



UNIVERSITY PRIORITY SETTING REPORT FOR THE PROVISION OF RESEARCH AND EDUCATION

UNIVERSITY OF MADRAS, INDIA

Integrating Talent Development into Innovation Ecosystems in Higher Education

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Table of Contents

Review of national priorities for research, innovation and education	2
University priorities for research and innovation targeted at the economy and business enterprises	13
University priorities for research and innovation targeted at inclusive economic growth	19
University priorities for research and innovation targeted at pressing challenges facing societies in Southern and Southeast Asia	22
Areas of innovation and research activities in which students should be involved	25

This report seeks to map priority areas for research and education provision at the University. It aims to provide a vision on how the institution can develop further to become innovation and skills provider for its region and locality, and how students and graduates should be involved in this process.

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Review of national priorities for research, innovation and education







After independence, India has implemented multiple initiatives and actions aimed at building a strong nation. The efforts have been guided by the country's Five Year Action Plans implemented by the Planning Commission of India. The Five Year Action Plans mainly focused on developing policies and plans for the development of key sectors such as agriculture, industry and education and by addressing important issues such as employment, public health, technological development, etc. Due to the results achieved in various sectors under the five year plans, now India is the world's third largest economy and second largest higher education system in the world in terms of the number of institutions and in terms of the number of Student's Gross Enrollment Ratio (GER). However, the Indian higher education system faces many challenges related to the social divisions that still characterize the country. Access to higher education is uneven, with multidimensional inequalities in enrolment persisting across population groups and regions.

Any nation that intends to achieve progress and development should prioritize investment in three key sectors: R&D, Higher Education and Communication and Technology. In the recent past, India has focused to boosting and increasing research, innovation and education. Now India is one of the largest public research systems in the world: in terms of absolute R&D expenditure by the higher education and government sectors it is larger than France and almost as large as Japan. Within the technology sector, India is known to be the global hub of the offshore knowledge-intensive IT services and industry. In 2015, India launched the Digital India programme with the vision of transforming the country into a digitally empowered society and a knowledge economy (https: //www.innovationpolicyplatform.org/content/india).

In this report, we have summarized the initiatives taken and implemented by India in its quest to promote research, innovation and education. The forthcoming pages discuss the relevant higher education policies and reforms, as well as the nodal agencies that are responsible for establishing and funding institutions, for facilitating and promoting research and capacity-building, and for developing vibrant research networks.

To boost up and build a strong research & innovation base in higher education sectors and to increases its importance, India essentially needs to connect and network with global research and innovation hubs. This involves increasing research funding, international collaborations and links with industries. However, India is facing many constraints in this area, such as lack of multidisciplinary working, insufficient cooperation with industry, lack of faculty and students in areas that stimulate innovation and strengthen links with industry. These constraints reveal themselves in the failure of Indian institutions to make their mark in the world global rankings. All the above challenges are addressed through the Government of India's 12th Five Year Plan for higher education and other actions and plans aimed at strengthening basic research and quality

RESEARCH & INNOVATION HUB DEVELOPMENT IN INDIA





teaching, and encouraging regional and international collaboration networks in support of scientific research and innovation.

To promote research and innovation at national level, the Ministry of Human Resource Development (MHRD), Government of India, has launched several initiatives in the field of education, such as the National Institutional Ranking Framework (NIRF), Impacting Research, Innovation & Technology (IMPRINT), Uchchtar Avishkar Yojna (UAY), and the Global Initiative of Academic Networks (GIAN). Under the NIRF, Educational Institutions are ranked by an independent ranking Agency on the basis of objective criteria. They are ranked separately in fields such as Engineering, Management, Pharma, Architecture, etc. Under the IMPRINT initiative, the Government has taken the initiative to address major engineering challenges through the collaborative efforts of the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc). A roadmap has been finalized to pursue engineering challenges in ten technology domains that have strong social impact. The objectives of the UAY scheme are to promote innovation in IITs addressing issues of manufacturing industries; to spur innovative mindset; to coordinate collaboration between academia and industry and to strengthen labs and research facilities. The GIAN scheme is aimed at facilitating partnership between Higher Educational Institutions in the country and other countries. The scheme is aimed at tapping and international talent pool of scientists and entrepreneurs

(this section is based on http://pib.nic.in/newsite/PrintRelease.aspx?relid=137911).

The Government has also undertaken to set up research parks in order to improve the quality of research and the business climate in the country. Start-up centres and incubation hubs have been created in selected higher educational institutions. The All India Council for Technical Education (AICTE) has introduced Hackathons to promote the quality of critical thinking among youth and encourage the search for creative solutions to problems through innovation. In 2018, the Hackathon will focus on hardware and software solutions to critical issues (https://www.ugc.ac.in/pdfnews/6076031_UGC-Letterreg_VCs-Meeting.pdf).

The former Prime Minster of India, Dr. Manomohan Singh at the 2010 Indian Science Congress declared 2010-20 as the "Decade of Innovations" and formed the National Innovation Council. The formulation and main goal of Indian's new Science and Technology and Innovation Policy (2013) is "A strong and visible Science, Research and Innovation System for High Technology led path for India" (SRISHTI). The STI Policy 2013 is in furtherance of the declaration and aims to bring fresh perspectives to bear on innovation in the changing context.

The STI Policy states that "India's global competitiveness will be determined by the extent to which the STI enterprise contributes social good and/or economic wealth". This reflects India's concerns about achieving stronger economic growth in all sectors. Energy and



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environment, food and nutrition, water and sanitation, habitat, affordable health care and skill building and unemployment are the major areas that need new structural mechanisms and models, while the promotion of scientific temper, enhancing skill for application of science among the youth, promoting careers in science, and making research and innovation attractive, are some of the other major elements identified as pertinent for efforts to connect science with the people and to increase the number of skilled manpower in the Science & Technology (S&T) sector. In the new STI policy, equal weight is given to establishing world-class R&D infrastructure, positioning India among the top five countries of the world, and increase its Gross Expenditure on Research and Development (GERD) to two per cent of GDP in the coming years.

The 2013 STI Policy has enlarged the government's mandate to promote achievements in indigenous technology. This is expected to be achieved by increasing private sector involvement in S&T programmes, promoting the establishment of large R&D facilities in a public-private partnership (PPP) mode, permitting the participation of multiple stakeholders in the R&D system, treating R&D in the private sector at par with public establishments (https://idsa.in/backgrounder/ScienceandTechnologyPoliciesinIndiaPa kistanandChina).

After more than five decades of India's independence, by realizing the importance of engaging institutions with industry through the development of science parks, incubation centres, technology transfer units, enterprise education, entrepreneurship and vocational skills, the Government of India has formed a separate Ministry for Skill Development & Entrepreneurship (MSDE) to focus on enhancing employability of the youth through skills development. 65% of India's youth fall in the working age group. To fully harvest this young and lowcost labour force, the Skill Mission was launched by the Prime Minister Shri Narendra Modi on 15 July 2015. The Skill Mission promotes a vision of empowering "all individuals through improved skills, knowledge, nationally and internationally recognized qualifications to gain access to decent employment and ensure India's competitiveness in the global market". Skills development is seen as intricately connected to improving quality standards in higher education. In 2014, the Central Government constituted a review committee for the University Grants Commission (UGC) and a Committee on National Ranking Framework to adjust the framework for ranking universities and higher education institutions. In 2015, the Education Sector Skill Council was formed to set up a Labor Market Information System (LMIS) that could assist in planning skill needs, identifying skills gaps, delivering training and supporting the development of skills and competencies standards and a qualifications framework

(https://www.msde.gov.in/nationalskilldevelopmentcorporation.html)



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SKILLS AND ENTREPRENEURSHIP DEVELOPMENT IN INDIA



INDIA AS A GLOBAL MANUFACTURING HUB

The establishment of R&D Centres by multinationals has accelerated India's integration into global R&D and innovation systems. India hosts several top corporate R&D investors in the automotive, industrial machinery and IT industries. In 2014, India announced the Make in India campaign to promote itself as a global manufacturing hub. Make in India aims at easing policies, simplifying regulations and improving policy predictability (e.g. tax policies). As part of the initiative, a one-stop shop and an Invest India team provide foreign investors with information on regulatory conditions and assistance for regulatory clearances (http://www.makeinindia.com).

NATIONAL RESEARCH PRIORITY AREAS

There are many important research areas in science and technology, but in recent years, India faces challenges related to water security, food security, energy security and the environment, since its demographic and economic growth exerts pressure on natural resources and leads to an increased dependence on imports of coal. Waste management is another pressing societal challenge, both because of the large volumes of generated waste and the practice of waste disposal in open areas despite environmental public health the concomitant and hazards (https://www.nature.com/.../research-management-priorities-forscience-in-india-1.17509).

The National Action Plan on Climate Change (2008) is the relevant policy framework that puts the development of renewable and energy efficiency on top of the research and innovations agenda for India. The agriculture sector is encouraged to develop climate-resilient crops. The manufacturing sector is encouraged to develop green manufacturing facilities (www.doccentre.net).

Examples of existing research initiatives in these areas are:

- A joint R&D initiative between the Department of Science and Technology (DST) and the Ministry of Railways (MoR) aims to develop alternative fuels, new technological solutions for fuel efficiency and emission control for traction vehicles.
- The Clean India Mission, launched in 2015, aimed at cleaning up cities and villages, improving hygiene, waste management and sanitation systems and raising awareness among populations
- A new competitive programme under the Technology Development Scheme has been initiated to create technological solutions for waste management, including hospital waste, plastic waste and electronic waste (dst.gov.in/Complete_Book_on_3_year_achievements_Final_Fil e_DST_Optimized. PDF)





NATIONAL RESEARCH PRIORITY AREAS

To conduct quality research innovations and promote Research & Development (R&D) in various areas and disciplines, the Government of India has taken various initiatives under the Five year Plans. There are various schemes to support higher education institutions to take up cutting-edge research and develop innovative technology. The following Central Government agencies act as nodal points providing research grants to all publicly funded departments, institutions and agencies, including universities, at both central and state levels, with the ultimate goal to promote research and innovation in their respective sectors.

University Grants Commission

The University Grants Commission (UGC) is the key governing body on Higher Education in India. It was established in November 1956 as a statutory body of the Government of India. It is tasked with coordinating, developing and maintaining standards of university education in India. At the same time, the UGC is a grant-giving agency. It is the only agency in the country that has been vested with such dual responsibility. The UGC supports research and innovation through major and minor research grant schemes for faculty working in higher educational institutions. Besides, the UGC also provides research fellowships for students to pursue cutting edge research in different disciplines. The UGC has issued guidelines for Skill Based Education under the National Skill Qualification Framework and also implemented the scheme of Community College in 2013-2014 for developing skills among the students and creating work-ready manpower on the large scale (https://www.ugc.ac.in).

Department of Science and Technology

The Department of Science & Technology (DST) was established in May 1971, with the objective to promote new areas of Science & Technology and to play the role of a nodal department for organizing, coordinating and promoting S&T activities in the country. India is one of the top-ranking countries in the field of basic research. Indian Science has come to be regarded as one of the most powerful instruments of growth and development, especially in the context of a competitive economy. In view of the new demands that are being placed on the S&T system, it is necessary for India to embark on some major science projects which have relevance to national needs and tomorrow's technology. (DST website, http://www.dst.gov.in/about_us)

DST fosters research and innovation through its 2013 Science Technology and Innovation Policy. Based on this policy, the DST has conducted a study and prepared a policy report "Enhancing S&T Based Entrepreneurship: The Role of Incubators and Public Policy", which should help encourage scientists and engineers to explore S&T based entrepreneurship and to seek publicly-funded incubation support. Incubation is a widely used policy tool to create favorable conditions for promoting innovation-based startups. Incubators have been central to public-policy engagement with S&T startups in India. Between 1985 and 2014, over 140 publicly-funded incubators were established across India.



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These incubators were established to act as intermediary agents that reinforce the innovation system and link its interrelated groups of actors, i.e., governments, universities, and firms, operating under a common framework of policies, cultural norms and institutions. Incubators therefore operate with the aim of providing a conducive environment to help convert innovative, risky ideas into enterprises (Enhancing S&T-Based entrepreneurship - The Role of Incubators and Public Policy by Kavita Surana et.al., 2018, published by DST Centre for Policy Research, Indian Institute of Technology, New Delhi).

DST also supports programs like Innovation and STEM (Science, Technology, and Engineering & Mathematics) Demonstration, Science and Technology interventions for the benefit of elderly population and disabled persons in the country, award of Abdul Kalam Technology Innovation National Fellowships to outstanding engineers to recognize, encourage and support translational research by individuals to achieve excellence in engineering, innovation and technology development (http://www.dst.gov.in).

Indian Council of Agricultural Research

Indian Council of Agricultural Research (ICAR), New Delhi, India is an autonomous organization under the Department of Agricultural Research and Education, Ministry of Agriculture, Government of India. ICAR has played a role in enabling the country to increase the production of food grains four times, horticultural crops six times, fish nine times (marine five and inland 17), milk six times and eggs 27 times since 1950. The Council is the apex body for coordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences in the country. It has 99 ICAR institutes and 53 agricultural universities spread across the country. Through these it supports research and innovation in the field of agriculture, fisheries and its related disciplines (https://icar.org.in).

Council of Scientific and Industrial Research

The Council of Scientific & Industrial Research (CSIR) is engaged in cutting edge R&D research and boasts a remarkable knowledge base in diverse S&T areas. Having Pan-India presence, CSIR has a dynamic network of 38 national laboratories, 39 outreach centers, 3 Innovation Complexes and 5 units. CSIR's R&D expertise and experience is embodied in about 4600 active scientists supported by about 8000 scientific and technical personnel. CSIR covers a wide spectrum of science and technology areas, including radio and space physics, oceanography, geophysics, chemicals, drugs, genomics, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology. It has engaged in significant technological interventions in many areas related to societal challenges, including the environment, health, drinking water, food, housing, energy, farm and non-farm sectors. CSIR has also assumed an important role in S&T human resource development (http://www.csir.res.in/about-us/about-csir). CSIR has pioneered



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patents in select technology domains that have created global niches for the country. 90% of US patents granted to Indian publicly funded R&D organizations belong to CSIR. In addition, CSIR hold a large number of Indian and foreign patents. CSIR is also active in licensing its patents. Amongst its peers in publicly funded research organizations in the world, CSIR is a leader in terms of filing and securing patents worldwide (http://pib.nic.in/newsite/PrintRelease.aspx?relid=116466).

CSIR has developed CSIR@80: Vision & Strategy 2022 – New CSIR for New India. CSIR's mission is "to build a new CSIR for a new India" and "Pursue science which strives for global impact, technology that enables innovation-driven industry and nurture trans-disciplinary leadership thereby catalysing inclusive economic development for the people of India".

CSIR activities are focused on:

- Innovative solutions utilizing new technologies
- Open innovation
- Crown sourcing
- Developing talent in trans-disciplinary areas
- Science based entrepreneurship
- Socio-economic development and transformation through science and technology interventions (http://techindiacsir.anusandhan.net/online/Control.do?_main =488t3s).

Indian Institutes of Science and Education Research

The Government of India, through the Ministry of Human Resource Development (MHRD), has established 7 Indian Institutes of Science Education and Research (IISER). They are located in Bhopal, Berhampur, Mohali, Pune, Kolkata, Thiruvanantapuram and Tirupati. These IISERs are notable for completely integrating teaching and education with state-of-the-art research. The Institutes are tasked with promoting fundamental research in basic sciences, including STEM subjects (http://mhrd.gov.in).

NITI Aayog (Formerly known as Planning Commission of India)

The National Institution for Transforming India, also called NITI Aayog, was established in 2015 by the Government of India. It serves as the government's leading policy "Think Tank', providing both directional and policy inputs. While designing strategic and long term policies and programmes for the Government of India, NITI Aayog also provides relevant technical advice to the States. The Government of India, in keeping with its reform agenda, constituted the NITI Aayog to replace the Planning Commission instituted in 1950. NITI Aayog reflects the desire to bring States to act together in the national interest, thereby fostering Cooperative Federalism. NITI Aayog has two hubs – Team India Hub and the Knowledge and Innovation Hub. The Team India





Hub is focused on the engagement of states with the Central government, while the Knowledge and Innovation Hub builds NITI's think-tank capabilities. These hubs reflect the two key tasks of the Aayog (https://www.niti.gov.in).

QUALITY ASSESSMENT MECHANISMS IN HIGHER EDUCATION

Efforts to ensure quality in higher education are not a new phenomenon and each higher education institution has its own mechanisms to assess quality of teaching and institutional academic quality. Beginning in the 1980s, countries like USA, France and UK, became concerned with academic quality and began experimenting with new policy instruments designed primarily to assess and improve the quality of teaching and student learning in the tertiary sector (Ref: Liu, Quality Assurance and Institutional Transformation, Higher Education in Asia: Quality, Excellence and Governance, published by Springer Science Business Media Singapore 2016).

National Assessment and Accreditation Council

Following the national policies on quality assessment, in 1994 the Government of India has led the establishment by the UGC of an independent national accreditation agency called National Assessment and Accreditation Council (NAAC), with a vision to make quality the defining element of higher education in India through a combination of internal and external quality evaluation, promotion and sustenance initiatives.

Academic institutions are called upon to provide highest quality education, generate cutting edge research, and attract talent. The Indian higher education system is among the largest and most diverse education system in the world. Even though many new programmes and initiatives are introduced to improve the standards of Indian higher education, there is a widespread concern about quality in the higher education system in India. The development and maintenance of a reliable mechanism to assess the quality of higher education in the country is therefore of upmost priority (www.naac.gov.in).

National Institutional Ranking Framework

In 2015, the Ministry of Human Resource Development (MHRD) has established another quality assessment agency called the National Institutional Ranking Framework (NIRF). It provides a methodology that is used to rank institutions across the country. The five parameters of assessment used to rank various universities and institutions are: "Teaching, Learning and Resources," "Research and Professional Practices," "Graduation Outcomes," "Outreach and Inclusivity," and "Perception" (https://www.nirfindia.org).

Institution of Eminence

Even though India's higher education system is one of the world' largest, no Indian University found a place in the World University Rankings in 2017. In response to this, the government proposed to set up



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Institutions of Eminence in India. Under this proposal, it planned to establish 20 such world class institutes in the country. Any Institution of Eminence shall continue to be ranked in the National Institutional Ranking Framework and, within five years, shall be ranked in an International Ranking index of repute. UGC has also stated that an enabling regulatory architecture would be provided to 10 public and 10 private institutions which will help them achieve the status of worldclass teaching institutes. The initiative was undertaken by the body to ensure that quality education shall be provided to Indian students irrespective of their financial background (https://www.ugc.ac.in/ugc_notices.aspx?id=1776).

National Skill Development Fund

The National Skill Development Fund (NSDF) was set up in 2009 by the Government of India. It raises funds both from Government and the non-governmental sectors. The Fund is tasked with enhancing, stimulating and developing the skills of Indian youth through various sector specific programs. The Fund meets its objectives through the National Skill Development Corporation (NSDC) which is an industry led non-profit Company, which is focused on forging strong linkages with the market. NSDC promotes skill development by directing funding to enterprises, companies and organizations that provide skill training. It also works to support and coordinate private sector initiatives (www.msde.gov.in).

Collaborations among HEIs through SWAYAM, MOOC, HRDC, SWAYAM PRABHA, INFLIB NET

To expand higher education, provide easy access to higher education for everyone and connect all higher education institutions, the Ministry of Human Resource Development (MHRD), the Government of India launched an initiative for on-line courses/programs.

SWAYAM is a programme initiated by the Government of India and designed to achieve the three main principles of education policy: Access, Equity and Quality. It seeks to provide access to the best teaching and learning resources for all, including the most disadvantaged. SWAYAM also seeks to bridge the digital divide for students who have not been able to take advantage of the digital revolution and have not been able to join the knowledge economy (swayam.gov.in).

Massive Open Online Courses (MOOCs) are free online courses available for anyone to enrol. MOOCs are affordable and allow for flexible learning and skills development.

UGC-Human Resource Development Centre (HRDC-previously called as Academic Staff College) was established in 1987 in order to fulfil the mission and objectives of the UGC. Since its establishment in various higher educational institutions, it has been organizing various professional staff development programmes such as Orientation Program, Refresher courses and short-term courses, workshops and



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training programmes for newly recruited faculty members, academics and administrative staff members at higher educational institutions. HRDC teaches management and methodologies in order to up-date the knowledge and curriculum development skills of University staff and faculty (www.ugc.ac.in).

The SWAYAM PRABHA is a group of 32 DTH channels devoted to telecasting high-quality educational programmes on 24X7 basis using the GSAT-15 satellite. It covers curriculum-based course contents at post-graduate and under-graduate level in diverse disciplines (www.swayamprabha.gov.in).

Information and Library Network

The Information and Library Network (INFLIBNET) Centre is an autonomous Inter-University Centre of the UGC of India. It was initiated in 1991. INFLIBNET is involved in modernizing university libraries in India and connecting them through a nation-wide high speed data network using state-of-art technologies. INFLIBNET is key to promoting scholarly communication among academicians and researchers in India (www.inflibnet.ac.in)

EXPANSION OF HIGHER EDUCATION INSTITUTIONS

Indian education is followed by two-tier system which central and state governments are equally responsibilities in framing education policies and each state has its own system of education which suit their people and culture. Accordingly, there are three main types of tertiary institution in India: 1) universities and university-level institutions, 2) colleges and 3) diploma-awarding institutions. These are categorized by funding source: central government, state government and private. it is always important that the Centre and states work together for better educational reforms and creating roadmap for achieving academic excellence and innovation hub.

After the Independence of India, the Higher Education sector has witnessed a tremendous increase in the number of Universities from 20 in 1950 to 867 in 2018. In addition to them, there are 51 Institutions of National Importance under MHRD (16 Indian Institutes of Technology, 30 National Institutes of Technology – 30 and 5 Indian Institutes of Science Education and Research (mhrd.gov.in).



University priorities for research and innovation targeted at the economy and business enterprises







UNIVERSITY OF MADRAS - GENERAL POLICY TOWARD RESEARCH AND INNOVATION

TOP PRIORITIES IN THE AREAS RELATED TO ECONOMY AND BUSINESS Since its inception, the University of Madras is a multi-disciplinary affiliating institution which has all the disciplines in its fold. In consonance with the policy decision of the Government of Tamil Nadu, the University has continued to teach and research in liberal arts, humanities, social sciences, sciences, basic medical sciences, commerce and management, law, education, sports, music and performing arts.

The University also promotes teaching inter-disciplinary subjects like Econometrics, Criminology, Defence and Strategic Studies, Women Studies, Human Resource Development in Social Sciences, Biophysics and Crystallography, Nuclear Physics, Nanoscience and Nanotechnology, Genetics, Endocrinology, Medical Bio-Chemistry, Bio-Informatics and Bio-technology. To enhance the employability skills of students, innovations in the curriculum have been made by restructuring all the 81 Boards of Studies. The latter were reconstituted with experts from industries and non-academic sectors representing one third of the members.

Top priorities

- Drug Development from Ocean
- Pharmaceutical Testing
- Pharmacology, Industrial Toxicology
- Genetics, Endocrinology, Bio-Chemistry
- Chemical analysis, testing and products
- New Materials
- Electronics, Nuclear Physics, Analysis and Testing
- Plant Science, Bio-Technology, Industrial Biology
- Marine Biology, Coastal Zone Production
- Geological Surveys, Groundwater Management, Micro Palaeontology, Minerals and Ore Testing
- Cartography and Mapping Technology, Geospatial Data Management
- GIS, GPS, Field Surveys, Land Use and Landscape Analysis
- Economic Surveys, Commerce and Business Evaluation, Market Management, Organization Planning
- Quality Assurance and Management
- Statistical Modelling, Sampling and Survey Design
- Market and business forecasting
- Life table management, Health Statistics
- Human Resource Management



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POTENTIAL EXPANSION OF EXISTING RESEARCH CENTRES AND CREATION OF NEW CENTRES

UGC - Human Resource Development Centre

As part of National initiatives, faculty members working at higher educational institutions have the opportunity to expand and update their knowledge and their innovation and creativity skills in view of building their capacity to impart quality education to the students. The Human Resource Development Centre at the University of Madras is tasked with providing training for faculty and continuing professional development for faculty and staff. It also provides Entrepreneurship courses for faculty members so that they can in turn motivate students to become entrepreneurs. Expansion of the work of this Centre is of paramount importance to the ability of the University of Madras to provide relevant education.

National Centre for Nanosciences and Nanotechnology

The National Centre for Nanosciences and Nanotechnology was created in 2006. It is supported by a Ministry of Human Resource Development grant (through UGC) and grants from the Government of Tamil Nadu. Since the 2010-11 academic year the Centre has been offering a two-year M.Sc. program in Nanoscience and Nanotechnology. The Centre avails of equipment essential for Nano-research and is fully equipped with facilities for carrying out quality research in Nanoscience and Nanotechnology. The Centre works in the areas of Biomedical Nanotechnology, Molecular Nanostructures, Nano-electronics, Computational Nano-science and Nano-biotechnology. Expanding the work of this Centre will greatly benefit both the University and many high-tech industries.

National Centre for Ultrafast Process

This Center has been operational since 1997 and has benefitted from funding from the Tamilnadu Government for a separate building. It is currently implementing research in the field of Ultrafast Spectroscopy and Photonics. The Centre receives financial support from the Department of Science and Technology, Government of India. The UGC has identified this centre as an "Innovative Centre" in 2004 and has provided support for a M.Sc Programme in "Photonics and Biophotonics". Expanding the work of this Centre will greatly benefit both the University and industries utilizing electronics and optical technologies, including telecommunications, health care, aerospace, etc.

ESTABLISHMENT OF NEW CENTRES

University of Madras has opened several new Centres that will further make the education its Faculties provide more relevant to the needs of the economy and various industries. These are a Centre for web-based learning, a Center for Infrastructural Management Studies, and a Centre for Cyber Forensics and Information Security. The precise activities and priorities of these Centres are in the process of being clarified.





POTENTIAL EXPANSION OF COLLABORATIONS WITH BUSINESS OR CREATION OF NEW COLLABORATIONS FACILITATING TEACHING AND RESEARCH TARGETED AT THE ECONOMY AND BUSINESS

Technology Business Centers

University of Madras has been actively engaged in research in the thrust areas supported by the national funding agencies. For example, the Department of Science and Technology (DST), Government of India has been encouraging universities to create Technology Business Centers for the incubation of small enterprises, which would also allow Faculties and industries to work together. The University of Madras has such a Center supported by DST. Its work can be further expanded to cover more industries and enterprises.

Center for Techno-entrepreneur Promotion Program (TePP)

The Department of Scientific and Industrial Research, Government of India, has chosen the University of Madras as a nodal center for the Techno-entrepreneur Promotion Program (TePP). The University of Madras thus helps to identify and fund innovative projects under this scheme. A total of 34 projects were successfully facilitated. There is great potential for continuing work under this program.

University Students Advisory Bureau

As per National priorities, innovative and skills-oriented training programs and courses are organized by the University of Madras through the University Students Advisory Bureau. The latter provides guidance and trains students as entrepreneurs. Expansion of this line of work of the Students Advisory Bureau will have a very positive impact on the employability of students.

In all study programs, the completion of an internship and/or a placement scheme is a requirement. Students are supported in accessing internships and/or placement schemes. The University has a centralized placement centre with dedicated staff and infrastructure facilitating the linkage between industries and the students of all the campuses. The University Students Advisory Bureau is responsible for offering placement services to graduates of the University. Campus interviews by various companies and institutions are organized. Companies that have participated in recruitment drives at the University include Wipro Technologies, Cognizant Technologies, ITC Limited, HCL Technologies Limited, Tata Consultancy Services Limited, Advinus Therapeutics Private Limited, Agility Global Integrated Logistics, Future-technologies Private Limited and Life Insurance Corporation of India, Indian Air Force, Everonn Education Limited, Royal Sundaram Alliance General Insurance and HDFC Bank. In addition to the centralized campus recruitments, some departments such as Management Studies and Chemistry organize their own specialized campus recruitment drives. In recent years, the number of students who have found a job through campus placements has been increasing. In the 2016-2017 academic years, over 250 students of the university found a job through placement.

Expansion of the internship- and placement-related work of the USAB is of paramount importance for the practical relevance of education



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17

provided at the University of Madras.

University Industry Community Interaction Centre (UICIC)

- As per the Ministry of National Skill Development and Entrepreneurship 2015 vision and priorities, the University of Madras established a University Industry Community Interaction Centre in 1997. This Centre has the following objectives:
- To monitor the needs of industries in the country and launch an Industrial Associateship program
- To coordinate R&D projects between University departments and Industries in the area of product/process development and technology transfer
- To assist in the signing of Memorandums of Understanding and in the development of IPR/patents by the University faculty
- To offer testing facilities and material characterization and certification facilities
- To offer training programs for small/medium scale enterprises, namely Certificate/diploma courses in professionally oriented fields
- To develop specialized continuing education programmes for industrial and social action agencies.

The Centre fulfils the University's mission to share knowledge and expertise and to help the community benefit from knowledge resources available within the Departments. On the other hand, the consultancy projects help generate revenue for the University and the faculty. The UICIC has so far operated 295 projects/courses/training programmes worth Rs.6.74 crore. A major breakthrough achievement is in obtaining a patent on "A Pharmaceutical Formulation from the Indian Medicinal Plant, Phyllanthus Amarus for the Treatment of Hepatitis B and a process for its preparation". An agreement for its commercialization as a drug has been signed by the University of Madras with M/s.Rallis India (Ltd) and M/s Phytopharm Inc., UK for marketing in India and other countries respectively.

The following industries have sponsored research projects in the University of Madras through UICIC: Shreya Life Sciences Pvt.Ltd., Biotechnologies Ltd., Malladi Research Centre, Abl Orchid Pharmaceuticals, Arogya Health Care, Care and Cure, Rumi Herbals Pvt.Ltd., Gautier French Furniture, Clarity Salts Pvt. Ltd., Span Diagnostics Pvt Ltd., Amruthanjan, Hardy Exploration and Production (India), Aban Informatics Pvt. Ltd., Reliance Industries Ltd., E.I.D Parry (India) Ltd., Piramal Healthcare Ltd., World Noni Research Foundation, Astor Scientific, ABLE - Association of Biotechnology Led Enterprises, Sri Hari Labs, G.E.T. Water Solutions Pvt. Ltd., Pepsi Co, Tuticorin Port Trust, Aquagri Processing Pvt. Ltd., Vijaya Hospital, ABiogenesis Lab, Ivoclar Vivadent Liechtenstein, Sree Ramcides Chemicals Pvt. Ltd., Sakthi Masala (P) Ltd., Retort Pharmaceuticals Pvt. Ltd., Tajmahal Agro



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Industries, Gencor Pacific Organics India Pvt. Ltd., Himalaya Drug Company.

Some of the Departments at the University of Madras have established Memorandums of Understanding with industries o research institutions and on that basis are carrying out collaborative innovative research of mutual interest.

Department of Zoology

- PG Diploma in Stem Cell Technology & Tissue Engineering
- UGC Sponsored Vocational Training Programme in Immunology and Molecular Biology

Department of Indian Music

Certificate Course in Karnatic Music

Department of Genetics

Short-term Consultancy -Training Programmes in Genetics



University priorities for research and innovation targeted at inclusive economic growth







TOP PRIORITIES IN AREAS RELATED TO INCLUSIVE GROWTH

POTENTIAL EXPANSION OF EXISTING RESEARCH CENTRES AND CREATION OF NEW CENTRES FACILITATING TEACHING AND RESEARCH TARGETED AT INCLUSIVE GROWTH

POTENTIAL EXPANSION OF COLLABORATIONS WITH BUSINESS OR CREATION OF NEW COLLABORATIONS FACILITATING TEACHING AND RESEARCH TARGETED AT INCLUSIVE GROWTH

- Microbiology, Disease control and Public Health
- Socio-Economic Surveys, Sociological Counselling, Psychological Services and Counselling
- Anthropological Surveys, Population Resource Management
- Cultural Studies
- Music Folklore, Traditional Culture and Dance
- Linguistics, Translation, Lexicography
- Regional Planning, Layout and Location allocation, Methodology, Operation Research Techniques

The Centre for Population Studies is operational since 2007. It engages in interdisciplinary research and education on population-related issues in the globalizing era. The key priority area is the analysis of the Demographic Dividend in India. The Centre is also researching in the fields of education and employment, the health and environmental implications of overpopulation and the changing demographic structure. The Centre plans to launch a Masters course on Population Resources Management. The potential expansion of the activities of this Center has thus already been recognized at the University of Madras.

Pan-African Programme

This programme was inspired by recent advances in the provision of healthcare and medical education through the use of Information and Communication Technology. It builds on India's long history of assisting Africa in capacity building programmes. Africa-India cooperation can play a major role in harnessing the benefits of globalization to mutual advantage. 1813 students are enrolled under this programme. University of Madras is offering MSc (IT) and BBA programmes under this project to the following countries: Cameroon, Eritrea, Ethiopia, Ghana, Ivory Coast, Rwanda, Seychelles, Sierra Leone, Tanzania, Togo, Mauritius, Somalia, Egypt, Malawi, Zambia, Lesotho, Zambia, Sudan, Madagascar, Niger, Mozambique, Guinea and Gabon.

Extension Activities

Besides academic activities, the University of Madras is carrying out many social activities through the National Service Scheme (NSS) and other voluntary services. Some of the NSS activities targeted at community development and education are listed below:

- Village adoption and survey
- Mass Tree Plantation
- Literacy Educating
- 'AIDS Awareness' Programme Seminar for student community,



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exhibition, Cycle Rally / Rally for general public

- Blood Donation Camp
- Immunization Programme
- Career Guidance Programme
- Sensitizing the any two of the following (for village Community)
 - o Consumer Awareness
 - o Voter's Awareness
 - o Child Labour Eradication
 - o Family Welfare and Population Education
 - o Women Empowerment

Transfer of technology from Lab to Land' Program

University of Madras is implementing various initiatives to promote research and innovation, as outlined in India's Higher Education Policy and the Department of Science and Technology Vision documents on R&D. Through research, innovation and technology development, University of Madras is reaching the society and addressing pressing issues such as creating employment opportunities and eradicating poverty. The research outcomes and technology innovations are transferred to the society through the novel initiative 'Transfer of technology from Lab to Land Program'.



University priorities for research and innovation targeted at pressing challenges facing societies in Southern and Southeast Asia







TOP PRIORITIES IN AREAS RELATED TO THE PRESSING CHALLENGES FACING SOCIETIES IN SOUTHERN AND SOUTHEAST ASIA

POTENTIAL EXPANSION OF EXISTING RESEARCH CENTRES AND CREATION OF NEW CENTRES FACILITATING TEACHING AND RESEARCH TARGETED AT PRESSING CHALLENGES FACING SOCIETIES IN SOUTHERN AND SOUTHEAST ASIA

- New Materials
- Plant Science, Bio-Technology, Industrial Biology
- Marine Biology, Coastal Zone Production
- Environment Impact Assessment, Remote Sensing Applications
- Linguistics, Translation, Lexicography

There are several existing and operational research centres in fields related to the challenges facing societies in Southern and Southeast Asia. All of those Centres demonstrate great potential for expansion in terms of activities and scope of research.

Centre for South and Southeast Asian Studies

The Center started functioning during the Academic Year 1977-78 under the Area Studies Programme of the UGC. The main focus of the Centre is on inter-disciplinary research programmes relating to the Maldives, Sri Lanka, Indonesia, Malaysia, and Singapore. The major emphasis is on analytical studies relating to foreign policies, political institutions, social, economic and cultural development. Priority is given to India's relations with South and Southeast Asian countries and problems faced by Indian immigrants in the region.

Centre for Environmental Sciences

The Centre was established in 2007. It is focused on multi-disciplinary Research and Development in the field of environmental studies and global environmental change, including climate change, global warming and biodiversity conservation, pollution and health disorders, urban water management, etc. The Centre also engages in human resources development in the same field.

tre that is focusing on research and education in the area of Disaster Risk Reduction. The Government of Tamil Nadu has approved of the setting of an integrated Masters' program for Disaster Management at the Centre.

Centre for Ocean and Coastal Studies

The Centre was established in 2007. Its mission is to undertake collaborative research and technology development programmes particularly in the areas of genetic diversity and sustainable harnessing of resources in the ocean and coastal regimes. The Centre is also engaged in human resource development in its focus fields. The Centre runs a M.Sc program in Ocean Science and Technology and a Ph.D. program in Interdisciplinary research in Marine Sciences.

Center for Water Resources Management

The Center for Water Resources Management was established in 2014 to carry out research on water resources management and sustainable utilization of the resources.





Research Schemes & Projects

To motivate and promote research activities of faculties and to facilitate and speed-up research activities, University of Madras has created a separate unit called Research Schemes & Projects (RSP).



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Areas of innovation and research activities in which students should be involved







The State Government of Tamil Nadu is the frontier of education reform. The government is open to innovative ideas within its priorities and is keen to show results. The Tamil Nadu State Government is also attempting to take the lead on industry-higher education collaboration. It is currently exploring proposals to establish collaborative centres in universities to encourage industry engagement in curricula reform, people exchange and technology sharing and transfer. There is a clear emphasis on the importance of enhancing employability skills among students and the Tamil Nadu government is reported to have allocated investment funding for enterprise and entrepreneurship education. Under this scheme, the State Government of Tamil Nadu has identified the University of Madras as a Centre for Entrepreneurship Skill Development to guide and encourage students to develop their innovative and technological skills in the following cutting edge research areas:

- Commerce and management
- Finance Management
- Management of Business Management
- Computer Science and Technology
- Clinical Psychology
- Basic medical sciences
- Stem cell research
- Life feed/aquaculture
- Nano materials

There are no limitations to students' involvement in research and innovation. Students have the freedom to choose, plan and execute research in their chosen discipline and area.

