives of the Indian Institutes visited Ireland and signed a programme of Cooperation which intends advancing implementation of the agreement.

Besides the government-to-government agreements, a few inter-institutional accords have also been signed. Some significant accords are:

- Agreement between Science Foundation Ireland (SFI) and the Indian National Science Academy (INSA).
- Agreements of Trinity College Dublin (TCD) with Tata Institute of Fundamental research (TIFR) and National Centre for Biological Sciences (NCBS), Bangalore, India.
- Agreement between the Irish Software Association (ISA) and National Association for Software Services and Communications (NASSCOM) India.
- Agreement between Cork Institute of Technology (CIT) and University of Pune (UoP).
- Collaboration agreements of Dublin City University (DCU) with the Indian Institute of Technology (IIT) New Delhi, Indian Institute of Science (IISc) Bangalore, National Physical Laboratory (NPL) New Delhi and National Institute of Technology (NIT) Surathkal, Karnataka.
- Recently, Indian Institute of Technology, Kharagpur invited premier Irish Universities/Institutions to collaborate on research projects and engage in student & faculty exchanges, as part of their Institutional Development Program.

"There exists a lack of knowledge of the S&T strengths and focus areas of each other on both sides."

Embassy of Ireland, New Delhi

As seen from the above, there have been numerous efforts from both sides in the recent past to stimulate bilateral cooperation. The potential of collaboration is enormous, and suitable allocation/ utilization of resources like funds and manpower support can do marvels to S&T development in both countries. The designing and implementation of concrete projects need to be explored.

It has been observed that one bottleneck is lack of information about the opportunities and avenues of collaboration. Recognising the immense potential for collaboration, the need was felt to carry out a scoping study with the aim of identifying areas of cooperation between Ireland and India.

This document includes a record of S&T agreements done at Government and agency levels, extent of implementation, and interviews with personnel involved in bilateral S&T activities. An account of the success accomplished so far in bilateral S&T efforts has been included. A brief outline of Indian publication activity and international collaboration activity is presented. Moreover, the research areas with collaboration potential have been mentioned.

India – An Outline

Economy

India is an emerging economic power with vast human and natural resources, and a huge knowledge base. It is a massive \$ 1.25 trillion economy.

Like the Celtic Tiger, India's growth has also been impressive during the last decade. It has weathered the world financial meltdown quite successfully and its economy has continued to grow at more than 7% a year.

In 1991 India began transiting from a command economy into a market oriented economy. Ever since, the process has continued unhindered. Economic liberalisation and need for foreign investment is accepted by all political parties today.

The country has a federal structure of governance based on universal suffrage. The courts enjoy sovereignty, and public freedoms are manifested through a powerful print and electronic media.

Provincial governments, called state governments, enjoy a fair degree of autonomy in economic matters. Both the central and state governments promote foreign investment. English is the business language in India and the large English speaking workforce is a benefit to collaborators.

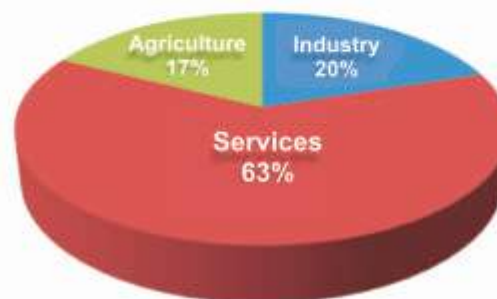
According to demographic projections, India would have an upper edge compared to any other nation in terms of working population in coming years. The current size of the labor force is half a billion workers. In the decade 2010-20, India will add another 120 million people in the working age-group. Indian workforce is also one of the world's youngest, adding to India's attractiveness.

S&T Infrastructure

Over years of developmental investments and democratic public governance, India has experimented with and evolved a complex web of S&T infrastructure. The S&T infrastructure is governed by central ministries, ministries of the state governments, structures under the local governments of the Panchayati Raj Institutions (PRI), public non-profit systems including universities/schools or training schools, several regulators in both the centre and the states, the institutions of audit, the complex web of legal institutions, the federated structures of law-making institutions, scores of establishments in both public sector and public-private cooperated sectors, private sectors entities, foreign investments in R&D and other science-related developments, and private charities. Many a times the governance structures overlap and interpenetrate.¹

¹ <http://www.mistads.res.in/indiasnt2008/>

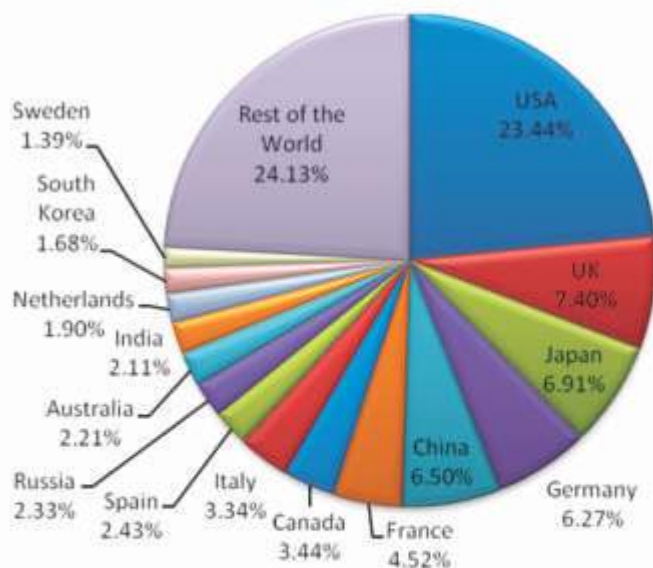
Sector distribution in Indian Economy



The S&T infrastructure is made up of close to four thousand research and development organizations, large organized systems of knowledge production, millions of knowledge-workers and an even larger number of citizens trying to engage in knowledge-based activities.

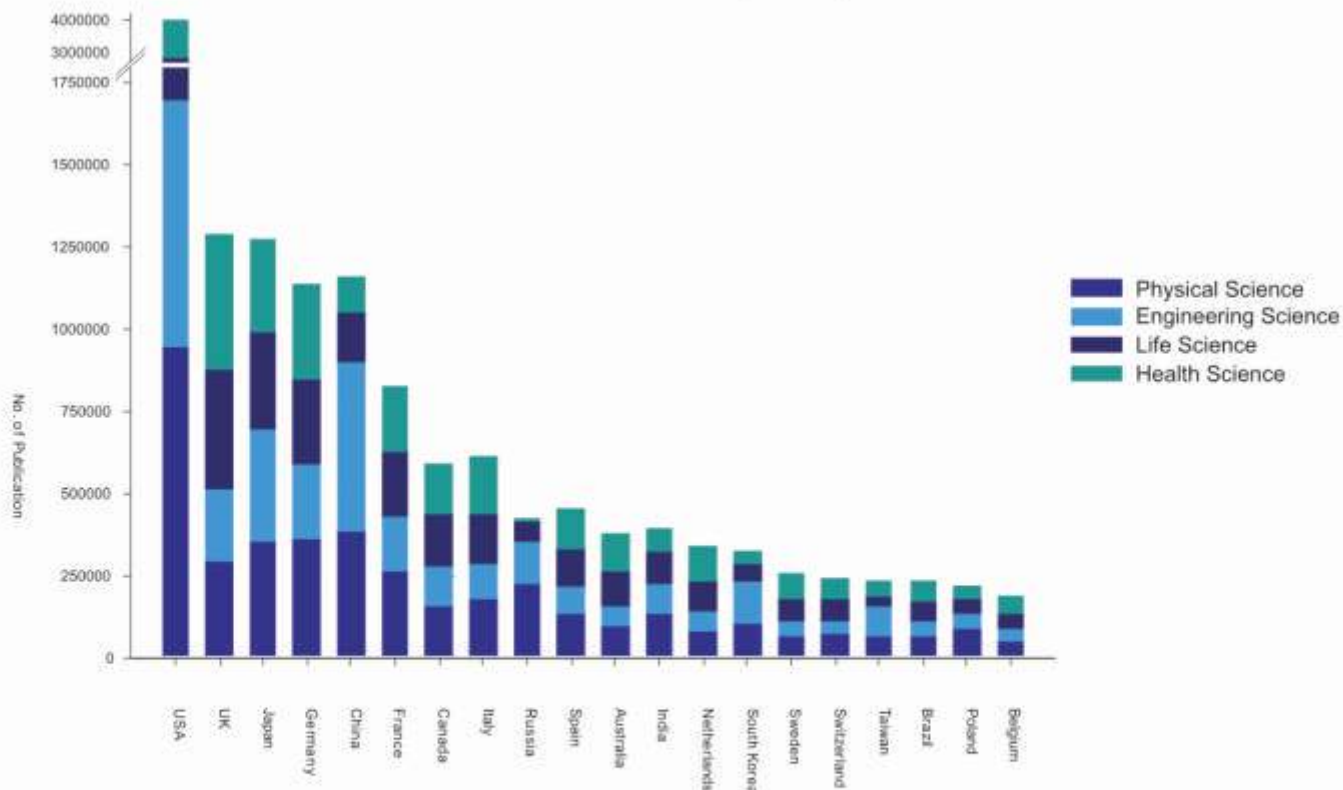
India ranks 12th among the top 20 productive countries in science and technology, with a global publications share of 2.11%, as computed from cumulative world publications data for 1997-2007.

The potential for Ireland-India S&T collaboration is immense and invigorating and holds enormous promise.



Global Publications Share

Broad Discipline wise Output of Top 20 Productive Countries as reflected in their Cumulative Publications Output during 1997-2007



Top 35 Productive Institutions in S&T in India, 1997-2007

Affiliation	1997- 2007	TP	TC	ACPP	h-index
Indian Institute of Science (IISc), Bangalore		12856	44081	3.43	82
Tata Institute of Fundamental Research (TIFR), Mumbai		4954	31870	6.43	76
Indian Institute of Technology (IIT), Kanpur		5996	18246	3.04	59
National Chemical Laboratory (NCL), Pune		3987	19023	4.77	59
University of Delhi (DU), Delhi		9664	24237	2.51	57
Indian Statistical Institute (ISI), Kolkata		4158	11923	2.87	56
University of Hyderabad (UOHYD), Hyderabad		4716	14160	3	55
Indian Institute of Technology (IIT), New Delhi		7604	15898	2.09	52
Indian Institute of Technology (IIT), Mumbai		6799	17154	2.52	51
Indian Institute of Technology (IIT), Chennai		6678	12986	1.94	51
Punjab University (PU), Chandigarh		2760	11004	3.99	51
All India Institute of Medical Sciences (AIIMS), Delhi		7893	19014	2.41	50
Indian Institute of Technology (IIT), Kharagpur		6565	15157	2.31	50
Bhabha Atomic Research Centre (BARC), Mumbai		6059	17385	2.87	50
Indian Institute of Chemical Technology (IICT), Hyderabad		4013	17775	4.43	50
University of Pune (UoP), Pune		2870	10103	3.52	47
Indian Association for Cultivation of Science (IACS), Kolkata		3095	11590	3.74	46
Jadavpur University (JU), Kolkata		4492	10541	2.35	45
Banaras Hindu University (BHU), Varanasi		4993	9985	2	44
University of Madras (UNOM), Chennai		3715	8125	2.19	38
Saha Institute of Nuclear Physics (SINP), Kolkata		2030	6080	3	37
University of Mumbai (MU), Mumbai		2331	5389	2.31	36
Jawaharlal Nehru University (JNU), Delhi		2013	5363	2.66	36
Anna University, Chennai		3429	6626	1.93	34

Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Bangalore	824	3607	4.38	34
Aligarh Muslim University (AMU), Aligarh	2387	4090	1.71	32
Karnataka University, Dharwad	1297	2968	2.29	31
Central Drug Research Institute (CDRI), Lucknow	1712	4255	2.49	30
Rajasthan University, Jaipur	1938	4753	2.45	29
Indian Agricultural Research Institute (IARI), Delhi	1928	3193	1.66	29
National Physical Laboratory (NPL), Delhi	1661	3603	2.17	29
Andhra University, Hyderabad	1462	2084	1.43	23
Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh	865	1495	1.73	20
Indian Institute of Technology (IIT), Roorkee	3091	6386	2.07	18
Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam	919	1126	1.23	18

TP – Total Papers, TC – Total Citations, ACPP – Average Citations per Paper
[Source: <http://www.nistads.res.in/indiasnt2008/t5output/t5out1.htm>]

Publication activities

Collaboration in S&T publication is a good indicator of the overall level of collaboration in aspects of Science and Technology activities.

The Scopus database was scanned in order to gauge the level of collaboration in the production of scientific papers between India and various European Union countries. Country level data in the adjoining table reveal an extremely low level of cooperation between Ireland and India. The picture at the institute level is equally dismal. For the sake of brevity, Institutes with publication output of more than 100 were selected. As evident from the table overleaf, none of the Irish institutes qualified for the selection and only four Irish institutes registered scores in double digits.

The reason for this state of affairs could be a lack of initial contact between Irish and Indian scientists or a lack of co-operation efforts.

Country collaborating with India	No. of papers during 2004 -08
Germany	4,383
UK	4,161
France	2,581
Italy	1,420
Netherlands	993
Spain	780
Sweden	662
Poland	506
Belgium	505
Austria	369
Czech Rep.	362
Denmark	317
Finland	312
Portugal	297
Hungary	264
Ireland	206
Greece	203
Romania	159
Bulgaria	116

[Source: Scopus]

EU and Irish Institutes Collaborating with India

Institute	Country	Papers during 2004-08
University of Manchester	United Kingdom	221
Imperial College	United Kingdom	176
Darmstadt University of Technology	Germany	165
Blaise Pascal University	France	160
University of Bonn	Germany	158
Lund University	Sweden	153
University of Cambridge	United Kingdom	153
Lancaster University	United Kingdom	148
University of Southampton	United Kingdom	146
University of Barcelona	Spain	137
University of Freiburg	Germany	136
University of Amsterdam	Netherlands	136
University of Mainz	Germany	135
University of Birmingham	United Kingdom	132
Ludwig Maximilian University	Germany	130
Institute of Physics	Czech Republic	124
Charles University	Czech Republic	124
Uppsala University	Sweden	124
Czech Technical University	Czech Republic	121
University of Oxford	United Kingdom	118
University of Paris VI and VII	France	115
Physikalisches Institut.	Germany	113
University of Liverpool	United Kingdom	109
University of Aberdeen	United Kingdom	107
University of Reading	United Kingdom	107
University of the Mediterranean	France	102
University of Wuppertal	Germany	100
University College London	United Kingdom	100
University College Dublin	Ireland	46
University College Cork	Ireland	22
Dublin City University	Ireland	17
Trinity college	Ireland	15

[Source: Scopus]

The European Union and India

The EU and India enjoy a close relationship. In recent years, the relationship has developed exponentially in terms of shared vision, goals and challenges. India-EU relations have existed since 1962 when India became one of the first countries to establish diplomatic relations with the then six-member European Economic Community.²

The 1994 cooperation agreement signed between EU and India took bilateral relations beyond mere trade and economic cooperation. Together with the Joint Political Statement signed in 1993, it opened the way for annual ministerial meetings and a broad political dialogue. The EU-India Annual Bilateral Summit, first held in 2000, provided an apt platform for political dialogue between the two global entities and paved the way in 2004 for a concrete strategic partnership between the EU and India. The Summit marked a watershed in the evolution of EU-India relationship. Since then there have been many Summit-level interactions and meetings at all levels – including business and civil society – and extensive dialogue and cooperation on political, geo-political and multilateral issues, economic and trade questions.

After the landmark Summit in 2004, relations have taken the form of a Strategic Partnership, making India one of the EU's select global partners. This is seen as a qualitative transformation in the way EU and India started working together in partnership with the world at large. The Joint Action Plan adopted in 2005 and revised in 2008 to reflect the new major global challenges has significantly reinforced these bilateral ties by setting out a roadmap of progress and promoting peace and security, sustainable development, research and technology and people-to-people contacts and cultural exchanges.

An EU-India Joint Declaration on Education was signed in New Delhi in 2008 with an agreement on mutual benefit from a sustained dialogue in various aspects of higher education systems. Prior to this the European Commission (EC) had started the Erasmus Mundus Programme (http://eacea.ec.europa.eu/erasmus_mundus/index_en.php); providing Indian and European students scholarships for courses at Universities in Europe and India.

Framework Programme

Under the Seventh Framework Programme (FP7), the EU's funding device for Research and Technological Development (RTD), India is considered as an International Cooperation Partnership Country (ICPC). Hence it receives funding from FP7 in collaboration with European organizations. India and the EU are strategic S&T cooperation partners. Besides regular calls, FP7 opens targeted calls for India. In addition, several joint calls are published in cooperation between the EC and the Government of India.

India is the third largest recipient of R&D projects funded under the EU Seventh Framework Programme (2007-2013). EC cooperation for 2007-13 will address some challenges by:

² http://ec.europa.eu/external_relations/india/index_en.htm

- Assisting India in meeting the Millennium Development Goals (MDG) by providing budget support to the social sector (health/education), encompassing best practice models in good governance, fostering decentralized decision-making and development, including innovative methods for improved service delivery to address poverty, gender issues, institutional reforms and public sector management.

- Implementing the EU-India Partnership through an ambitious Action Plan with a view to supporting India's pro-poor sector reform policies.

In India, the National Contact Point (NCP) supports the scientific and business communities in accessing European funds for Research and Development.³

Some Recent EU-India Activities

The European Union and India are already partners in the construction of the international fusion reactor ITER. The European Atomic Energy Community (Euratom) and the Indian Government signed a co-operation agreement in 2009 in the field of fusion energy research for the exchange of information on research issues and scientists in research projects. India is already collaborating with several European national research centers on fusion. Indian scientists will now join the major fusion experiments of Euratom.

EU-India Grid Projects

The EU-India Grid Project (2006) aimed at joining European and Indian grids for e-science and supporting the interconnection and interoperability of prominent European Grid infrastructure (EGEE) with the Indian Grid infrastructure for the benefit of e-Science applications. The project fully achieved its objectives and technical goals and even exceeded expectations. As a result of these excellent achievements, two year second phase EU- India Grid2 project – sustainable e-Infrastructures across Europe and India – funded by EC (under FP7), has been approved.⁴

While addressing global research challenges, EU-India Grid2 mobilizes the provisions of global cross-disciplinary research services by supporting specific user communities benefiting from Grid infrastructure in areas like Climate Change, High Energy Physics, Biology and Material Sciences.

EU Study Centers in India: To promote cooperation in higher education between India and the EU, the European Commission is implementing the 'India-EU Study Centers Programme' (IESCP). The programme supports links between institutions of higher education and academic cooperation through the development and creation of contemporary study centers in both regions. Following is a list of existing centers in India:

- Jawaharlal Nehru University, New Delhi.
- Mangalore University, Karnataka.
- Manonmaniam Sundaranar University, Tamil Nadu.
- Pondicherry University, Puducherry.
- Symbiosis Centre for International Education, Pune.
- University of Rajasthan, Jaipur.

³ <http://euroindiaresearch.org/>

⁴ <http://www.euindiagrid.eu/>

In 2009, seven more institutions were selected as seats of new centers. These institutions are:

- University of Delhi, Delhi.
- Indian Institute of Technology, Chennai.
- Manipal University, Karnataka.
- SP Jain Institute of Management & Research, Mumbai.
- Reutlingen University, Germany.
- University of Warsaw, Poland.
- Aarhus Universitet, Denmark.

RISE Project: The RISE project was officially launched in March 2009 within the scope of the FP7-Science in Society theme. It aims to promote pan-European and International awareness on ethical aspects of biometrics and security technologies. Moreover, it aims to create an internationally recognized ethical framework to be used while planning and managing security policies, notably biometrics. The RISE consortium brings together 9 European and non-European partners from 8 countries (5 EU member states, US, China and India).

Data Security Council of India (DSCI) is the India partner of the RISE Project. It is a self-regulatory organization created by NASSCOM, the premier trade body and chamber of commerce of the IT-BPO (Business Process Outsourcing) industries in India.

EU Scholarship Programme: The Erasmus Mundus External Cooperation Window (EMECW) is a co-operation and mobility scheme in the area of higher education funded by the European Union. The EMECW objective is to promote the exchange of persons, knowledge and skills at the higher education level. Various scholarships are granted under the EMECW programme, which involves a consortium of twelve European and eight Indian Universities.

Erasmus Mundus Association of India (EMAI) is registered as a non-profit organization with more than 500 registered members. The main objective is to raise awareness in India and promote the European Union as a centre of excellence in the field of higher education.

EUINEC - European Union and India Enhanced Cooperation: A framework for improved bilateral dialogue in the fields of Science and Technology, EUINEC provides opportunities for stakeholders in both the EU and India to learn what FP7 is about, how they can take part in FP7, as well as how they can meet and build stronger relations with their counterparts in both regions.

EUINEC Newsletters report recent conferences and other events. In addition, they also provide information about Indian participation in ongoing FP7 projects, funding and other FP7 instruments, experiences of those involved in FP7 activities and evaluation criteria.

EURAXESS Links: It is a vital networking tool set to become a global community acting as the forum for European researchers abroad, providing them with a virtual connection to Europe.

EURAXESS Links India is a network of European researchers, scientists, and scholars in India. This multidisciplinary network includes members at all stages of their career. It allows them to connect with each other and with Europe, ensuring that they are recognized as an important

resource for European research, whether they remain in India or return to Europe.

EURAXESS Links India was officially launched at a conference of India-EU and Member States Partnership in New Delhi in 2010. The following facilities exist:

- Networking opportunities with events, web forums, researchers' databases, etc.
- Information through websites, newsletters and information days.
- Collaboration, career & funding opportunities in Europe through career fairs, EURAXESS Jobs, joint conferences and workshops

http://ec.europa.eu/euraxess/links/india/index_en.htm

http://eeas.europa.eu/delegations/india/index_en.htm

EURAXESS Links India News is a monthly electronic newsletter that provides information of specific interest to European researchers in India.

Structures and Agencies for S&T collaboration with India

The Government of India (GOI) has signed bilateral agreements on cooperation in scientific research and technological development with more than 40 countries, which serve as the legal and political framework for its international cooperation activities.

DST: Department of Science and Technology (DST) is the nodal department responsible for development and implementation of these agreements. The science & technology international cooperation division of DST deals with the international scientific and technological affairs including talks and functioning of scientific and technological cooperation agreements. The division is responsible for S&T aspects of activities of international organizations. The division functions closely with the ministry of external affairs, Indian missions abroad, and foreign missions in India and United Nations (UN) bodies. Science counselors are also placed in some countries to facilitate cooperation.

Website: <http://www.stic-dst.org/>

CSIR: Council of Scientific and Industrial Research (CSIR), an autonomous society, includes 37 state-of-the-art laboratories in India. CSIR is one of the world's largest publicly funded R&D organizations having links with academia, R&D organizations and industry. Over the last decade, CSIR has partnered with more than 5000 industries in India and abroad. In addition to participating in governmental agreements coordinated by DST, CSIR has signed over 40 bilateral S&T programmes with 29 countries. Bilateral S&T cooperation of CSIR laboratories is coordinated by the International S&T Affairs Directorate (ISTAD) at the CSIR Headquarters. ISTAD acts as a bridge between CSIR and the scientific affairs bodies of other countries. It entertains requests and inquiries for cooperation with CSIR scientists in the priority areas of CSIR.

Website: <http://www.csirwebistad.org/>

Funding: In India, as in most developing countries, government budgetary allocation has been the main source of funds for carrying out R&D in basic and applied sciences. About 83%

of the R&D expenditure incurred by the Central Government goes to the following major scientific agencies:

Department of Science and Technology (DST)
Council of Scientific and Industrial Research (CSIR)
Department of Space (DOS)
Department of Biotechnology (DBT)
Department of Atomic Energy (DAE)
Indian Council of Medical Research (ICMR)
Defence Research & Development Organization (DRDO)
Ministry of Health & Family Welfare (MHFW)
Ministry of Human Resource Development (MHRD)
Indian Institutes of Technology (IITs)
Indian Council of Agricultural Research (ICAR)
Ministry of Information Technology (MIT)
Ministry of Non-Conventional Energy Sources (MNES)
Ministry of Environment and Forests (MoEF)

The rest is expended through other central ministries/departments/public sector industries. Amongst the major scientific agencies, DRDO accounted for more than 30% of the expenditure.

Education: University Grants Commission (UGC) is the grant-giving agency in India responsible for providing funds and co-ordination, as well as determining and maintaining standards in institutions of higher education.

Public-Private Partnerships (PPP): The Indian government encourages and promotes public-private partnerships in R&D activities. Three flagship programmes are:

- **NMITLI:** In order to encourage PPP, the government proposed a grant of INR 12 billion in the 11th five-year plan for the New Millennium Indian Technology Leadership Initiative (NMITLI), the largest public-private-partnership effort within the R&D domain in the country. It attempts to synergize the best competencies of publicly funded R&D institutions, academia and private industry. NMITLI has so far evolved around 57 largely networked projects in diverse areas viz. Agriculture & Plant Biotechnology, General Biotechnology, Bio-informatics, Drugs & Pharmaceuticals, Chemicals, Materials, Information and Communication Technology and Energy. These projects involve 80 industry partners & 270 R&D groups from different institutions. Approximately 1700 researchers are engaged in these projects.
- **SBIRI:** Department of Bio-Technology has set aside 30 percent of its total budget for PPP programmes. Small Business Innovation Research Initiative (SBIRI) is one such scheme launched by DBT to boost PPP in India. The scheme covers areas such as healthcare, agriculture, industrial process, environment biotechnology and biomedical devices.

- **GITA:** Global Innovation and Technology Alliance (GITA), promoted under PPP is partnership between DST and Confederation of Indian Industries (CII). It is dedicated to planning, promoting and executing various programmes under S&T cooperation. GITA supports commercialization of bilateral R&D projects and facilitates technology transfers. Currently, GITA is managing bilateral S&T projects with Canada, Israel, ASEAN countries and Taiwan.

Indian Industry's Apex Bodies: Apex bodies in India that represent the interests of industry and trade, interface with government on policy issues and interact with counterpart international organizations to promote bilateral economic issues are:

- Confederation of Indian Industry (CII).
- Federation of Indian Chambers of Commerce & Industry (FICCI).
- Associated Chambers of Commerce and Industry of India (ASSOCHAM).
- Indian Industries Association (IIA) [apex body of Micro, Small & Medium Enterprises].

Modes of Cooperation:

Learning from Experience

Cited below are some examples where the bilateral collaboration of India with other countries has taken off.

United States of America

Indo-US Science & Technology Forum (IUSSTF), with active Embassy participation, plays a very significant role in promoting bilateral collaborations between USA and India. The idea for establishing IUSSTF was formalized in 1997, leading to an agreement in 2000, after which IUSSTF was registered as a non-profit Scientific Society. A joint Governing Body provides leadership to the Forum. The India Science and Technology Partnership (INSTP) is the US partner of the IUSSTF based in Washington.

IUSSTF is an autonomous, bilateral, non-governmental, non-profit organization, which aims to facilitate, seed and promote Indo-US bilateral S&T collaborations. It is managed by the Executive Director from its headquarters in New Delhi.

IUSSTF strives to increase interactions among governments, academia and industry by promoting collaborative research and development, the transfer of technology, and dissemination of knowledge and information of common interest to the research communities in India and US. IUSSTF, through its program portfolio, promotes/supports a large canvas of activities such as:

- Symposia, workshops and conferences on topical and thematic areas of bilateral interest.
- Promoting contact between young scientists and engineers through Indo-US Frontiers of Science Symposium, and Indo-US Frontiers of Engineering Symposium.
- Special initiatives on strategic partnerships.
- Reaching out to industries on research and technological opportunities through industry - academia linkages.
- Training programs and advanced schools towards human resource development.
- Public-private networked centres cultivating techno-preneurship in academia.
- Various travel grants and visiting professorships for short courses in academia & industry.

IUSSTF receives funds from Government of India through DST which contributes matching funds to the annual interest earnings from the endowment created by the U.S. Government.

France

The Indo-French Centre for the Promotion of Advanced Research (IFCPAR) was set up in 1987 with the aim of promoting collaborative research in advanced areas of science and technology

between scientists of the two countries. The objective of the centre is to tap the complementary expertise of high quality research groups working in any specific area of science and technology in the two countries, to pool their efforts and thereby achieve results which would have been difficult if they were to work in isolation.

Established jointly by the Government of India and the Government of France and with a budget shared equally between the two governments, this Centre has entered the 23rd year of its activities and is looked upon as a model for international bilateral cooperation in S&T.

While striving to achieve its stated objective, IFCPAR maintains documentation of the names of the collaborative project investigators along with their affiliation, discipline in which the projects were funded, project number and the publications resulting from these projects. During 1998-2007, IFCPAR provided financial support to 239 projects in different disciplines of science and technology.

Germany

Germany's S&T Cooperation with India falls within three complementary areas:

- Student and scientist exchanges through the German Academic Exchange Service (DAAD), the Alexander von Humboldt Foundation (AvH), the German Research Association (DFG) and other organizations.
- Joint research projects
- Workshops, conferences, and reciprocal visits of specialist delegations, with the aim of initiating new activities.

DAAD is a joint organization of German Institutions of higher education and student bodies. It aims to promote academic co-operation worldwide, especially through the exchange of students, scholars, academics and scientists.

DFG is the central, self-governing funding organization, responsible for promoting research at Universities and other publicly financed research institutions in Germany.

At present approximately 50 mobility measures of the German Ministry for Education and Research (BMBF) provide support to about 75 Indian scientists and engineers who work at German universities and research institutions every year. The endeavour also enables about 75 German scientists to travel to India each year. Indian funding organizations provide for the accommodation of Germans in India and the flight expenses of Indians travelling to Germany. In addition about fifteen individual visits to establish initial contact and about five bilaterally financed workshops are supported yearly.

The Indo-German Science and Technology Centre (IGSTC) has been established in India. The Centre is supported jointly by Indian and German governments with equal contributions of two million euros per year from Germany and rupees thirteen crores per year from India for an initial period of five years. It will facilitate Indo-German bilateral collaborations in basic and applied sciences, and will promote research and technology development through substantial interactions amongst governments, academia and industry.

United Kingdom (UK)

UK India Education and Research Initiative (UKIERI) is playing an important role in fostering contacts across the UK and India in the field of higher education. The initiative also presents an opportunity for high level dialogue between the two countries in areas of mutual policy interest such as quality assurance, international standards and credit recognition schemes.

The initiative has committed over £20 million to support hundreds of bilateral partnerships between India and UK. In recognition of the success of the UKIERI programme, an additional £3 million has been allocated by the UK Government to UKIERI. The additional funds are being utilised to fund another round of higher education research awards and to launch two new programmes.

- Study India Programme for UK undergraduates.
- India Graduate Work Experience Programme for Indian graduates.

The private sector has also taken a keen interest in the initiative and there have been significant contributions from UK based as well as from global organizations. Indian partners in the initiative are: University Grants Commission (UGC), Association of Indian Universities (AIU), Council of Scientific & Industrial Research (CSIR), and Department of Biotechnology (DBT).

'UK - India Science Bridge BioPharm 2020' is a major UK and India Science Bridge program, established to create long-term collaborations in pharmaceutical research. The partnering Institutes are: University of Nottingham's School of Pharmacy, Nottingham University Business School, Indian Institute of Technology, Kanpur and the Indian Institute of Management, Bangalore.

It brings together industrialists, academics and students to undertake research in drug discovery, biological and cellular medicines, formulations and the supply chain.

Queen's University Belfast, Northern Ireland

Staff and research scholars from India based at Queen's University (QUB) have contributed significantly to research collaborations. A number of Indian delegations are hosted at QUB each year and QUB academic staff visit India to foster and develop research, educational and cultural links. Indian students currently represent the third largest group of international students enrolled in postgraduate programmes at the University.

The University recently broadened its alliance with a number of leading Indian institutions, after agreeing to new partnerships in the areas of cancer research, biotechnology, virology, regional development and water resource management. An international research partnership to develop new ways to treat and understand cancer was established through an agreement signed in 2007 between QUB and the Ministry of Biotechnology, GOI. This involves top cancer specialists from the National Institute of Immunology, India and the Centre for Cancer Research and Cell Biology at QUB. As part of the new exchange programme, a MoU was signed in 2007 with the University of Hyderabad (UoH). Delegations from both Universities have visited Belfast and Hyderabad.

Queen's has also launched the Queen's University Indian School Partnership (QUISP). The pilot scheme aims at developing strong partnerships between the University and many international Indian schools.

Queen's India Welcome Scheme (QIWS), which was started three years ago, aims to bring the best Indian students to Queen's. It began with students of Bengal Engineering and Science University traveling to QUB for three weeks and getting hands-on experience in the areas of electronics, communication and IT. It has been extended to the Jawaharlal Nehru University, Indian Railways, Institute of Mechanical and Electrical Engineering, Madras Christian College, and the University of Hyderabad. There is a programme under which Queen's PhD staff and students are sent to partner institutes in India, both at the postgraduate and undergraduate levels.

Dissemination: QUB has local representation in India in order to provide free advice and information about applying to Queen's. It offers this service in many Indian cities including New Delhi, Mumbai, Ahmedabad, Bangalore, Chennai, Hyderabad, Coimbatore, Kochi, Vizag, Baroda, Pune and Chandigarh. The British Council in India also offers advice on studying at the University. In addition, there is an active South Asian Students Society at Queen's University and an Indian Community Centre in Belfast.

India - Ireland Cooperation

A list of important S&T agreements signed so far between the two countries has already been given in the background section.

The perception of scientists in Irish and Indian institutes, who are working jointly, was gleaned through a survey. Cited below is a summary of responses to the questionnaire sent:⁵

1. Most respondents feel that their contacts have been through bilateral arrangements rather than through their own acquaintances. This means that personal contacts are yet to evolve into collaborative research activities.
2. It has been largely felt that existing joint research efforts are not very successful in creating awareness or addressing mutually beneficial issues of S&T development.
3. Though further networking has been possible in few cases of collaboration, the outcome has been meagre in terms of fund generation.
4. Researchers in Ireland-India common S&T activities do not mention administrative or academic hurdles. On the other hand, almost all of them feel the need for financial assistance in the form of travel grants for future joint ventures.
5. Almost all respondents are of the view that industry in Ireland and India will benefit through developing S&T alliance.

Personal interviews: Institutions involved in previous agreements - Indian National Science Academy (INSA), National Association for Software Services and Communications (NASSCOM) and Department of Science and Technology (DST) were visited to ascertain if any major follow-up had taken place. It was gathered from personal/telephonic discussion that no significant progress has been attained after signing of respective agreements apart from few collaborations actually making a start (given later in this section). As a whole, nothing substantial has been achieved in bilateral S&T activities. The reasons could be-

- a) Non availability of research funds.
- b) Lack of initial contacts between Irish and Indian scientists to kick off co-operation.
- c) There is no nodal agency to take these agreements further.

Agency Level Activities

This section gives an account of the efforts by agencies working towards promoting bilateral cooperation.

The Ireland-India Council (IIC): Established in 2002, it is a non-profit, independent institution created to encourage and facilitate cultural and economic exchanges between the people and institutions of Ireland and India. It has evolved into a premiere organisation that brings together present and future leaders, professionals, intellectuals and diplomats from Ireland and India. The Council aims to broaden Ireland-India relations and lay the groundwork for future cooperation.

⁵ See appendix 2 for questionnaire

Ireland-India Council works with Irish universities and colleges to develop a support mechanism for Indian students in Ireland. It has also supported through internship programme, information sessions & workshops, activities aiming at familiarizing Indian students with the Irish system.

Ireland-India Science & Technology Forum: The first Ireland-India Science and Technology Forum was held in February 2010 in Dublin, jointly organized by the IIC and by DCU at Dublin. The aim of the discussion was to promote and catalyse Irish-Indian Collaborations in Science, Technology, Engineering and Biomedical Research. The office of the Science, Technology & Innovation, Department of Enterprise, Trade and Employment, Irish Embassy at New Delhi and Indian Embassy at Dublin played important roles in this Forum.

The meeting received overwhelming participation from Irish universities and Institutes of Technology, along with public and private stake holders. This provided an opportunity to inform and engage decision makers and stakeholders of both public and private sectors. Insightful presentations were made by scientist/academics and policy makers including:

- Professor Ferdinand von Prondzynski, President of Dublin City University
- Dr Ruth Freeman, Director Enterprise and International Affairs, Science Foundation Ireland,
- Professor Eamonn Cashell, Cork Institute of Technology
- Dr. Conor O' Carroll, Research Director, Irish Universities Association (IUA) and Irish Representative for EU- FP7 Programme
- Professor Richard O' Kennedy, Dublin City University
- Dr. Satish Kumar, Queen's University Belfast
- Professor Michael Coey, Trinity College Dublin
- Mr. Aidan Hodson, Principal Officer, Office of the Science, Technology & Innovation, Department of Enterprise, Trade and Employment
- Professor Brian Norton, President, Dublin Institute of Technology

A steering committee was formed comprising of the Presidents of Irish Universities and Institutes of Technology to decide on the progress of forum's initiatives and events.

The 2nd S&T Forum is planned to take place around June this year aims to identify and implement appropriate cross border programme and policies. It has been decided to incorporate education together with S&T in the theme. The forum anticipates providing a platform to the stake holders to inform the progress, activities and initiatives in Ireland-India S&T and Educational cooperation.

“Ireland and India have a great deal to learn from each other. India can learn from the close relationship which Irish educational institutions have with business and industrial development. Ireland can draw inspiration from the commitment of millions of ordinary Indians to educational attainment and benefit from cooperating with the wide spectrum of cutting-edge scientific research taking place in Indian Institutes of Technology, Universities and laboratories. Much has been said and written about the traditional links between Ireland and India, but tradition is a word which implies that there is not so much taking place in the here-and-now.”

Kenneth Thompson, *Ambassador of Ireland to India*

Science Foundation Ireland (SFI) – Scientific Cooperation with India: SFI has established formal collaborative arrangements with India to increase the extent and the quality of exchange between the two countries, with a view to building links between Irish academic research leaders and their counterparts and this might be supplemented later with a broader top-down approach. It was also agreed that since international engagements have always been an integral part of SFI operations, this will continue, subject to availability of funding and will be particularly important in the context of the estimates and budget allocation.

SFI has the provision to support Indian collaborators on any SFI grant. Travel support may be included as a legitimate cost in applications to SFI. The Conference and Workshop programme has been revised to include international workshops, by invitation, and may require up to €20K. In 2009, SFI launched its strategy for 2009-2013, entitled 'Powering the Smart Economy'. The strategy seeks to build on the impetus and significant progress of the past five years in establishing Ireland as a location for internationally-recognised research and innovation.

Under the SFI-INSA agreement of 2006, SFI representatives and its supportive Bio Researchers visited India to examine the possibilities for concrete research collaborations with their Indian counterparts and attended the BioBangalore (a major international biotechnology conference) in 2006 in India. This facilitated exchanges between Irish and Indian scientists with a vision to building collaborations. In addition two SFI funded scientists attended the 2007 EU-India Science Conference in India.

In 2008 SFI met with the then Indian Ambassador to Ireland to explore areas of common concern with real prospects for S&T co-operation. The present Indian Ambassador to Ireland has also been active in discussions with DETE and SFI to add new impetus to the Government to Government agreement which has been ratified. SFI has also been engaged in dialogue with DETE to examine the best ways to advance cooperation.

SFI prefers the bottom-up approach to facilitate scientific cooperation through a range of suitable programmes and has actively encouraged its funded researchers to utilise these. SFI participated in the first meeting of the India-Ireland Joint Working Group in 2009. At this meeting it was agreed that the bottom-up approach should be adapted as the most suitable way to yield good results initially.

SFI-funded researchers are currently collaborating with 11 universities across India, in areas such as physics, material science, chemistry, biological sciences and computer science, while SFI currently funds five Indian lead researchers based in Ireland.

Ireland-India Joint EU projects:

Due to limited information, the listing may not be comprehensive.

● **ATHENA project - Advanced Theories for Functional Oxides:** New Routes to Handle the Devices of Future

The project started in May 2009 with the aim to investigate, through a synergy of advanced First-Principles, density-functional based methods, and Model Hamiltonian calculations suited for strong-correlated systems, the properties and functionalities of transition metal oxides that may be viable building blocks of future micro- and nanoelectronic devices with enhanced capabilities. Despite major achievements in the field, an in-depth and complete understanding of these systems is still lacking. This is due on the one hand to the complexity inherent in the physics of strong-correlated electrons, which includes a plethora of fascinating but overtly complex phenomena (e.g. charge and orbital ordering, polaronic formation, spin-charge separation, non-Fermi liquid behaviour, to name just a few). The project is a collaboration between 6 University partners forming two consortia one based in Europe and the other in India. There have been two meetings of the Indian Consortium and European Consortium in 2009. The kickoff meeting of the EU side of the ATHENA consortium took place in Dublin in June 2009.

European project partners

Trinity College Dublin, Ireland Prof. Stefano Sanvito (European Coordinator)

University of Cagliari, Italy Prof. Alessio Filippetti

University of Vienna, Austria Prof. Cesare Franchini

Indian project partners

S. N. Bose national Centre for Basic Sciences, Kolkata Prof. Priya Mahadevan (Indian Coordinator)

Harish-Chandra Research Institute, Allahabad Prof. Pinaki Majumda

Jawaharlal Nehru Centre for Advanced Scientific Research,
Bangalore Prof. Umesh Waghmare

● **ASSET (Advanced Safety and Driver Support for Essential Road Transport)**

The aim of ASSET is to contribute substantially to the improvement of safety in the field of sustainable road transportation. ASSET will generate process and provide important road safety information from essential system components. The Consortium consists of 19 partners; composed of Universities (7), research Institutes (3), industry (1), SMEs also from the developing countries (7) and public administrations (1) as user.

Irish project partner

Prof. Eugene O'Brien. National University of Ireland, Dublin

Indian project partner

MTEL-KTEI Teleinfra Company Pvt. Ltd. New Delhi

- **CETRRA** - Strives to stimulate participation of cooperation partners in surface transport research - This project aims to contribute to the European Research Area in surface transport to strengthen the competitiveness of the European surface transport sector. This will be achieved by using the excellent EURNEX competence to provide research excellence capabilities to European Small and Medium Size Enterprises. Furthermore, the cooperation with researchers from non EU countries will stimulate research that is of mutual interest and will hopefully strengthen the European as well as non European research establishments.

The project involves 66 research Institutes from 20 European countries and the associations of industry and operators UNIFE, UIC and UITP. More than 80% of the members cover not only the rail research domain but other forms of surface transport as well.

Irish project partner

Mr. Michael Murphy, Rivval limited

Indian project partner

Ms Rajashree Iyer, Anchorage Bangalore

- **UMPIRE** - Use of a Multidrug Pill in Reducing cardiovascular Events - The project will test whether a polypill could reduce the risk of heart attacks, strokes and other cardiovascular problems across the world. Ireland is participating with partners from Europe and India.

Irish project Investigator

Professor Alice Stanton, Royal College of Surgeons in Ireland

Indian project partners (sponsors and collaborators):

The George Institute for International Health; the Centre for Chronic Disease Control in New Delhi, part of the Public Health Foundation of India; and Dr Reddy's Laboratories Limited.

- **CLIMATE COST** - Full Costs of Climate Change- The objectives of the project are to fill in the gaps in the assessment of the full costs of Climate Change. These include ancillary benefits associated with mitigation policy, many of the sectoral impacts of Climate Change, including extreme and catastrophic events, and the costs and benefits of adaptation. The project will build on the findings of existing studies and aims to provide information at EU member state level. The project also aims to encourage cross fertilisation of research and a transfer of information among researchers in Europe, the USA, China and India.

Irish Project partner

Prof. Richard S.J. Tol, Economic and Social Research Institute

Indian Project partner

The Energy and Resources Institute

- **RISE** – Rising pan-European and International Awareness of Biometrics and Security Ethics - The RISE project was officially launched in March 2009 within the scope of FP7-Science in Society theme. Its mission is to create an internationally recognized ethical framework to be used while planning and managing security policies, notably biometrics. The RISE consortium brings together 9 European and non-European partners, located in 8 different countries (5 EU member states, US, China and India).

Indian partner

Data Security Council of India

Irish partner

European Biometric Forum Limited

Further Success Stories

Recently, there have been positive and encouraging outcomes as a result of accelerated efforts towards bilateral cooperation. This includes signing of agreements at the level of institutions, exchange of students and staff exchanges at university and research institutes. In one case, collaboration possibly resulted in joint curriculum development, joint research papers and staff exchange. Strong interaction with businesses and the development of commercialization linkages has been recognised as a very important and exciting development. In addition, the results of ongoing work in bilateral collaboration are expected to be highly beneficial to industry. The following section enumerates some such achievements.

European Higher Education Fair 2008

Higher Education Institutes from Ireland participated in European Higher Education Fair in New Delhi in November 2008. Representatives from prominent universities, institutes of technology, state-aided colleges and independent colleges met students and provided first-hand information on the courses, admission criteria, costs etc.

Ireland Higher Education Fair 2010

A higher education fair was organized by select Irish universities/institutes in February 2010 at New Delhi. University officials communicated information about the courses available and modes of studying in Ireland at graduate and post-graduate level. Participating Irish institutes were:

- University of Limerick
- University College Cork
- Dublin City University
- Waterford Institute of Technology
- Cork Institute of Technology
- Dundalk Institute of Technology
- Griffith College Dublin
- HSI College Limerick Business School
- Royal College of Surgeons

Developments at Trinity College Dublin

At Trinity College Dublin (TCD), the faculty includes staff of Indian origin including professors, lecturers, post-docs as well as graduate students. Indian students, including project students from IITs, visit TCD. Irish students from TCD have visited Indian institutes like NCBS Bangalore, TIFR Bombay and TERI New Delhi.

The college has Indian collaboration in the following projects:

- EU ATHENA project entitled 'Electronic structure of transition-metal oxides' (European Coordinator- Dr. Stefano Sanvito) with 3 Indian institutes.
- Inter University Accelerator Centre, New Delhi in collaboration with Dr. Igor Shvets.
- Project on prospects of wind energy in collaboration with NIT Suratkal, Karnataka.
- Neurogenetics and psychiatric genetics collaboration with the NCBS, Bangalore (Dr. Mani Ramaswami, TCD with 8 shared Ph.D. students and weekly video meetings).
- Pathogenesis of mycobacterium tuberculosis with IISc, Bangalore with Dr. Charles Dorman.

The benefits to Ireland from this alliance include:

- Access to the brightest students from India.
- Links with research groups in areas of strategic importance.
- Links to new institutions committed to enterprise and innovation.

“Historically, Trinity has shared very strong links with India, for example the university offered a comprehensive programme of language study in all of the major Indian languages by the mid 19th century. ...In recent times, Trinity has been actively engaged in developing exciting academic links with India. Students from all over India have experienced the richness of student life in Trinity and the rewards of studying in an environment of academic excellence. We currently have approximately 80 Indian students within our undergraduate, postgraduate and research programmes, studying a range of disciplines across the sciences and humanities.”

TCD Provost — *on Trinity College's links with India*

Trinity Indian Society

The Trinity Indian Society was launched in 2009 in TCD by His Excellency P.S. Raghavan, the Indian Ambassador to Ireland. The Trinity Indian Society comprising of both staff and students of Trinity College aims to develop cultural, social and educational links between India and Ireland. It will raise awareness of the rich history of India by creating a forum for members to experience Indian culture. For Indian students at Trinity, the society would provide a cultural 'home away from home' and aid student integration into the broader Trinity student body. The society is open to all staff and students within TCD. Planned events at Trinity will include celebration of Indian festivals, Indian cuisine nights, screening of Indian films and talks by leading cultural, social and political speakers.

On the occasion of the launch of the Trinity Indian Society, TCD Provost, Dr John Hegarty, and the Indian Ambassador, His Excellency, P.S Raghavan, became the society's first members.

Dublin City University (DCU) Initiatives

In 2010, Dublin City University formally adopted a “DCU India Strategy”, which was formulated within the context of the university's globalisation agenda and which established India as the priority country for international engagement through collaborative research, educational programmes, staff and student exchanges and industry engagement.

At just 30 years old, DCU is Ireland's youngest university and The Sunday Times Irish University of the Year 2011. In its short history, DCU has evolved rapidly and successfully into a vibrant educational, research-focussed and enterprising university. Since its establishment in 1980, its student strength has grown rapidly to over 11,500 today, of which over 2,000 are international students.

DCU is committed to 'societally-oriented' research and to enhancing its position as Ireland's University of Enterprise, as outlined by the new DCU President, Prof. Brian MacCraith, in his inaugural address in July 2010. Central to this objective is providing its graduates with the key skills and attributes to positively influence economic and social development in a globalized workplace.

“I have made partnership with academic and enterprise institutions in India my number one priority in my internationalisation strategy for DCU. We are seeking to build sustainable, research and education partnerships that will support the social and economic development of both our countries and equip our graduates with the skills and attributes they need to succeed in a globalised world.”

Professor Brian MacCraith - DCU President

DCU existing collaborations include the following:

- I. Post-graduate research student internships from IIT Delhi at the School of Electronic Engineering, DCU.
- ii. Six-week research visit by Dr. D. Venketesh, Dept. of Electrical Engineering, IIT Madras, to Prof. Liam Barry in the School of Electronic Engineering.
- iii. Three-month research visit by Dr. R. Kumar, Bharathiar University to Dr. Enda McGlynn, School of Physical Sciences.
- iv. Undergraduate summer internships for students from NIT Surathkal, Karnataka.
- v. Research M.Tech students exchanges from NIT Surathkal.

Students from India make up over 15% of the non-EU international student body (25% of the DCU Asian student population) and the number is steadily increasing. In the academic year 2010/11, DCU has the largest population of Indian students of any Irish university, with 103 registered students from India. In the past 4 years alone, 78 postgraduate and 43 undergraduate Indian students have graduated from DCU.

Over the past two years there have been four separate visits by senior DCU staff delegations to India. The primary focus of these visits was to underpin the importance to DCU of developing long-term strategic links with such prestigious Indian institutions as IIT Delhi, IIT Madras, IISc Bangalore, NIT Karnataka and the National Physics Laboratory, Delhi, all of which have signed a Memorandum of Understanding with DCU. In March 2010, Professor Brian MacCraith (DCU President), together with His Excellency Mr. Kenneth Thompson (Irish Ambassador to India), and Minister for Communications, Energy and Natural Resources Mr. Eamonn Ryan, met DST Secretary Dr. T Ramasami and Minister for Science and Technology Mr. Prithviraj Chavan to discuss the growing Science & Technology initiatives underway between the two countries.

The University has also used these visits with the help of IDA India in Mumbai and the support of both the Irish Embassy in New Delhi and the Indian Embassy in Dublin, to actively seek engagement with targeted Indian enterprises. Arising from these engagements, DCU plans to deliver a number of research-focussed workshops with enterprise partners in India in the next 12 months.

Additional steps have been taken by DCU to underpin its growing collaborations with India:

- a. The DCU Indian Society, which was launched in 2010 by Ambassador of India to Ireland, His Excellency, P.S.Raghavan, aims to serve as a social and cultural forum for the Indian community consisting of staff and students in DCU.
- b. The DCU India Working Group was established in 2010. This high-level working group consists of senior members of staff and has representation from all university faculties. Its role is to co-ordinate and support the growing relationships with Indian higher education institutions.
- c. In December 2010, the DCU India Working Group supported the submission of 16 proposals to the first Indian Government DST Call for bi-lateral research collaborations with Ireland. This is a further indication of DCU's strong commitment to fostering sustainable R&D partnerships with Indian institutes.
- d. Development Officer (International Research) – assigned within the Office of the Vice President for Research to support and encourage strategic international research collaborations.
- e. In February 2010, DCU hosted the first Ireland-India Science and Technology Forum organised by the Ireland-India Council in Dublin.
- f. DCU is an active member of the India-Ireland Business Association.

Cork Institute of Technology (CIT) and the University of Pune (UoP)

CIT and UoP have forged a strong relationship over recent years. The development of this relationship commenced in 2007 when CIT invited a senior management representative of UoP to visit its main campus in Cork for exploratory discussions. Subsequent developments have included:

The signing of a Memorandum of Understanding (MoU) between CIT and UoP in 2008 when CIT senior staff visited India;

- The holding of a joint research colloquium in Pune;
- Exchange visits by research staff and students, with some industry support;
- The extension of the MoU to facilitate joint programme development in research and taught programmes; and
- The expansion of the relationship to incorporate selected affiliated colleges of UoP leading to new opportunities in areas such as student exchange (primarily in taught programmes), joint student projects and internships.

The relationship between UoP and CIT is strong and vibrant. It continues to produce new opportunities for both institutions on an ongoing basis. The key steps in the development and expansion of this relationship are listed below:

- Develop Mutual Trust and Respect;
- Identify Complementary Capabilities;
- Ensure Senior Leadership and Support;
- Leverage State Support Structures and Services;
- Identify “Bridge Builders”;
- Continuously “Work at” the Relationship; and
- Focus on the Symmetrical, Long-term Approach.

Each of these steps is dealt with in more detail in following sections.

Develop Mutual Trust and Respect

A significant amount of time and energy has been invested by UoP and CIT in building the mutual understanding required for the development of a sustainable relationship. This has involved:

- Organising exchange visits by senior staff from both institutions;
- Facilitating detailed meetings between research teams operating in related areas;
- Organising detailed reviews of specific facilities and specialist capabilities; and
- Creating the time and space required for staff at all levels to “get to know each other”.

This investment of time and energy has ensured that the internationalisation goals and objectives of both parties are well understood and that an open approach can be adopted in relation to the discussion and/or development of any opportunity or area which either side might wish to focus on.

Identify Complementary Capabilities

From the outset, it was clear that UoP's deep strengths in research would match very well to CIT's own strengths in research, innovation, entrepreneurship and industry engagement.

With its long and deep tradition of research, UoP can provide to CIT students and staff members opportunities to collaborate with world class research teams within an institution-to-institution framework which supports such collaborations on every level. This aspect of the relationship commenced with reciprocal visits by individual research staff and has now developed to incorporate the preparation of joint research proposals to relevant funding bodies.

CIT's world-class research in clearly defined areas, allied to its closeness to industry and well-developed innovation ecosystem, has proved to be of significant interest to staff in UoP. The incubation of successful start-up companies, the development of research centres which enhance the competitiveness of industry by working closely with them, and the integration of education with research and innovation are all areas that UoP has been keen to explore with CIT.

It is clear that both parties can provide valuable knowledge and expertise to each other for the benefits of staff, students and all involved.

Ensure Senior Leadership and Support

The relationship between CIT and UoP was driven by senior members of staff from both sides from the outset. Mrs. Clair Nadkar, a native of India and Internationalisation Co-ordinator for the Faculty of Engineering & Science in CIT, played a pivotal role in this context by establishing contact with Dr. Pandit Vidyasagar, former Director of Board of College and University Development, UoP, and raising the possibility of developing a relationship between the two institutions. Thereafter, senior colleagues on both sides, including Dr. Narendra Jadhav, former VC of UoP, and his successor, Dr. Raghunath Shevgaonkar, Dr. Vasudha Garde, Director of the International Centre at UoP, Dr. Brendan Murphy, President of CIT, Mr Michael Loftus, Head of Faculty of Engineering & Science, CIT, Dr. Niall Smith, Head of Research, CIT, and various heads of function on both sides, took responsibility for building a shared understanding and vision in relation to how the relationship should develop.

This strong support and leadership has ensured that momentum has never been lost during the period in which the two institutions have been working together and that a dialogue can be maintained at all times in relation to any new opportunities for further developments which arise.

Leverage State Support Structures and Services

Enterprise Ireland, Science Foundation Ireland, the Embassy of Ireland in India and the Embassy of India in Ireland are hugely supportive in relation to the development of links between the two countries.

Enterprise Ireland runs trade missions and provides “on the ground” support to Irish institutions seeking to establish connections with compatible institutions in India. The Enterprise Ireland trade missions provide significant opportunities to access support from Government Ministers and senior decision-makers in relation to new developments. The Embassy of Ireland in India, led by His Excellency Mr. Kenneth Thompson, is always ready to mentor and support collaborating institutions, and to participate in events and initiatives which contribute to the development of fruitful partnerships. Support from the Embassy has been crucial to the development of the CIT-UoP relationship.

Science Foundation Ireland encourages the development of peer-to-peer research activity in areas where Irish and Indian institutions have the capacity to establish internationally competitive partnerships.

The Embassy of India in Ireland, under the leadership of His Excellency Ambassador P.S. Raghavan, has been a strong supporter of the development of the relationship through participation in a range of events organised by the institutions and through provision of advice and mentoring as required.

Visa sections in both embassies have facilitated visits through efficient processing of visa applications.

Identify “Bridge Builders”

The opportunities for collaboration between UoP and CIT are significant. However, it is vital that these opportunities be identified, explored and developed on a continual basis. In this context, the role of “bridge builders” is key. “Bridge builders” ensure that opportunities, once identified, are followed through to conclusion. They ensure that senior management, often preoccupied with competing challenges, devote sufficient time to ensure that the relationship can continue to flourish. They make connections between appropriate individuals and groups on both sides. On the CIT side, the role of Mrs. Clair Nadkar has been key in this context. On the UoP side, Dr. Vasudha Garde, Director of the International Centre at UoP, plays a pivotal role. They both have a deep understanding of the two cultures and ensure that both parties manage their participation in the relationship in a consistent and responsible manner.

Continuously “Work At” the Relationship

Dialogue between UoP and CIT is maintained at many levels on an ongoing basis. The aforementioned “bridge builders” speak with each other frequently to ensure that continuity is maintained at all times. Senior staff visit their counterparts when conducting any other business in India or Ireland. Research and academic staff participate in short exchange visits to explore new opportunities and to devise strategies to secure new funding whenever possible. The importance of maintaining these links on a continual basis should not be underestimated as ongoing contact leads to the identification, exploration and development of new opportunities.

Focus on the Symmetrical, Long-term Approach

As mature institutions of higher education, UoP and CIT have little to gain by focusing on the development of tactical, short-term relationships. The investment of energy and effort involved could not be justified given the geographical separation between Ireland and India. Rather, the institutions understand that the development of a symmetrical, long-term and strategic partnership is much more beneficial to the institutions and their students, staff and other stakeholders as this approach provides the opportunities which will stand the test of time and provide a platform for wide-ranging developments over a period of years rather than months.

SFI Ireland-India Seminar, Bangalore

SFI visited Bangalore with a group of Irish researchers at the beginning of March 2011. They organised a three-day symposium with NCBS, IISc and other Indian institutes. It has been the

most ambitious bilateral scientific forum held between the two countries. The symposium covered specialized areas such as information security, neuroscience and plant biology, and featured formal presentations by SFI-funded researchers based at Cork Institute of Technology, Dublin City University, Waterford Institute of Technology, University College Dublin, University of Limerick, Trinity College Dublin, University College Cork and NUI Galway. The Indian Ambassador to Ireland and the Irish Ambassador to India addressed the gathering at the main dinner.

In addition to the symposia, Industrial development Agency (IDA) Ireland is facilitating meetings between companies based in India and visiting Irish researchers to encourage further collaboration.

"Our visits to Pune and IIT Delhi, in particular, along with Fergusson College and Amity University, have shown us there is great potential for bi-lateral activities that benefit both parties. The willingness of all concerned to co-operate is a hallmark of the interaction. The complementary strengths make sense for all parties, and this makes us believe that the interactions will grow from strength to strength."

Survey respondent

Prospects for Collaboration

● **European Union Framework Programme**

One of the best ways in which Irish agencies can approach Indian S&T resources is by tapping into EU programmes/funding. Framing a programme of research, technological development and demonstration is one of the main EU programmes at the European level for the funding of research activities in key technological areas relevant to the competitiveness of European industry, the quality of life of European citizens and European policy development.

By definition, the Seventh EU Framework Programme (FP7) is an international programme. It consists of cooperative research actions among the 27 Member States of the EU as well as the seven Associated States, which are also full members of the FP by contributing to its overall budget. Much more than the previous EU Framework Programmes, FP7 welcomes participation by researchers across the world with the recognition that science is no longer confined to national borders; and that significant mutual benefit can arise from international scientific co-operation. FP7 was launched at the end of 2006 with a budget of approximately €50 billion covering the period 2007 to 2013. It is designed to build on the achievements of FP6 towards the creation of a European Research Area and carry it forward towards the development of the knowledge economy and society in Europe.

Ireland has already benefited greatly from previous EU Framework programmes, with its third level and company-based researchers drawing almost €200 million from FP6. Under the Strategy for Science, Technology and Innovation (SSTI) 2006-2013, Ireland has set a goal to become a leader in research, development and innovation. The SSTI sets a target of €400 million to be secured by Irish participants in FP7. This target was set, however, before the final structure and budgets for FP7 had been finalized. Over recent months, steps have been taken to establish a set of indicators by which Irish participation in FP7 would be monitored and to propose a new, more detailed set of targets for Irish participation in the programme up to the end of 2013. Based on the work undertaken, the Cabinet Committee has agreed that the total share of EU funding to be targeted by Ireland over the lifetime of FP7 should be in the region of €600 million. The National Support Network for FP7 in Ireland was established in 2006 to ensure that Ireland gets maximum benefit from FP7.⁶

India is an International Cooperation Partnership Country (ICPC) and participates and receives funding from FP7. Apart from FP7 regular calls, several joint calls are published in cooperation between the EC and the Government of India.

● **FP7 National Contact Point (NCP) for Ireland:** The NCP network is the main provider of advice and individual assistance to all member states and associated states. By using this service one can easily find the contact details of the designated National Contact Points for the country. Since NCPs are appointed for each of the areas of FP7, when seeking support one should contact the NCP related to the subject of interest.

NCP-Ireland http://cordis.europa.eu/fetch?CALLER=MSS_IE_FP7NCP_EN

NCP in India <http://euroindiaresearch.org/>

⁶ <http://www.fp7ireland.com>

● **NCP in India for FP7 programme in Information Communication Technology (ICT)**

Programme acronym: FP7-ICT

Mr. Arunabha Ghosh

Ministry of Communications and Information Technology
International Cooperation Division, Department of Information Technology
6 CGO Complex, Electronics Niketan
New Delhi 110003, India Tel: +91-11-24301891 a
Fax: +91-11-24363101

Mr. Rajneesh Agrawal

Ministry of Communications and Information Technology
International Cooperation Division, Department of Information Technology
6 CGO Complex, Electronics Niketan
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Fax: +91-11-24362279

● **List of Projects under FP7 with participation of Indian Organisations**

http://euroindiaresearch.org/fp7_india_indiaFP7.htm

● **Opportunity for Collaboration with IIT Kharagpur:** Recently, the Indian Institute of Technology (IIT) Kharagpur, India has taken initiatives to collaborate with premier Irish Universities/Institutions for Student & Faculty Exchange and Joint Research as a part of its Institutional Development Program.

Contact person:

Mr. Prashant Kumar Sharma
Executive Officer (Institutional Development)
Office of Alumni Affairs & International Relations
IIT Kharagpur – 721302, India
Ph.: +91-3222-281859, Mobile: +91-9476436315 / 9911856609, Fax: +91-3222-277480
Email- pksharma@adm.iitkgp.ernet.in
Web: www.iitkgp.ac.in

● **New INDIGO:** New INDIGO is a consortium of European and Indian S&T organizations involved in promoting research cooperation between Europe and India. The acronym New INDIGO refers to: Initiative for the Development and Integration of Indian and European Research. It is intended to strengthen the international dimension of the European Research Area (ERA) and to provide a gateway to European S&T for networking with Indian S&T platform.⁷

New INDIGO aims at providing a relevant framework to the scientific community and institutions in India to access the European Research Area, and helping the Euro-Indian S&T Cooperation fully benefit from the new networking tools already set up, especially the FP-7. The program addresses both European and Indian scholars experienced in mutual collaboration and those with little or no experience of working together in India and/or Europe.

⁷ www.newindigo.eu

Under the umbrella of the ERA-NET New INDIGO, partners from many countries have joined forces to launch the Networking Pilot Program (NPP). The programme offers opportunities in the field of Biotechnology and Health. More specifically, the NPP under New Indigo targets:

- Biomarkers and diagnostics
- Bioinformatics for health
- Structural Biology for health

By July 2010, thirteen proposals had been funded within the first NPP Call on Biotechnology and Health; they will soon start their networking activities. The Indian partners are Department of Biotechnology, Ministry of Science and Technology and Council of Scientific & Industrial Research.

- On the New INDIGO website, one can find relevant information on both Indian and European organizations and scientists. To find an Indian partner, one can check:
- the Indian S&T Landscape document
- the Partner Search Tool

- **Partner search tool for New Indigo**

<http://www.newindigo.eu/programme/partnersearch.html>

- **National Contact Point for New Indigo in India**

Ms. Shailja Vaidya Gupta

Department of Biotechnology, Ministry of Science and Technology
Lodi Road, New Delhi 110003, India

Tel: +91 11 24 36 37 48 E-mail: shailja@dbt.nic.in

- **Framework Programme 8 (FP8):** The EU is spending about €143bn during 2007-2013 to fund research and innovation projects within its seventh framework programme (FP7). Based on the priorities of the flagship initiative Innovation Union, which was announced in October 2010 and which is part of the EU's Europe 2020 strategy to boost growth and jobs, the Commission is now preparing the ground for the next round of funding.

Regarding the preparation of FP8 (to start from 2014), in February 2011 the European Commission presented a Green Paper to propose major changes to the current practice of EU research and innovation funding. Initial proposals suggest refocusing funding toward projects that tackle current challenges, such as health and the aging population, climate change, food security and diminishing natural resources. Funding would also be better coordinated along the innovation chain - from basic research down to launching new products and services in the market. Simplified procedures and rules would make it easier for researchers, companies and entrepreneurs to cooperate, apply for and use EU funding. The Commission has to make specific proposals on research funding later this year.

http://ec.europa.eu/research/csfri/index_en.cfm?pg=documents
http://ec.europa.eu/europe2020/index_en.htm

● **Erasmus Mundus External Cooperation Window (EMECW)**
- Partner Universities in India

University	Coordinator
University of Delhi	Prof. Kondepudy Sreenivas - kondepudysreenivas@rediffmail.com
Jadavpur University	Prof. Mridul Bose - mridulbose@yahoo.co.in
University of Pune	Prof. Vasudha Garde - intcentdir@unipune.ernet.in
University of Kerala	Prof. Achuthsankar S. Nair - sankar.achuth@gmail.com
Ind Ins of Tech, Kanpur	Prof. P. Murali Prasad - pmprasad@iitk.ac.in
Tata Institute of Social Sciences, Mumbai	Prof. Bipin Jojo - bipinj@tiss.edu
Pravara Institute of Medical Science, Loni, Maharashtra	Prof. Sanjeev Kulkarni - int.coordinator@pmtpims.org
Anand Agricultural University, Gujarat	Prof. Prajapati Jashbhai - prajapatijashbhai@yahoo.com

● **Euroscience Open Forum- Dublin City of Science 2012:**

Dublin will host the Euroscience Open Forum (ESOF) in July, 2012. Dublin, City of Science, 2012, will bring together about 6,000 world-leading scientists, companies, innovators, students and members of the general public during a year-long programme of science-themed events. The inter-disciplinary, pan-European meeting includes the objectives-

- Showcase the latest advances in S&T. Encourage discussions on the role of S&T in society and public policy.
- Stimulate and rouse public interest, excitement and debate about S&T.

Distinct streams to be covered in ESOF 2012 comprise:

- A Science programme of seminars, workshops and debates on the latest research.
- A Media programme to promote science communication.
- A Business programme to link basic research with industrial applications.
- A Careers programme for young researchers.
- An Exhibition to showcase the best of European public and private research.
- An Outreach programme to engage with the general public.

<http://www.dublinscience2012.ie/>

Recommendations

The 'Ireland-India S&T Cooperation Agreement' ratified in 2008 has come into force, showing that the possibility of an Ireland-India cooperation in Science and Technology has a huge potential. As seen from 'success stories' stated earlier in this document, concrete achievements have been seen in the recent past, raising hope for greater progress in the future.

The massive collaboration potential has to be exploited by suitable allocation and deployment of funds and manpower in both countries to stimulate S&T cooperation.

Promotional activities are needed to develop knowledge partnerships resulting in bilateral S&T projects. A concrete collaboration system should function to facilitate the Ireland-India S&T cooperation. The structure could have the following components:

1. Revitalize agreements: There is a need to boost the programmes assigned in the earlier MoUs with DST, INSA and NASSCOM. Depending on the funding opportunity of both sides, efforts are to be made to widen the scope of the collaborative research programmes which are socially and economically beneficial to both countries.

"Success has to be based on mutual respect and partnership. A clear alignment of Governmental targets/policies, which are reflected in bilateral agreements, is needed. It should not be one-sided."

- Survey respondent

- It is vital to attract industry to strengthen the India-Ireland S&T cooperation. Gains so far achieved in industry-outreach vindicate the fact that the collaboration can create multiplier effects – it would be possible through enhanced partnership with industry by promoting links between industry and academia.
- Mobility of scientific society plays a crucial role in propelling contacts into action. To create a co-operative environment, we need to bring the scientists of both sides together through bilateral scientific meetings.
- Workshops are most important for people to interact with and know about each other's capabilities.
- Organizing workshops with students' involvement has to be part of the strategy.
- The VISA procedure should be relaxed for academicians, scientists and to some extent industrialists.⁹

"Mutual respect is crucial for the success of any agreements. S&T in India has a social and community dimension and unless this is clearly articulated to the potential collaborators we will lose the focus -- Survey respondent

- Survey respondent

⁹ This recommendation is partially based on questionnaire response

2. Activate Funding: A viable mechanism for bilateral funding needs to be created. Increased and sustained budgetary support is a pre-requisite for meaningful S&T cooperation.

- To operationalise agreements, both governments should finalize funding and launch joint calls for projects.

“CIT has financed the activities with Pune and IIT Delhi but to really get the best from our collaboration we will need to access external funding to support more research and student exchanges.”

– Survey respondent

- Strategy should be devised to draw resources not only from the government, but also from private philanthropic funds and contributions from industries (e.g. target Irish/Indian corporates having R&D base in India/Ireland). Fund raising from expatriate communities belonging to the two countries should also be proactively pursued.
- Searching and strengthening trilateral S&T collaboration with Ireland, India and other countries is required.

“We have already established the links and engaged in widespread discussions with all the most appropriate Indian institutions and industry personnel. What we need now is a modest amount of financial support to convert the implementation plans into reality. For example, to support further bi-lateral discussions with industry, to introduce more Irish companies to potential Indian partners and vice versa, to facilitate more staff exchanges in the areas of mutual cooperation that we have already identified and in which there is already collaboration ongoing, to increase the bi-lateral exchange of students, not only at undergraduate level but also at postgraduate level ...”

– Survey respondent

3. Nodal group: It was concluded from interviews done with heads of international divisions in Indian S&T institutions that MoU by themselves do not make an impact. Some agency/ division should take steps to involve people, facilitate travels, visits and other interactions for efficient functioning. Setting up a small team (in Delhi and Dublin) to regularly scrutinize bilateral S&T cooperation may fill this gap. It could be a small team to facilitate bilateral collaborations, and formed within existing organizational arrangements. The group may execute the following:

- Maintain an electronic database of S&T infrastructures, S&T personnel and collaborative projects.

"A good starting point would be a travel scheme to develop the personal relationships that are needed for any collaboration. This should have a low threshold and a short and simple application procedure. I recommend that a combined industry / university approach would ensure industry involvement from the outset and would facilitate the Irish policy of commercializing university research"

— Survey respondent

- The database might include visits, seminars, involvement in international programmes and output resulting from the activity. Such a database would not only serve as a repository but could be used to compile a mailing list for all subsequent events.

"Unless there is clear understanding between various segments of the university to honor the MoU, the outcome is tardy and time consuming. The link between Project Investigators is crucial and there has to be an International Coordinator overseeing the activities"

- Survey respondent

4. Educational Interweaving Programme: The programme can be initiated by:

- Mutually recognizing degrees and certificates issued by educational authorities of both countries. Students can engage in post-graduate and Doctorate studies and be awarded joint degrees by the respective collaborating institutions/ universities.
- Institute level collaboration agreements on two-way student/ teacher exchange programmes. Other joint-research tie-ups at the institute level also need to be planned.
- Irish universities need to have local representation in India. Some cells should be formed to offer counseling on studying in an Irish university. Such initiatives can provide information to prospective students and establish and continue linkages. An India based projection of Irish Universities/ Institutions would also help develop faculty mobility.
- Some Indian portals (like Shiksha.com and indiastudycentre.com) have columns for 'Study abroad. Being dedicated sites for students, advertising here may be straightforward and effective for wider dissemination of information about higher education opportunities among Indian students.

In CIT we have made concrete associations with Pune University and IIT Delhi through both colloquia and Memoranda of Understanding. Cooperation between Ireland and India is very exciting and CIT wishes to strengthen its activities as a leader in developing academic and industry links between the two countries."

- Survey respondent

5. Frontier Science Programme: Initiate efforts to widen the scope of the collaborative research programmes in major identified areas like information technology and biotechnology which are socially and economically beneficial to both countries. Events like Frontiers of Science Symposium and Frontiers of Engineering Symposium involving students may be planned to generate interest in cutting edge research in both countries.

“From a CIT viewpoint, we don't need information sessions, introduction sessions, advice on how to get engaged with Indian universities or businesses – we've already done all that and need now to move to the next phase and grow our present bi-lateral activities into more and more outcomes.”

- Survey respondent

6. Participation in FP7: There is a need to activate programs (including those under the MoUs) via FP7 funding, to widen the scope of EU collaborative research. This is a promising avenue for bilateral/trilateral cooperation. Researchers should be encouraged to make use of FP7 cooperation project calls, especially in fields like ICT and biotechnology where India and Ireland have an edge. For information and other help, National Contact Point (NCP) of Ireland or India can be contacted.

- Trade shows for Indian and Ireland SME should be planned.
- Exchange of information and ideas is important in order to pinpoint and narrow down on areas of common interest, and this needs to be quickly followed up by actions to make things happen before the momentum is lost. Issuing of visas needs to be streamlined.
- Development of a dedicated website to promote Ireland-India cooperation would be useful.
- Foster discussion between national funding agencies.
- Outline concrete proposals to industry to facilitate industry tie ups.

- Recommendations compiled from Survey response

Appendix 1

Objectives and Methodology

Objective and scope of study

NISTADS was assigned to carry out a scoping study entitled "Science & Technology Scoping Study: Identifying areas of cooperation between Ireland and India" by the Embassy of Ireland in India. The underlying objective was to identify apparent and practical opportunities for cooperation because the embassy felt that "in a practical sense the 'Ireland-India S&T Cooperation Agreement' is yet to see the light of day". It further felt that "the bottleneck is lack of information."

Methodology

The study was conducted broadly along the following lines:

- Perceptions gathered through a questionnaire survey from Irish and Indian researchers involved in bilateral activities.
- Scientometric data analysis from a widely used database.
- Achievements seen from the initiation of the cooperation program till recently.

The report was compiled on the basis of the following:

- Perception data- Questionnaires and Personal Interviews.
- Data available with NISTADS.
- Scientometric data compilation from the Scopus database.
- Record of bilateral S&T agreements done so far.
- Recent progress in bilateral cooperation.

Questionnaire administration

Knowing that baseline data on collaborators in the joint projects does not exist, a novel technique was employed to get a representative sample of the opinions of researchers working together in projects and experiments across the boundaries. This was done from the information available on the Internet regarding co-authored publications and through few personal interviews conducted earlier, where we requested details about Irish and Indian scientists working jointly. Based on this, a set of respondents was drawn up.

Questions asked broadly related to:

- Creating awareness through exchange of information.
- Addressing mutually beneficial issues of S&T Development.
- Creating opportunities for bilateral cooperation.
- Nurturing contacts and networking.
- Fund generation.
- Follow-up visits planned/undertaken.

- Student exchanges planned/undertaken.
- Publications like proceedings, records or minutes and scientific papers.

Personal interviews

Institutions involved in previous agreements were visited to explore if any major follow-up event had taken place. Questions were posed to personnel responsible for managing international issues like MoU, exchange of visits etc. Institutes recently visited or planned to be visited by Irish delegations were also covered through personal interviews. Persons in charge were questioned to explore the present status and future potential of the collaborations.

Institutes recently visited by Irish delegations were also covered in interviews. They seem to be optimistic about the recent agreements signed, upcoming S&T events and future plans of Irish universities/institutes to put into practice the collaboration with other institutes.

Appendix 2

Questionnaire

Science & Technology Scoping Study: Identifying Areas of Cooperation between Ireland & India

1. Please distinguish whether your acquaintance with Irish/Indian research community is through academic links in bilateral collaboration ('1') or by your own contacts ('2').

Bilateral collaboration ('1') / own contact ('2').

2. Since you have been involved in Ireland-India research event/activity, how would you rate the event in output/expected output

(Excellent-1 Very good-2 Average-3)

Creating awareness through exchange of information

Addressing mutually beneficial issues of S&T Development

Creating opportunities for bilateral cooperation

Nurturing contacts and networking

Fund generation

3. Outcome/ Expected outcome of the event

(Y / N)

Awareness about capabilities of Irish/ Indian Institutions

Follow-up visits planned/undertaken

Student exchange planned/undertaken

Publications like proceedings, scientific papers

Any other outcome

Details of the outcome(s)

4. Mention any hurdles faced during the previous work like lack of support

(Many problems-1 Moderate -2 Easy -3)

Financial

Academic

Administrative

Any other

Remarks:

5. What kind of support would you envisage for future joint research ventures

(Needed-1 Not needed-2)

Information resource

Financial assistance

Visa

Travel

Any other aid

6. Do you think Irish/Indian industry will be benefitted by bilateral collaboration

(Yes -1 Not sure-2 No-3)

Remarks:

7. Please mention the aspects of the understanding that have been most interesting or most valuable to you

8. If possible, please suggest names of people/institutions who you think are significant in leveraging bilateral S&T/ Academia-Industry bilateral collaboration

Name	Affiliation	Contact Information

9. Please give specific suggestions to facilitate India-Ireland S & T cooperation through bilateral mechanism:-

Thank you

Appendix 3

Other Collaborations

Some Ireland India collaborations¹⁰

- Saibal Roy- Tyndall National Institute with National Metallurgical Laboratory
- Benjamin McKay - University College Cork (UCC) with Tata Institute of Fundamental Research.
- Marc Devocelle, Royal College of Surgeons in Ireland with Urumu Dhanalakshmi College
- Tom Naughton, National University of Ireland Maynooth with Indian Institute of Technology, Guwahati
- Igor Shvets, TCD with Materials Science Division, Inter University Accelerator Centre (IUAC)
- Mani Ramaswami, TCD with (i)Tata Institute of Fundamental Research, (ii) National Centre for Biological Sciences, and (iii) MetaOme Bangalore

Biotechnology: There has been an agreement to work together between the Irish Biotechnology Association and the Association of Biotechnology-led Enterprises of Bangalore.

Biocon India links with Ireland: Biocon India was incorporated as a joint venture in 1978 connecting Biocon Biochemicals Ltd. of Ireland and Indian entrepreneur, Kiran Mazumdar-Shaw. Kiran Majumdar Shaw has served on the Board of Science Foundation, Ireland. Biocon Foundation in collaboration with the Embassy of Ireland has launched the Biocon Foundation-Irish Aid Sanitation Programme at Huskur Gram Panchayat in Bangalore (Rural) district of India. Dr Kiran Mazumdar Shaw is also the Honorary Consulate of Ireland at its Bangalore office in India.

Biocon works with the following companies in Ireland:

- Sigmoid Biotech Website :<http://www.sigmoidpharma.com>
- Arrow Generics Website: <http://www.biocon.com/>

¹⁰ As reported in SFI Presentation during Ireland-India Science and Technology Forum held in February 2010 in Dublin.

Appendix 4

Prominent Indian S&T Institutions

CSIR Institutes

	CITY	NAME OF INSTITUTE	WEBSITE
1	Hyderabad	CCMB - Centre for Cellular & Molecular Biology	http://www.ccmbindia.org/
2	Karaikudi	CECRI - Central Electrochemical Research Institute	http://www.cecri.res.in/
3	Dhanbad	CFRI - Central Fuel Research Institute	http://www.cfriindia.nic.in/
4	Kolkata	CGCRI - Central Glass & Ceramic research Institute	http://www.cgcri.res.in/
5	Chennai	CLRI - Central Leather Research Institute	http://www.clri.org/
6	Bangalore	C-MMACS - CSIR Centre for Mathematical Modelling and Computer Simulation	http://www.cmmacs.ernet.in/
7	New Delhi	CRRI - Central Road Research Institute	http://www.crridom.org/
8	Bhavnagar	CSMCRI - Central Salt & Marine Chemicals Research Institute	http://www.csmcri.org/
9	Hyderabad	IICT - Indian Institute of Chemical Technology	http://www.iictindia.org/
10	New Delhi	IGIB - Institute of Genomics and Integrative Biology	http://www.igib.res.in
11	Chandigarh	IMT - Institute of Microbial Technology	www.imtech.res.in/
12	Bangalore	NAL - National Aerospace Laboratories	http://www.nal.res.in/
13	Pune	NCL - National Chemical Laboratory	http://www.ncl-india.org/
14	Hyderabad	NGRI - National Geophysical Research Institute	http://www.ngri.org.in/
15	New Delhi	NISCAIR - National Institute of Science Communication and Information Resources	www.niscair.res.in/
16	Jamshedpur	NML - National Metallurgical Laboratory	www.nmlindia.org/
17	Bhopal	AMPRI - Advanced Materials and Processes Research Institute	www.ampri.res.in
18	Jammu	IIIM - Indian Inst. of Integrative Medicine	www.iiim.res.in
19	Thiruvananthapuram	NIIST - National Institute for Interdisciplinary Science and Technology	www.niist.res.in
20	Roorkee	CBRI - Central Building Research Institute	http://www.cbri.org/
21	Lucknow	CDRI - Central Drug Research Institute	http://www.cdriindia.org/
22	Pilani	CEERI - Central Electronics Engineering Research Institute,	http://www.ceeri.res.in/
23	Mysore	CFTRI - Central Food Technological Research Institute	http://www.cftri.com/
24	Lucknow	CIMAP - Central Institute of Medicinal & Aromatic Plants,	http://www.cimap.res.in/
25	Durgapur	CMERI - Central Mechanical Engineering Research Institute	http://www.cmeri.res.in/
26	Dhanbad	CMRI - Central Mining Research Institute	www.cmriindia.nic.in/

27	Chandigarh	CSIO - Central Scientific Instruments Organisation	www.csio.res.in/
28	Kolkata	IICB - Indian Institute of Chemical Biology	http://www.iicb.res.in/
29	Dehradun	IIP - Indian Institute of Petroleum	http://www.iip.res.in/iipnew/index.html
30	Palampur	IHBT - Institute of Himalayan Bioresource Technology	www.ihbt.res.in
31	Lucknow	ITRC - Industrial Toxicology Research Centre	http://www.iitrindia.org/
32	Lucknow	NBRI - National Botanical Research Institute	http://www.nbri-lko.org/
33	Nagpur	NEERI - National Environmental Engineering Research Institute	www.neeri.nic.in
34	Goa	NIO - National Institute of Oceanography	http://www.nio.org/
35	New Delhi	NISTADS - National Institute of Science Technology & Development Studies	www.nistads.res.in
36	New Delhi	NPL - National Physical Laboratory	www.nplindia.org/npl/index.htm
37	Bhubaneswar	IMMT- Institute of Minerals and Materials Technology	www.immt.res.in
38	Jorhat	NEIST - North East Institute of Science and Technology	www.neist.org
39	Chennai	SERC - Structural Engineering Research Centre	http://www.sercm.org

Dept of Atomic Energy Institutes

	City	Name of The Institute	WEBSITE
1	Mumbai	Bhabha Atomic Research Center -BARC	http://www.barc.ernet.in/
2	Indore	Raja Ramanna Center for Advanced Technology - RRCAT	http://www.cat.gov.in/
3	Kalpakkam	Indira Gandhi Center for Atomic Research - IGCAR	http://www.igcar.ernet.in/
4	Kolkata	Variable Energy Cyclotron Center - VECC	http://www.vecc.gov.in/
5	Mumbai	Tata Institute of Fundamental Research - TIFR	www.tifr.res.in/
6	Kolkata	Saha Institute of Nuclear Physics	www.saha.ac.in/
7	Mumbai	Tata Memorial Centre	www.tatamemorialcentre.com/
8	Bhubaneswar ORISSA	Institute of Physics	www.iopb.res.in/
9	Allahabad	Harish Chandra Research Institute	www.mri.ernet.in/
10	Chennai	Institute of Mathematics	www.cmi.ac.in/
11	Ahmedabad	Institute for Plasma Research	www.ipr.res.in/
12	Hyderabad	Atomic Minerals Directorate for Exploration and Research	www.amd.gov.in

Indian Council of Medical Research (ICMR) Institutes

	City	Name of The Institute	WEBSITE
1	Agra	National JALMA Institute for Leprosy & Other Mycobacterial Diseases	http://www.jalma-icmr.org.in

2	Ahmedabad	National Institute of Occupational Health (NIOH)	http://www.nioh.org
3	Chennai	Tuberculosis Research Centre (TRC)	http://www.trc-chennai.org
4	Chennai	National Institute of Epidemiology (NIE)	http://www.nie.gov.in/
5	New Delhi	National Institute of Malaria Research (NIMR)	http://www.mrcindia.org
6	New Delhi	Institute of Pathology (IOP)	http://instpath.gov.in
7	New Delhi	National Institute of Medical Statistics (NIMS)	www.icmr.nic.in/000134/irms.htm
8	Hyderabad	National Institute of Nutrition (NIN)	http://www.ninindia.org
9	Kolkata	National Institute of Cholera and Enteric Diseases (NICED)	http://www.niced.org.in
10	Kolkata	ICMR Virus Unit	http://icmr.nic.in/pinstitute/ivu.htm
11	Madurai	Centre for Research in Medical Entomology (CRME)	www.icmr.nic.in/pinstitute/crme.htm
12	Mumbai	National Institute for Research in Reproductive Health (NIRRH)	http://www.nirrh.res.in
13	Mumbai	National Institute of Immunohaematology (NIIH)	http://www.niih.org.in
14	Noida	Institute of Cytology and Preventive Oncology (ICPO)	http://www.icpo.org.in/index.htm
15	Patna	Rajendra Memorial Research Institute of Medical Sciences (RMRIMS)	http://www.rmrim.org.in
16	Puducherry	Vector Control Research Centre (VCRC)	http://vcrc.res.in
17	Pune	National Institute of Virology (NIV)	http://www.niv.co.in
18	Pune	National AIDS Research Institute (NARI)	http://www.nari-icmr.res.in

ICMR's Regional Medical Research Centres

	City	Name of The Institute	WEBSITE
1	Bhubaneswar	Regional Medical Research Centre	www.icmr.nic.in/pinstitute/bhubaneswar.htm
2	Dibrugarh	Regional Medical Research Centre	http://rmrcne.org.in
3	Port Blair	Regional Medical Research Centre	http://www.rmrc.res.in
4	Jabalpur	Regional Medical Research Centre	http://www.rmrcj.org
5	Jodhpur	Regional Medical Research Centre	http://www.dmrjodhpur.org
6	Belgaum	Regional Medical Research Centre	http://www.icmr.nic.in/pinstitute/belgaum/index.htm

ICMR's Units

	City	Name of The Institute	WEBSITE
1	Hyderabad	Food & Drug Toxicology Research Centre	http://www.ninindia.org
2	Hyderabad	National Centre of Laboratory Sciences,	http://www.ninindia.org
3	Kolkata	ICMR Virus Unit	http://icmr.nic.in/pinstitute/ivu.htm

4	Mumbai	Genetic Research Centre	www.icmr.nic.in/pinstitute/grc/grc.htm
5	Pune	Microbial Containment Complex	www.icmr.nic.in/pinstitute/mcc/mcc.html

Indian Council of Agricultural Research (ICAR) Institutes

	City	Name of The Institute	WEBSITE
1	Port Blair	Central Agricultural Research Institute (CARI)	cari.res.in/
2	Jodhpur	Central Arid Zone Research Institute (CAZRI)	www.icar.org.in/cazri.htm
3	Izatnagar	Central Avian Research Institute (CARI)	www.icar.org.in/cari/index.html
4	Barrackpore	Central Inland Fishries Research Institute (CIFRI)	www.cifri.com/
5	Mathura	Central Institute for Research on Goats(CIRG)	www.cirg.res.in
6	Lucknow	Central Institute for Sub-Tropical Horticulture (CISTH)	www.cishko.org/
7	Hissar	Central Institute for Research on Buffaloes (CIRB)	cirb.gov.in/
8	Mumbai	Central Institute for Research on Cotton Technology (CIRCOT)	www.circot.res.in
9	Nagpur	Central Institute for Cotton Research(CICR)	www.cicr.org.in/
10	Bhubaneshwar	Central Institute for Freshwater Aquaculture (CIFA)	www.cifa.in/
11	Ludhiana	Central Institute of Post Harvest Engineering & Technology (CIPHET)	http://www.icar.org.in/ciphet.html
12	Bhopal	Central Institute of Agricultural Engineering (CIAE)	www.ciae.nic.in/
13	Bikaner	Central Institute of Arid Horticulture (CIAE)	www.icar.org.in/ciah/ciah.htm
14	Chennai	Central Institute of Brackishwater Aquaculture (CIBA)	www.ciba.tn.nic.in
15	Mumbai	Central Institute of Fisheries Education(CIFE)	www.cife.edu.in
16	Cochin	Central Institute of Fisheries Technology(CIFT)	www.cift.res.in/
17	Srinagar	Central Institute of Temperate Horticulture (CITH)	Email: cith@hub1.nic.in
18	Cochin	Central Marine Fisheries Research Institute (CMFRI)	www.cmfri.com
19	Kasaragod	Central Plantation Crops Research Institute (CPCRI)	cpcri.nic.in
20	Shimla	Central Potato Research Institute (CPRI)	cpri.ernet.in/
21	Barrackpore	Central Research Institute for Jute & Allied Fibres (CRIJAF)	www.crijaf.org
22	Hyderabad	Central Research Institute for Dryland Agriculture (CRIDA)	www.crida.ernet.in/
23	Cuttack	Central Rice Research Institute (CRRI)	crrl.nic.in/
24	Tehsil Malpura	Central Sheep & Wool Research Institute(CSWRI)	www.customercareinfo.in/
25	Dehradun	Central Soil & Water Conservation Research & Training Institute (CSWCRTI)	www.cswcrtiweb.org/
26	Karnal	Central Soil Salinity Research Institute(CSSRI)	www.cssri.org
27	Rajahmundry	Central Tobacco Research Institute (CTRI)	www.ctri.org.in

28	Trivandrum	Central Tuber Crops Research Institute(CTCRI)	www.ctcri.org/
29	ELA OLD , Goa	ICAR Research Complex for Goa(ICARRCG)	icargoa.res.in
30	Barapani , Meghalaya	ICAR Research Complex for NEH Region(ICARRCNEHR)	icameh.res.in
31	Ranchi	Indian Lac Research Institute (ILRI)	ilri.ernet.in/rinf.htm
32	Izatnagar	Indian Veterinary Research Institute (IVRI)	ivri.nic.in/
33	New Delhi	Indian Agricultural Research Institute(IARI)	www.iari.res.in
34	New Delhi	Indian Agricultural Statistics Research Institute (IASRI)	www.iasri.res.in
35	Jhansi	Indian Grassland & Fodder Research Institute (IGFRI)	igfri.ernet.in/
36	Kanpur	Indian Institute of Pulses Research (IIPR)	http://www.iipr.res.in/
37	Bangalore	Indian Institute of Horticulture Research(IIHR)	www.iihr.res.in
38	Bhopal	Indian Institute of Soil Sciences (IISS)	iiss.ernet.in
39	Calicut	Indian Institute of Spices Research (IISR)	www.spices.res.in/
40	Lucknow	Indian Institute of Sugarcane Research(IISR)	www.iisr.nic.in
41	Varanasi	Indian Institute of Vegetable Research(PDV)	www.iivr.org.in/
42	Hyderabad	National Academy of Agricultural Research Management (NAARM)	icar.naarm.ernet.in
43	Karnal	National Dairy Research Institute (NDRI)	www.ndri.res.in
44	Calcutta	National Institute for Research on Jute Allied Fibres Technology (NIRJAFT)	www.nirjaft.res.in/
45	Bangalore	National Institute of Animal Nutrition & Physiology (NIANP)	http://www.nianp.res.in/
46	Coimbatore	Sugarcane Breeding Institute (SBI)	Email: sugaris@md3.vsnl.net.in
47	Almora	Vivekanand Parvatiya Krishi Anusandhan Shala (VPKAS)	http://vpkas.nic.in

National Bureaus

	City	Name of The Institute	WEBSITE
1	Lucknow	National Bureaue of Fish Genetic Resources (NBFGR)	www.nbfgr.res.in/
2	Karnal	National Bureaue of Animal Genetic Resources (NBAGR)	www.icar.org.in/nbagr/nbagr.html
3	New Delhi	National Bureaue of Plant & Genetic Resources (NBPGR)	nbpgr.delhi.nic.in
4	Nagpur	National Bureaue of Soil Survey & Land Use Planning (NBSSLUP)	www.nbsslup.nic.in/
5	New Delhi	National Bureaue of Agriculturally Important Micro.Organisms (NBAIMO)	www.nbaim.org/

Project Directorates

	City	Name of The Institute	WEBSITE
1	Bhubaneswar	Water Technology Centre for Eastern Region(WTCER)	www.wtcer.stpbh.soft.net

2	Bangalore	Project Directorate of Biological Control (PDBC)	www.pdbc.res.in
3	Meerut	Project Directorate of Cropping System Research(PDCSR)	www.pdcsl.ernet.in
4	Hyderabad	Project Directorate of Oilseed Research (PDOR)	www.dor-icar.org
5	Hyderabad	Project Directorate of Rice Research (PDRR)	www.drrindia.org
6	Patna	Project Directorate of Water Management Research(PDWMR)	http://www.orissalinks.com/archives/1103
7	Karnal	Project Directorate of Wheat Research (PDWR)	www.nic.in/icar/dwr/dwrmain.htm
8	Meerut Cantt	Project Directorate on Cattle (PDC)	www.pdcattle.ernet.in
9	New Delhi	Project Directorate on Maize (PDM)	www.maizeindia.org/
10	Hyderabad	Project Directorate on Poultry (PDP)	www.pdpoultry.org

ICAR National Research Centres (NRC)

	CITY	NAME OF INSTITUTE	WEBSITE
1	New Delhi	National Centre for Agri Economics & Policy Research (NCAP)	www.ncap.res.in/
2	New Delhi	National Centre for Integrated Pest Management (NCIPM)	www.ncipm.org.in
3	Jhansi	National Research Centre for Agroforestry (NRCAF)	www.nrcaf.ernet.in/
4	Trichurapalli	National Research Centre for Banana(NRCB)	www.nrcb.tn.nic.in
5	Puttur	National Research Centre for Cashew(NRCC)	www.nrccashew.org
6	Bikaner	National Research Centre for Camel(NRCC)	www.nrccamel.com
7	Nagpur	National Research Centre for Citrus(NRCC)	www.nrccitrus.nic.in/
8	New Delhi	National Research Centre for DNA Fingerprinting (NRCDF)	www.nbpg.ernet.in
9	Hissar	National Research Centre for Equines(NRCE)	www.nrce.nic.in/
10	Pune	National Research Centre for Grapes(NRCG)	nrcgrapes.nic.in/
11	Junagarh , Gujarat	National Research Centre for Groundnut(NRCG)	www.nrcg.res.in/
12	Hyderabad	National Research Centre for Meat&Meat Products (NRCMMP)	http://www.indiaveterinarycommunity.com/indianscenario/researchinst.htm
13	Borivai, Anand , Gujarat	National Research Centre for Medicinal & Aromatic Plants (NRCMAP)	www.nrc-map.org/
14	Jharnapani , Medziphema	National Research Centre for Mithun(NRCM)	www.nrcmithun.res.in
15	Solan	National Research Centre for Mushroom(NRCM)	www.nrcmushroom.org
16	Pedavegi	National Research Centre for Oilpalm(NRCO)	www.dopr.gov.in/
17	Rajgurunagar , Distt Pune	National Research Centre for Onion & Garlic (NRCOG)	nrcog.mah.nic.in/
18	Pakyong	National Research Centre for Orchids(NRCO)	sikkim.nic.in
19	Sewar , Bharatpur	National Research Centre for Rapeseed Mustard (NRCRM)	www.nrcrm.res.in
20	Jabalpur	National Research Centre for Weed Science (NRCWS)	www.nrcws.org/

21	Bhubaneswar	National Research Centre for Women in Agriculture (NRCWA)	www.nrcwa.org/
22	Dirang , West Kameng	National Research Centre for Yak (NRCY)	www.nrcy.org.in
23	Nainital	National Research Centre on Coldwater Fisheries (NRCCWF)	www.docstoc.com
24	New Delhi	National Research Centre on Plant Biotechnology (NRCPB)	www.nrcpb.org/
25	Hyderabad	National Research Centre on Sorghum(NRCS)	www.sorghum.res.in
26	Indore	National Research Centre on Soyabean(NRCS)	www.nrcsoya.nic.in

Dept of Biotechnology

	City	Autonomous Institutions	WEBSITE
1	Hyderabad	DNA Fingerprinting & Diagnostics(CDFD)	www.cdfd.org.in
2	Imphal	Institute of Bioresources and Sustainable Development	www.ibsd-imphal.nic.in/
3	Bhubaneswar	Institute of Life Sciences	www.ils.res.in
4	New Delhi	National Institute of Immunology	http://www.nii.res.in/
5	New Delhi	National Institute Of Plant Genome Research	http://www.nipgr.res.in/
6	Gurgaon Distt, Haryana	National Brain Research Centre	http://www.nbrc.ac.in
7	Pune	National Centre For Cell Sciences	http://www.nccs.res.in
8	Thiruvananthapuram	Rajiv Gandhi Centre For Biotechnology	www.rgcb.res.in
9	Mohali, Punjab	National Agri-Food Biotechnology Institution (NABI)	http://www.nabi.res.in/

Public Sector Undertakings

	City	Autonomous Institutions	WEBSITE
1	Bulandshahar	Bharat Immunologicals & Biologicals Corporation Limited	www.bibcol.co.in
2	Gurgaon	Indian Vaccines Corporation Limited	www.dbtindia.nic.in

Dept of Science & Technology (DST) Institutes

	City	Scientific Programmes	WEBSITE
1		Science and Engineering Research Council (SERC)	www.serc-dst.org
2		Kishore Vaigyanik Protsahan Yojana (KVPY)	www.iisc.ernet.in/kvpy
3		Intensification of Research in High Priority Areas (IRHPA)	www.serc-dst.org/irpha.htm
4		National Science & Technology Management Information System(NSTMIS)	www.nstmis-dst.org

S&T and Socio-Economic Development

	Scientific Programmes	WEBSITE
1	National Council for Science & Technology Communication (NCSTC)	www.vichar.nic.in/
2	Science and Society Division	www.scienceandsociety-dst.org/
3	National Science & Technology Entrepreneurship Development Board (NSTEDB)	www.nstedb.com/ www.techno-preneur.net/
4	Natural Resources Data Management System (NRDMS)	www.nrdms.gov.in/
5	State Councils for Science & Technology	www.dst.gov.in
6	International S&T Cooperation	www.stic-dst.org

Scientific Services

	Scientific Programmes	WEBSITE
1	National Atlas and Thematic Mapping Organisation	www.natmo.gov.in
2	Survey Of India	www.surveyofindia.gov.in

Autonomous S&T Institutions

	CITY	Scientific Programmes	WEBSITE
1	Pune	Agharkar Research Institute	www.aripune.org
2	Nainital	Aryabhatta Research Institute of Observational Sciences (ARIES)	www.aries.ernet.in
3	Lucknow	Birbal Sahni Institute of Palaeobotany	www.bsip-india.org
4	Kolkata	Bose Institute	www.boseinst.ernet.in
5	Jalahalli, Bangalore	Centre for Liquid Crystal Research	www.clcr.res.in
6	Kolkata	Indian Association for the Cultivation of Science	www.iacs.res.in
7	Bangalore	Indian Institute of Astrophysics	www.iiap.res.in
8	Mumbai	Indian Institute of Geomagnetism	www.iigm.res.in/iigweb/index.php
9	Pune	Indian Institute of Tropical Meteorology	www.tropmet.res.in
10	Hyderabad	International Advanced Research Centre for Powder Metallurgy and New Materials	www.arci.res.in
11	ASSAM	The Institute of Advanced Study in Science & Technology	www.iasst.in
12	Bangalore	Jawaharlal Nehru Centre for Advanced Scientific Research	www.jncasr.ac.in
13	New Delhi	National Accreditation Board for Testing & Calibration Laboratories	www.nabl-india.org/
14	Bangalore	Raman Research Institute	www.rri.res.in/

15	Kolkata	S.N. Bose National Centre for Basic Sciences	boson.bose.res.in/
16	Thiruvananthapuram	Sreechitra Tirunal Institute for Medical Sciences & Technology	www.sctimst.ac.in
17	New Delhi	Technology Information, Forecasting & Assessment Council (TIFAC)	www.tifac.org.in
18	New Delhi	Vigyan Prasar	www.vigyanprasar.com
19	Dehradun	Wadia Institute of Himalayan Geology	www.himgeology.com/

Professional Bodies

	City	Scientific Programme	WEBSITE
1	New Delhi	Indian National Science Academy	http://insaindia.org/
2	Bangalore	Indian Academy of Sciences	www.ias.ac.in
3	New Delhi	Indian National Academy of Engineering	www.inae.org
4	Allahabad	The National Academy of Sciences	www.nasi.nic.in
5	Kolkata	The Indian Science Congress Association	www.sciencecongress.org/

Statutory Board

	Scientific Programme	WEBSITE
	Technology Development Board	www.tdbindia.org/

Indian Institutes of Technology (IITs)

	CITY	Name of the Institutes	WEBSITE
1	New Delhi	IIT - Indian Institute of Technology	www.iitd.ac.in/
2	Mumbai	IIT	www.iitb.ac.in/
3	Kanpur	IIT	www.iitk.ac.in/
4	Chennai	IIT	www.iitm.ac.in/
5	Kharagpur	IIT	www.iitkgp.ernet.in
6	Kanpur	IIT	http://www.iitk.ac.in
7	Roorkee	IIT	www.iitr.ac.in/
8	Bhubaneshwar	IIT	www.iitbbs.ac.in
9	Gandhinagar	IIT	www.iitgn.ac.in/
10	Guwahati	IIT	http://www.iitg.ac.in/
11	Hyderabad	IIT	www.iith.ac.in/
12	Indore	IIT	www.iitindore.in/

13	Mandi	IIT	www.iitmandi.ac.in/
14	Patna	IIT	www.iitp.ac.in/
15	Rupnagar	IIT	www.iitrpr.ac.in/

Department of Space (DoS)

	CITY	Name of the Institutes	WEBSITE
1	Bangalore	Indian Space Research Organisation	www.isro.org/
2	Ahmedabad	Physical Research Laboratory	www.prl.res.in/
3	Bangalore	National Natural Resources Management System	www.nnrms.gov.in/
4	Hyderabad	National Remote Sensing Centre	www.nrsc.gov.in/
5	Gadanki	National MST Radar Facility (NMRF)	www.vigyanprasar.gov.in/comcom/develop73.htm
6	Thiruvananthapuram	Vikram Sarabhai Space Centre	www.vssc.gov.in/
7	Sriharikota	Shar centre	www.daviddarling.info/encyclopedia/S/Sriharikota.html
8	Bangalore	Liquid Propulsion Systems Centre	http://www.isro.org/isrocentres/lpsc.aspx
9	Thiruvananthapuram	Liquid Propulsion Systems Centre	http://www.lpsc.gov.in/
10	Mahendragiri	Liquid Propulsion Systems Centre	www.isro.org
11	Bangalore	ISRO Satellite Centre	www.isac.gov.in/
12	Ahmedabad	Space Application Centre	www.sac.gov.in/
13	Ahmedabad	Development and Educational Communication Unit	http://www.isro.org/isrocentres/decu.aspx
14	Thiruvananthapuram	ISRO Inertial Systems Unit	http://www.isro.org/isrocentres/iisu.aspx
15	Hassan	INSAT Master Control Facility	http://www.isro.org/isrocentres/mcf_hassan.aspx
16	Bangalore	ISRO Telemetry Tracking And Command Network	http://www.isro.org/isrocentres/istrac.aspx

Ministry of Human Resource Development

	CITY	Name of the Institutes	WEBSITE
1	New Delhi	University Grants Commission (UGC)	http://www.ugc.ac.in/
2	New Delhi	Association of Indian Universities (AIU)	http://www.aiuweb.org/
3	New Delhi	Indian Council of Social Science Research, ICSSR	www.icssr.org/
4	New Delhi	Indian Council of Philosophical Research, ICPR	http://icpr.in/
5	New Delhi	Indian Council of Historical Research ICHR	http://www.ichrindia.org/
6	Hyderabad	National Council of Rural Institutes NCRI	http://www.ncri.in/
7	New Delhi	Project of History of Indian Science, Philosophy and Culture	http://www.phispc.nic.in/projects.htm

Other Institutes of Higher Learning

	CITY	Name of the Institutes	WEBSITE
1	Shimla	Indian Institute of Advanced Study	www.iias.org/
2	New Delhi	Dr Zakir Hussain Memorial College Trust	www.zakirhusaincollege.in
3	New Delhi	Shri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeetha	www.slbsrsv.ac.in/home.asp
4	Tirupati	Rashtriya Sanskrit Vidyapeetha	rsvidyapeetha.ac.in/
5	New Delhi	National University of Educational Planning and Administration (NUEPA)	www.nuepa.org/
6	New Delhi	Shastri Indo-Canadian Institute	www.sici.org/home/
7	New Delhi	United States-India Educational Foundation	www.usief.org.in/

Ministry of Information Technology

	CITY	Name of the Institutes	WEBSITE
1	Dehradun	Dehradun Institute of Technology	http://www.dit.edu.in/
2	New Delhi	National Informatics Centre (NIC)	http://home.nic.in/
3	New Delhi	Standardisation, Testing and Quality Certification	http://www.stqc.nic.in/
4	Pune	Centre for Development of Advanced Computing	http://www.cdac.in/
5	Pune	Centre for materials for electronic technology	http://www.cmet.gov.in/
6	New Delhi	Department of Electronics and Accreditation of Computer Courses DOEACC	http://www.doeacc.edu.in/index.jsp
7	Mumbai	Society for Applied Microwave Electronics Engineering and Research	www.sameer.gov.in/
8	New Delhi	Software Technology Parks of India	www.stpi.in/
9	New Delhi	Education and Research Network	www.eis.ernet.in/
10	New Delhi	Electronic and Computer Software Export Promotion Council	http://www.escindia.in/
11	New Delhi	Media Lab Asia	http://medialabasia.in/
12	New Delhi	National Informatic Centre Services	http://www.nicsi.com/
13	New Delhi	National Internet Exchange of India	http://www.nixi.in/

Ministry of Non-Conventional Energy Sources

	CITY	Name of the Institutes [Nodal Agencies]	WEBSITE
1	New Delhi	Delhi Energy Development Agency	www.geda.org.in/snass_state.html
2	Thiruvananthapuram	Agency for Non-conventional Energy and Rural Technology	anert.gov.in/
3	Kolkata	West Bengal Renewable Development Agency (WBREDA)	www.wbreda.org/
4	Andhra Pradesh	Non-Conventional Energy Development Corporation of Andhra Pradesh	www.aponline.gov.in
5	Patna	Non-Conventional Energy Development Corporation of Andhra Pradesh	www.sdabeebreda.com/sda.htm
6	Patna	Bihar Renewable Energy Development Agency	www.sdabeebreda.com/sda.htm
7	Chandigarh	Haryana State Council for Science & Technology	dstharyana.org/html/hscst/schemes.htm
8	Shimla	Himachal Pradesh Energy Development Agency	himurja.nic.in/
9	Bhubaneswar	The Orissa Renewable Energy Development Agency (OREDA)	www.oredaorissa.com/
10	Bangalore	Karnataka Renewable Energy Development Limited (KREDL)	www.indiabuildinginfo.com/virtualclean/kredl/kredl.htm
11	Pune	Maharashtra Energy Development Agency	www.mahaurja.com/
12	Shillong	Meghalaya Non-Conventional and Rural Energy Development Agency	mnreda.gov.in/
13	Guwahati	Assam Science Technology and Environment Council	www.astec.gov.in/
14	Jammu	J&K Energy Dev. Agency	jakeda.nic.in/
15	Pondicherry	Govt. Departments of Pondicherry	www.pon.nic.in/

Biomass Research Centres

	CITY	Name of the Institutes [Nodal Agencies]	WEBSITE
1	Lucknow	National Botanical Research Institute (NBRI)	www.nbri-lko.org/
2	Madurai	School of Biological Sciences	http://www.genomicsmku.org/sbs.html
3	Bhubaneswar	Regional Plant Resource Centre	http://www.rprcbbsr.com/
4	New Delhi	The Energy Research Institute, TERI	www.teriin.org/
5	New Delhi	School of Life Sciences	http://www.jnu.ac.in/main.asp?sendval=School Of Life Sciences

Ministry of Environment and Forests (MoEF)

	CITY	Name of the Institutes [Sub-ordinate Offices]	WEBSITE
1	Dehradun	Forest Survey of India	www.fsi.nic.in
2	Kolkata	Botanical Survey of India	http://bsi.gov.in
3	Kolkata	Zoological survey of India	http://zsi.gov.in
4	Dehradun	Indira Gandhi National Forest Academy	www.ignfa.gov.in

5	Dehradun	Directorate of Forest Education	http://dfe.gov.in
6	Faridabad	National Institute of Animal Welfare	E-mail:- anjani.moef@yahoo.com
7	New Delhi	National Museum of Natural History	http://nmnh.nic.in

Autonomous Organisations

	CITY	Name of the Institutes [Sub-ordinate Offices]	WEBSITE
1	Almora	Gobind Ballabh Pant Institute of Himalayan Environment & Development	http://gbpinhed.gov.in
2	Dehradun	Indian Council of Forestry Research and Education	http://www.icfre.org
3	Bhopal	Indian Institute of Forest Management	http://www.iifm.ac.in
4	Bangalore	Indian Plywood Industries Research and Training Institute	www.ipirti.gov.in
5	Dehradun	Wildlife Institute of India	http://www.wii.gov.in

Authorities

	CITY	Name of the Institutes [Sub-ordinate Offices]	WEBSITE
1	New Delhi	Central Zoo Authority	http://www.cza.nic.in
2	Chennai	National Biodiversity Authority	http://www.nbaindia.org
3	New Delhi	National Tiger Conservation Authority	http://projecttiger.nic.in

Boards

	CITY	Name of the Institutes [Sub-ordinate Offices]	WEBSITE
1	Chennai	Animal Welfare Board of India	http://www.awbi.org
2	Delhi	Central Pollution Control Board	www.cpcb.nic.in

Public Sector Undertakings

	CITY	Name of the Institutes [Sub-ordinate Offices]	WEBSITE
	Port Blair	Andaman & Nicobar Islands Forest & Plantation Development Corporation Ltd.	http://forest.and.nic.in/frst/anifpc1.html

Defence Research and Development Organisation

	CITY	NAME OF INSTITUTE [Laboratory & Establishment]	WEBSITE
1	Hyderabad	Armament Numerical Research & Analysis Group (ANURAG)	http://www.studentsguide.in/specialized-research-institutes/DRDO-laboratories.html
2	Pune	(ANURAG) Armament Research and Development Establishment	http://pune.justdial.com/armament-research-and-development-establishment_pashan_Pune_zpvbjerPhsq.html
3	Bangalore	Center for Artificial Intelligence and Robotics	http://www.university-directory.eu/India/Center-for-Artificial-Intelligence-and-Robotics-Bangalore.html
4	Haldwani	Defence Institute of Bio-Energy Research (DIBER)	www.drdo.org/labs/darl/index.html
5	Bangalore	Defence Avionics Research Establishment	http://www.drdo.org/labindex.shtml
6	Bangalore	Defence Bioengineering and Electromedical Laboratory (DEBEL)	http://science.feedfury.com/content/21919379-defence-bioengineering-and-electromedical-laboratory-debel-india.html
7	Dehradun	Defence Electronics Application Laboratory (DEAL)	http://rac.drdo.in/nri_labs/deal.html
8	Hyderabad	Defence electronics research laboratory dmrl	http://www.drdo.org/labindex.shtml
9	Mysore	Defence Food Research Laboratory, DFRL	http://www.drdo.gov.in/labs.html
10	Pune	Defence Institute of Advance Technology	http://www.diat.ac.in/~newdiat/index.html
11	New Delhi	Defence Institute of High Altitude Research (DIHAR)	http://www.drdo.org/labs/fri/index.html
12	Hyderabad	Defence Metallurgical Research Laboratory	http://www.globalsecurity.org/wmd/world/india/hyderabad-drc-other.htm
13	Gwalior	Defence Research and Development Establishment	http://www.drdo.gov.in/
14	New Delhi	Defence Scientific Information and Documentation Centre	http://www.drdo.org/labs/desidoc/
15	New Delhi	Defence Terrain Research Laboratory	http://www.drdo.org/labindex.shtml
16	Bangalore	Gas Turbine Research Establishment	http://bangalore.justdial.com/gas-turbine-research-establishment-centre_o-v-raman-nagar_Bangalore_orevPhlg.html
17	New Delhi	Laser Science and Technology Centre	http://www.worldoflasers.com/laserinstitutions.html
18	Bangalore	Microwave Tube Research and Development Center	http://www.drdo.gov.in/labs/mtrdc/index.html
19	Amarnath	Naval Materials Research Laboratory	http://www.drdo.gov.in/labs/nmrli/index.html
20	Thrikkakara	Naval Physical and Oceanographic Laboratory	http://www.drdo.org/labs/npol/index.html
21	New Delhi	Scientific Analysis Group	http://www.drdo.org/labs/npol/index.html
22	Himparisar, Chandigarh	Snow and Avalanche Study Establishment	http://www.drdo.org/labs/sase/index.html
23	New Delhi	Solid State Physics Laboratory	http://www.drdo.org/labindex.shtml
24	Chandigarh	Terminal Ballistics Research Laboratory	http://www.drdo.gov.in/labs/tbrl/index.html
25	Ahmednagar	Vehicle Research and Development Establishment	http://www.drdo.gov.in/labs/vrde/index.html

Ministry of Health and Family Welfare

	CITY	NAME OF INSTITUTE [Laboratory & Establishment]	WEBSITE
1	New Delhi	Food Safety India	http://www.foodsafetyindia.nic.in
2	Noida	National Institute of Biologicals	http://mohfw.nic.in/nibwebsite/pages/index.html
3	New Delhi	Central Bureau of Health Investigation	http://cbhidghs.nic.in/
4	New Delhi	Central Health Education Bureau	http://cheb.nic.in/

Programmes

	CITY	NAME OF INSTITUTE [Laboratory & Establishment]	WEBSITE
1	New Delhi	National Rural Health Mission	http://mohfw.nic.in/NRHM.htm
2	New Delhi	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH)	http://indianmedicine.nic.in/
3	New Delhi	Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)	http://cheb.nic.in/

[Source: NISTADS]

Appendix 5

Central Universities in India

University	State/UT	City/Town
Andhra Pradesh		
English and Foreign Languages University	Andhra Pradesh	Hyderabad
Maulana Azad National Urdu University	Andhra Pradesh	Hyderabad
University of Hyderabad	Andhra Pradesh	Hyderabad
Arunachal Pradesh		
Rajiv Gandhi University	Arunachal Pradesh	Itanagar
Assam		
Assam University	Assam	Silchar
Tezpur University	Assam	Tezpur
Bihar		
Central University of Bihar	Bihar	Patna
Chattisgarh		
Guru Ghasidas University	Chattisgarh	Bilaspur
Delhi		
Jawaharlal Nehru University	Delhi	New Delhi
Jamia Millia Islamia	Delhi	New Delhi
Indira Gandhi National Open University	Delhi	New Delhi
University of Delhi	Delhi	New Delhi
Gujarat		
Central University of Gujarat	Gujarat	Gandhinagar
Haryana		
Central University of Haryana	Haryana	Mahendragarh
Himachal Pradesh		
Central University of Himachal Pradesh	Himachal Pradesh	Kangra
Jharkhand		
Central University of Jharkhand	Jharkhand	Brambe
Jammu & Kashmir		

Central University of Jammu and Kashmir	Jammu & Kashmir	Ganderbal
Karnataka		
Central University of Karnataka	Karnataka	Gulbarga
Kerala		
Central University of Kerala	Kerala	Kasaragod
Manipur		
Central Agricultural University	Manipur	Imphal
Manipur University	Manipur	Imphal
Madhya Pradesh		
Dr. Hari Singh Gour University	Madhya Pradesh	Sagar
Maharashtra		
Mahatma Gandhi Antarrashtriya Hindi Vishwavidyalaya	Maharashtra	Wardha
Meghalaya		
North Eastern Hill University	Meghalaya	Shillong
Mizoram		
Mizoram University	Mizoram	Aizawl
Nagaland		
Nagaland University	Nagaland	Kohima
Orissa		
Central University of Orissa	Orissa	Koraput
Puducherry		
Pondicherry University	Puducherry	Puducherry
Punjab		
Central University of Punjab	Punjab	Bathinda
Rajasthan		
Central University of Rajasthan	Rajasthan	Bikaner
Sikkim		
Sikkim University	Sikkim	Yangang
Tamil Nadu		
Central University of Tamil Nadu	Tamil Nadu	Tiruvarur
Tripura		
Tripura University	Tripura	Agartala

Uttarakhand		
Hemwati Nandan Bahuguna Garhwal University	Uttarakhand	Srinagar
Uttar Pradesh		
Aligarh Muslim University	Uttar Pradesh	Aligarh
University of Allahabad	Uttar Pradesh	Allahabad
Banaras Hindu University	Uttar Pradesh	Varanasi
Babasaheb Bhimrao Ambedkar University	Uttar Pradesh	Lucknow
West Bengal		
Visva-Bharati University	West Bengal	Santiniketan

[Source: NISTADS]

NISTADS at a Glance

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<http://nistads.res.in>, <http://csir.res.in>

National Institute of Science, Technology and Development Studies (NISTADS) is a constituent laboratory of the Council of Scientific and Industrial Research (CSIR) of the Government of India. NISTADS is a leading institution in India specializing in science, technology and innovation policy research.

R&D activities at NISTADS encompass a large spectrum, covering policy advice on S&T, knowledge mapping, technology impact assessment and foresight, evaluation studies, innovation indicators, data mining and data management, public understanding of S&T and knowledge sharing for international cooperation.

The core competence of NISTADS as a premier national institution stems from its interdisciplinary research teams, multi-disciplinary faculty, and extensive research experience. This is coupled with its access to CSIR resources, technologies and personnel. It has a functional visitation program with network partners in India and other countries which broadens its vision.

As part of its extensive program portfolio, NISTADS undertakes regular sponsored and grant-in-aid research, consultancy and advisory research activities, networked research, in-house research and training programs.

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Identifying Areas of Cooperation between Ireland & India

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