



सत्यमेव जयते

NITI Aayog

EASE OF DOING

Research & Development in India

*Removing **O**bstacles,
Promoting **E**nablers*

2026

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Disclaimer: The information presented in this report is based on insights gathered from an extensive consultation process comprising open-ended inputs, survey, regional consultative meetings, and a series of brainstorming sessions on “Ease of Doing R&D”. The objective of this report is guided by the principle of *Removing Obstacles, Promoting Enablers*, and in the efforts the report presents a compilation of various obstacles faced by R&D practitioners, along with a set of recommendations to address them. Thus, the report is a reflection of the collective wisdom of different role players in the R&D ecosystem.

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NITI Aayog

EASE OF DOING RESEARCH & DEVELOPMENT IN INDIA

Removing Obstacles, Promoting Enablers

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Message

The trajectory of India's development over the coming decades will be closely linked to its capacity to generate and scale-up the application of knowledge. In this context, a strong and responsive research and development ecosystem is a foundational pillar of economic growth, strategic autonomy, and societal progress.

India today stands at an inflection point. The country has established a broad-based scientific and institutional architecture, and its innovation landscape continues to expand across sectors. However, as the scale and ambition of national priorities increase, it is equally important to ensure that the systems underpinning research are aligned with these aspirations. The challenge is no longer confined to expanding capacity, but extends to enhancing performance; ensuring that research efforts translate into outcomes with greater efficiency, relevance, and impact.

The report, "*Ease of Doing Research & Development in India – Removing Obstacles, Promoting Enablers*", addresses this critical dimension. Drawing on the experiences of researchers, institutions, and industry, it highlights the frictions that persist within the system often subtle, yet cumulatively significant. It underscores the need for a more coherent and enabling environment, where processes facilitate progress rather than impede it, and where institutions are better equipped to respond to emerging opportunities.

A key direction that emerges from this report is the need to reorient research governance. Greater emphasis must be placed on clarity of purpose, flexibility in execution, and accountability for outcomes. This entails creating conditions that enable institutions to operate with confidence and initiative, while ensuring that public resources are deployed effectively. Strengthening the interface between research, industry, and national priorities will also be essential to bridge the gap between knowledge generation and its application.

As technological change accelerates and global competition intensifies, countries that are able to organise their research ecosystems with agility and foresight will be best placed to lead. For India, improving the ease of doing research and development is therefore not a peripheral concern, but a strategic imperative that cuts across sectors and institutions. This report provides a thoughtful foundation for advancing this objective, and I trust it will inform ongoing and future initiatives to strengthen India's research and innovation ecosystem.

(Suman Bery)

Place - New Delhi

Dated - 06/04/2026

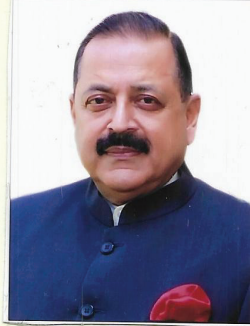


डॉ. जितेन्द्र सिंह

राज्य मंत्री (स्वतंत्र प्रभार),
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MESSAGE

India's scientific enterprise has entered a phase of renewed ambition. From emerging technologies to solutions for local challenges, the expectations placed on research today are wider in scope and greater in urgency than ever before. In this evolving context, the ability to support researchers with a conducive and enabling environment becomes as important as the resources invested in science itself.

A defining feature of India's research landscape is the growing participation of young scientists, start-ups, and interdisciplinary teams. This shift is expanding the frontiers of inquiry and opening new pathways for innovation. To sustain this momentum, it is essential that institutional systems keep pace, allowing ideas to be pursued with continuity, collaboration to take shape without friction, and research outcomes to find timely application. The report, "Ease of Doing Research & Development in India – Removing Obstacles, Promoting Enablers", brings useful attention to these aspects. It reflects on how researchers experience the system, particularly at points where procedural requirements, or fragmented processes can affect the flow of work. Such insights are valuable in identifying where incremental changes can yield significant improvements in the overall research environment.

Science, by its nature, requires a degree of flexibility, both in how it is conducted and how it evolves. Creating space for experimentation, supporting interdisciplinary approaches, and ensuring that institutions are able to respond dynamically to new opportunities are important considerations going forward. At the same time, stronger pathways for translating research into technology, products, and services will be critical in enhancing the broader impact of scientific effort. The Government of India has, in recent years, placed increasing emphasis on mission-driven research, emerging technologies, and strengthening the innovation ecosystem. Efforts to improve the Ease of doing R&D complement these initiatives by ensuring that the underlying systems are aligned with the needs of a rapidly evolving scientific landscape.

I would like to acknowledge the efforts of NITI Aayog in undertaking this important exercise. By bringing together perspectives from across different stakeholders, the report contributes to a more informed and constructive dialogue on strengthening India's research ecosystem. This report adds to the ongoing dialogue on how best to achieve this alignment. I also appreciate the contributions of all stakeholders involved and hope that its findings will support continued efforts to make India's research ecosystem more responsive, inclusive, and effective.

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MESSAGE

India's ambition to emerge as a global leader in science, technology and innovation rests fundamentally on the strength, efficiency, and responsiveness of its research and development ecosystem. Over the years, the country has made steady progress in expanding its scientific base, fostering innovation, and building institutional capabilities. However, it is equally evident that a number of systemic and procedural constraints continue to affect the ease with which research is undertaken, managed, and translated into meaningful outcomes. Addressing these constraints is critical to unlocking the full potential of India's research ecosystem and enabling it to contribute more effectively to national development priorities.

It is in this context that the report "*Ease of Doing Research & Development in India – Removing Obstacles, Promoting Enablers*" has been developed. This report represents a comprehensive and evidence-based effort to examine the key barriers that researchers and institutions encounter across the R&D lifecycle. Drawing upon an extensive consultative process, including inputs from academia, research institutions, industry stakeholders, and government agencies – it seeks to capture both systemic issues and the experiences of the research community. As part of this exercise, particular emphasis has been placed on identifying areas where policy, institutional frameworks, and administrative processes can be strengthened to create a more enabling environment for research.

The analysis presented in the report highlights several interrelated challenges, both external and internal to institutions, ranging from constraints in funding mechanisms and human resource management to institutional inefficiencies, limited translational capacity, and gaps in access to research infrastructure. It also draws attention to the need for greater coherence in governance frameworks, improved coordination across stakeholders, and a shift towards more flexible and outcome-oriented systems of research management. These challenges, while complex, are not insurmountable, and addressing them in a structured and sustained manner can significantly enhance the productivity, quality, and impact of research in the country.

The recommendations put forward in this report are designed to be practical, actionable, and aligned with the broader objective of strengthening India's science and innovation ecosystem. They seek to simplify procedures, reduce administrative burdens, improve the efficiency of funding flows, and strengthen institutional support systems, while also fostering closer linkages between academia, industry, and government. Importantly, the report underscores the need to move towards a more trust-based and facilitative governance approach, supported by appropriate digital systems and capacity-building efforts.

As India advances towards its long-term vision of becoming a knowledge-driven and innovation-led economy, improving the ease of doing R&D will be a key enabler of this transformation. It is expected that the insights and recommendations presented in this report will contribute meaningfully to ongoing policy efforts and serve as a useful reference for decision-makers, institutions, and the wider research community. I would also like to place on record my appreciation for the contributions of all stakeholders who have participated in this exercise.


(Dr. V. K. Saraswat)

New Delhi
25.03.2026



एक कदम स्वच्छता की ओर

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MESSAGE

India's journey towards becoming a leading knowledge and innovation economy will be defined not only by the strength of its scientific capabilities but by the conditions under which research is conducted. The ease with which ideas can be pursued, institutions can respond, and outcomes can be realised will ultimately determine the pace and quality of progress. Over the past decade, India has made significant investments in expanding its scientific base, strengthening institutional capacity, and fostering a culture of innovation and entrepreneurship. These efforts have laid a strong foundation. However, the demands of the next phase of growth are qualitatively different. They call for a shift from expansion to efficiency, from capability creation to performance, and from isolated excellence to system-wide coherence. This, in turn, requires a close examination of how the research ecosystem functions in practice, and where it falls short in enabling speed, flexibility, and impact.

2. The report, *“Ease of Doing Research & Development in India – Removing Obstacles, Promoting Enablers”*, is an important contribution in this regard. Grounded in extensive stakeholder engagement, it brings out with clarity the points at which the system slows down, where complexity outweighs value, where processes substitute for outcomes, and where fragmentation limits scale. By doing so, it provides a credible basis for prioritising reforms that can have a meaningful impact.

3. A key insight that emerges is the need to move beyond a compliance-driven approach towards one that is facilitative, trust-based, and outcome-oriented. This requires rethinking existing frameworks to enable greater institutional autonomy, streamline decision-making, and embed accountability in a manner that supports, rather than constrains, scientific work. The intelligent use of digital systems, along with stronger linkages between research and application, will be critical in driving this transformation.

4. In an environment where technological advancements are reshaping economic and strategic landscapes at an unprecedented pace, the ability to conduct research efficiently, at scale, and with purpose will be a key determinant of national competitiveness. Improving the ease of doing R&D must therefore be approached as a strategic priority, requiring coordinated action across institutions and stakeholders. The insights and recommendations presented in this report provide a valuable basis for advancing this agenda. And I am confident that it will contribute meaningfully to shaping a more agile, effective, and future-ready research ecosystem for the country.

Dated: 27th March, 2026


(Nidhi Chhibber)

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Foreword

Improving the environment in which research is carried out has become an important priority as India seeks to strengthen its science, technology, and innovation (STI) ecosystem. In recent years, there has been a growing recognition that while investments in infrastructure and funding are essential, the effectiveness of research ultimately depends on how smoothly the system functions for those who engage with it on a daily basis. As India's research landscape continues to expand, reflected in rising scientific output, improved global innovation performance, and a growing start-up ecosystem, the need to address underlying structural and procedural constraints has become increasingly evident. In this context, enhancing the **Ease of Doing Research and Development (EoDR&D)** is central not only to improving research productivity, but also to ensuring that scientific efforts translate more effectively into meaningful outcomes.

This report is the outcome of a comprehensive and consultative exercise undertaken by NITI Aayog to examine these issues in a structured manner. The consultation comprised regional consultative meetings, survey and follow up brainstorming sessions with relevant stakeholders. The multi-layered approach adopted has enabled a grounded understanding of both systemic challenges and the lived experiences of researchers, administrators, and institutional leaders across the country.

Persistent gaps are evident across multiple dimensions of the research ecosystem. **Funding constraints** remain a central concern, while allocations have grown in absolute terms, overall investment relative to GDP is still modest, and inefficiencies in fund flow mechanisms, including complex application processes, delays in disbursement, and rigid utilisation norms, continue to limit research effectiveness. **Human resource challenges** further compound this, with an underdeveloped postdoctoral ecosystem, delays in fellowship disbursement, and uncertain career pathways affecting the system's ability to attract and retain talent. At the **institutional level, administrative and governance structures** often fall short of supporting research efficiently; fragmented processes, the absence of dedicated R&D support systems, and centralised decision-making place a disproportionate operational burden on researchers. At the same time, the **translation of research** into tangible outcomes remains limited, despite strong performance in publications and patents, due to gaps in technology transfer mechanisms, intellectual property management, and access to translational funding. These issues are further reinforced by **uneven access to infrastructure**, knowledge resources, and funding opportunities, particularly for institutions outside the top tier and at the state level, leading to persistent regional disparities. Finally, **monitoring and policy coordination frameworks** continue to be largely compliance-driven, with insufficient emphasis on outcomes, impact assessment, and data-informed decision-making, thereby constraining the overall effectiveness of the ecosystem.

In response, the report puts forward a set of recommendations anchored in the principle of **"Removing Obstacles, Promoting Enablers"**. These are directed towards strengthening the funding ecosystem, streamlining administrative and compliance processes, building more robust and predictable human resource pathways, enhancing institutional governance with greater autonomy, enabling more effective translation of research into application, and expanding equitable access to research infrastructure and knowledge resources. A central emphasis is placed on shifting towards a more trust-based and outcome-oriented approach to governance, one that is supported by simplified procedures, strengthened digital systems, and more effective coordination across stakeholders.

India's research ecosystem stands at a pivotal juncture. With a strong foundation of talent, expanding institutional capacity, and growing engagement in emerging areas of S&T, the country is well positioned to accelerate its progress. Addressing the structural and systemic constraints identified in this report will be critical to unlocking this potential. Strengthening the ease of doing research and development will enable researchers to focus on inquiry and innovation, while ensuring that their work contributes meaningfully to national priorities. Sustained and coordinated efforts in this direction will play an important role in shaping India's journey towards becoming a leading knowledge and innovation-driven economy.

(Prof. Vivek Kumar Singh)

Acknowledgement

This report is a reflection of insights and collective wisdom of various stakeholders in the Science, Technology and Innovation ecosystem of the country. The inputs on various aspects of the R&D systems and processes, and the action roadmap has been developed through a consultative process involving institutional leaders, policy practitioners, industry leaders and distinguished scientists and researchers.

First of all, we would like to express sincere gratitude to **Shri Suman K. Bery**, Hon'ble Vice Chairman, NITI Aayog, who has been a constant source of encouragement for the various initiatives towards improving the Science & Technology ecosystem of the country, including the Ease of Doing R&D exercise. We are equally grateful to the guidance and support provided by **Ms. Nidhi Chhibber**, CEO, NITI Aayog and **Shri BVR Subrahmanyam**, Former CEO, NITI Aayog, throughout the entire exercise.

We take this opportunity to express our sincere gratitude to esteemed dignitaries, namely **Smt. Anandiben Patel**, Hon'ble Governor of Uttar Pradesh; **Shri Jishnu Dev Varma**, Hon'ble Governor of Telangana; **Shri Rajendra Vishwanath Arlekar**, Hon'ble Governor of Kerala; and **Dr. Jitendra Singh**, Hon'ble Minister of State (Independent Charge), Ministry of Science and Technology, for their august presence and inspiring addresses during the different regional consultative meetings.

We would like to record our deepest respect and gratitude to distinguished guests and participants in the regional consultative meetings, including **Dr. Anil Kakodkar**, Former Chairman of the Atomic Energy Commission; **Dr. R. A. Mashelkar**, Former Director General, CSIR; **Dr. N. Kalaiselvi**, Director General, CSIR & Secretary DSIR; **Dr M. Ravichandran**, Secretary, MoES; **Prof. Ashutosh Sharma**, Former President, INSA; **Prof. Vinod Kumar Singh**, President, NASI; and **Dr Shekhar Mande**, President, INSA & Former DG, CSIR; for their guidance and suggestions.

We extend our profound thanks and appreciation to distinguished institutional leaders for their pivotal role in hosting and co-organizing the regional consultation meetings, including **Shri Sudhir M. Bobde**, Addl. Chief Secretary to the Hon'ble Governor of UP; **Dr. Harender Singh Bisht**, Director, CSIR-IIP; **Prof. M. S. Gaur**, Director, IIT Jammu; **Ms P. Bharathi**, Secretary, DST, Gujarat and **Dr. Narottam Sahoo**, Member Secretary, GUJCOST; **Dr. Srinivasa Reddy**, Director, CSIR-IICT Hyderabad; **Prof. Devendra Jalihal**, Director, IIT Guwahati; and **Prof. N.V. Chalapathi Rao**, Director, NCESS, Thiruvananthapuram.

We gratefully acknowledge the invaluable contributions of the eminent institutional leaders – Directors of National laboratories, Vice-Chancellors and Heads from National Institutes, Universities, Research laboratories, Scientific ministries, who participated in the regional consultative meetings and the brainstorming sessions to deliberate on various aspects of Ease of Doing R&D. Their collective insights were instrumental in enabling us to accurately identify and compile the challenges currently faced by the Indian research community, and develop a suggestive action roadmap.



We would also like to thank the State Support Mission team of NITI Aayog, for their generous financial support, the R&N Division, Communications Cell and creative graphics team of NITI Aayog, for their indispensable roles in this whole exercise.

Finally, the authors acknowledge the collective efforts of every stakeholder who contributed to this endeavor, through active consultation or passive support; their involvement at different stages was vital to the successful completion of this exercise and preparation of this report.



Executive Summary

India's science, technology, and innovation ecosystem has evolved significantly over the past few decades, emerging as a major contributor to global knowledge production and innovation. The steady rise in research publications, improved performance in global innovation indices, and the rapid expansion of the startup ecosystem reflect the growing depth of India's scientific capabilities. This progress has been achieved despite relatively modest levels of investment and persistent structural inefficiencies. With Gross Expenditure on Research and Development (GERD) remaining well below that of leading economies, and with bottlenecks affecting researchers throughout the research lifecycle, there is a clear need to re-examine and strengthen the enabling environment for R&D in the country. Improving the "Ease of Doing Research & Development (EoDR&D)" is therefore central not only to enhancing research productivity, but also to ensuring that scientific efforts translate effectively into technological and socio-economic outcomes aligned with India's long-term vision of becoming a knowledge-driven economy.

This report is the outcome of a comprehensive exercise conducted by NITI Aayog to identify key barriers affecting the R&D ecosystem and develop a set of actionable recommendations. The exercise draws on a wide evidence base, including open-ended inputs from research institutions, a structured nationwide survey of researchers conducted in collaboration with national science academies, eight regional consultative meetings covering diverse geographies and institutional types, and a series of focused brainstorming sessions with government departments, funding agencies, and industry stakeholders. This multi-layered approach has ensured that the analysis captures both systemic issues and the experiences of researchers, administrators, and institutional leaders across the country. The findings point to a set of deeply interlinked challenges that span funding, human resources, institutional processes, translational capacity, access to resources, regional disparities, and governance mechanisms.

A central concern emerging from the analysis is the nature and utilization of R&D funding in India. While overall allocations have increased in absolute terms, the level of investment relative to GDP remains low, and the funding ecosystem continues to be heavily dependent on public sources, with limited participation from the private sector and philanthropic institutions. This is compounded by inefficiencies in the way funds are allocated, disbursed, and utilized. Researchers face complex and often repetitive application processes across multiple funding portals, long delays in proposal evaluation and fund release, and rigid financial rules that limit flexibility during project execution. The current fund flow mechanisms, coupled with accounting and compliance requirements, often result in delays, disruptions, and underutilization of resources. Issues such as limited overhead provisions and cumbersome procurement procedures further constrain the effective use of funds, ultimately affecting the pace and quality of research.

Equally significant are the challenges related to human resources, which form the backbone of any research ecosystem. Despite India's large pool of young talent, the overall density of researchers remains low, and the system struggles to attract and retain high-quality human capital. The postdoctoral ecosystem is particularly underdeveloped, limiting the continuity and depth of research. Delays in fellowship disbursement, rigid recruitment processes, and a large number of unfilled positions in institutions further weaken the research base. At the same time, career pathways

in R&D remain uncertain and often unattractive, especially in comparison to opportunities in the private sector and emerging technology domains, further reducing research productivity and discouraging long-term engagement in R&D careers.

Institutional structures and internal processes also emerge as a major area of concern. In many institutions, the absence of dedicated and professionally managed R&D offices results in fragmented administrative systems, placing a significant burden on researchers to manage non-scientific tasks. The lack of standardized guidelines and clear operating procedures leads to inconsistencies and delays in approvals, procurement, and project management. Decision-making processes are often overly centralized, with limited delegation of authority, which slows down routine operations and reduces institutional agility. At a broader level, there is limited emphasis on leadership accountability, strategic prioritization of research areas, and periodic self-assessment of institutional systems and processes. The absence of clear and enabling policies for faculty entrepreneurship further limits the ability of institutions to translate research outcomes into tangible innovations.

The gap between knowledge creation and its translation into products and technologies remains another critical challenge. While India performs strongly in terms of publications and patents, the conversion of these outputs into commercially viable solutions is relatively weak. This is due to a combination of factors, including ineffective technology transfer mechanisms, lack of clarity in intellectual property management, and limited access to prototyping and validation infrastructure. Financial and policy constraints, including limited availability of translational funding and disincentives in areas such as taxation, further inhibit the commercialization of research. As a result, a substantial portion of research outcomes does not progress beyond the laboratory stage.

Access to knowledge and research resources also presents a significant constraint, particularly for institutions outside the top tier. While premier institutions may have relatively better access to scientific databases, journals, and advanced infrastructure, a large number of universities and research institutions, especially at the state level or those in the private sector, face limitations in accessing these essential resources. High costs of journal subscriptions, limited availability of shared infrastructure, and fragmented access mechanisms create disparities in research capability across institutions. These gaps not only affect the quality of research but also limit opportunities for collaboration and interdisciplinary work, which are increasingly important in contemporary science and technology.

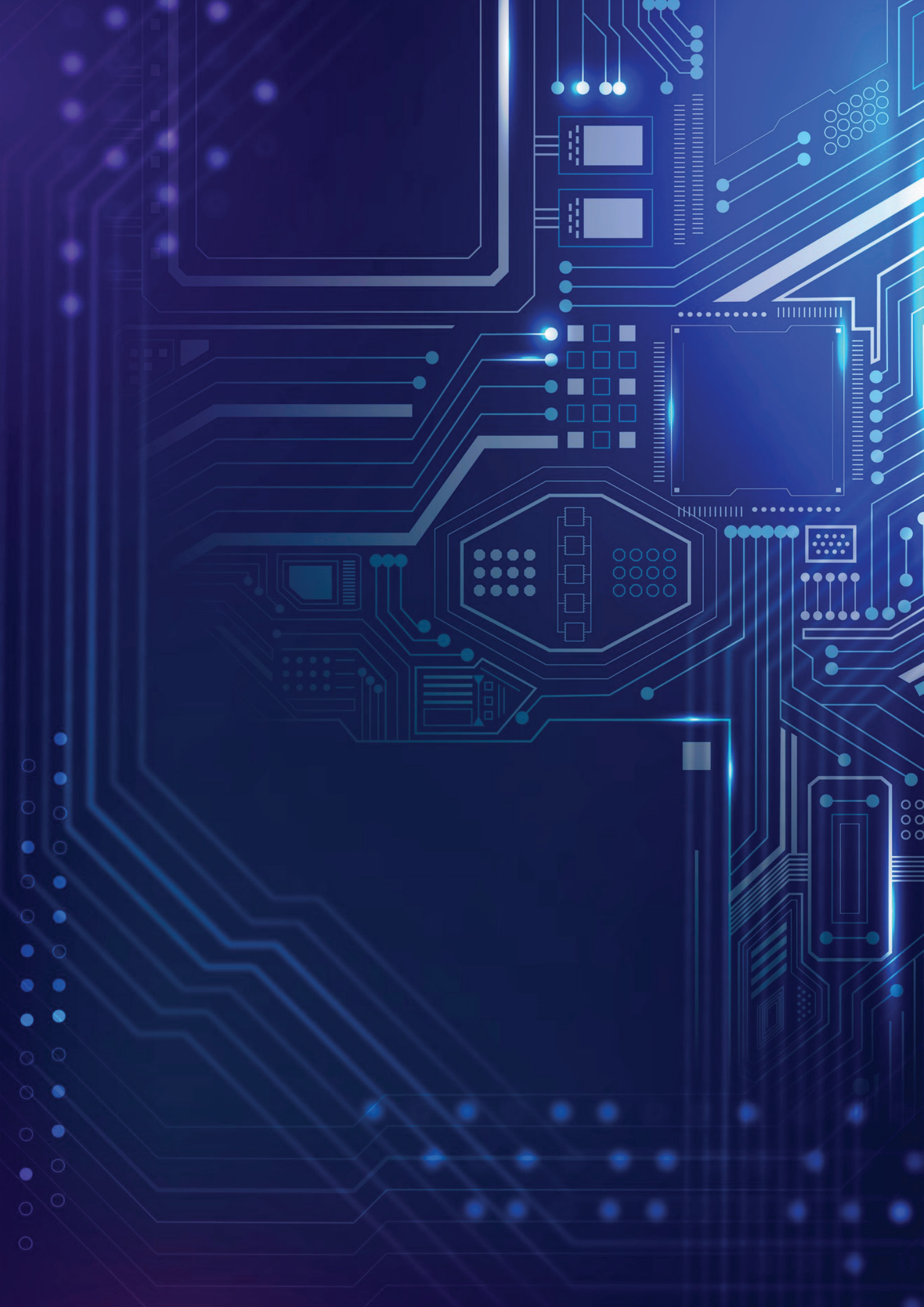
The challenges faced by state institutions deserve particular attention, given their critical role in expanding the research base of the country. Many of these institutions operate under significant resource constraints, with limited funding, inadequate infrastructure, and high teaching loads that leave little time for research. They often face barriers in accessing national-level funding opportunities and lack the institutional support systems required to build and sustain research programs. As a result, there are pronounced regional and institutional disparities in research capacity, which, if left unaddressed, could limit the overall growth and inclusiveness of India's R&D ecosystem.

Finally, the report highlights gaps in monitoring, evaluation, and policy administration that affect

the overall effectiveness of the R&D ecosystem. Existing systems are largely compliance-oriented and do not adequately capture research outcomes, institutional performance, or the impact of policy interventions. There is limited use of data-driven approaches to inform decision-making, and coordination across different agencies and stakeholders remains fragmented. In addition, there is a lack of structured capacity-building mechanisms for research administrators, which further constrains the efficiency of institutional processes.

Taken together, these challenges point to the need for a systemic and coordinated reform effort aimed at removing procedural bottlenecks and creating a more enabling environment for research and innovation. The report outlines a comprehensive set of recommendations anchored in the principle of “*Removing Obstacles, Promoting Enablers*”, with a focus on enhancing investment in R&D, streamlining funding and administrative processes, strengthening human resource systems, improving institutional governance, enabling technology translation, expanding access to resources, and building robust monitoring and evaluation frameworks. A key emphasis is placed on moving towards a more trust-based and outcome-oriented governance model, supported by digital public infrastructure and greater institutional autonomy.

By addressing the structural and systemic constraints identified in this report, India can unlock the full potential of its scientific talent, accelerate the translation of knowledge into impact, and position itself as a global leader in innovation. Such a transformation will be critical to achieving the broader vision of Viksit Bharat @2047, where science, technology, and innovation serve as key drivers of economic growth, societal progress, and national self-reliance.



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The background is a complex digital landscape. It features a color gradient from deep blue at the bottom to a warm, glowing orange and red at the top. Overlaid on this are various geometric and circuit-like patterns. In the top left, there's a glowing circular element with concentric rings. A network of thin, light-colored lines crisscrosses the upper half. On the right side, a series of parallel lines with small circular endpoints curves downwards. The bottom half is dominated by a grid of faint, light blue lines, suggesting a data matrix or a circuit board layout. The overall aesthetic is futuristic and technological.

1

Introduction

A decorative horizontal line with a circuit-like shape, featuring a small circle at the left end and a small circle at the right end, with a central rectangular notch.

India has made significant progress in Science, Technology and Innovation during the last few decades. It is now ranked among the world's leading producers of scientific knowledge, as reflected in the steady growth of research publications and a marked increase in patent filings. India's performance in the Global Innovation Index (GII) has also shown consistent improvement, alongside a rapid expansion of the startup ecosystem, positioning India among the largest startup hubs globally. These trends underscore the growing depth and breadth of India's science, technology and innovation capabilities.

Despite these gains, the funding structure in India's STI ecosystem remains heavily skewed towards public investment. As against the pattern in leading knowledge economies, in India the government funding continues to account for the dominant share of R&D expenditure, while private sector participation remains relatively modest. As a result, India's Gross Expenditure on Research and Development (GERD) stands at approximately 0.65% of GDP, which is significantly lower than that of countries such as the United States (~3.5%), China (~2.4%), and the Republic of Korea (~4.5%). This comparatively low level of investment constrains the capacity and scale required for sustained technological advancement. In addition, India's researcher density, measured in full-time equivalent (FTE) researchers per million population, remains far below levels observed in both developed and emerging economies. This highlights a structural gap in human capital availability for R&D.

This unique phenomenon of India's higher innovation output with lower inputs has also been noted in the Global Innovation Index report 2025, which characterises India as an “*overperformer*” on innovation outputs relative to its inputs. The GII 2025 report cautions, however, that without addressing persistent gaps in R&D investment, human resources, and institutional capacity, India risks stagnation or decline in its relative global innovation standing. Therefore, it is very important to address relevant systemic and structural aspects of the Indian STI ecosystem.

India's STI ecosystem nevertheless possesses substantial untapped potential. With focused policies and programs, improved implementation mechanisms, and impactful reforms aimed at easing the Research and Development (R&D) processes, this potential can be systematically unlocked. By addressing structural and systemic issues, streamlining administrative and financial processes, and improving the overall ease of doing R&D, India can achieve a more robust STI ecosystem capable of effectively translating scientific capabilities into national outcomes. Such measures are central to India's long-term vision of *Viksit Bharat @ 2047*, which envisages technological self-reliance, sustained economic growth, and the evolution of India into a vibrant knowledge-based economy. Achieving these objectives will require focused and time-bound interventions over the coming decades, particularly in mobilising resources and modernising R&D governance and institutional frameworks.

1.1 Ease of Doing Research & Development Initiative

The initiative on improving the Ease of Doing Research & Development (EODR&D) in the STI ecosystem draws its motivation from the long standing call for reforms by the academic and research communities. In the 102nd Indian Science Congress (2015), the Hon'ble Prime Minister (PM) remarked about '*Ease of Doing Science*', highlighting the needs- (a) To help scientists focus on R&D rather than spending hours on administrative procedures, (b) To incentivise research activities thereby attracting talent, and (c) Expanding the S&T ecosystem. These remarks were reiterated by the Hon'ble PM in the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC) meeting of 2020. Similarly, in the Anusandhan National Research Foundation (ANRF) Board Meeting held on 11th September 2024, the Hon'ble PM emphasized on the need to reshape India's R&D landscape by identifying and removing barriers in the R&D ecosystem.

At the 108th Indian Science Congress held in January 2023, the Hon'ble PM again emphasized the need to foster an environment of "*Ease of Doing Science*" in India. He emphasized on minimizing bureaucracy and red tape to make it easier for scientists to conduct research, and called for an enabling institutional framework to make India the most advanced laboratory of modern science during the "Amrit Kaal" (the 25-year period leading up to 100 years of independence). The PM urged young scientists to focus on futuristic areas, including quantum computing, artificial intelligence (AI), augmented reality (AR), virtual reality (VR), and semiconductor research. He further stressed that scientific efforts should move out of laboratories and reach the land ("Jameen"), ensuring that the impact of research is visible in real life.

Several initiatives have been taken during the last few years to support ease of doing science. These include creation of Anusandhan National Research Foundation (ANRF) in 2023, launch of Research Development and Innovation Fund (RDIF) in 2025, and notifications of special provisions for scientific departments/ ministries in the Government Financial Regulations (GFR) during 2023-2025. However, India's current R&D ecosystem still faces several challenges, including complex administrative processes, bureaucratic systems, rigid financial procedures, inefficient resource utilization etc. Other challenges include the lack of standardization, disparities in grant management and compliance processes across institutions, poor monitoring and evaluation, and accountability gaps. Above all, there exists a significant trust deficit between the R&D project granting agency and researchers due to several reasons. The researchers are often not able to utilize their time purely for R&D activities without being worried about the administrative issues. There are also issues of capacity as well as rigidities in the science administration systems, which are largely internal to the institutions.

In view of the importance of the issue and the magnitude of problems it is causing, NITI Aayog has carried out a systematic and comprehensive study towards identifying the major barriers in doing R&D in India, addressing the overall ecosystem for R&D in the country. The exercise focused on all major aspects of the R&D ecosystem in detail, including funding and support structure at national and state level, regulatory & policy frameworks, and the administrative structures & processes governing the allocation and utilization of R&D grants. A multi-dimensional approach was taken to understand major impediments and develop recommendations for corrective action.

1.2 Objectives

The EODR&D exercise was guided by an overarching goal and framework, termed as '**Removing Obstacles, Promoting Enablers (ROPE)**'. While the systematic methodological framework used helped in identifying obstacles, extensive consultations with relevant stakeholders guided development of actionable insights and suggestions.

More specifically, the exercise attempted to:

- identify key obstacles affecting the R&D ecosystem across all dimensions (funding, regulatory processes, institutional structures, systemic barriers etc.), and
- develop a strategic roadmap to overcome the challenges through concrete interventions, policy reforms, and institutional support mechanisms required to strengthen the R&D ecosystem.

While addressing these objectives, the two critical dimensions of the R&D ecosystem and the constituent organisations have been underscored. One is the **internal factors** localised within the academic and research institutions such as structures and processes of the individual organisation/Institute. The other is the **external factors** which are outside the institutional systems and involve broader aspects related to funding, policies, rules, regulations and guidelines issued by the government(s) and regulatory bodies.

1.3 Methodology

Building on existing efforts and responding to the persistent challenges in the R&D ecosystem, NITI Aayog adopted a systematic approach comprising open-ended inputs, a structured survey, regional consultations, and multiple brainstorming sessions. The entire exercise was thus structured around following four key components:

- Gathering Open-ended Inputs from R&D laboratories across different ministries and departments,
- Deploying a structured survey in association with the two national science academies to capture ground-level insights directly from scientists and academicians,
- Region-wise consultative meetings guided by a focused and outcome-oriented agenda, and
- Organizing involved brainstorming sessions with government departments, funding agencies, regulatory bodies, Industry leaders and different Industry associations, to develop actionable recommendations.

The exercise started with gathering open-ended inputs from R&D labs under different ministries and departments. The initial effort to obtain open-ended inputs not only provided an informed account of the overall STI ecosystem and associated challenges, but also gave the confidence that the EODR&D initiative is extremely important, timely and worth pursuing. The inputs obtained helped shape further activities, which involved the regional consultative meetings and the survey through the national science academies.



The regional consultative meetings were then planned in such a manner that they facilitated a correct and comprehensive identification of the various challenges associated with doing R&D, across different regions and institutional setups in India. Each regional consultative meeting involved consultations with institutional leaders and senior research administrators from all kinds of R&D institutions, Higher Education Institutions (HEIs) under central and state governments, institutions managed by private bodies, and industrial R&D units etc. located in the region.

The structured survey complemented the regional consultative meetings in the sense that while regional consultative meetings saw participation of directors, vice chancellors and other institutional leaders, the survey was targeted to reach individual researchers to gather their inputs and insights. The survey questionnaire was designed jointly by NITI Aayog and Indian National Science Academy (INSA) and conducted in online mode through the two science academies-INSA and The National Science Academy of India (NASI). Some of the participants of the regional consultative meetings also took part in the survey, as the survey and regional consultative meetings overlapped in time.

The inputs and suggestions obtained through the open-ended inputs, structured survey, and the regional consultative meetings, were then discussed extensively with various stakeholders through multiple brainstorming sessions. These sessions involved participation of senior officials from relevant government departments/ ministries, leaders from science academies, Industry leaders, and representatives from different Industry associations etc. The brainstorming sessions helped in detailed analysis, prioritizing key areas and developing recommendations for the strategic roadmap. The entire consultation process is described in more detail in chapter 2.

The whole exercise underscores 'Ease of Doing R&D' as a systems level function of the R&D ecosystem. The focus is on identifying impediments that affect researchers' ability for knowledge creation, translation and application and come up with key actions that are required to create enabling opportunities for reducing the challenges faced by researchers across the entire research life cycle. The analysis and outcomes from the four activities of the exercise are organized in following seven key pillars: (a) R&D Funding and Utilization, (b) Attracting and retaining quality Human Resource, (c) Institutional Structures and Processes, (d) Technology Development, Translation & Commercialization, (e) Access to Knowledge & Resources (f) R&D in State



Institutions, and (h) Monitoring, Evaluation, Capacity Building & Policy Administration. Each of the pillars corresponds to a key dimension of 'Ease of Doing R&D', and serve as the structural subsection of the analysis.



The Consultation Process

To develop a grounded and holistic assessment of challenges faced by R&D practitioners in India, NITI Aayog adopted a comprehensive process of consultations. This involved incorporating inputs from key stakeholders, results from a large-scale survey of researchers conducted with national science academies, extensive discussions in the regional consultative meetings, and deliberations in the brainstorming sessions. Together, these efforts ensured that the assessment reflects both systemic issues and experiences across the diverse R&D landscape.

2.1 Open Ended Inputs

The EODR&D exercise began with obtaining open-ended views from selected R&D institutions in the country. About 200 R&D institutions under different scientific ministries/ departments of the central government were contacted through an email to the Director of the institution. The email aimed to know from each contacted R&D institute if their researchers face some major difficulties in carrying out R&D activities. They were suggested to respond with special reference to problems related to availability of R&D funding, regulatory framework and administrative processes, and the institutional structures in place for R&D, along with any key suggestions they may like to share. The key goal behind this process was to assess if the lack of 'Ease of Doing R&D' exists as a major concern for researchers. Responses were requested in about three weeks time and in this short duration, about 60+ R&D institutions shared their inputs.

The responses received were analysed in detail to understand both, the major areas of concern and the magnitude of problems. The key concerns flagged in the inputs were mainly systemic in nature and revolved around inadequate and delayed R&D funding, complex and rigid processes of procurement of equipment and recruiting human resources, and weak institutional structures and mechanisms for fostering collaboration and technology transfer & commercialization. The **Image 1** presents a word cloud plot derived from the input text. The size of the words in the picture is proportional to their frequency of occurrence in the combined inputs from all the institutions.

The analysis of open-ended inputs indicated the existence of a wide variety of problems in the R&D ecosystem, which in turn suggested the need for a detailed and comprehensive exercise to assess the 'Ease of Doing R&D'. The open-ended input exercise did not include the Higher Education Institutions (HEIs), which is another major institution category engaging in R&D activities. Accordingly, the next set of steps were thought and planned for carrying out a comprehensive exercise involving all relevant stakeholders in the R&D ecosystem. This included in-person regional consultative meetings and online survey on Ease of Doing R&D.

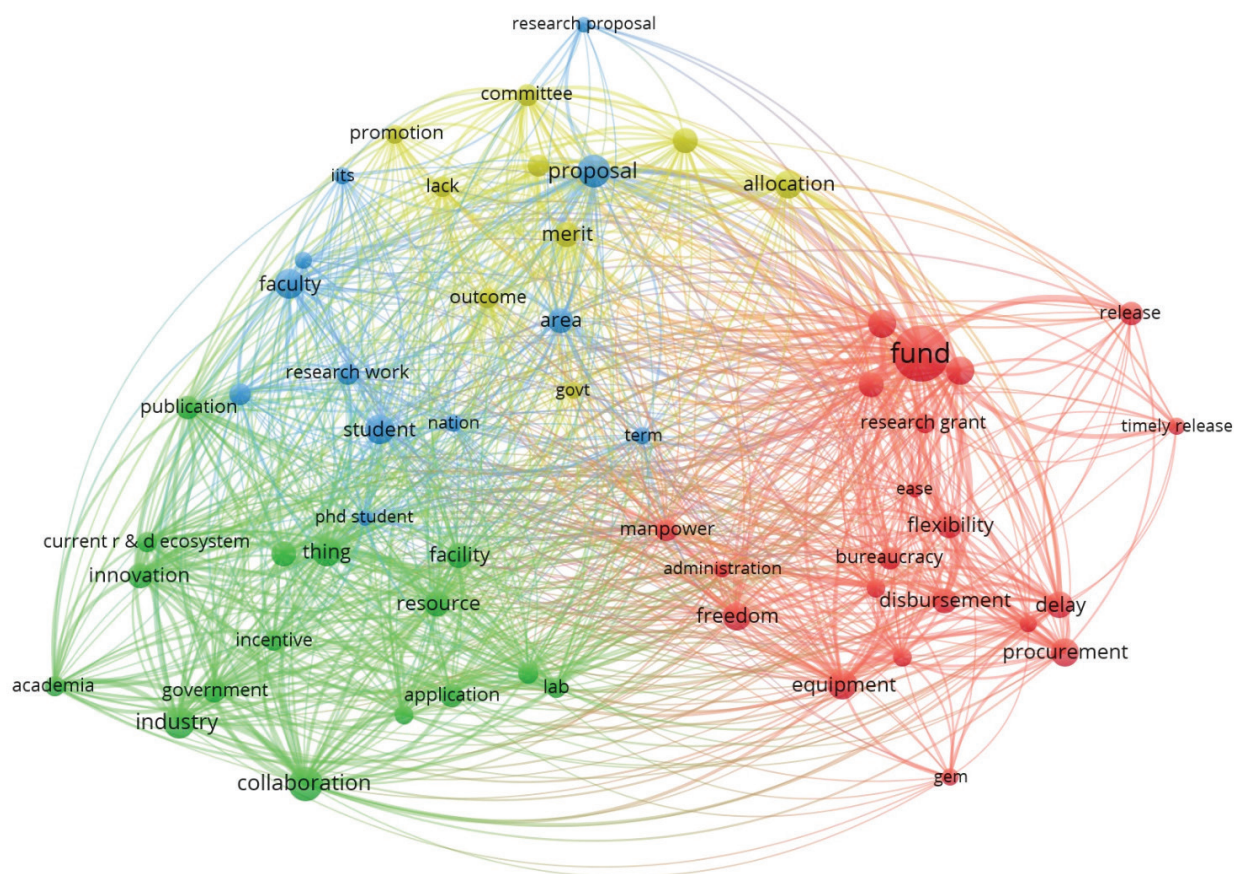


Image 2. Network Visualization of Key aspects highlighted in the survey

2.3 Regional Consultative Meetings

To assess and examine the challenges faced by the R&D practitioners in a much more detailed and comprehensive manner, a series of regional consultative meetings were organized. The purpose of the regional consultative meetings was to understand the major issues faced by the R&D ecosystem.

To identify the various types and the extent of problems faced by the R&D practitioners across the different types of the institutions located in different geographic regions and focusing on different scientific disciplines; a systematic approach was taken in planning and organizing the regional consultative meetings. A total of eight regional consultative meetings were organized across different parts of the country. Each regional consultative meeting invited participants from institutions located in a select set of states. The invited participants in each meeting represented institutional leaders (directors of R&D and academic institutions and Vice Chancellors of Universities) and some distinguished academicians, researchers and academic/ R&D administrators.

The eight regional consultative meetings combined, featured participation of 430+ distinguished institutional leaders, academicians and researchers representing major R&D institutions and HEIs under central and state governments as well as selected private institutions. Almost all major R&D laboratories under CSIR, DST, DBT, MoES, DRDO, DAE, DoS were represented across different meetings. Similarly, all major HEIs such as IITs, IISERs, NITs, IIITs, Central Universities and

State Universities had their institutional leaders attending the consultative meetings. Each regional consultative meeting had a mix of institutional leaders from different types of institutions located in that region.

Table 1 presents a quick summary of the key details of the eight regional consultative meetings organized, and the **Image 3** shows the geographical spread of the regional consultative meeting venues. More details of the eight regional consultative meetings are provided next.

Table 1: Key details of the eight regional consultative meetings

S. No.	Date & Place	Key Sessions	States Covered
1	27-28 May 2025 at Governor House, Lucknow	The meeting consisted of four Technical Sessions: <ul style="list-style-type: none"> - <i>Funding and support structures,</i> - <i>Regulatory and administrative processes,</i> - <i>Strengthening institutional mechanisms,</i> - <i>Reforms to enhance Ease of Doing R&D.</i> <p>Each session included expert presentations and structured discussions to capture stakeholder inputs.</p>	Uttar Pradesh Bihar
2	3-4 June 2025 at CSIR-IIP, Dehradun	The meeting consisted of three Technical Sessions: <ul style="list-style-type: none"> - <i>Funding and support structures,</i> - <i>Regulatory and administrative frameworks,</i> - <i>Institutional mechanisms facilitating R&D.</i> 	Uttarakhand
3	14-15 July 2025 at IIT Jammu, Jammu	The meeting consisted of three Technical Sessions: <ul style="list-style-type: none"> - <i>Accelerating R&D in academic institutions,</i> - <i>Enabling R&D personnel for cutting-edge research,</i> - <i>Translating publications and patents into products.</i> <p>An Open Forum was also included to enable broader stakeholder interactions in a semi-formal setting to get deeper feedback.</p>	Jammu and Kashmir Punjab Himachal Pradesh Ladakh

4	6 th August 2025 at NITI Aayog, New Delhi	<p>The meeting consisted of three Technical Sessions:</p> <ul style="list-style-type: none"> - <i>Global best practices in R&D,</i> - <i>Institutional benchmarking for Ease of Doing R&D,</i> - <i>Strengthening R&D ecosystems through funding, infrastructure, and regulatory reforms.</i> <p>The programme concluded with consolidated discussions aimed at identifying actionable recommendations</p>	Delhi NCR Haryana
5	12-13 Aug 2025 at Science City, Ahmedabad	<p>The meeting consisted of four focused Technical Sessions:</p> <ul style="list-style-type: none"> - <i>Strengthening R&D ecosystems (funding and regulation),</i> - <i>Access to knowledge resources,</i> - <i>Institutional structures and processes,</i> - <i>Applied and translational research.</i> <p>These sessions were complemented by two panel discussions synthesising cross-cutting issues and recommendations</p>	Gujarat Madhya Pradesh Rajasthan Maharashtra
6	10-11 Sep. 2025 at CSIR – IICT, Hyderabad	<p>The meeting consisted of four Technical Sessions:</p> <ul style="list-style-type: none"> - <i>Strengthening R&D ecosystems (funding and regulation),</i> - <i>Enhancing access to knowledge resources,</i> - <i>Institutional structures and processes,</i> - <i>Applied and translational research.</i> <p>These sessions were complemented by a panel discussion and a special session with senior leadership.</p>	Telangana Orissa Andhra Pradesh Jharkhand Chhattisgarh Goa

7	15-16 Oct. 2025 at IIT Guwahati, Guwahati	<p>The meeting consisted of five Technical Sessions:</p> <ul style="list-style-type: none"> - <i>Process streamlining for R&D efficiency,</i> - <i>Attracting and retaining human resources,</i> - <i>Technology translation and commercialization,</i> - <i>Fostering collaboration and mobility,</i> - <i>Measuring Ease of Doing R&D.</i> <p>These sessions were complemented by a panel discussion on the way forward, focusing on reform priorities, including specific issues for the North East Region.</p>	<p>Assam</p> <p>Arunachal Pradesh</p> <p>Manipur</p> <p>Meghalaya</p> <p>Nagaland</p> <p>Sikkim</p> <p>Mizoram</p> <p>Tripura</p> <p>West Bengal</p>
8	30-31 Oct. 2025 at NCESS, Thiruvananthapuram	<p>The meeting consisted of three Technical Sessions:</p> <ul style="list-style-type: none"> - <i>Strengthening the R&D ecosystem,</i> - <i>Attracting and retaining quality human resources,</i> - <i>Technology translation and commercialization.</i> <p>The technical sessions were complemented by a special session highlighting key findings from surveys and regional consultations, and a panel discussion on the way forward to identify reform priorities.</p>	<p>Kerala</p> <p>Tamil Nadu</p> <p>Karnataka</p> <p>Puducherry</p>

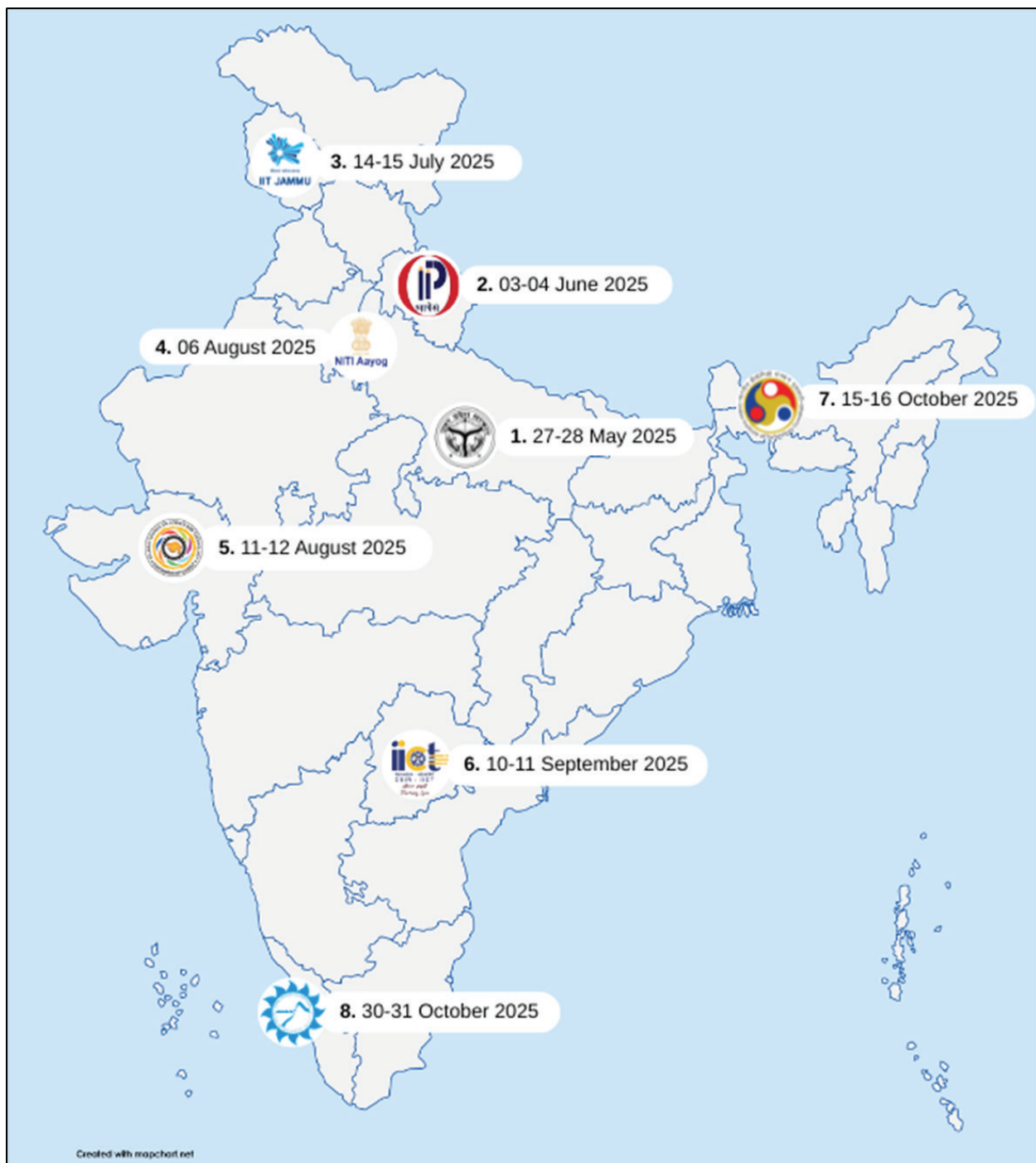


Image 3: Geographical Mapping of EODR&D regional consultative meetings

1st Regional Consultative Meeting at Raj Bhawan, Lucknow, May 27-28, 2025



The first regional consultative meeting on “Ease of Doing Research & Development ” was held in Raj Bhawan, Lucknow under the leadership of Smt. Anandiben Patel, Hon’ble Governor of Uttar Pradesh, in the august presence of Dr. V.K. Saraswat, Hon’ble Member, NITI Aayog, Dr. N. Kalaiselvi, Director-General of Council of Scientific & Industrial Research (CSIR) & Secretary DSIR, Prof. Vinod Kumar Singh, President of National Science Academy India, and Shri Sudhir M Bobde, Additional Chief Secretary, Govt of Uttar Pradesh. The meeting was attended by institutional leaders (Vice Chancellors and Directors) of major universities and R&D institutions in Uttar Pradesh and the nearby region. Several top officials from scientific departments and ministries in Govt of India, including the Secretary, University Grants Commission and Secretary, Technology Development Board, also attended the meeting. The deliberations explored the need for structural reforms aimed at streamlining institutional processes, accelerating fund flow, and creating a more agile and innovation-friendly environment to strengthen the nation’s research and development capabilities.

More Details at: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2132164>



2nd Regional Consultative Meeting at CSIR-IIP, Dehradun, June 3-4, 2025



The second regional consultative meeting was held at CSIR-Indian Institute of Petroleum (IIP), Dehradun. The meeting was chaired by Dr. V. K. Saraswat, Member of NITI Aayog, and graced by senior dignitaries including Dr. N. Kalaiselvi, Director General of CSIR & Secretary, DSIR; Prof. Ashutosh Sharma, President of Indian National Science Academy (INSA); Dr H.S. Bisht, Director, CSIR-IIP Dehradun, along with institutional leaders from premier universities, national research laboratories and scientific ministries. The meeting featured insights from a diverse group of eminent speakers and focused thematic discussions on governance reform, translational research, public-private partnerships, and support systems for young researchers. Participants proposed mechanisms to enhance autonomy, streamline regulatory frameworks, and incentivize high-impact research.

More Details at: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2133874>



3rd Regional Consultative Meeting at IIT Jammu, July 14-15, 2025



The third regional consultative meeting was held at Indian Institute of Technology (IIT) Jammu, Jammu & Kashmir under the leadership of Dr. Jitendra Singh, Hon'ble Minister of State (Independent Charge), Ministry of Science and Technology, in the august presence of Dr. V. K. Saraswat, Member of NITI Aayog. The meeting was graced by distinguished participants, including Dr. Shivkumar Kalyanaraman (CEO, Anusandhan National Research Foundation), Prof. Vinod Kumar Singh, President, National Academy of Sciences, India, and Prof. Manish R. Joshi, Secretary, University Grants Commission (UGC), along with Prof. Manoj Singh Gaur, Director, IIT Jammu. The agenda focused on key themes such as Accelerating R&D in Academic Institutions, Enabling R&D Personnel to do Cutting-Edge Research, Translating Publication and Patents to Products, Reforms needed. Discussions highlighted the need to bridge the lab-to-market gap, strengthen research capacity in non-metro and regional institutions, and streamline regulatory frameworks to accelerate innovation and translational research.

More Details at: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2145031>



4th Regional Consultative Meeting at NITI Aayog New Delhi, August 6, 2025



The fourth regional consultative meeting was held in NITI Aayog, New Delhi. The meeting was chaired by Dr. V. K. Saraswat, Hon'ble Member of NITI Aayog and had a distinguished gathering, including Dr. Rajesh Gokhale, Secretary, Department of Biotechnology (DBT), Dr. Shivkumar Kalyanaraman (CEO, Anusandhan National Research Foundation), Dr M. Mohapatra, DG, IMD, New Delhi, Dr. M Srinivas, Director, All India Institute of Medical Sciences (AIIMS), New Delhi and several other distinguished institutional and academic leaders. The representatives from the Science & Technology Offices of selected foreign embassies and international organizations also graced the event and shared global best practices on promoting R&D. The agenda focused on key themes such as Global Models and Best Practices for R&D, Measuring and Enhancing Institutional Competitiveness, Funding, Infrastructure and Regulatory Framework.



5th Regional Consultative Meeting at Science City, Ahmedabad, August 12-13, 2025



The fifth regional consultative meeting was held at Science City, Ahmedabad on 12-13 August 2025, bringing together over 110 participants. The meeting was chaired by Dr. V. K. Saraswat, Hon'ble Member of NITI Aayog and was graced by talks from Dr. R.A. Mashelkar, former DG, CSIR, Ms. P. Bharathi, IAS, Secretary, DST, Gujarat, and Dr. Narottam Sahoo, Advisor and Member Secretary, GUJCOST, alongwith other distinguished institutional leaders from the region. The agenda focused on key themes such as Funding and Regulatory Framework, Enhancing Access to Knowledge Resources, Institutional Structures & Processes, Towards Applied and Translational Research. Participants underscored the critical need to reinforce foundational enablers, including streamlined funding mechanisms, robust research infrastructure, and simplified regulatory procedures. The dialogue highlighted the importance of coordinated efforts and translational research in unlocking India's full research and innovation potential.

More Details: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2156261>



6th Regional Consultative Meeting at CSIR-IICT, Hyderabad, September 10-11, 2025



The sixth regional consultative meeting was held at CSIR-Indian Institute of Chemical Technology (CSIR – IICT), Hyderabad under the leadership of Shri Jishnu Dev Varma, Hon'ble Governor of Telangana, in the august presence of Dr. V. K. Saraswat, Hon'ble Member of NITI Aayog, Dr. Anil Kakodkar, Hon'ble Former Chairman, Atomic Energy Commission, Prof. Ashutosh Sharma, President, Indian National Science Academy (INSA), Dr. N. Kalaiselvi, Director General, Council of Scientific and Industrial Research (CSIR) and Secretary, DSIR, Govt of India, and Dr. D. Srinivasa Reddy, Director, CSIR-IICT Hyderabad, alongwith participation of institutional leaders from the region. The agenda focused on key themes such as Funding and Regulatory Framework, Enhancing Access to Knowledge Resources, Institutional Structures & Processes, Towards Applied and Translational Research. The meeting concluded with a resounding message that India's scientific future will be defined not only by the ease of doing research but, more critically, by the ease of translating research into tangible outcomes.

More Details: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2165917>



7th Regional Consultative Meeting at IIT Guwahati, October 15-16, 2025



The seventh regional consultative meeting was held at the Indian Institute of Technology (IIT) Guwahati under the chairmanship of Dr. V. K. Saraswat, Hon'ble Member, NITI Aayog. It featured a welcome address by Prof. Devendra Jalihal, Director, IIT Guwahati, and special addresses by Dr. Sanghamitra Bandopadhyay, Director, Indian Statistical Institute (ISI), Kolkata, and Dr. Vinita Sahay, Director, Indian Institute of Management (IIM), Bodh Gaya, who emphasized the importance of cultivating a strong research culture beginning at the school level. The meeting was attended by distinguished academic leaders from academic and R&D institutions in the region. The agenda focused on key themes including streamlining processes to enhance R&D efficiency and productivity, attracting and retaining quality human resources, strengthening technology translation and commercialization (“Lab to Land”), fostering collaboration and mobility, and developing measurable reforms to improve Ease of Doing R&D. Dr. Saraswat highlighted the relevance of adopting the Mohali model for the North-Eastern region, with Guwahati as a central hub to promote integrated research and innovation clusters. The discussions underscored the need for coordinated institutional reforms, stronger translational pathways, and region-specific innovation strategies to accelerate sustainable R&D growth.

More Details: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2180328>



8th Regional Consultative Meeting at NCESS Trivandrum, October 30-31, 2025



The 8th regional consultative meeting was organized at the National Centre for Earth Science Studies (NCESS), Thiruvananthapuram, under the chairpersonship of Shri Rajendra Vishwanath Arlekar, Hon'ble Governor of Kerala, in the august presence of Dr. V. K. Saraswat, Member, NITI Aayog, Dr. M. Ravichandran, Secretary, Ministry of Earth Sciences, along with Prof. N.V. Chalapathi Rao, Director, NCESS and distinguished academic and R&D leaders from the region. The Hon'ble Governor remarked that "State development will lead to national development", reinforcing the need for regionally rooted innovation ecosystems. The two-day meeting concluded with interactive sessions and consultations with representatives from academic institutes, research laboratories, and government reaffirming the collective commitment to build an enabling, efficient, and collaborative R&D ecosystem in India.

More Details: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2185429>



2.4 Brainstorming Sessions

To deliberate on the inputs that were received from the survey and the regional consultations, a set of brainstorming sessions were conducted with the key scientific departments, funding agencies, and industry stakeholders. The sessions focused on developing recommendations for reform actions and enabling pathways for Ease of Doing R&D.

Consultations with the senior officials of the Department of Science and Technology (DST), Department of Biotechnology (DBT), Department of Scientific and Industrial Research (DSIR), and Anusandhan National Research Foundation (ANRF) were first to begin with. This provided an opportunity to examine the grant mechanisms and disbursement systems, institutional autonomy, regulatory mechanisms, support structures for translation, and monitoring mechanisms. It further helped in assessing the operational mechanisms of project approvals and fund disbursals, aligning the recommendations that emerged with the policy and programmatic initiatives that were already underway.

Structured interactions were also conducted with industry leaders and industry associations to better comprehend the challenges faced by the private sector for contributing in R&D, and challenges in academia-industry collaboration. Further review and guidance were provided through interactions with the *Standing Consultative Committee on EoDR&D*, which pondered on the emerged findings, and helped refine the prioritisation of the recommendations.

The brainstorming sessions were an important part in the consultation process, ensuring that the closing recommendations are feasible, aligned across stakeholders, and can be implemented in a time-bound manner.

Challenges & Recommendations



This chapter presents major identified challenges faced by scientists and researchers across the R&D ecosystem of the country. The analysis draws on insights shared by stakeholders who participated in the consultation process, as detailed in the previous chapter. The chapter is organized into seven sections, each section listing out the major identified challenges and relevant suggestions for corrective actions.

3.1 R&D Funding and Utilization

The research and development activities do not solely depend upon researchers but also rely broadly on research infrastructure, access to knowledge and tools, and a conducive environment for creation and application of knowledge. To support these critical requirements, sufficient and sustained R&D funding and its proper utilization play a critical role, which eventually lead to shaping the nation's innovation capacity, technological self-reliance, and long-term economic growth.

R&D funding is usually sourced in two ways: (a) extramural, which involves funding provided by various Government departments and funding agencies, and (b) intramural, which is supported by internal resources of the institution or its parent organization. The major part of extramural R&D funding in India is provided by different government funding agencies, such as Department of Science and Technology (DST), Department of Biotechnology (DBT), Council of Scientific and Industrial Research (CSIR), Anusandhan National Research Foundation (ANRF), and University Grants Commission (UGC). There are also certain mission mode programs to support R&D in different areas of national priority. While the absolute allocation for R&D has increased over time, India's Gross Expenditure on Research and Development (GERD) has remained low at 0.6 to 0.7% for quite some time. The Government Financial Rules (GFR) and the complex fund flow and accounting systems create further problems in utilization of the already limited R&D funds.

The consultation process has highlighted several systemic and operational challenges across all three components of the R & D process, namely Fund Availability, Fund Flow and Fund Utilization. **Table 3.1** presents a top-level overview of the key dimensions of the R&D Funding challenges.

Table 3.1: Key Dimensions of R&D Funding Challenges

Dimension	Core Issues Identified
Fund Availability	Low GERD, Weak private sector participation, Limited Philanthropic contribution to R&D, Funding concentration in select institutions.
Fund Flow and Governance	Cumbersome proposal formats, Duplication of schemes and funding calls, Long processing times, Fund disbursement delays, Complex fund flow mechanism for low value grants, Year-end automatic withdrawal, Reconciliation challenges.
Financial and Administrative Rigidities affecting Utilization	Rigid budget heads, GFR restrictions, Procurement delays of routine R&D consumables, Absence of gatekeeping on GeM, High GST on R&D equipment, Limited overhead costs, Repeated submissions of UC and SE.

3.1.1. Inadequate R&D Funding

India's overall R&D funding pool has remained largely unchanged, as reflected in India's low value of GERD (hovering around 0.6 to 0.7% for over a decade). This is significantly lower than countries like China (2.6%), USA (3.4%), and South Korea (5.3%). Though the absolute R&D funding has increased, it has not been effective due to several reasons including inflation, increase in the number of institutions, and reduced institutional funds for R&D. In fact, there is now much higher competition for R&D grants than ever before, with application to grant ratio declining to under 10% across several R&D funding agencies. Therefore, the available R&D funds are insufficient to meet the R&D appetite of the institutions and researchers.

Another important aspect in India's R&D funding is that it is heavily dependent on public funding (with about 64% contribution), unlike the case in several leading innovation economies which have more than 60% of the R&D budget contributed by the private sector (<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2153547>). Further, the culture of philanthropic contribution to scientific research is still in its nascent stage. Absence of attractive fiscal incentives is one major factor inhibiting private sector and philanthropic contribution.

3.1.2. Skewed Funding

The consultation process brought forward the issue of a higher concentration of R&D funding in selected premier institutions (for instance, the IIT system is known to receive more than 80% of ANRF's R&D funding). While uniformity in R&D funding is neither expected nor desirable, over-concentration of funding in only a selected set of institutions reduces the funding opportunity for researchers working in other R&D institutions and HEIs. It may be noted that ANRF has a specific mandate for supporting R&D in state institutions, however, this goal is far from being achieved. Participants in the consultative meetings also highlighted that most of the expert committees on ANRF do not have suitable representation from outside the IIT system, which may be unintentionally resulting in skewed funding decisions.

3.1.3. Cumbersome Process of R&D Grant Applications

Researchers seeking R&D funding are required to navigate through multiple portals or systems by different ministries or funding agencies, each portal being independent of others. Therefore, researchers end up making repetitive data entries about their CV and institution details etc., each time they submit a proposal. Several times, these proposal formats are very lengthy asking for undesired routine information, which does not actually help in assessing the proposals. Long proposal formats also create a burden for review committees. Therefore, it is desirable to have a unified portal for R&D calls of Govt of India. *In this context, NITI Aayog has already taken an initiative for the design of a Unified Architecture for Project Management System (UPMS). The system under development by National eGovernance Division, Ministry of Electronics & Information Technology, will provide a unified view of R&D calls, a simplified interface for proposal submission and management, and various other value added services like researcher microsite, individual and institutional expertise mapping, ease of financial reporting etc. (Refer Box 1).*

Box 1**Unified Architecture for Project Lifecycle Management (UPMS)**

UPMS is a national initiative of strategic importance, one that seeks to bring systemic improvement to the way research, development, and public investment projects are conceptualized, monitored, and delivered across Ministries and Departments. By enabling a unified, interoperable, and digitally empowered architecture, UPMS will significantly strengthen transparency, efficiency, and real-time decision-making across the Government ecosystem.

UPMS is proposed as a unified and modular architecture for end-to-end project lifecycle management, taking into account technical, operational, and financial considerations. The architecture will support the creation of multiple sibling and child instances, allowing ministries and agencies to retain contextual and operational flexibility while operating within a common national framework. The system will enable both vertical and horizontal API-level integration to facilitate seamless data exchange across schemes, departments, and institutions. The platform will be hosted on a secure and scalable cloud infrastructure to ensure high availability, resilience, and on-demand scalability. Reporting, monitoring, and analytics capabilities will be embedded by design from the outset, enabling real-time visibility into funding flows, project progress, institutional participation, and thematic overlaps.

To ensure coordinated progress, a dedicated Inter-Ministerial Committee is constituted, and a core implementation team is overseeing the platform's architecture, development, and phased rollout. The National e-Governance Division (NeGD) under the Ministry of Electronics & Information Technology is being empowered with the necessary resources to advance this important national initiative in a timely and effective manner. The pilot system is to be deployed soon.

3.1.4 Duplication of Schemes and Calls

Limited cross-departmental visibility has resulted in multiple ministries and agencies supporting similar R&D activities and issuing near-identical funding calls, sometimes even within the same ministry. For example, in areas like Hydrogen Energy, Carbon Capture Utilization and Storage etc., both DST and CSIR are supporting R&D projects. Similarly, there are several areas where ANRF is simply duplicating the efforts of DST. As an example, ANRF calls on Centre for Excellence for STI Indicators and Analytics proposes to explore topics which are already a long-standing mandate of NSTIMIS division of DST. Given that R&D funds are already limited, there is a need to avoid such duplication and provide for more judicious and optimized utilization of R&D funds.

3.1.5. Long Proposal Processing Times

At present most of the funding agencies are taking a long time in evaluation of R&D project proposals and disbursement of grants for approved projects. In a rapidly changing science & technology landscape, long delays in the processing of R&D proposals pose a risk of the proposal becoming outdated. Unlike global best practices that allow year-round submissions or call for proposals with periodic decision cycles, India's current approach results in extended waiting

periods, reducing responsiveness to emerging scientific opportunities. The delays in proposal processing are often attributed to administrative complexities, difficulties associated with the current fund flow system, smaller size of expert committees, and limited scientific manpower in funding agencies. Timeliness of R&D is a very critical factor and therefore necessary corrective steps are required to significantly reduce proposal processing times.

3.1.6. Delayed Fund Disbursal and Misaligned Accounting System

The success of R&D initiatives depends critically on timely and seamless provision of financial support. Facilities such as biobanks, data centers, and high-end equipment require sustained, long-term investment. In the current extramural funding landscape, the continuity of sustained fund flow is primarily disrupted by two major factors: (a) delays in the release of the fund, and (b) complex or misaligned accounting systems.

(a) Delay in Release of Funds

- At present, even after a scientific decision is taken on a project proposal, it takes more than 3-6 months (sometimes even more) for the release of the grant. Thus, the already long processing time of R&D proposals gets affected further, often resulting in turnaround times of more than a year or more. It is desirable that fund disbursal tasks may be handled by a dedicated Project Management Unit (PMU) comprising professionals trained for such tasks. This may allow the turnaround delays to be minimized and more judicious utilization of time of scientific staff.
- Frequent changes in the fund distribution mechanism during the last few years have also created difficulties and introduced delays at different stages. Institutions find it difficult to adjust with frequent changes in the fund flow system.

(b) Misaligned Accounting Systems

- In the current accounting system, extramural R&D projects with low financial requirements are also required to pass through the same complex fund flow mechanisms involving TSA or Hybrid-TSA models that are used in larger fund allocations. It may be noted that the total financial outlay for extramural R&D (accounting for about 40,000 projects a year) across all ministries and departments is only about Rs. 4,000 Cr annually.
- Due to a large number of sanctions and the corresponding authorization and fund flow complexities, the fund disbursal for approved R&D projects gets significantly delayed. The large number of sanctions and transactions, which otherwise are of small value, stresses the complete system.
- The funds allocated are automatically withdrawn at the end of the financial year under the current “use it or lose it” budgeting framework, and then it often takes another 2-3 months in the reassignment of funds. This is constraining the institutional systems resulting in periodic discontinuity of R&D activities, non-payment of fellowships to research personnel for a few months, and repeated efforts for assignment and reassignment.

- The automatic withdrawal of funds in March and the reassignment of that fund from next year's budget of the funding agency, is resulting in an undesired loop of cumulative committed liabilities for funding agencies and are reducing their capability to fund new R&D activities.
- The expenditure monitoring for jointly funded R&D projects with external funding sources is not possible in the case of TSA or Hybrid TSA systems. The Hybrid TSA system has some other operational difficulties, such as those related to making advance payments for the procurement of specialised scientific equipment and international services.
- In cases where payments are failed or some inadvertent error happens, reconciliation or resolution is a time-consuming and cumbersome process, leading to delays in the release of subsequent tranches of funds.
- The fund processing often becomes extremely slow on the 30th & 31st of March, resulting in the inability to upload bulk payment files on the PFMS portal.
- The strict mapping of R&D funds with specific projects in TSA or Hybrid TSA has taken away the institutional capacity to leverage available overall R&D funds to temporarily meet funding gaps in other R&D projects.

3.1.7. Challenges in Fund Utilisation & Reporting

Ease of utilization of R&D grants is an essential component for any STI ecosystem, more so in a system having fund availability constraints. However, there are several challenges that R&D practitioners face due to rigid financial rules, constraints with the GeM portal, limited institutional autonomy, and restrictive delegation of financial powers. Some of the key issues highlighted during the consultation are as follows:

- Rigid Head-wise Allocation of R&D Grants:** R&D activities have an inherent component of risk and uncertainty. New findings, expert feedback, or changes in technology often require some adjustments or realignments during the project duration. However, in the current system, most of the R&D grants come with strict head-wise budgets, such as equipment, manpower, or consumables. Once approved, there is no or limited flexibility of reappropriations, including even for intra-major-head realignments. Each time such reappropriation becomes necessary, the researchers have to seek approval of the funding agency, which takes a lot of time. This sometimes results in ineffective fund utilization.
- Complex Process for Procurement of Routine R&D Consumables:** In the current framework, the same standard procurement procedures designed for general government purchases, are used even for low value repetitive purchase of R&D consumables. As a result, even small value repeated procurements become time taking and difficult. International best practice allows institutions autonomy in low-risk, repetitive procurement, subject to audit and accountability norms. Therefore, for an efficient and uninterrupted execution of R&D activities procurement of small value R&D consumables may be eased by greater authority to researchers and the institutions.

- (c) **High GST Burden:** R&D grants are mostly government-to-government transfers, but a high GST is still applied on procured research items, which reduces the effective funds available for actual research activities. The R&D related procurements were eligible for GST at 5% slab till June 2022. However, now institutions are required to pay GST as per actuals for all R&D related procurements. This reduces the actual availability of already limited R&D funds.
- (d) **Insufficient Overhead Component:** The extramural R&D support provided to institutions usually has an overhead component. This overhead is used by the institutions to provide basic facilities required by the R&D personnel to carry out research activities associated with R&D projects. These include electricity, air conditioning, maintenance of facilities etc. However, in view of the rising cost of electricity, services and maintenance, the overhead charges at the current usual rate of 5% to 10% of the project cost do not suffice. As a result, it becomes difficult to maintain laboratories and facilities.
- (e) **Financial Reporting:** The R&D grants are usually allocated in a yearly fashion and the release of the next installment requires submission of Utilization Certificate (UC) and Statement of Expenditure (SE). Many times researchers are required to submit UC and SE multiple times and as a result they end up putting in a good amount of time which could have been otherwise utilized in actual R&D work. During the consultation process it was pointed out that since all procurement and payments in R&D projects are now done through the Public Financial Management System (PFMS), there should be a provision of automatic generation of UC and SE from the system.

Major Recommendations

3.1 (a) Enhance Gross Expenditure on R&D to at least 2% in a phased manner

To strengthen India's R&D ecosystem, there is an urgent need to significantly enhance the national investment in R&D, from the current level of 0.64% to at least 2% of GDP, in the next four to five years.

3.1 (b) Attract Private R&D Investment through well-designed Incentives Framework

India needs to introduce time-bound, incremental fiscal incentives to boost private sector investment in R&D, both the in-house industrial R&D and collaborative R&D with public R&D labs and HEIs. The target should be to attract half of the targeted GERD from the private sector.

3.1 (c) Add optional reporting head of R&D Expenditure under Schedule III (Balance Sheet & Statement of profit & Loss) of Companies Act 2013

Adding reporting head of R&D Expenditure under Schedule III (Balance Sheet & Statement of profit & Loss) of Companies Act 2013, Section 129, can provide for better data about private sector investment in R&D and also sensitize them to consider higher investments.

3.1 (d) Enhance Philanthropic and CSR Support for R&D

In order to meet the requirement of a higher fund availability for R&D, a more bold and forward-looking approach is required to attract philanthropic support for R&D. This in turn calls for strengthening and effectively leveraging CSR provisions under the Companies Act, as well as providing higher deduction (say at least 125%) for individual contributions to funds supporting R&D, under Sec. 133 (Deduction in respect of donations to certain funds, charitable institutions, etc.) of the Income Tax Act 2025.

3.1 (e) Create Inter-departmental Coordination Committee to Minimize Overlaps

It is necessary to create an inter-departmental Committee within the Ministry of Science & Technology, that meets at regular intervals, to target synergy and complementarity of schemes and calls across constituent departments and funding agencies, and ensure avoiding or minimizing duplication of schemes across departments.

3.1 (f) Introduce Round the year Call for proposals with six months cap on processing time

The R&D funding agencies should introduce round the year call for proposal submissions, preferably with two periodic review and processing cycles in a year. The proposal reviews can start immediately after they are submitted, thereby reducing the proposal processing and decision times.

3.1 (g) Establish Dedicated Project Management Units (PMUs)

R&D funding agencies should establish dedicated PMUs to handle post-grant approval administrative and financial activities, including fund disbursement and compliance. This will ensure clear separation of scientific and administrative roles, reduce burden on scientific staff, and expedite fund release. The PMUs, in due course, may leverage functionalities in the UPMS portal being developed.

3.1 (h) Provision Direct Fund Transfer for Extramural R&D

For extramural R&D projects, which have relatively small approved financial outlays, a direct grant transfer mechanism to institutional accounts need to be adopted. Larger or core grants may continue to be disbursed through the TSA or Hybrid TSA system. This approach will significantly ease and speed up the fund disbursement, ensure continuity of funding and enable effective monitoring for jointly funded projects, thereby significantly benefitting a large number of researchers.

3.1 (i) Enable Grant Re-appropriation at Institutional Level

Researchers or Institutions should be permitted to undertake intra-major head grant reappropriations at their own level. This flexibility will support timely decision-making, reduce the need for repeated approvals, and improve overall project execution efficiency.

3.1 (j) Ease Procurement of Routine R&D Consumables

Procurement of consumables for R&D being routine and repetitive in nature, while at the same time of small value, may be eased either by excluding R&D consumables under GFR Rule 143 or by enabling institutions to provision annual rate contracts at their own level.

3.1 (k) Consider Restoring 5% GST Slab for R&D procurement

A lower GST slab of 5%, as available till June 2022, may be considered for all R&D-related procurements, so as to increase effective usable funds to R&D institutions.

3.1 (l) Enhance Institutional Overhead Component

Introduce a more enabling overhead structure, at a rate of about 20% instead of the current rate of 5 to 10%, to allow grantee institutions to sustain R&D activities and effectively maintain R&D equipment and infrastructure.

3.2 Attracting and Retaining Quality Human Resource

Human resource is viewed as “human capital” whose creativity and specialized skills determine how effectively knowledge is created and translated into a tangible product that serves industry and society. India has a demographic dividend and is often regarded as a powerhouse of talent. However, the support base for young talent involved in R&D activities somehow remains low. This issue is further evidenced by the Global Innovation Index (GII) report 2025, which shows that the number of Full-Time Equivalent (FTE) researchers in India remains as low as 262 per million, compared to Switzerland (5,552), the UK (4,821), the USA (4,821), China (1,585), etc.

Though various national programmes along with doctoral and postdoctoral fellowships supported by DST, DBT, CSIR, and other agencies, have played a role in expanding the pool of trained researchers for science & technology, they fall short of creating a critical mass of researchers for India’s technological needs.

Several challenges related to availability of competent human resources for R&D, career pathways for R&D professionals, limited institution autonomy, lack of mid-career training, absence of inter-institutional mobility etc. were highlighted during the consultation process. **Table 3.2** provides a top level overview of the key dimensions of human resources related challenges for R&D.

Table 3.2: Key Dimensions of Human Resource Related Challenges

Dimension	Core Issues Identified
Research Talent Supply Gaps	Low FTE per million, Weak postdoctoral ecosystem, Delayed fellowship disbursals.
Institutional Rigidity & Recruitment Constraints	Limited hiring flexibility, Rigid post structures, Delayed recruitments, Vacant sanctioned posts.
Retention, Incentives & Career Pathways	Lack of incentives, Unattractive career pathways, Policy gaps in faculty entrepreneurship.
Mobility, Skill Development & Workload Imbalance	Limited inter-institutional mobility, Non-uniform pay levels and nomenclatures, Weak mid-career training, Unbalanced teaching and research loads.

3.2.1. Weak Postdoctoral Research Ecosystem

While support for startups has increased, the support system for R&D human resources in the R&D institutions and HEIs remains suboptimal, leading to a low FTE. The postdoctoral research ecosystem is quite weak with very limited support in terms of fellowships. While the doctoral research fellowships have increased over time and India is now among the top three countries in Ph.D. produced, the support at the next level for taking the knowledge generated forward into a translation journey, needs to be instituted. Currently, the overall post-doctoral fellowships support from all departments and agencies combined together is about 2,500 per year. This is too low as compared to what is needed for a robust STI ecosystem capable of translating knowledge into usable products and socio-economic goods.

3.2.2. Delayed Disbursal of Fellowships

Though there are now over 20,000+ Ph.D. fellowships available per year through combined support of multiple departments and agencies, there are often instances of delays in scholars' receiving their fellowships. The time taken in release of the first fellowship instalment at present is about four to five months. Similarly, there are other intermittent delays, either due to fund reassignment delay with change in financial year or temporary unavailability of funds.

3.2.3. Limited Institutional Autonomy in Human Resource Mapping

R&D institutions and HEIs often face difficulties in need-based recruitment of manpower in desired areas. This is mostly due to difficulties associated with posts being rigidly tied to specific departments and hierarchical levels (such as professor, associate professor, scientist, etc.). At the moment, any effort to change the mapping of a faculty or research position is seen as the 'creation of a new post' which has associated restrictions and a long approval process going up to the Department of Expenditure (DoE). This has created problems in the system of rolling advertisements in institutions. Institutions are not able to rationalize or dynamically manage their faculty/ researcher allocation, even though such exercise may not change the overall financial outlay needed for salaries.

3.2.4. Delays in Recruitment

A significant number of sanctioned positions in Indian R&D institutions and HEIs remain vacant for long periods. This constrains the functioning and performance of institutions as they have to manage with a suboptimal number of researchers, technical staff, and administrative staff in the institutions. Consultations suggested that the majority of the delays in recruitment are largely due to administrative reasons. In the case of state institutions, these delays are also due to financial reasons as well, i.e., state governments often do not have enough financial resources to provide for salaries and allowances of the total sanctioned staff strengths of their institutions.

3.2.5. Retention Challenges for Human Resource

The Indian STI ecosystem lacks suitable incentives or attractive career pathways to young professionals engaged in R&D activities. There is a high volume of STEM Ph.D. graduates being trained from Universities and R&D institutions, but the post-Ph.D. career pathways are not well-developed. The already limited number of full-time faculty/ researcher positions remain vacant due to administrative reasons, which discourages young professionals from going for R&D careers. Moreover, government pay scales in emerging high-skill sectors like AI, Semiconductors, Biotechnology etc. are not as attractive as the private sector. As a result, Ph.D. graduates often gravitate towards the private sector opportunities in the country and outside.

Another aspect observed is that the faculty members in HEIs often limit their R&D activities to publications and patents and do not attempt to translate them into products in absence of any incentive to do so. In fact, HEIs not only lack incentives but also lack clarity about faculty entrepreneurship policy.

3.2.6. Limited Inter-institutional Mobility

Limited mobility of research personnel across institutions under different government departments, including sometimes between the institutions under the same department/ ministry, restricts opportunities for exchange of knowledge and collaboration among researchers. Scientists from different government institutions but working in related areas find it difficult to move from one institution to another in their career. There are variations in pay scales, pay levels and nomenclatures across Administrative and Technical cadres in different autonomous R&D institutions. This limits inter-institutional mobility. Better opportunities for inter-institutional mobility, including those for short fixed-term stays, can help provide opportunities for cross-fertilisation of ideas, interdisciplinary learning, exposure to diverse research environments, and increased collaboration opportunities.

3.2.7. Absence of Mid-Career Training

Scientists in R&D institutions and faculty members in HEIs do not get adequate opportunities of periodic mid-career training. In HEIs, faculty development programs (FDPs) try to address this to some extent, but they lack depth and effectiveness. In R&D institutions, the mid-career training opportunities are usually in the form of short-term programs conducted by outside

bodies, which are infrequent and ad hoc in nature unlike the practice of well-designed mid-career training programs in many countries. For example, the University of California has a “Mid Career Development Program” for junior faculty, which includes \$75K per year, mentorship, sponsorship, and networking activities. Therefore, there is a need for a suitable structural mechanism for regular periodic training of scientists, researchers and University faculty. Indian Science academies may play an important role here.

3.2.8. Unbalanced Teaching and Research Load

Faculty members in Indian Universities are often heavily engaged in teaching responsibilities and administrative duties, leaving them with very limited time for R&D activities. This reduces research productivity and leads to inefficiencies in research outcomes. Therefore, a more balanced time allocation framework is needed for University faculty. Options like Research-focused and Teaching-focused tracks, with associated performance evaluation framework, may provide a more conducive environment for a greater R&D intensity in institutions.

Major Recommendations

3.2 (a) Enhance the number of Postdoctoral Fellowships

DST, ANRF, DBT, DSIR, DHE, ICAR and ICMR may consider increasing the number of post-doctoral fellowships in S&T, by 20% every year, for the next few years. This may significantly strengthen the post-doctoral research ecosystem of the country.

3.2 (b) Create ‘Vigyan Nidhi’- a unified Fellowship system

To address the gaps in fellowship funding and disbursement delays, a unified and streamlined funding architecture with digital public infrastructure, may be created. This system can streamline fellowship disbursement and help attract funds to finance an enhanced number of fellowships (**Refer Box 2**).

Box 2**Vigyan Nidhi****Objective**

A unified, efficient, and uninterrupted funding architecture for research fellowships and personnel support across India's scientific ecosystem is needed. It can support post-doctoral fellowships, under competitive grants, institutionally or industry-supported fellowships, and mobility and short-term research enhancement grants. All centrally funded fellowships can be progressively routed through the Vigyan Nidhi mechanism.

Funding Architecture

A Government of India seed grant (say of ₹1,000 crore) may be instituted as initial working capital to function as a revolving buffer for uninterrupted fellowship disbursement, capable of supporting approximately 20,000 research personnel for one year at prevailing norms. Ministries and Departments will continue to sanction fellowships under their respective schemes, with sanctions issued through the Vigyan Nidhi digital platform and funds transferred in periodic tranches. Additional resources in the corpus may be mobilised through industry contributions with tax incentives, philanthropic and institutional funding, and voluntary individual contributions routed through the platform. Institutions may also be allowed to use the portal for their fund raising initiatives.

Digital Public Infrastructure and Governance

Vigyan Nidhi may be underpinned by a robust digital public infrastructure comprising a unified sanction module, an automated DBT-based payment system, a national fellowship dashboard, real-time monitoring and impact analytics, and fully digital institutional reporting. The fund will be managed by a designated Government administrative body responsible for fund administration, inter-ministerial coordination, digital platform operations, donor engagement, compliance, audit, and monitoring and evaluation.

Expected Outcomes

In the short term, Vigyan Nidhi can eliminate delays in fellowship disbursement and ensure seamless continuity of support for research personnel through uniform digital processes. In the medium term, it will significantly expand India's FTE researcher base, strengthen the post-doctoral ecosystem, and increase industry and philanthropic participation in research manpower development. In the long term, it will enhance national research capacity and output, improve innovation outcomes, strengthen global competitiveness, and establish a sustainable talent pipeline aligned with India's future scientific and technological priorities.

Summary

Vigyan Nidhi may address a core structural bottleneck in India's science and innovation ecosystem by creating a unified, reliable, and scalable mechanism for research manpower support. Complementing ANRF and the RDI framework, it places human capital at the centre of India's long-term national innovation architecture and enables predictable, transparent, and dignified funding pathways for researchers.

3.2 (c) Provide Institutional Autonomy for Faculty/ Researcher Mapping

R&D institutions and higher education institutions should be empowered to rationalise faculty and researcher allocations across departments and subject areas at their own level, within their approved salary budgets. This can speed up the hiring process and the need-based human resource deployment.

3.2 (d) Incentivize quality R&D Outcomes

A structured mechanism for incentivizing high quality research outcomes should be developed. This may include performance-based incentives and/ or the provision of holding equity in startups to encourage translation of knowledge into useful technologies and products.

3.2 (e) Explore uniformity in pay scales and cadre nomenclature across different Autonomous R&D institutions

Uniformity in pay scales, pay levels and cadre nomenclature may be instituted across all autonomous R&D institutions under different scientific ministries, beginning with the autonomous R&D institutions in the Ministry of Science & Technology. This can provide greater flexibility in recruitment and increased inter-institutional mobility and collaboration.

3.2 (f) Provision Focused Mid-career Training & Capacity Building

Indian Science academies may be entrusted with developing intensive and focused training programs for scientists, researchers, research administrators, and University faculty. This may be further complemented by the National Institute for Science Policy and Governance (NISPG), as proposed in Section 3.7.

3.2 (g) Create Teaching and Research focused tracks in Universities

UGC, AICTE and other regulatory bodies may explore creating teaching and research focused tracks in Universities. This can help in role based recruitment and better evaluation frameworks.

3.3 Institutional Structures and Processes

The effectiveness of a national R&D ecosystem depends not only on funding and talent, but also on the institutional structures and internal processes that shape how R&D is planned, supported, evaluated, and translated into societal and economic outcomes. At present many research-performing institutions continue to operate within governance and administrative frameworks that have not kept pace with the needs of contemporary research systems. As a result, institutional arrangements that were once adequate now constrain agility, innovation, and impact.

At the institutional level, there are several challenges ranging from rigid administrative and financial rules to absence of necessary substructures to promote R&D. Researchers often

spend substantial time dealing with obtaining different approvals, hiring of research staff, and procurement of consumables and equipment etc. Institutions often do not have well-defined guidelines and templates to speed up such processes. Further, there are limited opportunities for faculty entrepreneurship and performance-based incentives. The key institutional and governance challenges are highlighted in this section, with a top level overview presented in **Table 3.3**.

Table 3.3: Key Dimensions of Institutional & Governance Challenges

Dimension	Core Issues Identified
Research Administration	Fragmented R&D management, absence of unified R&D offices, limited professional expertise, weak administrative processes.
Institutional Decision Making	Inconsistent guidelines, unclear SOPs, audit-centric orientation, procedural delays, over-centralisation, limited delegated authority.
Strategic Leadership, Institutional Focus & Research Direction	Weak core competence strategy, Limited leadership accountability and performance-linked pay, absence of periodic institutional self-assessment, no structured Ease of Doing R&D (EoDR&D) assessment framework.
Entrepreneurship & Commercialisation Support	Weak faculty entrepreneurship policies, uneven implementation of Knowledge Equity OM, limited commercialization orientation.

3.3.1 Absence of Effective R&D Offices

R&D activities are carried out by a wide variety of institutions, including R&D labs and HEIs under central or state governments or in the private sector. Sometimes, the institutions either do not have a dedicated R&D office or they are not effective and professionally managed. In the absence of such well-designed professional offices, administrative and management responsibilities of R&D are either distributed across multiple administrative units or devolved informally to individual researchers. As a result, researchers are routinely required to put in time and effort to handle administrative work of R&D activities, along with their scientific responsibilities. This not only takes away researchers' core scientific time, but also increases the risk of procedural errors. The limited presence of effective R&D Offices also constrains effective institutional engagement with funding agencies.

3.3.2 Lack of Professional Expertise in Research Administration

The personnel assigned with the tasks of administrative management of R&D projects often lack systematic exposure to evolving research funding norms and the operational realities of laboratory and field-based research. As a result, administrative processes often get more focused towards the procedural aspects than the considerations of research timelines, uncertainties, and adaptive project management. Scientists face delays in approvals, procurement, and staffing that directly affect project outcomes, while administrators operate without clear mandates or incentives linked to research performance. This disconnect reinforces a compliance-driven culture rather than a facilitative and solution-oriented approach.

3.3.3 Inadequate Institutional Guidelines and SOPs

In a large number of R&D institutions and HEIs, there are no well-defined guidelines and standard operating procedures (SOPs) for handling administrative and financial aspects of R&D projects. Even if such guidelines exist, they are either outdated or unevenly articulated. In some cases, guidelines and templates exist only for select functions, such as financial compliance or procurement. Several other critical aspects of research activity, including collaborative research agreements, research personnel hiring, technology transfer, are addressed through ad hoc decisions. The absence of comprehensive, up-to-date, and enabling institutional guidelines with well-defined templates, often creates problems for both researchers and administrators. This situation leads to uncertainty at multiple levels and causes delays in decision-making.

3.3.4 Institutional Leadership Accountability and Over-Centralization Issues

In many institutions, researchers or Heads of Departments/ Divisions are not given enough administrative and financial powers. Therefore, even routine matters involving small procurements or temporary hiring, are sent to the Vice Chancellor/ Director for approval. The practice of self-declaration or self-certification by researchers for administrative tasks associated with R&D projects, as adopted in several countries, is not well-developed at present. This unnecessarily causes delays in different R&D activities.

In some cases, leadership focus may not be aligned with research growth and long-term R&D goals of the institution. This is due to limited linkage between institutional leadership performance and measurable research outcomes of the institution. Unlike practices followed in several advanced research systems internationally, performance-linked remuneration and accountability based on clearly defined targets for institutional heads are generally absent in the Indian context.

3.3.5 Institutional Divergence from the Core Research Focus

Many R&D institutions lack a clear strategy for identifying and strengthening their core areas of expertise. R&D efforts are sometimes spread across too many themes without deliberate prioritisation or long-term planning. This results in scattered activities rather than focused and deep growth in selected domains. While HEIs may maintain multiple focus areas, the R&D labs are expected to be more focused so as to develop as centres of excellence having expertise and excellence in a selected domains.

Without a defined institutional focus, it becomes difficult to build critical mass, create specialised infrastructure, or attract high-quality faculty and doctoral scholars in priority areas. Research proposals tend to reflect individual interests instead of a coordinated institutional direction, limiting the ability to undertake large, mission-driven or nationally aligned programmes. Over time, this weakens the institutional unique strength, reduces competitiveness for major grants, and limits the ability to emerge as a recognised centre of excellence.

3.3.6 Absence of Periodic Assessment of Ease of Doing R&D in the Institutions

Most institutions do not have a structured system to regularly assess the difficulties faced by researchers in managing administrative and financial aspects of R&D projects. There is a limited culture of feedback or internal review to identify delays and operational bottlenecks. Suggestion boxes placed in institutions are often not taken seriously by the leadership or management, and are seldom used to address systemic shortcomings or difficulties. As a result, the procedural complexities and inflexibilities in institutions remain unaddressed. Given the growing presence of private and foreign HEIs with more flexible processes, it is especially important for publicly funded institutions to undertake periodic self-assessment to remain competitive, efficient, and research-oriented.

Similarly, at the national level, there is no focused assessment or rating framework dedicated to Ease of Doing Research & Development, either as a standalone exercise or integrated within an existing mechanism such as National Institutional Ranking Framework (NIRF) or the accreditation by National Assessment and Accreditation Council (NAAC). It is desirable that institutions should conduct periodic self-assessments, which may be integrated within an existing mechanism. Such benchmarking can promote internal reforms, strengthen institutional culture, encourage healthy competition, and enhance the ability of institutions to attract quality faculty and research funding. Over time, such scores may also be used by funding agencies in multiple ways, such as for time-bound R&D needs and large grant decisions.

3.3.7 Lack of Faculty/ Researcher Entrepreneurship Policy

Many R&D institutions do not have clear and enabling policies to support faculty or researcher-led entrepreneurship. For the majority of HEIs, the institutional focus has traditionally remained on teaching and fundamental research, with limited emphasis on productisation or commercialization, based on research outcomes. This gap persists despite the need being formally recognised as early as 2009 through the DSIR notification on “Knowledge Equity,” which encouraged equity participation and technology commercialization. In the present context of rapidly changing R&D landscape, a greater need is felt for productizing R&D outcomes. Therefore, it is necessary that the 2009 notification may be updated to align with present-day innovation ecosystems and market realities. All the R&D institutions may adopt suitable entrepreneurship policies to ensure that research outcomes are effectively translated into products and enterprises.

Major Recommendations

3.3. (a) Establish Strong R&D Offices in Institutions

R&D institutions and HEIs Institutions should set up professional R&D Offices as single-window hubs for grant management. DST, DBT, DSIR/CSIR and DHE may develop a model structure for their institutions. These offices should have adequate authority and operational freedom. (**Refer Box 3**).

Box 3**R&D Offices in Institutions****Objective and Scope**

Institutions should create an R&D Office that can serve as a centralized unit to manage and accelerate the research with efficient mechanisms. This office can also help researchers in assisting the TRL assessment and knowledge translation. Institutions which already have such an office may further strengthen and empower the office with the structural elements suggested here. The institute should periodically monitor and define clear SOPs and timelines for various administrative tasks to strengthen the overall R&D ecosystem.

Structure of R&D Office

R&D office in institutions may have following units:

A. Sponsored Research Unit

- Acts as a bridge between funding agency and PI
- Identifies the funding opportunities
- Supports in budget preparation and submission
- Administrative and financial coordination

B. Consultancy Unit

- Helps in understanding formal agreements, applying for grants, financial approvals and compliance
- Offers market surveys or reports to meet the institutional research with industry needs.
- Standardizing the MoU templates.

C. Incubation Centre

- Provide support for startups or entrepreneurship initiatives like facilitating with cost effective office space, shared resources and access to labs.
- Provides initial funding to avoid early-stage risks.
- Develops an understanding of business management and risk mitigation.

D. Patent Facilitation Unit

- Provides training and workshops on IPR
- Identifies patentable research
- Assistance in drafting, filing and maintenance
- Coordination with patent offices
- Ensures legal compliance of the research output with the patent regime.

E. Technology Transfer Offices (including TRL Assessment)

- Assisting TTOs in determining when a technology is sufficiently mature for licensing
- Evaluating market needs and negotiating licensing agreements with existing companies
- Managing various legal agreements, including Non-Disclosure Agreements (NDAs), Material Transfer Agreements (MTAs), and license contracts
- Helping to identify technical or developmental gaps and potential deployment risks
- Establishing an efficient communication among researchers, investors, and policymakers, about technology status clearer and more effective.

F. Coordination & Ranking

- Aligning research to national goals
- Data collection and coordination with agencies for national or international accreditations
- Monitoring and updating research performance indicators

G. Staff and Professionals

- The R&D office should be handled by a competent academician, and one dedicated person should be made in-charge of all the above functions.
- The office should have professional staff including research administrators, project managers, IP analysts, incubation managers, and data analysts.

3.3. (b) Professionalise Research Administration

Structured induction and continuous training programmes should be introduced to sensitize and familiarise administrative staff with research funding norms, scientific procurements, contract management, and regulatory frameworks etc. The Indian Science Academies may design and deliver such training modules.

3.3. (c) Develop Standard Research Governance Guidelines

R&D institutions and HEIs should adopt standard internal guidelines covering all major aspects of research governance. These guidelines should define roles, responsibilities, timelines, and approval pathways, along with required templates. Scientific ministries/ departments may develop model guidelines to coordinate such efforts in their institutions.

3.3. (d) Promote a Trust-based R&D Framework

Administrative systems must transform from a compliance-centric orientation towards trust-based administration. Majority of the administrative functions should suffice with self-declaration or self-certification by researchers, with financial statements being the only possible exceptions requiring institutional endorsement.

3.3 (e) Ensure Leadership Accountability and Performance-linked Governance

Institutional leaders should be provided with clearly defined and measurable performance targets on taking charge. Performance-linked incentives may be considered to align leadership accountability with institutional R&D outcomes.

3.3 (f) Decentralize Decision-making through Delegation of Power

Institutions should adopt a clear decentralization framework by delegating defined administrative and financial powers for R&D to Heads of Departments or to individual researchers. Routine approvals should be resolved at the unit/ institutional level, with only exceptional or high-level policy matters escalated to the Head of the Institution/ Governing Council.

3.3. (g) Institutions to Identify and Align with their Core Research Competence

R&D institutions should clearly identify priority research areas based on their existing strengths, faculty/ researcher expertise, and national relevance, so as to allow them to develop as centres of excellence in chosen area(s). Recruitment, infrastructure investment, funding allocation, and collaborations may be aligned with these identified focus areas.

3.3 (h) Conduct Periodic Assessment of Ease of Doing R&D in Institutions

Institutions should conduct periodic self-assessment of their R&D management processes. A structured Ease of Doing Research & Development Assessment Framework may be developed to facilitate this.

3.3 (i) Enable Entrepreneurship Policy for Faculty / Researcher

Institutions should notify clearly defined faculty and researcher entrepreneurship policies with flexible norms for time allocation and liberal, transparent revenue-sharing arrangements. The 2009 DSIR notification on “Knowledge Equity,” should be updated to reflect current innovation ecosystems, startup models, and market realities and re-notified. This may subsequently be adopted by all R&D institutions and HEIs.

3.4 Technology Development, Translation & Commercialization

India has made significant progress in terms of knowledge outputs, measured in terms of publications and patents. However, the translational ecosystem continues to remain weak. As a result, a significant part of the knowledge generated by R&D institutions and HEIs does not get converted into usable products, technologies and socio-economic goods. This is due to several reasons, including limited translational expertise, weak industry engagement, and lack of incentives for productization. As India advances towards a knowledge-driven economy, greater emphasis is needed on creating enabling conditions that allow scientific outcomes to move from laboratories to industry and society. Developing indigenous technologies and capabilities is critical for a country to achieve technological self-reliance, reduce import dependence, and strengthen national competitiveness across strategic sectors. **Table 3.4** highlights the key dimensions of the issues highlighted regarding technology development, translation and commercialization.

Table 3.4: Key Dimensions of Technology Development, Translation and Commercialisation Challenges

Dimension	Core Issues
Institutional Technology Transfer Systems	Weak TTOs, weak IP cells, ownership ambiguity, IP issues in co-funded research.
Prototyping, Testing & Regulatory Infrastructure	Limited access to TRL 3–6 facilities such as facilities for prototyping and pilot scale validation, Absence of domestic certification mechanisms and high validation costs, Absence of Regulatory Sandbox provision.
Industry Linkages & Enterprise Innovation Capacity	Weak problem articulation, limited co-development, fragmented MSME support, low industry absorption, overall weak university industry linkage and lack of innovation culture in MSMEs.
Talent Enabler & Translational Finance	Employee Stock Option Plan (ESOP) taxation burden, limited researcher mobility, Technology Indigenization gaps.

3.4.1 Lack of Effective Technology Transfer Support in Institutions

While many institutions have a setup for facilitating technology transfer outside the lab, they are not very effective. Few R&D institutions, such as CSIR labs, have Independent Business Divisions (IBD) which takes care of the translational aspect of the technologies developed in the lab. However, in order to be more effective, they need to be further strengthened in terms of capacity and resources. In case of HEIs, a dedicated Technology Transfer Office (TTO) usually does not exist. Further, the R&D offices in HEIs do not possess capability and resources beyond management of research projects. Transfer of technology and commercialization is a complex process involving administrative, legal, business related issues, and hence the TTOs across R&D institutions and HEIs have to be adequately strengthened with the required capacity and resources.

3.4.2. Weak Industry-Academia Linkage

There is a general disconnect between academia and industry in R&D space. The R&D institutions and HEIs usually do not have an active interaction framework with Industry. Similarly, many times the industry does not trust the capabilities of R&D institutions and HEIs. While the situation has started to change lately, there is still a long way to go. The R&D institutions and HEIs need to realize that translating the knowledge created in their labs, and scaling up the prototypes developed within the institution, need active support of industry for successful products. Accordingly, an enabling framework for greater interaction between the two is becoming altogether more important.

Standard MoU and NDA templates define roles, responsibilities, budgets, timelines, and confidentiality upfront, reducing ambiguity and delays. However, such standardised templates are largely absent in the institutional ecosystem, leading to prolonged negotiations and discouraging collaboration. Therefore, design of suitable templates for MOUs, NDAs and IP Co-ownership can play an important role here. The model adopted by DRDO could serve as a useful starting point.

3.4.3. Limited Mobility between Academia and Industry

The R&D institutions and HEIs currently lack structured support for both in-bound and out-bound researcher mobility, unlike advanced economies where well-defined frameworks enable seamless movement across universities, public labs, and industry. The current mobility initiatives remain fragmented and small-scale. Programmes such as AICTE's Industry Fellowship Programme, and models like Professor of Practice are positive steps but lack scale, consistency, and sustained support. Therefore, there is a need to develop a suitable framework to enable increased mobility. Further, a larger number of support schemes may be provisioned for enhanced mobility between academia and industry, and vice-versa.

3.4.4. Lack of Prototyping, Testing & Assessment Facilities

The R&D ecosystem suffers from lack of access to high-quality prototyping, testing, validation, and certification facilities. The absence of shared, prototyping and validation platforms, delays the translation of research outputs from laboratory stage to proof-of-concept and pilot demonstration stage. In many cases, researchers struggle with long wait times and limited technical support for product refinement and standards compliance. This disproportionately affects early-stage innovators working at TRL 3–6. Therefore, there is a clear need for setting up adequate facilities for the purpose.

3.4.5. Weak IP Ownership Norms for Co-Funded Research

While India has a large number of R&D institutions and HEIs that are engaged in R&D activities, the collaboration with industry remains limited, due to various reasons, including uncertainties around intellectual property ownership and access rights. This is especially critical as ANRF prepares to launch co-funded schemes. Clearly spelt and well-defined IP ownership is very important for an increased engagement between public funded and private institutions. The recently launched Research Development and Innovation Fund (RDIF) also calls for clear provisions in this regard. The Rule 233 of the General Financial Rules (GFR), which governs intellectual assets created through public funding, therefore, needs to be reviewed and adapted for government-industry co-funded projects.

3.4.6. Need for ESOP Taxation Rationalising to Strengthen Deep-Tech Talent Retention

The current scheme of taxation of ESOPs (*Employee Stock Option Plan*) at the point of exercise imposes a cash-flow burden on employees, due to the fact that the tax liabilities arise before any real economic gain is realised. This adversely affects the ability of deep tech startups to attract and retain highly skilled scientific and engineering personnel. Early taxation of ESOPs creates an immediate personal cash-flow requirement for employees which makes this instrument of stock option unattractive. The issue is particularly acute for deep-tech startups, where long development cycles, high risk, and delayed liquidity mean shares often cannot be monetised for many years.

3.4.7. R&D and Innovation Challenges in Startups and MSMEs

In the current market linked innovation ecosystem, research outcomes have limited value unless they are translated into market ready products. This is where startups and MSMEs play a critical role and contribute in reducing import dependence and enhancing exports for the country. MSMEs can bridge the manufacturing gap by enabling scale up and production, together ensuring effective productization of research outcomes. However, startups and MSMEs face several challenges, including limited second level incubation support comprising expertise in finance, legal/ regulatory, marketing, and social innovation alongside technical mentoring. Other challenges include low diversity in funding, and a general lack of the culture of Innovation in MSMEs. Similarly, startups and MSMEs face challenges due to the absence of domestic certification and validation mechanisms in several technology domains, compelling them to rely on foreign agencies. This leads to higher costs and delays commercialisation.

3.4.8. Absence of a Systematic effort for Technology Indigenization

Development of indigenous technologies and capabilities in selected priority areas is critical for a country. Achieving technological self-reliance in critical areas can not only help reduce import dependence, but strengthen national competitiveness in those sectors. India has shown its capabilities in indigenization through several landmark programs such as Tejas, nuclear submarine, the BrahMos missile, and the rapid development and deployment of the COVID-19 vaccine etc. However, these are isolated cases and a systematic framework in this regard does not exist. Despite significant investments in R&D, much of the innovation ecosystem still relies on imported technologies or foreign collaborations for high-end solutions. Strengthening domestic innovation requires focused support for the full technology lifecycle from fundamental research to prototype development. In order to address the challenges faced in the indigenization of technologies, a dedicated national centre may be set up to promote technology indigenization. This centre may be tasked with analysing the technology import trends and identifying technologies to be indigenized, along with enablers needed to accelerate the process.

3.4.9. Lack of a widely accepted TRL Assessment Framework and Nodal Institutions

The recently launched Research, Development and Innovation Fund (RDIF) is an ambitious program initiated by the government, allocating a funding corpus of ₹1 lakh crore to enhance R&D and innovation in emerging and strategic sectors. It has been observed that large industry players in India are generally not constrained by access to capital and, therefore, may be hesitant with the equity or debt financing proposed in RDIF. However, the RDIF is likely to be very effective in supporting MSMEs and startups, for whom access to capital remains a key constraint in scaling research-driven innovations. The RDIF is primarily focused on supporting technologies from TRL-3 onwards, which demands a robust mechanism to assess and classify technologies by their appropriate TRL levels. For this purpose, dedicated technical manpower and domain experts are required for correct assessments. Common standards and capabilities need to be developed for an authentic and well-accepted assessment of TRL for technologies under development. While self-disclosures may be accepted by RDIF fund managers, there should be some nodal institutions to intervene in case of disagreements on assessment.

3.4.10. Absence of Regulatory sandbox provision in deep-technology domains

Deep-tech startups operate at the frontier of innovation, where existing regulatory frameworks are often not designed to accommodate emerging technologies. A regulatory sandbox allows temporary relaxation of regulations so that innovators can test new products under controlled real-world conditions, while ensuring adequate safeguards. Sandboxes help reduce uncertainty for startups by providing regulatory clarity at early stages, thereby lowering compliance costs and accelerating time to market. They also allow regulators to better understand new technologies, assess associated risks, and develop informed, adaptive regulations based on evidence rather than assumptions. MeitY has taken an early lead in the country by framing this provision within IoT and AI based technology. Other examples include RBI's lead in FinTech and DoT's efforts on 6G technologies. However, widespread adoption of the framework, specially in deep tech is required.

Major Recommendations

3.4. (a) Embed Technology Transfer Functions in R&D Offices

Establishing/ Strengthening TTOs and embedding them in R&D offices with clear policies, standardized revenue-sharing models, transparent governance mechanisms, and the ability to establish innovation-support entities such as Section 8 companies is critical to building a robust research-to-market ecosystem.

3.4. (b) Design standard model/ guiding templates for MOUs

Design of standard model/ guiding templates for MOUs related to technology co-development can strengthen Academia Industry interactions, and reduce times.

3.4. (c) Develop a framework for Industry-Academia mobility of scientists and researchers

Researcher mobility policy/ framework may include provisions of joint appointments, flexible affiliations, and seamless movement across academia, public research institutions, and industry. Dedicated funding windows and harmonised service rules should be introduced to incentivise cross-sector mobility, strengthen knowledge transfer, and accelerate the translation of research into innovation and industrial impact.

3.4. (d) Establish RDI Clusters

Establish State-level RDI Clusters by integrating HEIs, R&D institutions, MSMEs, PSUs, and industry. These clusters should provide shared IP, TTO, incubation, and R&D infrastructure, coordinate Central and State schemes, and progressively move toward self-sustainability and global collaboration. The Research Development and Innovation Fund (RDIF) may be leveraged for developing such facilities in PPP mode (**Refer Box 4**).

Box 4**Research, Development and Innovation Clusters****Objective**

RDI Clusters are proposed to create, promote, and accelerate research and development activities, strengthen innovation ecosystems, and support technology development and deployment within the State. These clusters can serve as integrated hubs for research, scientific & technology-based facilities operating on a triple-or quadruple-helix model in which academia and universities, industry, research institutions, public agencies and civil society collaborate to generate shared value for the state.

Location of the Clusters should be strategic, where existing State/Central Universities, R&D Institutes could be benefitted. Also, it can be anchored in an industrial cluster, enabling faster commercialization. Cluster should be able to house several science and technology firms, government agencies, centres of academic institutions, startups and non-profits. Thereby, promoting cooperation between universities and industry. These clusters must bring together and connect all major R&D institutions as well as academic institutions. MSMEs, CPSEs, PSUs, industry in the state must become members of these clusters. Industry associations must also join. These RDI Clusters can be sector specific.

A Specialized cell for Technology Indigenisation should be an integral component of each cluster, to identify import dependent technology portfolios and promote the indigenisation of identified technologies, keeping in context the regional capacity and priorities. This would require active participation from MSMEs and startups in the respective state, thereby providing them with new opportunities and further strengthening the domestic innovation ecosystem.

Operational Scope

Existing research funding largely supports discovery and basic research, while industry incentives are primarily oriented towards scale-up. As a result, the critical intermediate stage focused on prototyping, testing, certification, IP support and early validation remains inadequately addressed. RDI Clusters can bridge this gap by housing shared, specialised facilities such as:

- Advanced instrumentation centres
- Second-level incubation with prototyping and pilot manufacturing capabilities
- Testing and validation infrastructure
- Value Addition Centres
- Coordination platforms and Information Sharing Facilities
- Accelerated quality and compliance certification services
- Innovation accelerators offering structured mentorship, technical validation and market access, and Business and market development advisory services

Execution Mechanism

State S&T Council may be empowered and made the operational/executive organizations for anchoring these clusters in the respective states. A part support from RDIF may be explored. These clusters can be set up in PPP mode with a shared initial investment in the ratio of 40:40:20 participation from Centre, State, and industry partners, respectively, excluding the cost of land and facilities to be supported by the state.

3.4. (e) Enable Better IP Ownership Norms for Co-funded R&D

A clear and standardised IP framework for co-funded research needs to be developed to address joint government-industry funding scenarios. A suitable provision in Rule 233 of the GFR for co-sharing of IPR may be introduced for jointly funded R&D projects between industry and public funded institutions.

3.4.(f) Consider amending ESOP Taxation Provision for employees in Deep-tech startups

The ESOP taxation provisions may be amended to allow employees in deep-technology startups to discharge tax liabilities at the time of actual monetisation rather than at the point of exercise.

3.4.(g) Broaden the mandate of Technology Business Incubators

It is required to broaden the mandate of Technology Business Incubators to deliver end-to-end, cross-disciplinary support from innovation to commercialisation. Mentoring Scope of TBIs should include expertise in finance, legal/ regulatory, marketing, and social innovation alongside technical mentoring etc.

3.4.(h) Create a linking framework for Incubators

A linking framework for incubators across ministries/ departments should be developed, possibly by Atal Innovation Mission (AIM) or the Department for Promotion of Industry and Internal Trade (DPIIT), for enhancing capacity, integration and synergy across the incubation ecosystem.

3.4.(i) Strengthen domestic certification mechanisms

Strengthening domestic certification mechanisms can help improve market access for deep-technology startups and MSMEs. Further, it can reduce costs and delays in commercialisation due reliance on foreign agencies for the purpose.

3.4. (j) Establish a Centre for Technology Indigenization (CTI)

The Centre for Technology Indigenization (CTI) can help identify priority technologies for indigenization through analysis of import trends and national priorities, and maintain a centralized repository. It can coordinate with MSMEs to facilitate indigenization of relevant technologies.

3.4. (k) Develop a widely accepted TRL assessment framework and notify Nodal Institutions

It is necessary to develop a widely accepted TRL assessment framework and notify suitable institutions (such as NRDC, BIRAC, and TDB) as nodal institutions for the purpose of addressing disagreements/ disputes in assessment.

3.4. (l) Develop regulatory sandbox provision in deep-technology domains

Develop a legally anchored, cross-sectoral regulatory sandbox framework for deep-technology domains with defined eligibility norms, inter-agency coordination mechanisms, and time-bound evaluation and exit pathways.

3.5 Access to Knowledge & Resources

Innovations and discoveries in STI are rarely developed in isolation; they build upon earlier research, existing knowledge, and prior experimental findings. For scientists and technologists to generate high-quality and original work, it is essential that they remain continuously updated about global developments, emerging trends, and advances in their respective fields. This requires reliable and timely access to scholarly journals, digital libraries, patent databases, and other knowledge repositories that provide comprehensive and curated information. Without such access, researchers risk duplication of effort, gaps in understanding, and reduced competitiveness. Strengthening access to high-quality knowledge resources is therefore fundamental to fostering innovation, improving research outcomes, and ensuring that the STI ecosystem remains globally relevant. **Table 3.5** presents a top level overview of the key dimensions of access and collaboration related challenges, which are then discussed in detail.

Table 3.5: Key Dimensions of Challenges related to Access & Collaboration

Dimension	Core Issues Identified
National Knowledge Access, Platforms & Tools	ONOS coverage gaps such as exclusion of major scholarly & patent databases and lack of access for private universities, limited institutional access to high-cost research software, fragmented and ineffective institutional repositories.
Publishing & Research Data Governance Ecosystem	Weak culture of research data sharing and reuse, absence of national or centralised platforms for hosting multidisciplinary research datasets, weak indigenous academic publishing ecosystem with limited high-quality platforms for regional and India-specific research.

3.5.1. Gaps in Access to Journals, Databases and Software

India has rolled out a very ambitious program - *One Nation One Subscription (ONOS)*- to provide access to journals and periodicals from a set of reputed publishers to researchers and academicians across the country. This initiative has not only broadened the access, but also optimized associated costs. However, the ONOS has not included access to scholarly and patent databases (such as Web of Science, Scopus, Derwent etc.) in its current version. Further, ONOS is currently not extended to private universities and institutions, which are also producing good research outcomes, and are an important part of the STI ecosystem.

Beyond publications, a large number of universities and research institutes lack access to essential high-cost research software, advanced modelling tools, and simulators - including platforms such as COMSOL, etc, and bioinformatics suites like Schrödinger. The absence of institutional or national-level licensing arrangements/ or agreed rates limits faculty and researchers from adopting globally competitive research methodologies.

3.5.2. Limited Opportunities for Hosting Pre-prints to support Open Access

The DST-DBT Open Access Policy of 2014 mandates that research publications coming out of public funded research projects should be made openly accessible. A similar policy has been adopted by CSIR. Uploads of pre-print/ post-print to archives is considered a potential route to do so. To facilitate the process, different central repositories have been created by different ministries/ departments. This includes *Science Central*, *CSIR Central*, *KrishiKosh* etc. However, neither the policies are enforced, nor the repositories created are effective. Most of the repositories in India do not provide for automatic discovery by Web Crawlers, as a result articles uploaded on these repositories do not appear in search results of different Web search engines. Therefore, there is a need for creation of an effective, Web discoverable National Repository that can host pre-prints and post-prints of researchers from different institutions in India. Such a repository can create an environment where all Indian research outcomes can be hosted for open access to all Indian researchers, thereby reducing the dependence on foreign journal publishers at least for access to Indian research outputs.

3.5.3. Weak Research Data Sharing Ecosystem

The current R&D ecosystem is characterised by a weak culture of research data sharing and reuse. While research insights and recommendations are frequently disseminated through reports, publications, and policy briefs, the underlying datasets are often poorly structured, inadequately documented, and often remain inaccessible. This significantly limits their integration into future research, cross-disciplinary use, and secondary analysis by other researchers. One possible reason for this is the absence of suitable national or centralised platforms for hosting the research data generated across institutions and sectors. Existing repositories are limited by visibility and scale. Therefore, there is a need for scaling up the current limited number of such repositories (like the Indian Biological Data Centre (IBDC) at the Regional Centre for Biotechnology (RCB) and the AI Kosh under MeitY). An interlinked national data repository framework capable of hosting multidisciplinary datasets can significantly enhance data reuse, collaboration across disciplines, and improve the overall quality and impact of research.

3.5.4. Limited publication platforms for Regional and Country Specific Research

A significant amount of R&D effort in a country is often targeted at solving local and regional problems. However, much of this work fails to achieve wider visibility and dissemination, as international journals usually do not entertain such research. A natural choice would be to publish such research outcomes in national journals. However, there are not enough high-quality publication platforms that can publish regional and India-specific research outcomes.

Many national journals face challenges such as slow or inconsistent peer-review processes, limited international indexing, and low citations, which reduces their credibility and discourages researchers from publishing in them. These structural limitations collectively restrict the translation of regionally relevant research into broader academic, policy, and practice-oriented learning. Therefore, there is a clear need to establish/ strengthen the national journal publishing system, that is professionally managed, appropriately indexed, and designed to disseminate high-quality regional and country specific research, while meeting global standards of academic publishing. Indian Science academies may play an important role here.

Major Recommendations

3.5 (a) Expand ONOS coverage to include Publication and Patent Databases and widen coverage

ONOS coverage should be expanded to include subscriptions to high-quality publication & patent databases, and its coverage may be widened to include private institutions on a reasonable cost-sharing basis.

3.5 (b) Explore Licensing high-cost software, tools and resources

Explore institutional or national level licensing arrangements or price discovery mechanisms for essential high-cost research software, advanced simulation & modeling tools, to ensure equitable access, cost efficiency, and wider utilisation across universities and research institutions, on the lines of ONOS.

3.5 (c) Explore creating a National R&D Repository

Explore developing a large-scale, integrated, and Web discoverable National Repository to provide open access and seamless sharing of Indian research output and data to Indian researchers. In due course, such a repository may be integrated with UPMS being developed.

3.5 (d) Develop quality National Journals

It is required to develop a professionally managed ecosystem to support quality indexed national journals. The expertise and domain knowledge of Indian Science academies may also be leveraged for the purpose.

3.6 R&D in State Institutions

R&D in state institutions and region-specific STI lie at the intersection of local priorities, institutional capacity and national ambitions. The Science Technology and Innovation Policy 2013 articulated a clear mandate for strengthening the STI ecosystem in states, particularly through strengthening State Science & Technology Councils. However, the implementation of policy imperatives has

been uneven, and as result the progress in the state STI ecosystem remains limited more than a decade later. Therefore, a substantial effort is still required to catalyse and strengthen the STI ecosystem across the states.

India has an inherent culture of innovation, where the community and its innovators try to address the local and regional problems in their own ways. Such (grassroots) innovations are deep rooted in the communities and regions, often characterized by the bottom-up approach of innovation. Strengthening state institutions is therefore not just important, but urgent, as they form the foundation on which sustainable and inclusive national outcomes are built. As is said, Viksit Bharat will happen only through Viksit Rajya. A number of unique challenges specific to state universities and state-funded research institutions were identified during the consultation process. They are grouped under some key dimensions in **Table 3.6**, which are further discussed in detail subsequently.

Table 3.6: Key Dimensions of R&D Challenges in State Institutions

Dimension	Core Issues Identified
Systemic & Institutional Capacity Gaps, Funding constraints in State STI Ecosystems	Capacity gaps, Low extramural funding, Weak R&D culture, disparities across states, insufficient infrastructure, weak S&T Councils, administrative gaps, Burden of affiliations, Limited autonomy, Geographic & Connectivity constraints.
Human Resource & Academic Ecosystem Constraints	Vacancies, adhoc appointments, pay disparities, teaching overload, weak PhD ecosystem, attrition.
Grassroots Integration	Weak grassroots support, limited NIF integration.
Centre–State Coordination Gaps	Poor collaboration with central institutions, PAIR limitations, equipment transfer gaps.

3.6.1. Capacity Gaps in State Science and Technology Councils

The State Science and Technology Councils, created through enabling support from DST, function as nodal agencies at the state level for planning, promoting, and coordinating science and technology (S&T) activities. State universities and colleges often look forward to support and funding from State S&T Councils, given their role in capacity development and financial assistance. However, Councils themselves face considerable limitations in capability and resources, making it difficult for them to play an important role. Therefore, it is essential to enhance their capacity and improve the overall governance structure. This need has also been recognized by NITI Aayog in its 2025 report, “A Roadmap for Strengthening State Science & Technology (S&T) Councils”, which outlined measures to significantly empower State S&T Councils, enhancing their capacity and funding mechanisms. Effective implementation of the report’s recommendations is essential for strengthening the state S&T Councils. The recent initiatives by the state of Andhra Pradesh in S&T domain is an excellent example to be followed by other states.

3.6.2. Lack of Institutional Support for Grassroots Innovation in States

India's grassroots innovators contribute significantly in addressing the local and regional problems through technological innovations. While grassroots innovations play an extremely valuable role, many promising technologies developed by communities, individuals and informal innovators, do not have the support system for validation and scaling. In some states, the state S&T councils have established connections with the National Innovation Foundation (NIF) to promote grassroots innovators in the state, however, these are only initiative driven and not embedded in the councils systematically. By acting as nodal agencies, the State S&T councils, can on one hand support decentralised grassroots innovation activities, and on the other link these efforts with national institutions and programs. The NIF can play a major role in supporting grassroots innovations, however, it needs to be strengthened to be able to support a distributed network across states for supporting grassroot innovators.

3.6.3. Weak R&D Culture and Capacity in State Institutions

The STI capabilities of states and state institutions remain underdeveloped due to inadequate funding, limited research infrastructure, faculty shortages and overall weak R&D culture. The major issues affecting the R&D culture and capability of state institutions are following:

- (a) **Poor R&D funding:** State Universities and Institutions have very poor internal R&D funding and lesser opportunities of attracting extramural R&D funding. This limits their ability to undertake good quality research, upgrade laboratories, and support faculty and students. Another major challenge is the limited availability of seed funding, which is crucial for initiating new research ideas, establishing basic laboratory infrastructure, and generating preliminary results to develop strong proposals for securing competitive extramural R&D grants.
- (b) **Weak R&D Infrastructure:** State institutions often have limited or outdated research equipment and laboratories, which reduces exposure of researchers to state-of-the-art equipment. Even where facilities exist, poor maintenance limits their use. As a result, researchers in these institutions remain dependent on access to facilities in the central R&D institutions located in geographical proximity, which is not an easy task. There is a need to improve research infrastructure, improve connections between existing facilities, and actively establish new R&D facilities in state institutions.
- (c) **Burden of Affiliations:** Most state universities now have a major role as affiliating bodies for a large number of colleges. Managing and maintaining the affiliation activity takes a lot of time and energy of faculty and administration of Universities, leaving very little time to focus on research activities and institutional capacity building. Incentives and institutional support for good quality research are also inadequate, limiting the shift of culture in state institutions from teaching to active research. Faculty face restricted funding for conferences, professional development, and sabbaticals; hindering research, training, and collaboration.
- (d) **Vacant regular teaching positions:** A significant proportion of the sanctioned regular faculty positions in the state institutions often remain vacant. Universities make ad hoc arrangements in

the form of engaging contractual, ad-hoc, guest or other temporary appointments. The salaries of such appointees are often not attractive or at par with regular appointees, discouraging good candidates from taking up such assignments. Further, the prevailing rules of funding agencies make such appointees ineligible for extramural R&D funding. In many cases such appointees are not even considered eligible for any seed grants that may be provided by institutions from their own resources.

- (e) **Weak doctoral research ecosystem:** State universities face a lack of doctoral students due to inadequate funding for fellowships and low focus on research. Low doctoral enrolment and the migration of research scholars to centrally funded institutions (particularly to IIT's and other central institutions), further depletes research manpower and undermines the vitality of state-level R&D systems. A complete absence of a post-doctoral ecosystem further weakens research capability and quality.

3.6.4. Administrative Misalignments and Financial Rigidities in State Institutions

Researchers and scientists, in state institutions, often face several unique challenges in managing R&D activities and processes, due to administrative and financial misalignments. Some of the key bottlenecks are discussed below:

- (a) **Administrative Misalignments due to Dual Control Structures:** In many State institutions, Registrar, Finance Controller, and similar administrative positions are occupied by members of the state civil services. While the functional authority rests with the Vice-Chancellor, the actual control and accountability of such officers often remains with the State government. This duality leads to reduced administrative authority and autonomy of institutional leadership, which delays decision making.
- (b) **Inefficient Financial Procedures:** State institutions often operate under rigid financial norms that do not distinguish adequately between routine administrative procurement and research oriented procurement. Further, special provisions/ relaxations provided by the Government of India for scientific departments (e.g., those under GFR and GeM frameworks) are often not operationalized at the state level due to absence of enabling state-level circulars or lack of awareness.

3.6.5. Weak Centre-State Collaboration in STI

As the STI ecosystem has expanded, a dense network of centrally funded R&D institutions and HEIs has emerged across states. However, physical presence alone has not translated into effective integration with state academic and R&D systems. A state may be hosting numerous central institutions and yet there may be no or a minimal collaboration between these institutions and the state universities and R&D institutions. The following issues need to be addressed in this regard:

- (a) **Lack of a suitable Collaboration Framework:** At present there is no mandate or a well-defined framework to support collaboration of central R&D labs and HEIs located in a state, with the state government institutions. As these institutions are under administrative control of

different governments, there is no straightforward connection between them. As a result, the opportunities of application of the collective knowledge and expertise of such institutions to state specific problems reduce significantly.

- (b) Absence of mechanism for Equipment transfer:** As central institutions upgrade infrastructure, some functional equipment often becomes surplus and is underutilised or scrapped, despite being valuable for resource-constrained state institutions. There are no mechanisms at present to identify and transfer functional surplus R&D equipment from centrally funded institutions to smaller state institutions and universities, instead of disposing of them as scrap. Such transfers may enhance research and training capacity at low cost in state institutions, with minimal budgetary support for maintenance and operation.
- (c) ANRF's PAIR Program Issues:** Recently, ANRF introduced the Hub and Spoke model through the Partnerships for Accelerated Innovation and Research (PAIR) programme to promote research activities in state institutions. However, its current design tends to concentrate equipment and research infrastructure at hub institutions. The absence of explicit provisions for infrastructure creation at state partners, limits sustained capacity building. Therefore, suitable updates are needed in the PAIR programme to provide greater equipment support to state institutions.

3.6.6. Geographic and Connectivity Constraints

There are several R&D institutions and HEIs located in a geographically remote, high-altitude, or a high-humidity region, where a conducive environment for R&D activities is not straightforward. Researchers working in such environments often face harsh and extreme climatic conditions that directly affect health and productivity. Poor connectivity and long travel times create excess barriers which in turn make people feel secluded and isolated from the rest of the country. This weak physical and digital connectivity limits access to skilled manpower and creates a sense of instability in researchers. Institutions located in regions such as Ladakh, the North-East, and J&K often have these constraints. Further, eligible candidates from the local population from the tier 3 cities in such regions enter scientific R&D careers at a later stage, which could restrict their eligibility under existing “age-based” recruitment criteria.

Major Recommendations

3.6 (a) Empower State S&T Councils

State Science and Technology Councils need to be strengthened in capability and resources so that they are able to identify state specific STI needs, support R&D projects in state institutions, and help evolve a vibrant STI ecosystem in the state. NITI Aayog's 2025 report on the subject presents a roadmap to do this.

3.6 (b) Create a cell for supporting grassroots innovation in each State S&T Councils

Creating a dedicated Grassroot innovation cell within each State S&T Council will provide a platform to coordinate and support grassroots innovation across the state.

3.6 (c) Strengthen National Innovation Foundation (NIF)

A strengthened NIF can create a distributed network across states (with state S&T councils), for supporting grassroots innovators, and hence play a more effective role in promoting and supporting grassroot innovations in diverse areas ranging from engineered tools to traditional knowledge.

3.6 (d) Recruit Faculty on Regular Basis against sanctioned posts in State Universities

Appointment of regular faculty in state institutions would greatly strengthen the state research ecosystem by improving access to funding, ensuring continuity of research, and enhancing overall institutional capacity.

3.6 (e) Develop a suitable framework for collaboration between centrally funded R&D institutions/ HEIs with the state level HEIs and S&T institutions.

It is required to develop a suitable collaboration framework for strengthening collaboration and synergies between centrally funded R&D institutions/ HEIs with state institutions. Such collaborations can help improve the culture of R&D in state institutions and sensitize scientists and researchers in the central institutions to work on state level S&T challenges as well.

3.6 (f) Improve and expand the PAIR program

The PAIR program guidelines may be updated to include a higher level of equipment support to participating state institutions, in addition to mentoring. Further, more PAIR networks may be created, preferably one in each large state.

3.6 (g) Develop an enabling mechanism to transfer some of the functional R&D equipment in central institutions to state institutions

Transfer of additional (including old but functional) equipment in central institutions to state institutions can help provide access to costly equipment for researchers and students in state institutions. This can help improve their comfort level of working on high end equipment.

3.6 (h) Institute special Human Resources provisions for Hard Areas

Instituting attractive special provisions/ incentives for researchers working in institutions and labs situated in hard areas can help longer stay in such places, which in turn will help create a better sense of continuity and belongingness required for engaged R&D activities.

3.7 Monitoring, Evaluation, Capacity Building and Policy Administration

Effective governance of the STI ecosystem requires well-designed institutional mechanisms that systematically monitor policy implementation, generate reliable data for decision making, and strengthen both scientific and administrative capacities across institutions. The pathway towards developing a robust STI ecosystem calls for creation of stronger and more coordinated STI policy governance mechanisms, to ensure accountability, improving programme effectiveness, and facilitating timely policy correction. At present several specific challenges persist in the monitoring and evaluation, capacity building and training of personnel, and the administrative management of STI activities. These challenges are enumerated at a higher level in **Table 3.7**, and discussed later in detail.

Table 3.7: Structural Dimensions of Monitoring, Evaluation and Policy Administration Challenges in the STI Ecosystem

Dimension	Core Issues Identified
Policy Monitoring and Evaluation Frameworks	Absence of systematic mechanisms to track implementation, Limited feedback loops between programme outcomes and policy design, Lack of clearly defined output & impact indicators, Weak integration of evaluation findings into future policy formulation.
STI Data Systems and Analytical Capacity	Fragmented and delayed STI data collection, Limited institutional capacity for regular and standardized analytics, Gaps in benchmarking and global reporting.
Capacity Building for Science Policy and Administration	Limited opportunities for structured training of scientists and science administrators, Absence of mid-career programmes in science governance and policy evaluation, Inadequate institutional mechanisms to build administrative capabilities for managing complex STI programmes.

3.7.1. Absence of an effective framework to monitor effective implementation of policies

The existing STI management framework largely follows a linear flow, with limited feedback mechanisms to systematically monitor progress, and assess on-ground outcome & impact of policies, programmes, and funded projects. Policies and missions are often designed in absence of up to date and robust baseline data or foresight analysis. The implementation of projects is also often difficult to track in absence of clear outcome and impact indicators. Since, the outputs and outcomes of R&D programs and projects are not measured in an effective manner, lessons from past programs are not fed back into future policy design.

One of the best practices adopted worldwide is development of a set of STI indicators and maintaining scoreboards/dashboards for benchmarking and trend analysis (example: [EU/JRC](#) scoreboards and [OECD](#) indicator). It also helps in embedding continuous programme/mission reviews so that the policies may be adjusted to include emerging technologies and societal needs (as practiced by [KISTEP/ STEPI](#)). Similarly, [UKRI](#) also uses explicit evaluation frameworks for monitoring and evaluation feed back into programme design (<https://www.ukri.org/publications/uk-research-and-innovation-evaluation-strategy/ukri-evaluation-strategy/>). It also maintains a repository of past evaluations; synthesis reports and best practices case studies so new programmes don't repeat past mistakes. Such mechanisms can help improve the STI ecosystem.

3.7.2. Lack of a setup for systematic and periodic STI Data Collection and Analytics

Current operating mechanisms in STI data collection and analytics in the country exhibit variability in approach and consistency. The national-level exercises, primarily STI surveys and commissioned bibliometric studies are undertaken by DST, to systematically collect, analyse, and compile data on the country's science, technology, and innovation ecosystem. However, often these exercises are delayed and some of them are even carried out occasionally and hence the updated data for the country is not fed into relevant sources for different global indices and benchmarks (such as Global Innovation Index). Therefore, there is a greater need to strengthen systemic capabilities for STI data collection and analytics in a standardised, timely, and independent manner. Japan's NISTEP is a good example of such a dedicated institute. The Science & Technology Policy Institute of South Korea is another example. Several OECD countries also have this type of capability.

3.7.3. Limited Opportunities of Periodic Training of Scientist and Science Administrators

A widely observed issue across different scientific ministries and departments is the absence of a regular training and capacity building mechanism for science administrators. Most of the staff members may be very good scientists in their domains/disciplines, but they may lack the science administration skills, more so when it comes to managing and advancing programs in newer and critical areas of Science and Technology. Science administrators and scientists in scientific ministries and departments do not get suitable opportunities for periodic training and capacity building. Therefore, there is a need for a dedicated setup to support and coordinate training in policy design, program evaluation, and science governance roles, along with periodic capacity building in new and emerging areas of science & technology.

Major Recommendations

3.7 Establish a National Institute for Science Policy and Governance (NISPG)

The proposed institute can bridge gaps in analytics, policy design, monitoring, regular capacity building, and governance across the STI ecosystem (**Refer Box 5**).

Box 5**National Institute for Science Policy and Governance****Objective**

To bridge policy, implementation and monitoring gaps in India, a National Institute for Science Policy and Governance (NISPG) may be established as a leading national nodal institution, or as an autonomous institute or attached office under DST, with a high degree of functional autonomy. It may help in standardisation of evaluation frameworks, impact assessment processes and policy coherence mechanisms, similar to STEPI (South Korea) and NISTEP (Japan).

Operational Scope

Major roles of such an institute may include (but not limited to):

- I. STI Data Collection and Analytics
- II. Monitoring and Evaluation
- III. Policy and Governance
- IV. Capacity Building of science administrators.

For roles (i) and (ii), NISPG will be the central hub/repository for STI data collection, analytics, foresight, monitoring and evaluation across the full R&D lifecycle-inputs, outputs, outcomes and societal impact. It will develop national STI indicators, and implementation/compliance scorecards for all scientific ministerial and inter-departmental policies and missions. For (iii), it will strive to benchmark Indian STI governance against global standards and rankings (indices) taking insights from their best practices.

With respect to the capacity-building role (iv), NISPG can serve as India's premier training institute for capacity building of science administrators and scientific leadership in R&D institutions. The institution can provide induction as well as mid-career training and organize focused workshops on topics of national importance. Two examples from other sectors include the AJNIFM and the NCGG. The proposed institution can also bring in active participation of the Indian science academies and also liaison with relevant international organizations and bodies like OECD, ISSI, CWTS etc.

Charting the Road Ahead: Towards a robust & future-ready R&D Ecosystem



4.1 Summary of Recommendations and Actions

A vibrant research ecosystem thrives when administrative and financial systems function as enablers rather than controllers. The consultations undertaken as part of the EoDR&D initiative clearly emphasized that our scientific potential is not constrained by talent or ambition, but often by procedural rigidity, disorganized processes, and delayed decision-making. Through structured consultations, including eight focused meetings with researchers, institutional leaders, funding agencies; the critical bottlenecks affecting India's R&D landscape were identified and examined in depth.

The recommendations presented in this section are aimed at transitioning the R&D framework from a compliance-driven architecture, to a systematic, facilitation-oriented, trust-based, and outcome-focused system. These recommendations seek to enhance agility in funding and procurement, strengthen institutional capacities, enable talent mobility and retention, improve technology translation, and embed robust monitoring mechanisms aligned with national priorities. Together, these measures are intended to create an enabling ecosystem where researchers can operate with greater autonomy, accountability, and confidence - thereby positioning the R&D system to meet emerging scientific and technological challenges.

The major recommendations emerging from the consultative process, detailed in Chapter 3, are outlined below in **Table 4.1**, along with the proposed mapping for action by relevant Ministries/ Departments/ Agencies.

Table 4.1: Summary of Recommendations

S.N.	Topic	Recommendation	Action/ Implementation By
1	<i>R&D Funding and Utilization</i> (Ref. Section 3.1)	Raise GERD from 0.64% to at least 2% of GDP, in the next four to five years to strengthen India's research base and achieve Viksit Bharat 2047 goals.	DST and DoE
		Introduce time-bound incremental fiscal incentives linked to additional R&D spend and promote industry-led research centres within public institutions.	DSIR and DoR
		Introduce an optional R&D Expenditure reporting line under Schedule III of the Companies Act, 2013 (Section 129) to improve visibility of private sector R&D investments and encourage higher spending.	MCA
		Strengthen CSR provisions under the Companies Act and provide higher tax deductions for individual donations to R&D-supporting funds under Section 133 of the Income Tax Act, 2025 to enhance philanthropic and CSR funding for R&D.	DSIR and DoR
		Create an inter-departmental coordination committee to regularly align schemes and funding calls across departments and minimize duplication.	DST, DBT, DSIR, ANRF

1	<i>R&D Funding and Utilization</i> (Ref. Section 3.1)	Mandate a maximum six-month processing timeline for R&D proposals, with a four-month target to improve predictability and reduce delays.	DST, DBT, DSIR, ANRF & other scientific ministries
		Create dedicated Project Management Units within funding agencies to manage post-approval administration, ensuring faster disbursement and reduced burden on scientists.	DST, DBT, DSIR, ANRF & other scientific ministries
		Adopt direct grant transfers for extramural R&D to expedite fund flow, while continuing TSA/ Hybrid models for larger institutional grants.	DST and DoE
		Allow institutional flexibility for reallocation within capital and revenue heads to enable timely project execution without repeated approvals.	DST, DBT, DSIR, ANRF & other scientific ministries
		Enable streamlined procurement of research consumables through expanded exclusions or facilitating institutions to do rate contracts.	DST and DoE
		Consider a reduced 5% GST slab for R&D-related procurements to maximise effective utilization of limited research grants.	DSIR and DoE
		Provide higher overheads to support infrastructure maintenance and long-term equipment sustainability.	DST, DBT, DSIR/ CSIR, & ANRF
2	<i>Attracting and Retaining Quality Human Resource</i> (Ref. Section 3.2)	Increase the number of postdoctoral fellowships in S&T by 20% annually, for the next few years, to strengthen the national postdoctoral research ecosystem.	DST, DBT, DSIR, DHE, ICAR, ICMR
		Establish Vigyan Nidhi, a digital fellowship platform enabling direct benefit transfers and structured support for postdocs, mobility grants, and industry-linked research positions.	DST, DBT, DSIR/ CSIR and DHE
		Empower institutions to rationalise faculty allocations and adopt flexible hiring models within approved budgets to accelerate recruitment and improve FTE strength.	DST, DBT, DSIR/ CSIR and DHE
		Introduce performance-linked incentives and equity-based models to reward excellence and promote long-term research commitment.	DST, DBT, DSIR/ CSIR and DHE
		Standardise pay structures across autonomous R&D institutions and offer competitive packages for mission-critical national initiatives.	DST, DBT, DSIR/ CSIR, and ANRF
		Develop focused mid-career training and capacity-building programs for scientists, researchers, and university faculty.	Indian Science Academies with DST
Implement clearly defined teaching-focused, research-focused, and administrative tracks to align roles with expertise and enhance institutional productivity.	DHE		

S.N.	Topic	Recommendation	Action/ Implementation By
3	<i>Institutional Structures and Processes</i> (Ref. Section 3.3)	Set up professionally staffed R&D Offices as single-window hubs for grant management, compliance, procurement, and funding agency coordination.	DST, DBT, DSIR/ CSIR and DHE
		Create dedicated research administrator roles with defined career pathways, specialised training, and performance metrics aligned with research facilitation outcomes.	DST, DBT, DSIR/ CSIR and DHE
		Develop and periodically update clear institutional guidelines covering IP, industry collaboration, infrastructure sharing, and research governance processes.	DST and DHE
		Transform administrative systems from a compliance-centric orientation towards trust-based administration. Majority of the administrative functions should suffice with self-declaration or self-certification by researchers.	DST, DBT, DSIR/ CSIR and DHE
		Establish clearly defined performance targets for institutional leaders and consider performance-linked incentives to strengthen accountability and improve institutional R&D outcomes.	DST, DBT, DSIR/ CSIR and DHE
		Adopt a decentralized decision-making framework by delegating defined administrative and financial powers for R&D to Heads of Departments and enabling trust-based self-certification for routine research processes to reduce procedural delays.	DST, DBT, DSIR/ CSIR and DHE Institutions
		R&D institutions should clearly identify priority research areas based on their existing strengths, faculty/researcher expertise, and national relevance.	Institutions under DST, DBT, DSIR
		Develop an Ease of Doing R&D assessment framework and require institutions to conduct periodic self-assessments, with a standardized national scoring mechanism integrated into existing benchmarks or as a separate system.	DST, DBT, DSIR/ CSIR, DHE and NITI Aayog
		Implement faculty and researcher entrepreneurship policies with flexible time allocation, transparent revenue-sharing, and an updated framework reflecting current innovation and startup ecosystems.	DSIR to notify knowledge equity policy and DST, DBT, CSIR and DHE to adopt

4	<p style="text-align: center;"><i>Technology Development, Translation & Commercialization</i></p> <p style="text-align: center;">(Ref. Section 3.4)</p>	Embed and strengthen Technology Transfer Offices (TTOs) within R&D institutions to facilitate effective research commercialization.	DST, DBT, DSIR/CSIR and DHE
		Develop standard model/guiding templates for MoUs on technology co-development to strengthen academia-industry collaboration and reduce timelines.	DST, DBT, DSIR/CSIR and DHE
		Develop a framework to enable industry-academia mobility of scientists and researchers through joint appointments, flexible affiliations, and dedicated support mechanisms.	DST, DBT, DSIR/CSIR and DHE
		Create State-level RDI Clusters by integrating HEIs, industry, and MSMEs under a Centre-State model to provide shared TTO, IP, incubation, and TRL infrastructure.	DST, DBT, DSIR/CSIR and DHE, coordinated by NITI Aayog
		Establish a standardised IP framework for co-funded research with clear ownership, revenue-sharing, and access norms to enhance industry participation.	DST and DoE
		Amend ESOP taxation provisions to allow employees in deep-tech startups to defer tax liability until actual monetisation of shares rather than at the time of exercise.	DoR with CBDT
		Broaden the mandate of Technology Business Incubators to provide end-to-end, cross-disciplinary support from innovation to commercialisation, including mentoring in finance, legal/regulatory, marketing, and social innovation.	DST, DBT, DSIR/CSIR
		Develop a linking framework across incubators under different ministries and departments to enhance capacity, integration, and synergy within the incubation ecosystem.	Atal Innovation Mission (AIM), NITI Aayog or DPIIT
		Strengthen domestic certification mechanisms to improve market access for deep-tech startups and MSMEs and reduce reliance on foreign certification agencies.	DPIIT
		Establish a Centre for Technology Indigenization (CTI) to identify priority technologies for indigenization, maintain a centralized repository, and coordinate with MSMEs to support domestic capability development.	DST
Develop a widely accepted TRL assessment framework and notify nodal institutions to address disputes in TRL assessment.	DST		
Develop a legally anchored, cross-sectoral regulatory sandbox framework for deep-technology domains with clear eligibility norms, inter-agency coordination, and time-bound evaluation mechanisms.	DPIIT		

5	<i>Access to Knowledge & Resources</i> (Ref. Section 3.5)	Expand ONOS to include private institutions on a cost-sharing basis and integrate high-quality journal and global patent database subscriptions.	DHE
		Negotiate national or consortia-based licenses for advanced research software and simulators to ensure equitable access and cost efficiency.	DHE
		Explore establishing a National R&D Repository to enable integrated, web-discoverable access and sharing of Indian research outputs and data.	DST
		Develop quality indexed Indian journals through a professionally managed ecosystem, leveraging the expertise of Indian science academies.	DST and CSIR
6	<i>R&D in State Institutions</i> (Ref. Section 3.6)	Strengthen State S&T Councils through enhanced project-based funding and technical support to improve coordination and implementation capacity.	State Governments, and DST
		Establish dedicated grassroots innovation cells within State S&T Councils to identify, mentor, and scale local innovations.	State S&T Councils, and DST
		Provide enhanced resources to NIF to build a coordinated state-level innovation support network in partnership with State S&T Councils.	DST
		Recruit regular faculty against sanctioned posts in State Universities to strengthen research capacity and continuity in the state research ecosystem.	State Governments
		Develop a framework to enable collaboration between centrally funded R&D institutions/ HEIs and state-level HEIs and S&T institutions, with State S&T Councils acting as facilitators.	DST, DBT, DSIR/ CSIR and DHE in collaboration with NITI Aayog and State Government
		Expand and strengthen the PAIR programme to include targeted equipment support for participating state institutions.	ANRF
		Institutionalise mechanisms for transferring usable surplus equipment from central institutions to resource-constrained state universities.	DST, DBT, DSIR/ CSIR and DHE, State Government
		Institute special human resource incentives for researchers working in institutions located in hard areas to promote longer tenure and strengthen continuity in R&D activities.	DST, DBT, DSIR/ CSIR and DHE

7	<i>Monitoring, Evaluation, Capacity Building and Policy Administration</i> (Ref. Section 3.7)	Set up a National Institute for Science Policy and Governance (NISPG) to bridge the Analytics, Policy, Monitoring, Governance and capacity building gaps.	DST to setup
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4.2 Towards an Enabling R&D Ecosystem

As India advances towards the vision of Viksit Bharat @ 2047, it is equally important to improve research quality, accelerate technology development and translation, increase industry participation, and develop globally competitive scientific institutions across the country. Achieving this will require sustained commitment, inter-governmental coordination, and measurable implementation outcomes. To support sustained progress and accountability, a structured Ease of Doing Research and Development (EoDR&D) Assessment Framework may be developed to systematically evaluate how effectively institutions enable and support R&D activities. Over time, such assessments should become intrinsic to the R&D culture of institutions, promoting continuous improvements in research governance and institutional practices. The framework should also be periodically reviewed and updated, in coordination with relevant national agencies, to reflect evolving R&D dynamics and ensure its continued effectiveness in the national and global context.

Institutions should undertake periodic self-assessments based on defined parameters covering research administration, funding processes, collaboration frameworks, infrastructure, and translational support. At the national level, a standardized scoring mechanism may be introduced, either embedded within existing institutional benchmarking systems such as NIRF, NAAC, or through a dedicated independent assessment framework. Such an approach would help create transparent performance benchmarks, incentivise institutional reforms, and enable continuous monitoring of improvements in the research ecosystem. NITI Aayog may coordinate this exercise in collaboration with different scientific departments and agencies.

By systematically removing procedural bottlenecks and reinforcing enabling conditions with the recommendations highlighted in the report, India can strengthen the operational foundations of its R&D ecosystem. Such reforms will be crucial in enhancing research productivity, attracting and retaining high-quality talent, improving translational outcomes, and ensuring that scientific advancement contributes effectively to long-term national development priorities.

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